Bear Valley Creek 4b Justification



The dorsal fin of a chinook salmon breaks the surface of Upper Bear Valley Creek (AU 12_02a).

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February 2011

Bear Valley Creek 4b Justification

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Table of Contents

LIST OF FIGURES ..... **V**

LIST OF TABLES ..... **VI**

ABBREVIATIONS, ACRONYMS, AND SYMBOLS ..... **VII**

1. INTRODUCTION **11**

Bear Valley Creek and Elk Creek Watersheds **14**

Forest Service Management Boundaries and Direction **16**

Geology **25**

Hydrology **25**

Channel Characteristics **26**

Fisheries **28**

Vegetation **30**

Fires **30**

Grazing **37**

Mining **40**

2. BEAR VALLEY WATERSHED 4B JUSTIFICATION **42**

1. Identification of Segment and Statement of Problem Causing the Impairment including Identification of Sediment Goals 42
2. Description of Pollution Controls and How they will Achieve Water Quality Standards 74
3. Estimated or Projected Time When Water Quality Standards will be Met 85
4. Schedule for Implementing Pollution Controls 86
5. Monitoring Plan to Track Effectiveness of Pollution Controls 87
6. Commitment to Revise Pollution Controls as Necessary 89

REFERENCES CITED **92**

GLOSSARY **96**

APPENDICES **109**

LIST OF FIGURES

Figure 1.1 Bear Valley Watershed Area Vicinity and Subwatersheds 13
Figure 1.2 US Forest Service, Bear Valley Management Area, Management Prescription Categories 20
Figure 1.3 Watershed Restoration Category and Aquatic Conservation Strategy Priority Subwatersheds 24
Figure 1.4 Bear Valley Creek Average Monthly Flow (USGS 2007) 26
Figure 1.5 Stream gradient in Bear Valley and Elk Creek Watersheds 27
Figure 1.6 Past fires in the Bear Valley Watershed 32
Figure 1.7 Recent Wildfire (2006-2007) Severity Class 33
Figure 1.8 Roads and Trails in the Bear Valley and Elk Creek Watersheds 36
Figure 1.9 Historic Grazing Allotments 39
Figure 1.10 Big Meadows Dredge Mining Restoration Area, 2008. 41
Figure 2.1 Bear Valley Watershed IDEQ 2010 Proposed Category 4b Assessment Units. 44
Figure 2.2 Bear Valley 5th Order % Surface Fines (IDEQ 2008) 48
Figure 2.3 PIBO data: Percent fine sediment (<6mm) metric score for Bear Valley streams compared to all reference sites in the Upper Columbia River Basin. 53
Figure 2.4 PIBO Macroinvertebrate Data for the Boise National Forest: Managed sites, Reference Sites and Bear Valley Sites (only Bearskin Creek) 55
Figure 2.5 Trends in percent fines (least squares line fit) for monitoring sites in Bear Valley showing a steeper trend for years prior to 2000 than for the all years through 2008 (Burton 2008). 56
Figure 2.6 Snow water equivalent (inches) at the Banner Summit Snotel Station for years 1994 to 2001 and 2008, analogous to the monitoring years in Bear Valley (USDA SNOTEL 2010). 57
Figure 2.7 Trends in average streambank stability at monitoring sites on Bear Valley Creek (BV), Elk Creek (Elk), and tributaries (Tribs) as compared with trends at the reference sites Porter Creek and Fir Creek 58
Figure 2.8 Trends in Winward Stability Ratings as compared with trends at reference sites for stations in Bear Valley Creek (BV), Elk Creek (ELK), and tributaries (Tribs). 59
Figure 2.9 Ecological status trends at monitoring sites in Bear Valley Creek (BV), Elk Creek (Elk), and tributaries (Tribs) showing trends in comparison to trends at the reference sites (purple) 60
Figure 2.10 Substrate fine sediment trends at monitoring sites in Bear Valley Creek (BV), Elk Creek (Elk), and tributaries (Tribs) as compared to trends at the reference sites 61
Figure 2.11 Relationship between the number of age 0+ Chinook salmon parr and the number of redds the previous year from 1989-2003 in Upper Bear Valley Creek AU ID17060205SL012_02a. (H.Ray, Shosone Bannock Tribes, personal communication 2005) 65
Figure 2.12 Relative abundance of macroinvertebrate groups within the enhancement area pre (1992) and post (2004) enhancement in Upper Bear Valley Creek (H.Ray, Shoshone-Bannock Tribes, personal communication 2005) 66
Figure 2.13 Average percent surface fine sediment < 8 mm below and within the enhancement area in Upper Bear Valley Creek between 1984 and 2004 (H. Ray, Shoshone-Bannock Tribes personal communication 2005). 66
Figure 2.14 GRAIP Drain points actively delivering sediment (Fly et al 2011) 71

List of Tables

Table 1.1 Water Quality Impaired Bear Valley Assessment Units proposed in 2010 for 4b Listing 12
Table 1.2 Bear Valley Watershed Physical and Stream Characteristics 14
Table 1.3 Elk Creek Watershed Physical and Stream Characteristics 15
Table 1.4 Boise Forest Plan Management Prescription Categories (USFS 2003) and FC-RONR Wilderness within the Bear Valley Watershed 19
Table 1.5 Fire History in Bear Valley (acres burned) 31
Table 1.6 Road length, miles with a riparian conservation area and density (miles of road length per miles squared of area) for the Bear Valley Watershed by sub-watershed (HUC6). 34
Table 1.7 Bear Valley Watershed Grazing Management Actions 38
Table 2.1 Water Quality Impaired Bear Valley Assessment Units proposed in 2010 for 4b Listing 43
Table 2.2 IDEQ BURP Scores for Bear Valley Sites 46
Table 2.3 303(d) Listing History in Bear Valley and Elk Creeks 49
Table 2.4 PIBO Bank stability and Percent fines data (2001-2009), (PIBO 2009) .. 51
Table 2.5 PIBO habitat index approach: Regression model used to score percent fine sediment (Al-Chokhachy et al 2010). 53
Table 2.6 GRAIP Stream sediment load values by subwatershed (HUC6). 68
Table 2.7 GRAIP Stream sediment load values by Assessment Unit. 70
Table 2.8 Percent Surface Fines in Four Streams affected by the Red Mountain Fire 73
Table 2.9 Percent Accumulated Road Sediment over Inherent Reference Sediment (tons/mi^2/yr) by Assessment Unit Meeting Beneficial Uses 76
Table 2.10 Percent Accumulated Road Sediment over Natural Reference Sediment (tons/mi^2/yr) by Assessment Unit included in 4b. 77
Table 2.11 General Summary of Pollution Controls Already in Place 78
Table 2.12 Predicted Change in Percent Accumulated Road Sediment over Natural Reference Sediment as a result of Road Improvement Actions for the 4b Assessment Units 83
Table 2.13 Predicted Change in Percent Accumulated Road Sediment over Natural Reference Sediment as a result of Road Improvement Actions for the Assessment Units Meeting Beneficial Uses 84
Table 2.14 Schedule for Implementing Pollution Controls, 2010-2020. 86
Table 2.15 Parameter estimates, model structure, and model fit from reference-reach multiple regression models used to score individual metrics for each dependent variable in the index (Al-Chokhachy et al 2010) 88
Table 2.16 Proposed IDEQ, USFS, EPA Monitoring and Assessment Schedule ... 91

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)

ACS Aquatic Conservation Strategy

AU Assessment unit

BAER Burned Area Emergency Rehabilitation

BLM Bureau of Land Management

BMP Best management practice

BNF Boise National Forest

BOISED Boise National Forest Sediment Model

BPA Bonneville Power Administration

BURP Beneficial Use Reconnaissance Program

BVW Bear Valley Watershed (including the Bear Valley Creek and Elk Creek Watersheds

C Celsius

cfs cubic feet per second

C&H Cattle and Horse

CWA Clean Water Act

CWAL Cold water aquatic life

EPA United States Environmental Protection Agency

EPT Order of Insects: Emphemeroptera, Plecoptera, Trichoptera

ESA Endangered Species Act

FCRONR Frank Church River of No Return Wilderness

GRAIP Geomorphic Road Analysis and Inventory Package

HUC Hydrologic Unit Code

IDASA Idaho Assessment Database Supplemental Application

IDEQ Idaho Department of Environmental Quality

IDFG Idaho Department of Fish and Game

INFISH Federal Inland Native Fish Strategy

IRG Integrated Report Guidance

km kilometer

km^2 square kilometer

m meter

m^3 cubic meter

MA Management area

mi mile

mi^2 square miles

MPB Mountain pine beetle

MPC Management Prescription Categories

NA Not assessed

NB Natural background

nd no data (data not available)

NF National Forest

NFS National Forest System (USFS road designation)

NFS Not fully supporting (IDEQ designation)

NMFS National Marine Fisheries Service (former name of NOAA Fisheries)

NOAA National Oceanic and Atmospheric Administration

ORV Outstandingly remarkable value

ORW Outstanding Resource Water

PACFISH Federal Pacific Anadromous Fish Strategy

PIBO PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program

PNC Potential Natural Community

RAC Resource Advisory Committee

RCA Riparian conservation area

SBI USFS GRAIP's Stream Blocking Index

SFI IDEQ's Stream Fish Index

S & G Sheep and Goat allotment

SHI IDEQ's Stream Habitat Index

SMI IDEQ's Stream Macroinvertebrate Index

SWIE Southwest Idaho Ecogroup

SWRA Soil, Water, Riparian and Aquatic resources

T&E Threatened and/or endangered species

TEPCS Threatened, endangered, proposed/petitioned, candidate and sensitive species

TMDL Total Maximum Daily Load

USFS United States Forest Service

WARS Watershed and Aquatic Recovery Strategy

WQS water quality standard

1. Introduction

This document contains the State of Idaho and the U.S. Forest Service's (USFS) justification for Integrated Report Category 4b listings for Bear Valley Creek and Elk Creek. This demonstration is submitted to the Environmental Protection Agency (EPA) as part of the Idaho Department of Environmental Quality's (IDEQ) 2010 Integrated Report. EPA regulations recognize that alternative pollution control requirements may obviate the need for a total maximum daily load (TMDL) analysis. Specifically, assessment units (AU) are not required to be included on the Section 303(d) list if "other pollution control requirements (*e.g.*, best management practices) required by local, State, or Federal authority" are stringent enough to implement applicable water quality standards within a reasonable period of time. Waters with these alternatives to TMDLs may be included in Category 4b of a State's Integrated Report, in lieu of Category 5 (i.e. 303(d) list). Four assessment units within the Bear Valley and Elk Creek watersheds are proposed for inclusion within Category 4b of Idaho's Integrated Report, based on this document.

The IDEQ and USFS will address the following six elements as described in the US Environmental Protection Agency's (EPA) Integrated Report Guidance (IRG) for Sections 303(d), 305 (b), and 314 of the Clean Water Act (USEPA 2005:2006)

1. Identification of impaired assessment unit and statement of problem causing the impairment;
2. Description of pollution controls and how they will achieve water quality standards;
3. An estimate or projection of the time when water quality standards will be met;
4. Schedule of implementing pollution controls;
5. Monitoring plan to track effectiveness of pollution controls; and
6. Commitment to revise pollution controls, as necessary.

EPA lists specific circumstances in which a waterbody can be placed in section 4b of the Integrated Report (EPA 2008 IRG, specifically attachment #2). This section is for those water bodies which have already implemented some or all of certain measures that will result in attainment of water quality standards in that waterbody in a reasonable time.

The Bear Valley Watershed (BVW) includes two 5th HUC watersheds: Bear Valley Creek and Elk Creek and seven 6th HUC subwatersheds (Figure 1.1). Both the 2003 Boise National Forest Land and Resource Management Plan (Boise Forest Plan)

and the updated 2010 Bear Valley Watershed Analysis (USFS 2010) contains directives to reduce nonpoint source loading to this watershed. Furthermore, the US Forest Service and its partners have implemented a substantial amount of these measures (see Appendices 1 and 2) that would have the largest benefit to water quality (rehabilitation of the dredge mining area and cessation of livestock grazing).

IDEQ's assertion is that assessment units (AU) in the Bear Valley watershed (Table 1.1) meet the above criteria. Boundaries and data for the specific assessment units will be discussed in Section 2.

Table 1.1 Water Quality Impaired Bear Valley Assessment Units proposed in 2010 for 4b Listing

Assessment Name	Stream name	Pollutant	Miles	Beneficial Uses **
17060205SL012_02a	Upper Bear Valley Creek and tribs –1st and 2nd order	Sediment	28.9	undesignated
17060205SL012_05	Bear Valley Creek 5th order	Sediment, Temperature*	11.24	undesignated
17060205SL013_03	Bearskin Creek – 3rd order	Sediment	1.83	undesignated
17060205SL013_04	Elk Creek – 4th order	Sediment	8.94	undesignated

*Temperature will be addressed in a future analysis by IDEQ.

** IDEQ presumes undesignated surface waters to support cold water aquatic life and primary or secondary contact recreation beneficial uses.

Hence forth in this document we will abbreviate the AU identifier from its 8 digit 4th order to simply its water body identification and stream order (e.g. 012_02a) in order to avoid repetition.

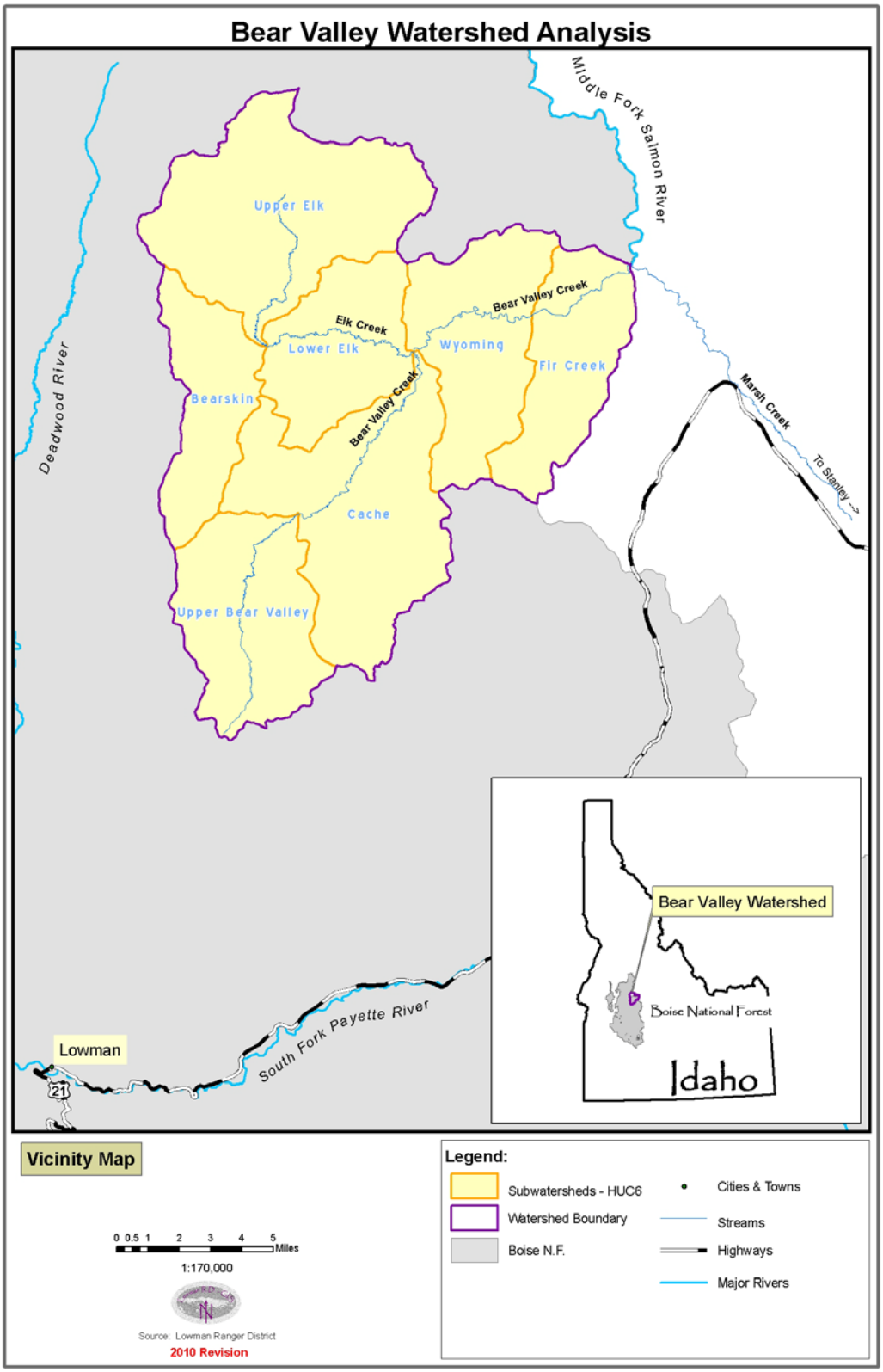


Figure 1.1 Bear Valley Watershed Area Vicinity and Subwatersheds

The Bear Valley Creek Watershed has been largely impacted by historic dredge mining activities and to a lesser extent grazing. Roads within the watershed are also a source of sediment. Impacts from recreation were identified as not being significant sources of sediment (USFS 2010). The main pollutant stressor in the watershed is sediment. Both mining and grazing have ceased in the watershed. Over the last 20 years, numerous stream improvement projects have been implemented to address water quality and aquatic habitat issues arising from the historic mining and grazing activities.

Bear Valley Creek and Elk Creek Watersheds

Bear Valley Creek flows 20 miles in a northerly direction before it joins Marsh Creek to form the Middle Fork Salmon River (Figure 1.1). This fifth order stream is an important spawning and rearing stream for Endangered Species Act (ESA) – listed chinook salmon, steelhead and bull trout. Bear Valley Creek's watershed area comprises about 23% of the Upper Middle Fork watershed and less than 4% of the entire Middle Fork Salmon River, which include two subbasins (Upper and Lower Middle Fork of the Salmon River). Its drainage area is approximately 191 square miles and contains about 393 total perennial stream miles. The high point in the watershed is 9,526 feet at the summit of Cape Horn Mountain while the low point is 6,300 feet at the mouth of Bear Valley Creek. Bear Valley Watershed is divided by Bear Valley Creek nearly down the middle. Valley sides rise moderately steep to steeply to the upland mountains. Broad valleys filled with glacial and alluvial deposits of highly erosive sandy soils and low gradient meandering streams characterize the valley bottom.

This introductory section 1 will discuss the Bear Valley Watershed (BVW) area in general (this includes Elk Creek) (Table 1.2), then characteristics specific to Elk Creek will follow in Table 1.3.

Table 1.2 Bear Valley Watershed Physical and Stream Characteristics

Parameter	Value
Channel Types Found (Rosgen 1995)	A/B/C
Area in Square miles	192
Relief in feet	3,360
Average elevation in feet	7,080
Average area slope in percent	23
Percent of area with slope greater than 30%	31
Percent of area with slope greater than 30% and north facing slope	10

Parameter	Value
Percent of area covered by forest	70
Mean annual precipitation in inches	30
Hydrologic regime	Snowmelt/Rain
Q1.5 (CFS estimated bankfull discharge)	1810
Q10 (CFS 10 year estimate of peak flow)	3200
Base flow (CFS 20 year minimum estimate of low flow in February)	70

USGS 2010

Elk Creek, part of the BVW, originates at approximately 7382 feet and is approximately 79 square miles in drainage area size. Generally, a sinuous, low gradient stream, Elk Creek meanders through meadows before flowing into Bear Valley Creek.

Elk Creek is the largest tributary to Bear Valley Creek and is roughly the same size as Bear Valley Creek when it enters Bear Valley Creek. Tributaries to Elk Creek include the North Fork, West Fork and East Forks of Elk Creek, Bearskin Creek and Porter Creek. General watershed characteristics are listed in Table 1.3.

Table 1.3 Elk Creek Watershed Physical and Stream Characteristics

Parameter	Value
Channel Types Found (Rosgen 1995)	A/B/C
Area in Square miles	79
Relief in feet	2,110
Average elevation in feet	7,010
Average area slope in percent	22
Percent of area with slope greater than 30%	20.1
Percent of area with slope greater than 30% and north facing slope	8
Percent of area covered by forest	67
Mean annual precipitation in inches	31
Hydrologic regime	Snowmelt/Rain
Q1.5 (CFS estimated bankfull discharge)	869
Q10 (CFS 10 year estimate of peak flow)	1560
Base flow (CFS 20 year minimum estimate of low flow in February)	30.8

USGS 2010

Forest Service Management Boundaries and Direction

The entire watershed is public land managed by the National Forest System (NFS). Most of the land is administered by the Lowman Ranger District of the BNF, although some road segments are administered by the Salmon-Challis National Forest.

The BVW is bordered by the Boise National Forest to the west and south, the Salmon-Challis National Forest to the east, and the Frank Church - River of No Return Wilderness (FCRONR) to the north. The watershed contains 37,576 acres of the southernmost portion of the FCRONR. This portion of the wilderness comprises 31% of the BVW and is managed by the adjacent Salmon-Challis National Forest. The Forest Service has recommended the Red Mountain area for Wilderness designation.

All or portions of seven roadless areas, totaling 29,174 acres, are within the BVW. Four of the areas are adjacent to the FCRONR. An estimated 62 percent of the area is inventoried as roadless, including all of the Blue Bunch, Poker Meadows, Nameless Creek, and Tennessee Roadless Areas, and portions of the Red Mountain, Whitehawk Mountain, and Bernard Roadless Areas.

The Boise Forest Plan (USDA 2003) identifies management areas, for which specific direction is developed. The Bear Valley management area (MA 12) lies adjacent to the FC-RONR Wilderness.

Comprehensive descriptions and details of management area prescriptions are defined in Chapter 3 of the Boise Forest Plan (USDA 2003). As a result of the 2003 Forest Plan, all the previous forest land identified as “suited timber base” was changed to “non-suited timber base. Currently, none of the BVW is included in the suited timber base for the BNF. The Management Prescription Categories (MPCs) define what types of management can occur within those lands. The MPCs for BVW are Recommended Wilderness, Wild and Scenic Rivers and their Corridors, Passive Restoration and Maintenance of Aquatic, Terrestrial and Hydrologic Resources, and Active Restoration and Maintenance of Aquatic, Terrestrial, and Hydrologic Resources (Tables 1.4, 2.8 and Figure 1.2 and 1.3). The MPCs for BVW are described below.

MPC 1.2 – Recommended Wilderness

This prescription applies to areas the Forest Service recommends for Wilderness designation. The primary management objective is to maintain

wilderness attributes until Congress decides to designate the areas as wilderness or release them to some other form of management. Although these areas do not fall under the authority of the Wilderness Act, they are managed to maintain wilderness attributes where feasible, and to generally allow ecological processes to prevail.

MPC 2.1 – Eligible Wild and Scenic Rivers and Their Corridors

This prescription applies to areas that are eligible orhave been Congressionally designated as Wild, Scenic, or Recreational Rivers and their associated land corridors, which extend an average of 0.25 mile from each bank. There are no Congressionally designated Wild , Scenic or Recreational Rivers within the BVW. However, portions of two eligible Wild and Scenic Rivers are within the BVW, Bear Valley Creek and Elk Creek. Bear Valley Creek is considered eligible because its outstandinly remarkable cultural resource value. Elk Creek is considered eligible because of its outstanginly remarkable wildlife value. Wild and Scenic Rivers and their corridors are managed to protect their free-flowing waters, outstandingly remarkable values (ORVs), and their classification status. A “Wild” classification is the most primitive or least developed. These rivers have essentially undeveloped corridors and are generally inaccessible except by trail. “Scenic” river corridors may have some development, and are accessible in places by roads. “Recreational” rivers are readily accessible by roads and often have development within their corridors.

MPC 3.1 – Passive Restoration and Maintenance of Aquatic, Terrestrial and Hydrologic Resources

This prescription is designed to minimize temporary-term risks and avoid short- and long-term risks from management actions to soil/hydrologic conditions and aquatic and terrestrial habitats. The objective of 3.1 is to keep management-related impacts from degrading existing conditions for threatened, endangered, proposed/petitioned, candidate species (TEPCS) fish, wildlife, and botanical species, or 303(d) impaired water bodies. Low levels of management activities occur, and these activities are expected to have minimal and temporary degrading effects to soils, water quality, riparian areas, and aquatic and terrestrial habitats. Other uses and activities, such as salvage harvest or Wildland Fire Use, may occur and may have some temporary effects, provided they do not retard attainment of short- and long-term objectives for aquatic and terrestrial habitat, or soil/hydrologic resources. Tools associated with this prescription—such as special order restrictions, operating plan adjustments, and prescribed fire—are typically of low intensity and designed to maintain existing conditions, primarily through ecological processes.

MPC 3.2 – Active Restoration and Maintenance of Aquatic, Terrestrial, and Hydrologic Resources

This prescription is designed to minimize temporary and short-term risks and avoid long-term risks from management actions to soil/hydrologic conditions and aquatic and terrestrial habitats. The objective of this prescription is to actively restore or maintain conditions for TEPCS fish, wildlife, and botanical species, or 303(d) impaired water bodies through a combination of management activities and natural processes. Management activities used to achieve this objective include watershed restoration, noxious weed treatments, and vegetative treatments that include prescribed fire, wildland fire use, and mechanical. Restoration is focused on those components of the ecosystem that are not functioning properly, or are outside the range of desired conditions, while maintenance helps to preserve those components that are functioning properly.

Active restoration is generally where capital investments and ground disturbing activities are necessary in the attempt to improve degraded systems and secure a network of connected habitats. Typically, active restoration is required where the habitat is degraded to the point that natural recovery would not be enough to get it to the desired condition or in an appropriate amount of time. Active restoration may be identified as the initial strategy or may be identified following implementation of a passive restoration, in which the degraded subwatershed was unable to recover to a desired condition and or within a desired time period. This can occur when a subwatershed has crossed a threshold during the process of degradation to a state where natural recovery may no longer be possible to a desired level or time period. The desired time period will vary from temporary (1-3 years), short term (3-15 years) and/or long-term (15 years and longer). The desired time period is based on the conditions of the watershed components, aquatic components, and associated concern for aquatic viability. To achieve restoration in such situations, active restoration may be required.

Passive restoration is where only management adjustments are required to allow aquatic habitat, water quality and subwatershed functions to restore at its natural rate of recovery. An example of passive restoration would be updating and modifying a special use permit to benefit riparian or upland conditions. Passive restoration is usually quite risk aversive regarding temporary risks to local fish habitat and populations, although long-term risks could occur if vegetation is moved out of the desired vegetation condition.

Table 1.4 Boise Forest Plan Management Prescription Categories (USFS 2003) and FC-RONR Wilderness within the Bear Valley Watershed.

Management Prescription Category	Percent of BVW
FC-RONR Wilderness	31
1.2 – Recommended Wilderness	12
3.1 – Passive Restoration and Maintenance of Aquatic, Terrestrial, & Hydrologic Resources	31
3.2 – Active Restoration and Maintenance of Aquatic, Terrestrial, & Hydrologic Resources	26

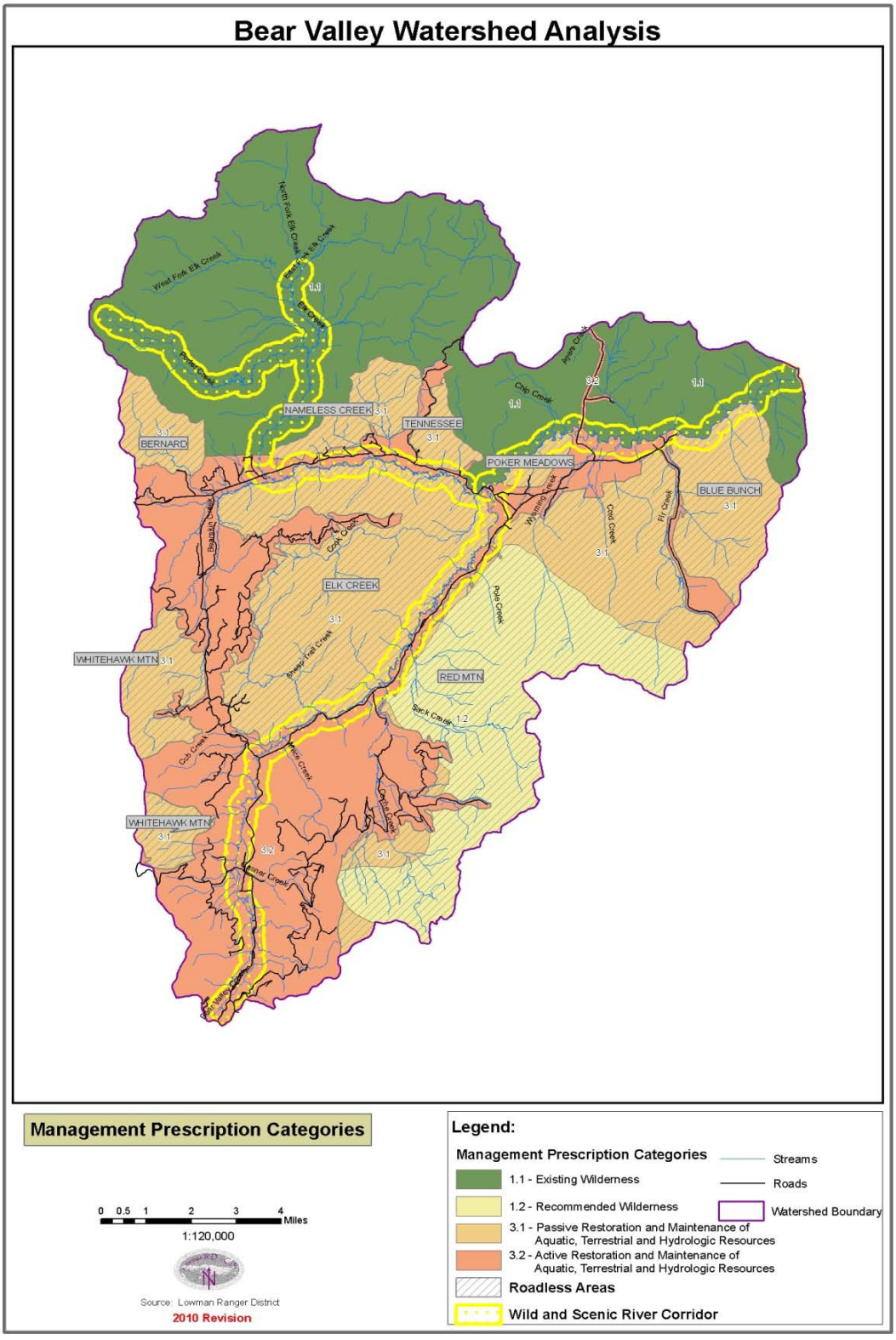


Figure 1.2 US Forest Service, Bear Valley Management Area, Management Prescription Categories

The 2003 Boise Forest Plan also developed a long-term management strategy to ensure restoration of watershed and aquatic resources on the forest, the Aquatic Conservation Strategy (ACS). The ACS provides direction to maintain and restore characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. How these components are applied at the subwatershed and site-specific levels affects the types and outcomes of management actions and is an overriding factor that influences potential effects for Soil, Watershed, Riparian and Aquatic (SWRA) resources.

The eight ACS components are identified below. Each component is discussed in detail in the Forest Plan (USDA 2003, Appendix B), including its role in addressing reduction of threats associated with factors of decline and/or its role in a comprehensive recovery and restoration strategy for listed fish species and their habitats. Any of these components has the potential to influence any of the factors of decline or the recovery/restoration strategy.

1. Goals to Maintain and Restore SWRA Resources
   These goals reduce threats, like sediment, associated with the decline of healthy, functioning watersheds, riparian areas, and associated fish habitats.

2. Watershed Condition Indicators (WCI) for SWRA Resources
   WCIs represent diagnostic indicators of the health and trend of watersheds and associated aquatic systems. Water quality WCI includes sediment/turbidity ratings as measured by surface fines.

3. Delineation of Riparian Conservation Areas (RCAs)
   RCAs contribute to maintaining the integrity of aquatic ecosystems by (1) influencing the delivery of coarse sediment, organic matter and woody debris to streams; (2) providing root strength for channel stability; (3) shading the stream; and (4) protecting water quality.

4. Objectives, Standards, and Guidelines for Management of SWRA Resources, including Riparian Conservation Areas (RCAs)
   The management objectives, standards and guidelines reduce threats and the risks of negative effects to listed fish species, resident fish, and water quality conditions by providing protection necessary to conserve listed fish species and water quality.

5. Determination of Priority Subwatersheds within Subbasins
   Priority subwatersheds have been identified that provide a pattern of protection and restoration in the BVW for the recovery of T,E,S fish species, the de-listing of water quality impaired water bodies and the restoration and

maintenance of soil, water, riparian and aquatic resources. Identification and management of the priority subwatersheds are designed to complement other recovery/restoration plans and build on actions already taking place to recover these species and de-list impaired water bodies. There are 2 ACS priority subwatersheds in the BVW; Upper Elk and Upper Bear Valley.

6. Multi-Scale Analyses of Subbasins and Subwatersheds

   The BNF completed a Forest-level, subbasin level assessment of the current condition of soil, water, riparian and aquatic resources. This included subwatershed analysis of water quality indicators, such as sediment.

7. Determination of the Appropriate Type of Subwatershed Restoration and Prioritization

   The restoration and priority categorization incorporates the subwatershed's geomorphic integrity, water quality integrity, aquatic integrity and vulnerability ratings. Figure 1.3 displays the category for each subwatershed in the BVW.

8. Monitoring and Adaptive Management Provisions

   The Boise Forest Plan is monitored every 5 years and includes evaluation of the ACS.

The ACS provides a scientific basis for the management of aquatic ecosystems; providing for a comprehensive short and long-term recovery of listed fish species; restoration of aquatic habitats and surrounding terrestrial uplands; de-listing of water quality impaired water bodies; and planning for sustainable resource management. In essence, this strategy integrates many of the goals and objectives of both the ESA and the Clean Water Act. Figure 1.3 displays the Watershed Restoration (component 5 of the ACS) and Aquatic Conservation Strategy (ACS) priority subwatersheds in the BVW. These restoration categories are used to direct all management activities in the BVW.

The Watershed and Aquatic Recovery Strategy (WARS) is largely founded on two of the eight components (#5 and 7) of the ACS. This further refinement is viewed overall as the re-establishment of a subwatersheds functions, processes, and structures, including historical ranges of conditions. The intent of the Southwest Idaho Ecogroup (SWIE) watershed restoration direction is to recognize the variability of natural systems while (1) securing existing habitats that support the strongest populations of wide-ranging aquatic species and the highest native diversity and geomorphic and water quality integrities; (2) extending favorable conditions into adjacent subwatersheds to create a larger and more contiguous network of suitable and productive habitats; and (3)

restoring soil-hydrologic processes to ensure favorable water quality conditions for aquatic, riparian, and municipal beneficial uses that will contribute to the delisting of fish species and water quality limited water bodies.

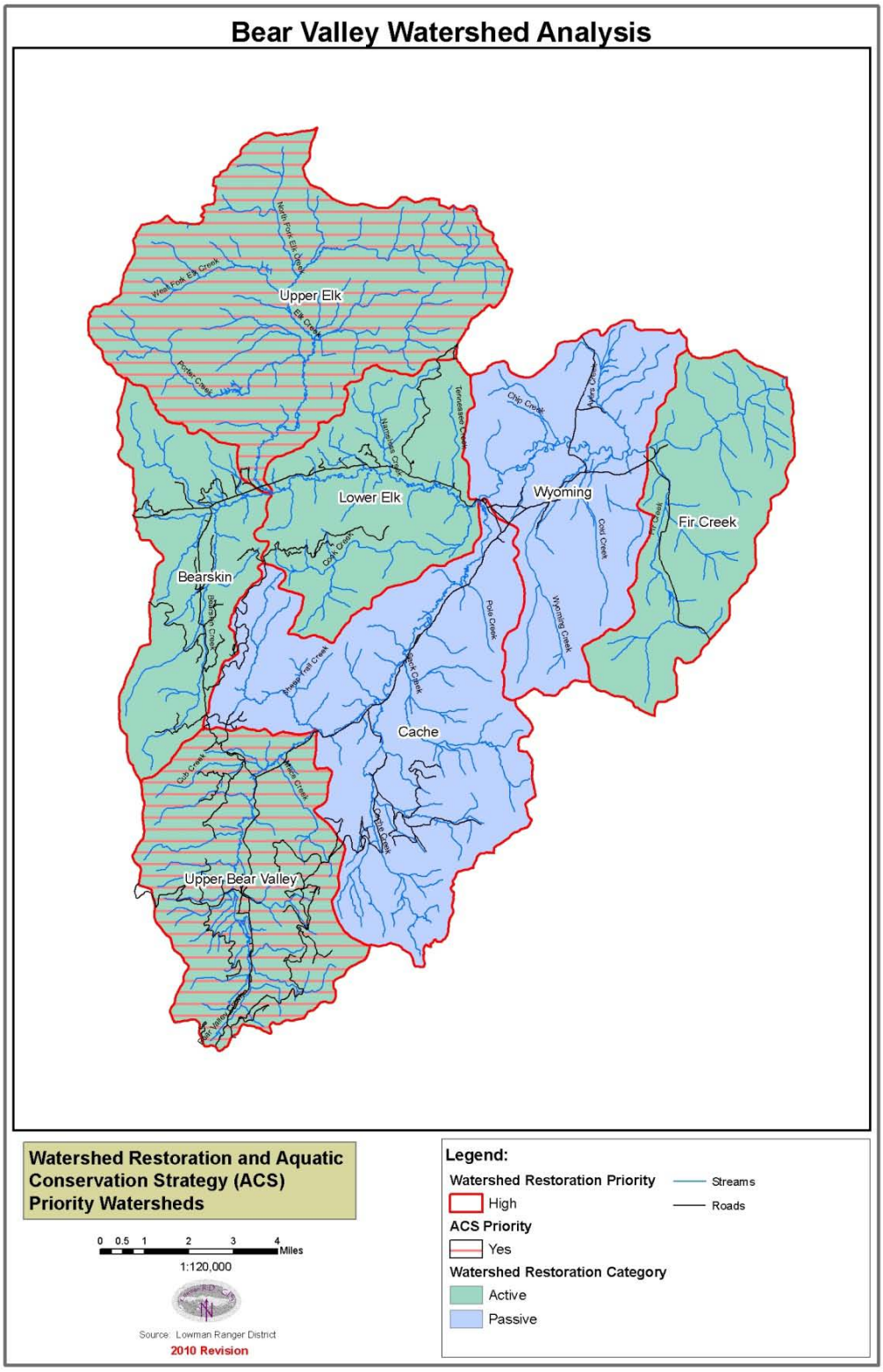


Figure 1.3 Watershed Restoration Category and Aquatic Conservation Strategy Priority Subwatersheds

Geology

The BVW lies entirely within the Idaho Batholith. Weathering, glaciations, and fluvial and hillslope erosion have shaped the granitic parent material into the variety of landforms observed in the watershed today. The deep valley fill of lower mainstem Bear Valley Creek is composed of material translocated from upland sources by glacial or fluvial processes. Near the mouth of Fir Creek, Bear Valley Creek descends through a steep, incised canyon to the Middle Fork Salmon River. These canyonlands are comprised of strongly dissected fluvial granitic lands and steep granitic canyon slopes (USFS 2000).

Hydrology

Bear Valley Creek is a perennial stream with an average gradient of 21 feet per mile. A moderately to highly sinuous creek, Bear Valley Creek has an unconfined to moderately confined channel. Oxbows and abandoned channels are evident in aerial photographs. The main valley reaches are Rosgen C3, C4 and C5 channel types (Rosgen 1985). Major tributaries include Elk, Fir, Cub, Sheep Trail, Wyoming, Sack, Cache and Casner Creeks.

Meadow and valley bottom riparian areas receive much of their water from deep seepage and interflow from upland slopes. Many of these areas become completely saturated or inundated during spring thaw, and then slowly drain during summer and fall. As water drains from these areas during summer and through mid-fall, water tables near the surface drop progressively lower.

Mean monthly streamflow for the period of record is illustrated in Figure 1.4. These streams experience peak flows related to snowmelt which occurs in the late spring and early summer months. Base flows dominate the remainder of the year. Rain and rain-on-snow events contribute an estimated 25% of the annual runoff. Groundwater influences are estimated to contribute 5% of annual runoff. Base flow in the summer is maintained by groundwater and the affects of precipitation are minimal.

Forty-seven percent of the headwater tributaries to Bear Valley Creek are source reaches, meaning that this steeper gradient (4% or greater) creek is where initial entrainment of bedload materials begins. Overall in the BVW, 41% of the stream miles are response reaches, which are the areas where transported sediment is deposited. Transport reaches only comprise about 12% of the watershed stream miles. These are intermediate gradient (1.6% to 4%) streams that function to transport material from the high gradient source reaches to the low gradient

response reaches. The high proportion of response reaches makes this watershed sensitive to disturbance.

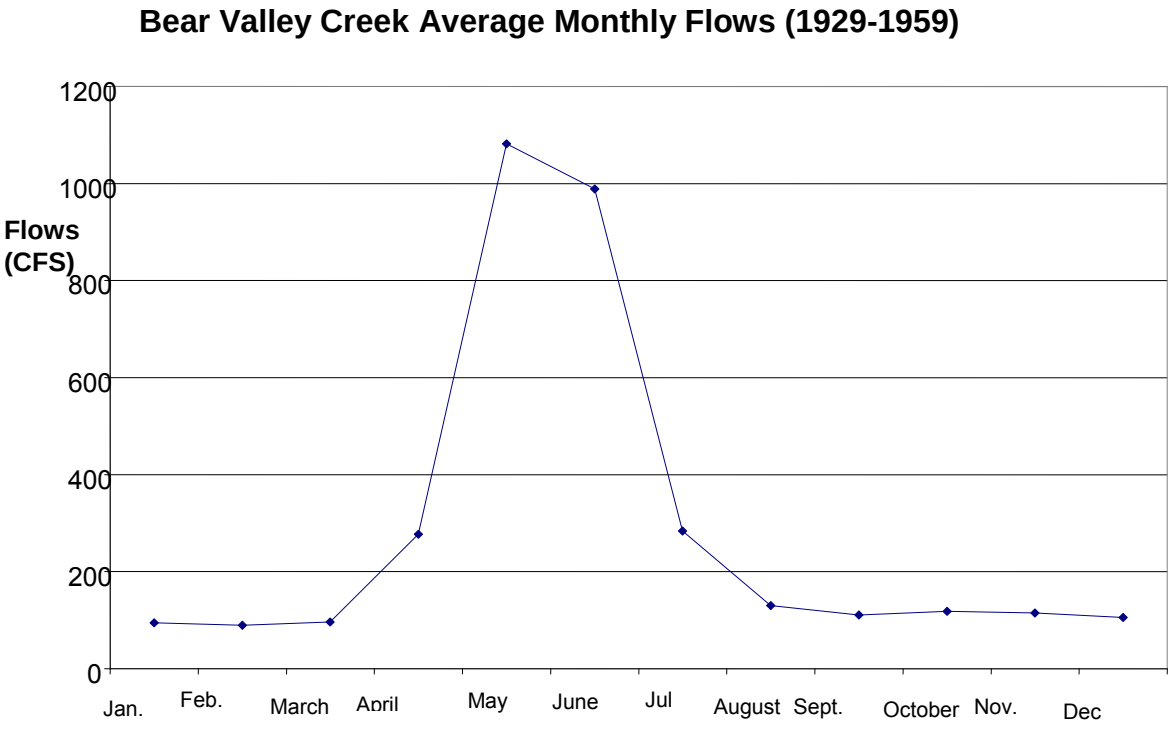


Figure 1.4 Bear Valley Creek Average Monthly Flow (USGS 2007)

Channel Characteristics

The majority of low-gradient response reaches are located in the valley bottom meadows and riparian areas of mainstem Bear Valley and Elk Creeks (USFS 2000). Floodplain and terrace landforms dominate much of the length of Bear Valley Creek along the relatively broad, unconfined main valley. Floodplain features are typically two to four times wider than bankfull width. Bear Valley Creek has a low-gradient and falls approximately 750 feet in 36.3 stream miles. It exhibits a moderate to high degree of sinuosity along much of its length. The channel is generally unconfined to moderately confined, and banks are moderately stable to unstable. The reach near the mouth below Fir Creek has a higher gradient than the meadow reach as it enters a narrower canyon before joining Marsh Creek.

The following figure (Figure 1.5) show stream gradients where the source reaches are A channels in the Rosgen (1985) classification, B channels are the transport reaches and C channels are the response reaches.

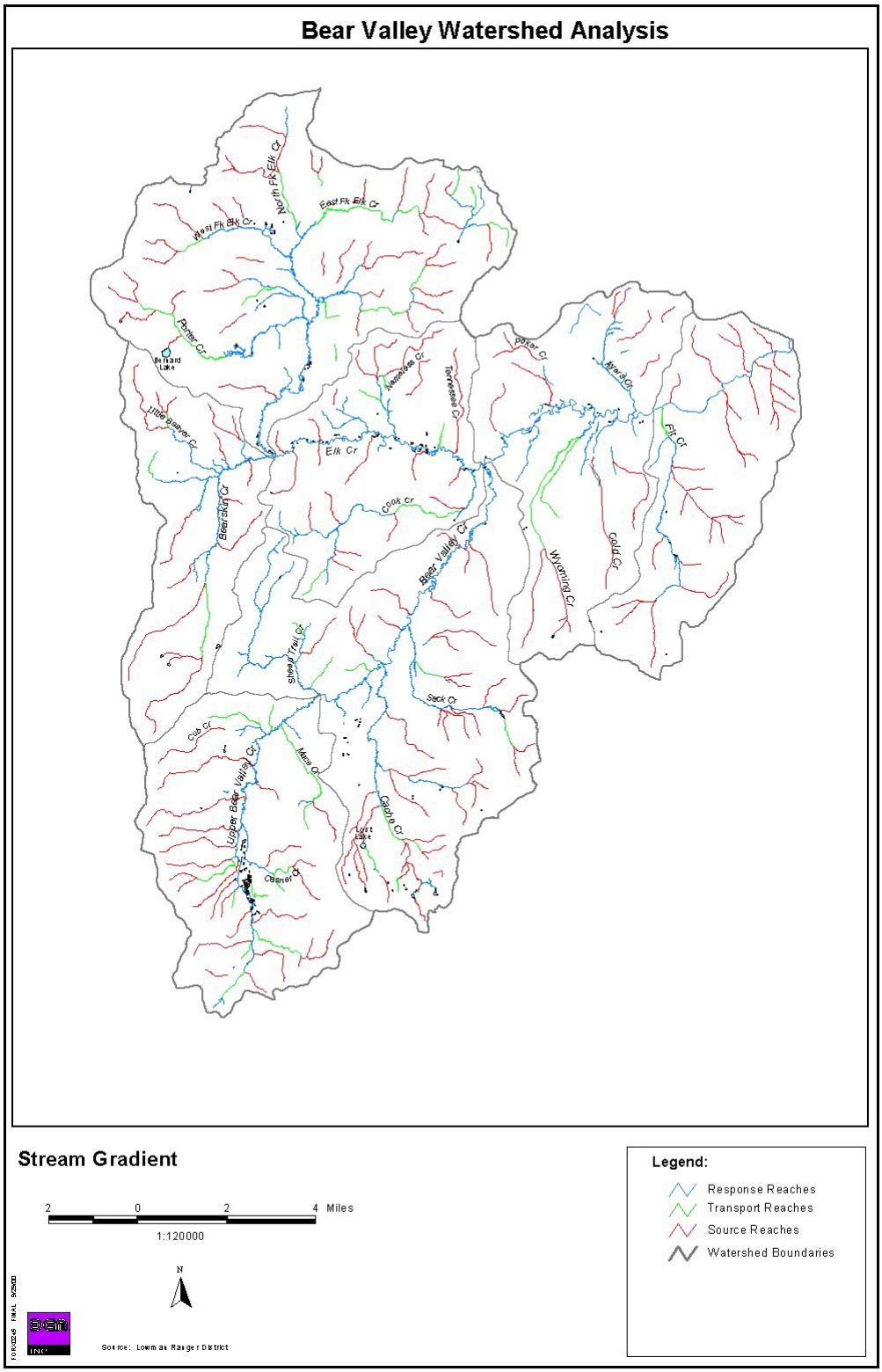


Figure 1.5 Stream gradient in Bear Valley and Elk Creek Watersheds

Between 1956 and 1959, dredge mining of private land occurred in Upper Bear Valley Creek, resulting in the obliteration of 17,000 linear feet of Bear Valley Creek and 10,000 linear feet of tributary channels. In 1969 an attempt to correct a portion of the dredged area was made. The lower reaches of Casner Creek and the dredged section of Bear Valley Creek were diverted and channelized. However, this diversion failed several times, most notably in a flood event in 1984 that resulted in massive downstream erosion and erosion of tailing materials. The 1984 event resulted in the involvement of the Shoshone-Bannock Tribes in a more comprehensive remediation project (Figure 1.10). Fortunately, the 1984 to 1989 rehabilitation effort has brought about an upward trend (USFS 2000). This summary is expanded further in the mining section.

Fisheries

The BVW is an extremely important drainage for fish resources in the entire Salmon River Basin. The spring/summer chinook salmon (*Oncorhynchus tschawytscha*) population is extremely unique because the BVW is one of the few remaining areas left that has only wild salmon, with essentially no hatchery influence. In addition, the BVW has been identified by the State of Idaho and the Forest Service as a “key” watershed (watersheds with the greatest potential for protecting and restoring bull trout populations) for bull trout (*Salvelinus confluentus*). Under the ESA of 1973 (as amended), chinook salmon and steelhead were listed as Threatened by the National Marine Fisheries Service (NMFS), and bull trout was listed as Threatened by the US Fish and Wildlife Service. The BVW contains critical spawning, rearing, and migratory habitats for wild Snake River spring/summer chinook salmon, steelhead trout, bull trout, and westslope cutthroat trout.

In 1991, NMFS received a petition to list Pacific Northwest Salmon Runs under the ESA. Spring, summer, and fall run chinook were listed as threatened species in the Salmon River basin in 1992. Snake River basin steelhead trout were listed as a threatened species in 1997. These listings of anadromous fish prompted a review of current habitat management practices on federal lands by National Oceanic and Atmospheric Administration (NOAA) Fisheries, and NOAA Fisheries issued a biological opinion (Opinion) on the adequacy of land and resource plans to protect anadromous fish habitat. One of the commitments identified in the Opinion was to monitor grazing strategies to determine if current grazing practices were meeting PACFISH riparian management objectives.

BVW is an important traditional use area for the Shoshone-Bannock and Shoshone-Paiute Tribes. The Nez Perce Tribe also has an interest in this area as well. Major

fish-bearing tributaries to Bear Valley Creek include Ayers, Chip, Poker, Tennessee, Cook, Nameless, Elk, East and West Fork Elk, Little East Fork Elk, Porter, Little Beaver. In general, salmon, steelhead, westslope cutthroat, and possibly fluvial bull trout and mountain whitefish are found in mainstem Bear Valley Creek. Resident bull trout are found in upper, relatively undisturbed reaches of most tributaries. Chinook salmon and steelhead spawn and rear in mainstem Bear Valley Creek from the mouth upstream through Big Meadows/Cache Creek. Elk, Bearskin, Casner, Cub, Mace, Sheep Trail, Cache, Sack, Pole, Wyoming, Cold, and Fir creeks are also spawning and rearing areas (USFS 2000).

Historically, the watershed accounted for 49% of the chinook salmon redds in the Salmon River Basin and 65% in the Middle Fork Salmon River. Increases in sediment and loss of pool habitat are the biggest changes in the BVW from historic to current aquatic habitat conditions. Current chinook salmon and steelhead redd, parr, and smolt numbers in the BVW are less than 1% of potential historic numbers. The installation of numerous downstream dams has greatly influenced the ability for migration of the anadromous fish. Grazing and past mining activities have had the biggest impact on the local water quality and aquatic habitat.

The primary factors limiting ESA-listed fish productivity are: negative competition with introduced fish (brook trout), excess substrate fines, and local disconnection between overwintering and spawning habitats. Smolt-to-adult survivals are much lower than egg-to-smolt survivals for anadromous fishes, suggesting that factors external to Bear Valley are most limiting to productivity (USFS 2000).

Both the Shoshone-Bannock Tribes and the Idaho Fish and Game (IDFG) conduct annual surveys of chinook salmon redds. While there is some overlap in the survey dates, generally the Shoshone-Bannock Tribes' surveys are at the beginning of the spawning season and the IDFG surveys are towards the middle and end of the spawning season. IDFG results were 143 chinook salmon redds in 2009 (IDFG et al 2009), 101 in 2008, 75 in 2007, 38 in 2006, 95 in 2005, 86 in 2004, 251 in 2003, 240 in 2002, 153 in 2001 and 59 in 2000.

Fish density has shown a significant increase since the habitat restoration project in the headwaters of Bear Valley Creek (mine restoration discussed in more detail under mining). Chinook salmon were observed throughout Bear Valley Creek in 2003, and were most abundant in the second and fourth order sections. The surveys found no rainbow trout in 2003. The greatest species and age-class diversity was found in the fourth and fifth order reaches.

Spawning of steelhead and rainbow trout in the Upper Middle Fork Salmon subbasin is estimated to begin in early March and go through Mid-May. Spring/summer chinook are estimated to spawn from September to Mid-October. Cutthroat trout are estimated to begin spawning in May and end in June. Bull trout, in general, are estimated to spawn between September 1 and mid-October (Grafe et al. 2002).

Vegetation

Forest cover dominates the BVW with nearly three-fourths of the area occupied by conifer trees. Six major potential vegetation groups occur in the BVW, with five of these found in the Upper Bear Valley Creek area. They are in descending order of prevalence: warm, dry subalpine fir; persistent lodgepole pine; cool, moist Douglas fir; cool, dry Douglas fir; hydric subalpine fir. Subalpine fir vegetation, a high altitude group, is found at higher altitudes. The predominant shrubs in wet meadows are willows. Grasses and sedges are the predominant herbaceous vegetation. Non riparian meadows include a variety of forbs and grasses. Shrubs in these drier meadows include shrubby cinquefoil, currants, willows, and some sagebrush.

There is an active mountain pine beetle (MPB) outbreak in the BVW area that is causing tree mortality throughout the watershed. Lodgepole pine is the host tree for the MPB and is the most common tree species in the project area. In addition to the beetle-induced mortality, the Red Mountain Fire burned more than 26,000 acres in 2006 and the Sheep Trail Fire in burned more than 8,700 acres in 2007.

Fires

The Red Mountain Fire burned approximately 26,445 acres in the Bear Valley Watershed in 2006. The Sheep Trail Fire started in 2007 and burned around 8,701 acres in the BVW (Green 2009). Table 1.5 depicts acres burned in major wildfires in the BVW and Figures 1.6 and I.7 show the past and more recent fire perimeters.

Table 1.5 Fire History in Bear Valley (acres burned)

Fire Name	1924	1949	1957	1979	1986	1987	1989	1990	1992	2006	2007	Totals
Cache Creek		924										924
Cook Ridge				783								783
Cook Ridge							372					372
Countyline									2,572			2,572
Cub Creek			882									882
Cub Creek									2,715			2,715
Deadwood Summit						29,691						29,691
Porter Creek								891				891
Red Mountain										26,445		26,445
Sheep Trail											8,701	8,701
Tennessee Cr					935							880
unnamed	388											383
Grand Total	**388**	**924**	**882**	**783**	**935**	**29,691**	**372**	**891**	**5,287**	**26,445**	**8,701**	**71,727**

(Source: Green 2009)

In Chapter 2 (Bear Valley 4b Justification), Section 1 of this document, sediment from wildfires is discussed. Fire suppression strategies utilized in the BVW follow the “minimum impact tactics”. During the recent 2006 and 2007 wildfires, there was no road construction or bulldozer fireline construction. Fire suppression tactics utilized handline, low-impact feller-bunchers along roads, existing openings and air resources. Additionally, rehabilitation on all firelines was completed once the wildfires were declared controlled. Sediment contribution from fire suppression activities has not been observed and is estimated to be very minimal.

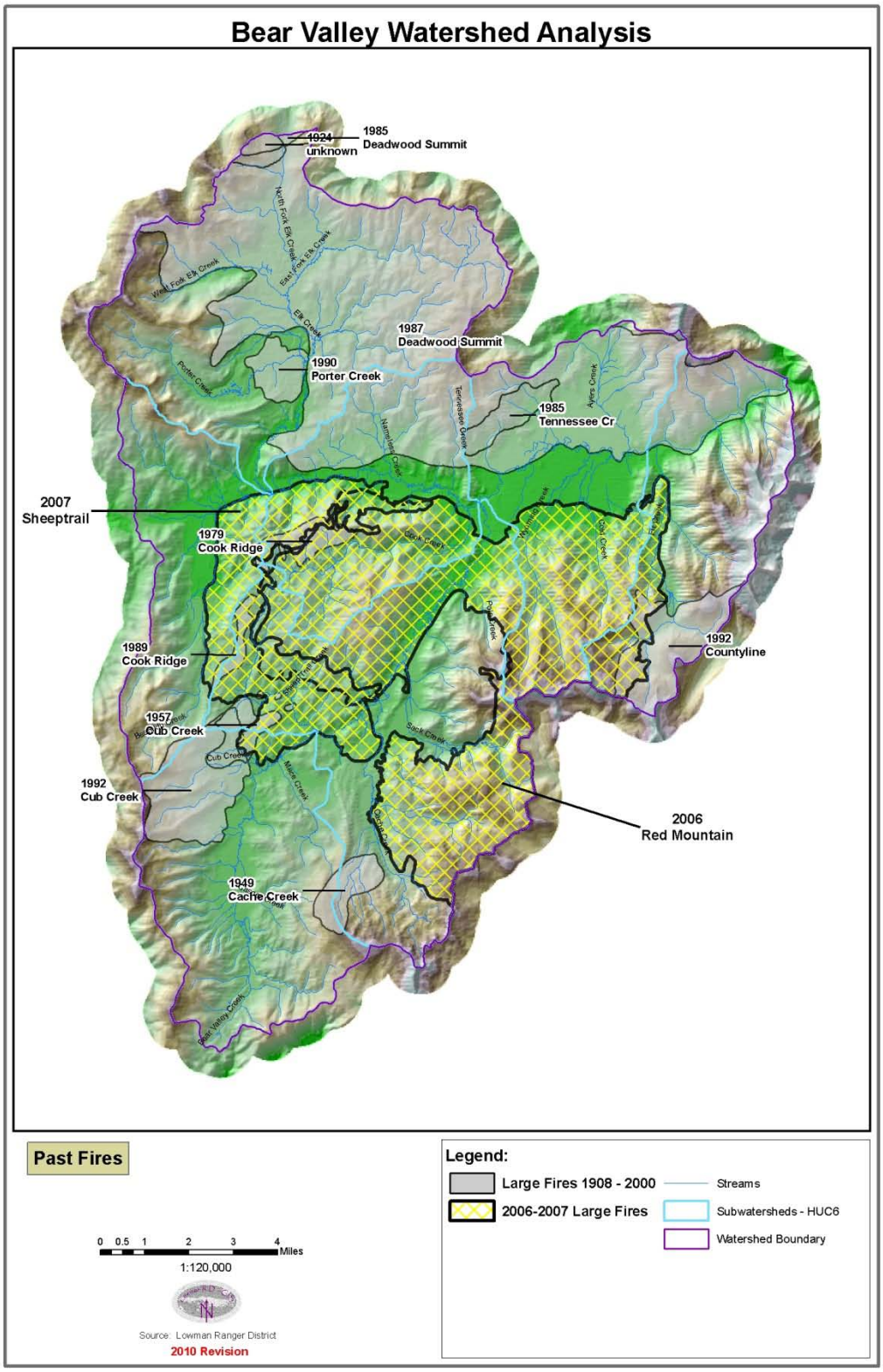


Figure 1.6 Past fires in the Bear Valley Watershed

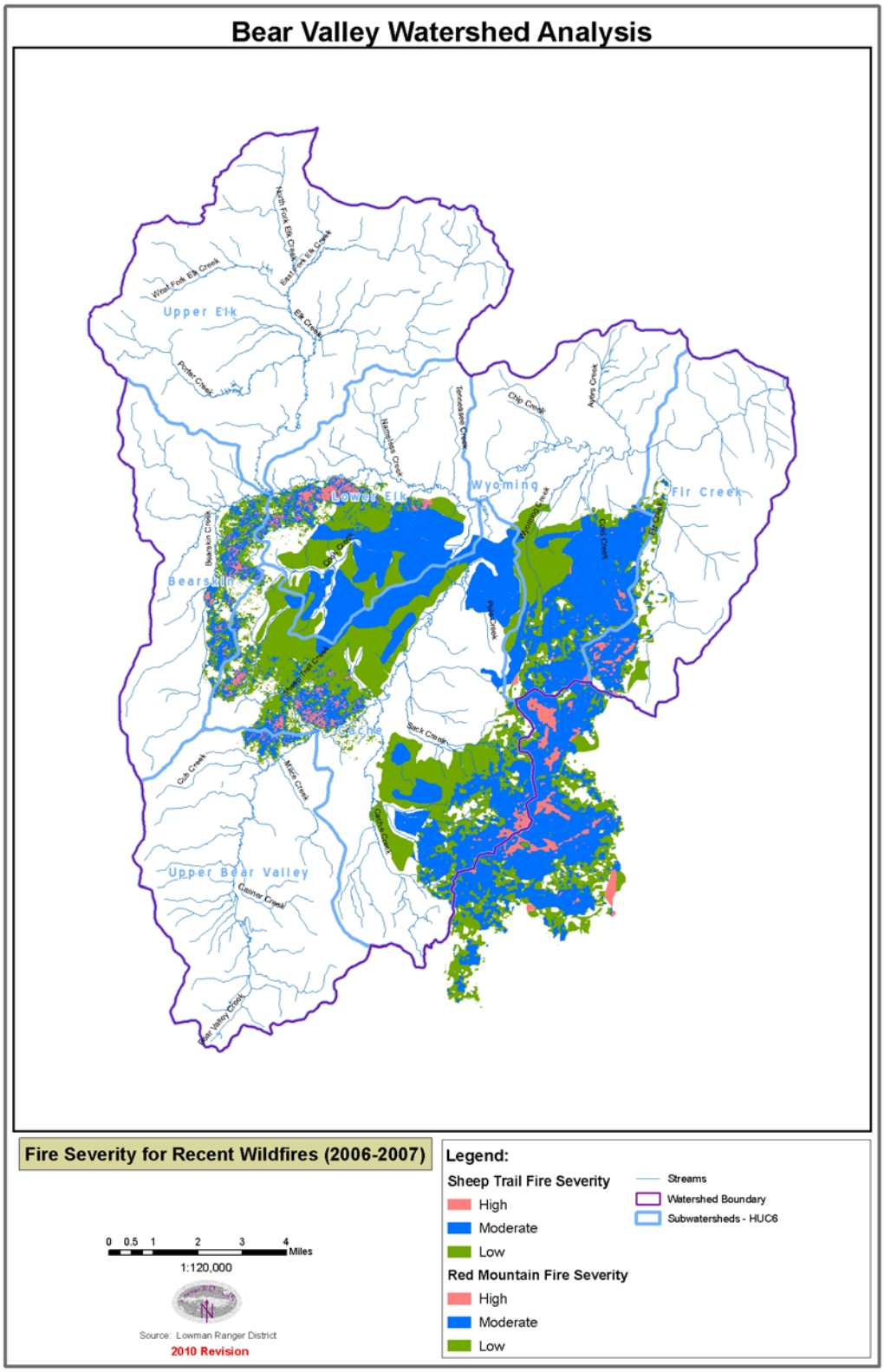


Figure 1.7 Recent Wildfire (2006-2007) Severity Class

Roads

Approximately 167 miles of unpaved Forest Service Roads*[1] exist in the BVW (Table 1.6). An estimated 36 miles are unauthorized or non-system or user-created roads and the remaining 131 miles of road are Forest roads. Roads exist in all 6th field subwatersheds, with Upper Bear Valley having the most (55 miles) and Upper Elk subwatershed having the least (4 miles) (USFS 2010).

All roads in the BVW were targeted in the road inventory. However, due to time and resource constraints certain roads were given priority based on assessments made in the field by a crew leader. All 131 miles of Forest Roads (including open, closed, or otherwise designated roads) were prioritized and successfully surveyed. Most unauthorized roads (user-created or otherwise unclassified roads) were prioritized, but not all were surveyed. Up to 21 miles of unauthorized roads were not surveyed. A total of 18 miles out of the 146 miles of surveyed roads in Bear Valley (12.5%) were hydrologically connected to a stream (Fly et al 2011).

Table 1.6 Road length, miles with a riparian conservation area and density (miles of road length per miles squared of area) for the Bear Valley Watershed by sub-watershed (HUC6).

Sub-watershed	Miles within an RCA	Total Existing Road Length (mi)	Total Area (mi^2)	Road Density (Rd mi/mi^2)
Wyoming	2.9	13	25.7	0.5
Fir Creek	2.6	6	20.2	0.3
Cache	9.7	37	40.0	0.9
Upper Bear Valley	13.0	55	26.3	2.1
Upper Elk	0.6	4	40.8	0.1
Lower Elk	2.5	21	20.8	1.0
Bearskin	5.0	31	17.6	1.7
Combined Total	**36.3**	**167**	**191.4**	**0.9**

BNF (2010)

As displayed in Table 1-6 above, road densities throughout the watershed are generally low, the highest density being in Upper Bear Valley subwatershed (2.1

[1] * Forest Roads include all National Forest System Roads and other Forest Roads which have been authorized by a legally documented right-of-way held by Valley County (36 CFR 212.1). Forest Roads do not include unauthorized roads

miles/square mile). Road 582 takes a southwesterly route along lower Bear Valley Creek and is the longest road in the BVW.

Existing roads are usually located on gentle relief; therefore, their capability to route or concentrate any surface flow resulting in sediment delivery is limited. Because of the low road density and the watershed's inherent ability to attenuate peak flows, roads have limited influence on hydrologic response at both the subwatershed and watershed scale.

Individual road segments in the northeastern part of the watershed are administered by the Middle Fork Ranger District of the Salmon-Challis National Forest. Portions of National Forest System Roads 568 and 579 are subject to the majority of traffic use in the watershed, most of which is associated with wilderness access and whitewater recreation. Users drive these routes to obtain access to the Middle Fork and FC-RONR. Consequently, administration and maintenance of Road 579 between its intersection with Road 568 to State Highway 21, as well as the entire length of Road 568, have become their responsibility (Metz pers. comm. 2000).

Recently, Valley County has claimed that the main travel routes in the watershed fall under their jurisdiction. These include Roads 579, 582, and 563. They are declared by the County to be retained in perpetuity as primary thoroughfares for public access. The remainder of FR579 from the Bruce Meadows airstrip to Deer Creek Pass (all the way to Cascade), FR563 or Bearskin Road and FR582, and FR582K is maintained and administered by Valley County through a public road easement (Aug. 22, 2005). See following map (Figure 1.8) for roads and trail.

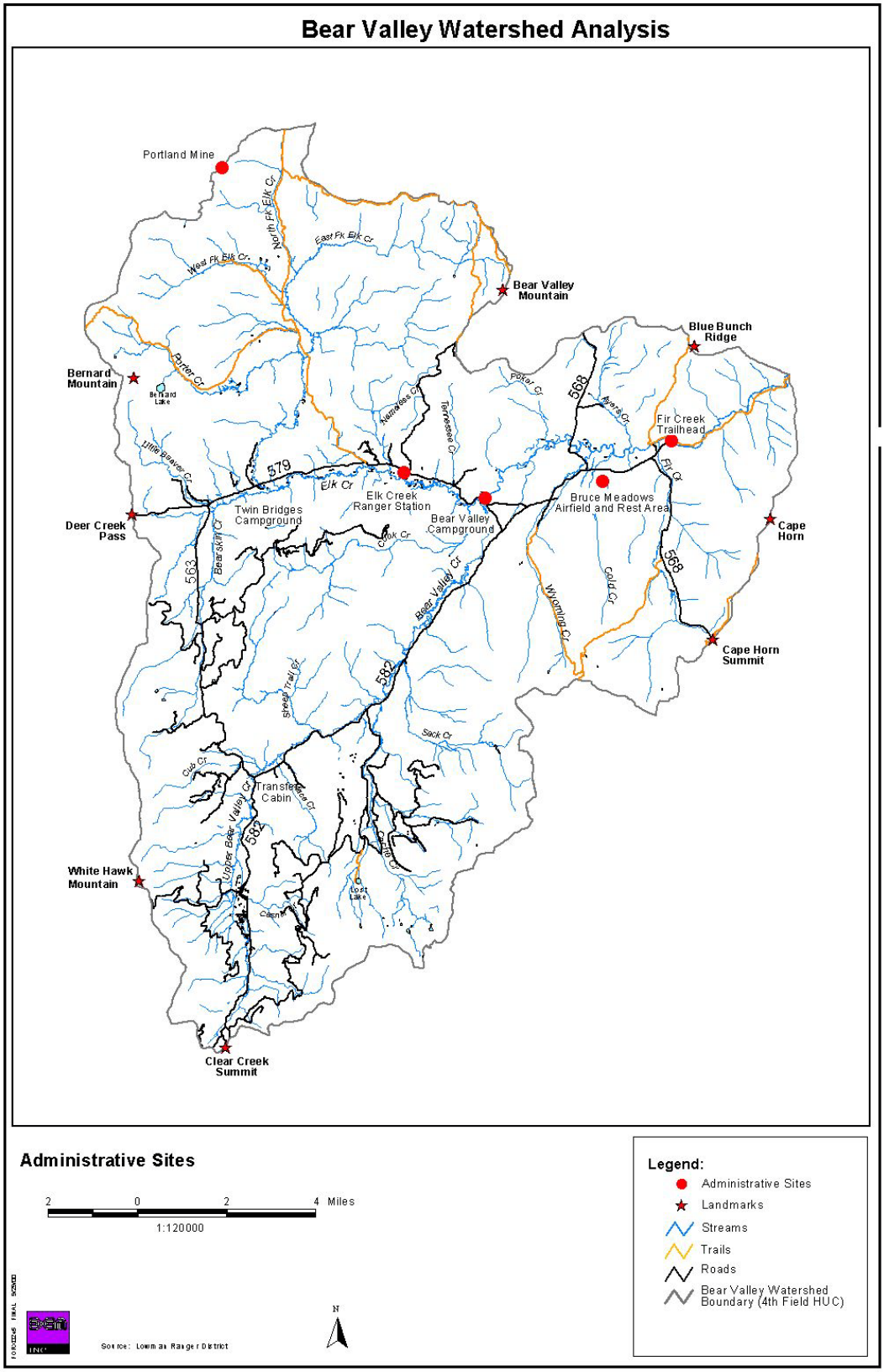


Figure 1.8 Roads and Trails in the Bear Valley and Elk Creek Watersheds

Grazing

Grazing has historically been of importance in the BVW. Early records of exact numbers and locations of livestock grazing do not exist. By 1930, there already were reports of over-grazing. The grazing section of the 1975 Land Use Plan for the Bear Valley Planning Unit concludes with this statement: "Grazing and anadromous fish do pose some conflicts. The economic value of both is important. The loss of vegetation and trampling damage caused by cattle grazing of streambanks along Bear Valley and Elk Creeks has an undetermined adverse effect on fishery values." In the 1960s, a deferred rest rotation system of pasture management was initiated on the Bear Valley Cattle and Horse (C&H) allotment. During the mid 1960s to mid 1970s sheep grazing declined, and in 1995 the area grazed by sheep was converted into a cattle allotment (USFS 2010).

By the 1990s, there were three grazing allotments managed in the BVW: the Elk allotment, Bear Valley allotment and the Deer Creek allotment (see color coding in Figure 1.9). During the period of grazing, 6,000 feet of barriers were completed to prevent trailing of cattle along the streambanks of Elk Creek. A 4,500 acre riparian pasture was established to prevent access to critical portions of Elk Creek. While a sheep allotment still existed in the 1990s, no sheep were grazed from 1985 onwards until the allotment was retired in 2000 (Table 1.7).

With the issuance of the biological opinions for chinook salmon and bull trout in the 1990s, grazing utilization requirements became stricter and the permittees eventually opted to discontinue grazing. The Deer Creek allotment was retired in 2000, the last season of grazing occurred in 1999. No grazing has occurred in the Elk Creek drainage since 2000. The Elk Creek C & H allotment was retired in 2000. In 2001, the Bear Valley allotment was closed after its last year of livestock grazing.

In 2001, the permittees of the three allotments waived their grazing privileges to the BNF, based on payments received (to the permitees) from the Bonneville Power Association (BPA). The payments from the BPA were a result of an interagency effort to protect anadromous fish in Bear Valley. Then, the Forest Supervisor closed each of the three Bear Valley livestock grazing allotments (Deer Creek, Elk Creek and Bear Valley) to grazing.

Table 1.7 Bear Valley Watershed Grazing Management Actions

Year	Grazing Management Action
1987	Ayer's Meadow Unit of Bluebunch S & G converted to cattle and added to the Elk Creek C & H allotment
1990	Cache Creek S & G added to the Bear Valley C & H allotment
1992	Portions of Whitehawk S & G and portions of Fir Creek S & G added to the Bear Valley C & H allotment
1996	Elk Creek C & H was under an injunction. No grazing on the allotment
1999	Last year Elk Creek C & H grazed
2000	Last year Deer Creek C & H grazed, Elk Creek C & H closed
2001	Last year Bear Valley C & H grazed, Bear Valley C & H closed, Deer Creek C & H closed

S & G = Sheep and Goat, C& H = Cattle and Horse

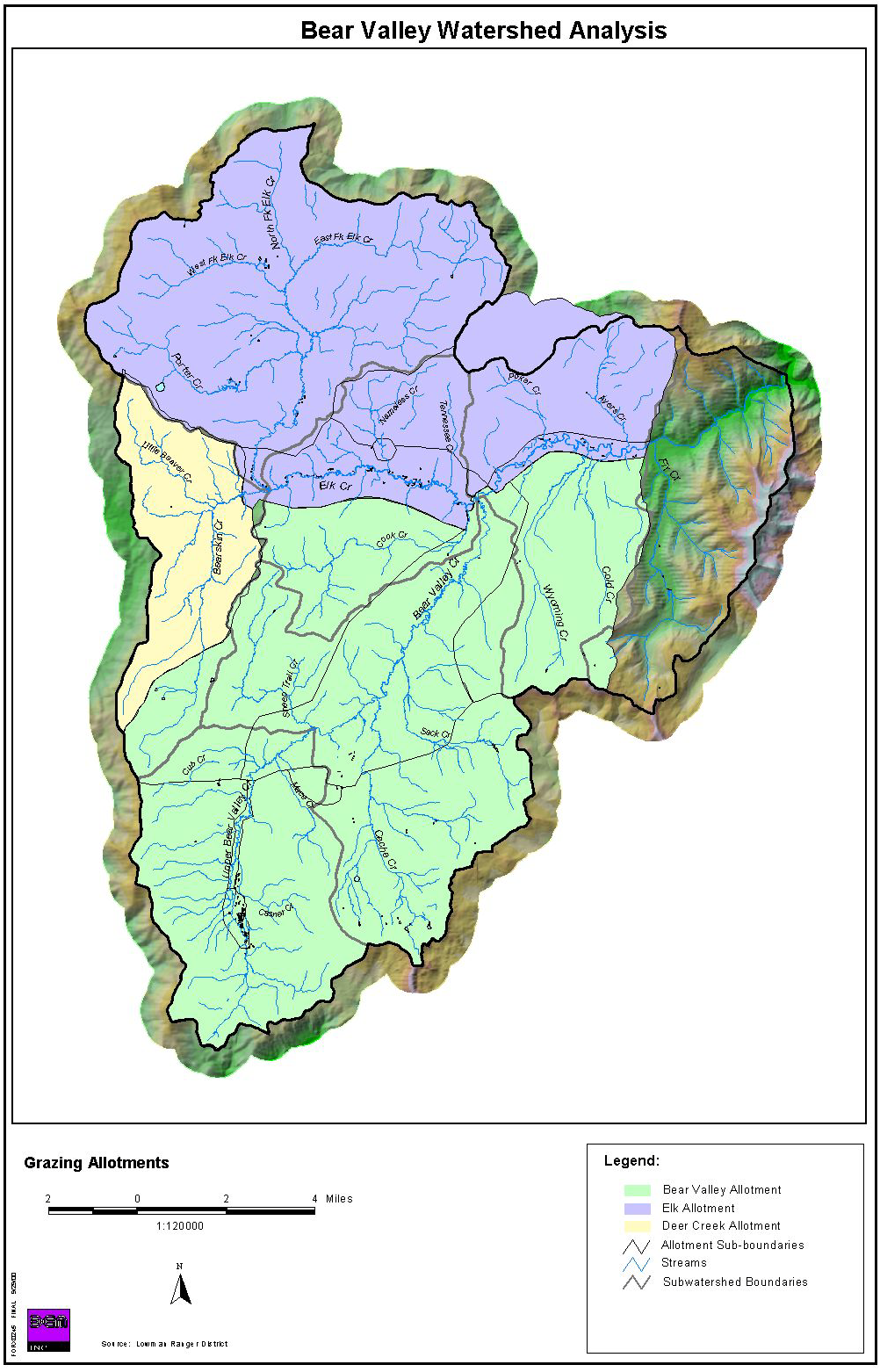


Figure 1.9 Historic Grazing Allotments

Mining

In the 1950s, dredge mining sponsored by the General Services Administration for recovery of rare earth minerals near the headwaters of Bear Valley Creek left large amounts of unconsolidated overburden along 1.4 miles of the stream's floodplain. As a result, over 17,657,333.36 ft^3 of fine sediment has entered the stream since the mining activities began. Specifically, from 1956 to 1959, a major dredging operation was undertaken on approximately 180 acres of mining claims in the upper reaches of the creek. Over the four-year period, approximately 180 acres were dredged by two floating dredges resulting in about 17,000 lineal feet of the original Bear Valley Creek channel being obliterated. The creek channel that was not obliterated by dredging was dewatered for 45,000 lineal feet. The artificial channels that were created were not suitable for salmon habitat. Since then, Bear Valley Creek has downcut through 1.4 miles of unconsolidated overburden in the mined area.

To reduce the amount of sediment entering the stream and enhance salmonid habitat, the Shoshone-Bannock Tribes initiated an enhancement effort within the mined area. During the construction phase from 1985 to 1989, the high cut banks were graded and vegetated to create a new floodplain along 1.5 miles of stream. The rehabilitation of the dredged area and the immediate surroundings was completed in 1989 at a final cost of $2.8 million. The BPA provided funding for this restoration project and the Shoshone-Bannock Tribes administered the restoration project, with participation from the Boise National Forest, other federal agencies and State of Idaho agencies. In 1989, the owners of the mineral resources sold the land to the US government (Figure 1.10). The restoration effort protects Bear Valley Creek from an additional 250,000 to 500,000 cubic yards of mining overburden that is still present in the area from entering the stream. Prior to the completion of the project, an estimated 800 to 1400 cubic yards of sediment entered the Bear Valley Creek each year from the overburden area.

Currently, there are two placer mining claims in the BVW specifically located in T11N, R8E, sections 23 and 24 (BLM Mining Claim Records 2009 http://www.blm.gov/lr2000). There has not been an operating plan submitted to the Boise National Forest to date.

As stipulated in the FCRONR Act, no dredge or placer mining is allowed in much of this management area. Locatable mineral potential is moderate to high in much of the area. Potential for leasable geothermal resources is moderate. Potential for other leasable minerals is unknown. Potential for common variety mineral materials is moderate to unknown (USFS 2003).

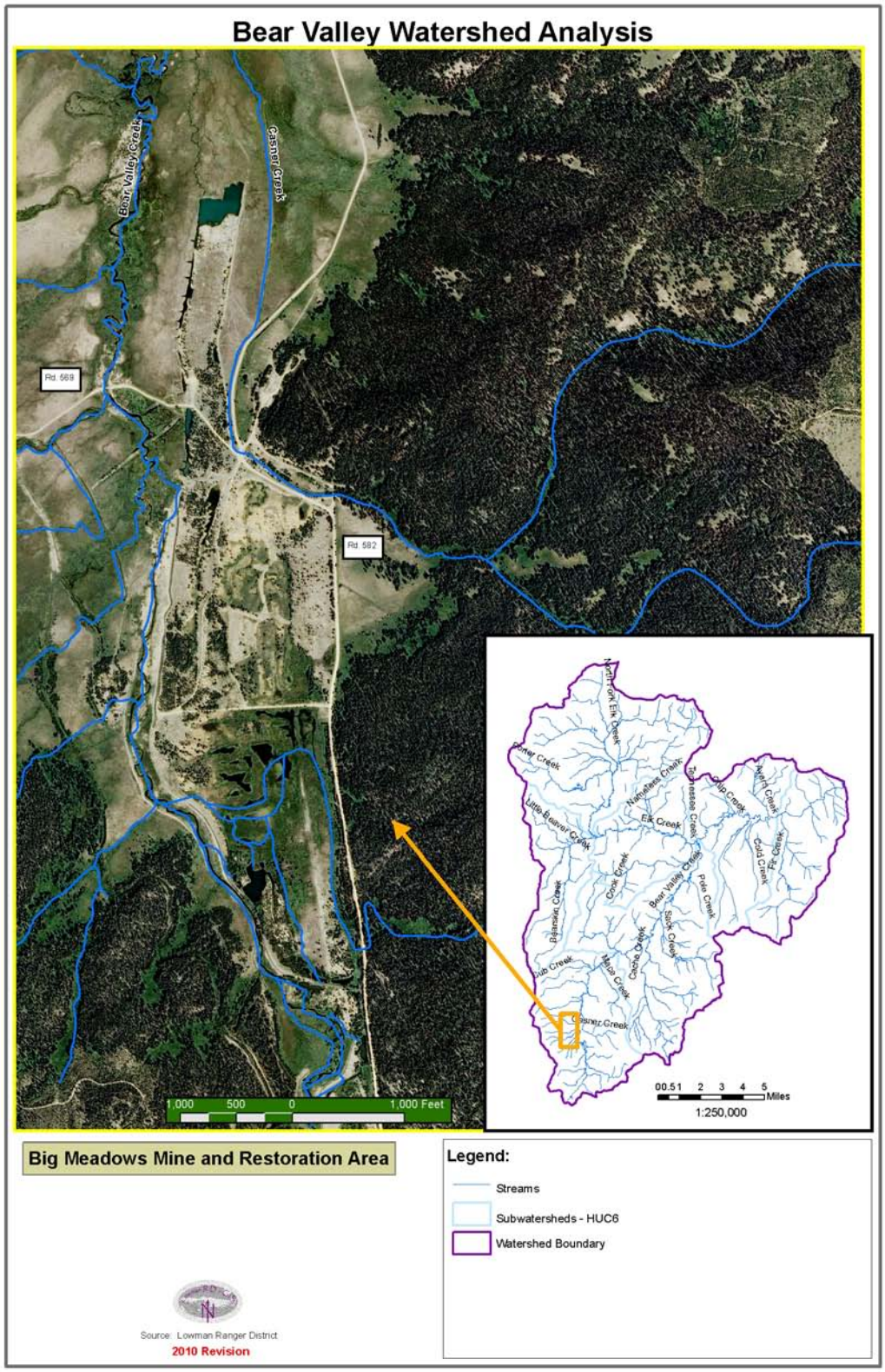


Figure 1.10 Big Meadows Dredge Mining Restoration Area, 2008.

2. Bear Valley Watershed 4b Justification

This section will address the following six elements, as they each relate to the Bear Valley Watershed and as described in the US Environmental Protection Agency's (EPA) Integrated Report Guidance (IRG) for Sections 303(d), 305 (b), and 314 of the Clean Water Act (USEPA 2005:2006)

1. Identification of impaired assessment unit and statement of problem causing the impairment;
2. Description of pollution controls and how they will achieve water quality standards;
3. An estimate or projection of the time when water quality standards will be met;
4. Schedule of implementing pollution controls;
5. Monitoring plan to track effectiveness of pollution controls; and
6. Commitment to revise pollution controls, as necessary.

1. Identification of Segment and Statement of Problem Causing the Impairment including Identification of Sediment Goals

Segment Description/Impairment and pollutant causing impairment

The IDEQ has identified four assessment units proposed for 4b listing in the 2010 Integrated Report. These assessment units are differentiated based upon stream order. The second order assessment unit occupies the first and second order drainages in the headwaters region of Bear Valley Creek. The fifth order assessment unit includes the mainstem of Bear Valley Creek downstream of the confluence of Elk Creek to the confluence with Marsh Creek, which then forms the mainstem of the Upper Middle Fork of the Salmon River.

The 1st, 2rd and 5th order sections of Bear Valley Creek, the 4th order of Elk Creek and the 3rd order of Bearskin Creek comprise the four different segments that are proposed for the 2010 303(d) list section 4b as shown in Table 2.1 below. Table 2.1 also shows that beneficial uses associated with these assessment units (AU) are undesignated at this time.

Table 2.1 Water Quality Impaired Bear Valley Assessment Units proposed in 2010 for 4b Listing

Assessment Name	Stream name	Pollutant	Miles	Beneficial Uses **
012_02a	Upper Bear Valley Creek and tribs –1st and 2nd order	Sediment	28.9	undesignated
012_05	Bear Valley Creek 5th order	Sediment, Temperature*	11.24	undesignated
013_03	Bearskin Creek – 3rd order	Sediment	1.83	undesignated
013_04	Elk Creek – 4th order	Sediment	8.94	undesignated

*Temperature will be addressed in a future analysis by IDEQ.

** IDEQ presumes undesignated surface waters to support cold water aquatic life and primary or secondary contact recreation beneficial uses.

As described in Table 2.1, sediment is the pollutant of concern for the four stream AUs proposed for Category 4b waters in 2010. The 2008 IDEQ Beneficial Use Reconnaissance Program (BURP) data suggest that sediment is the pollutant most likely causing beneficial use impairment, as well as additional data collected by the Forest Service suggest that sediment could be a limiting factor for beneficial uses.

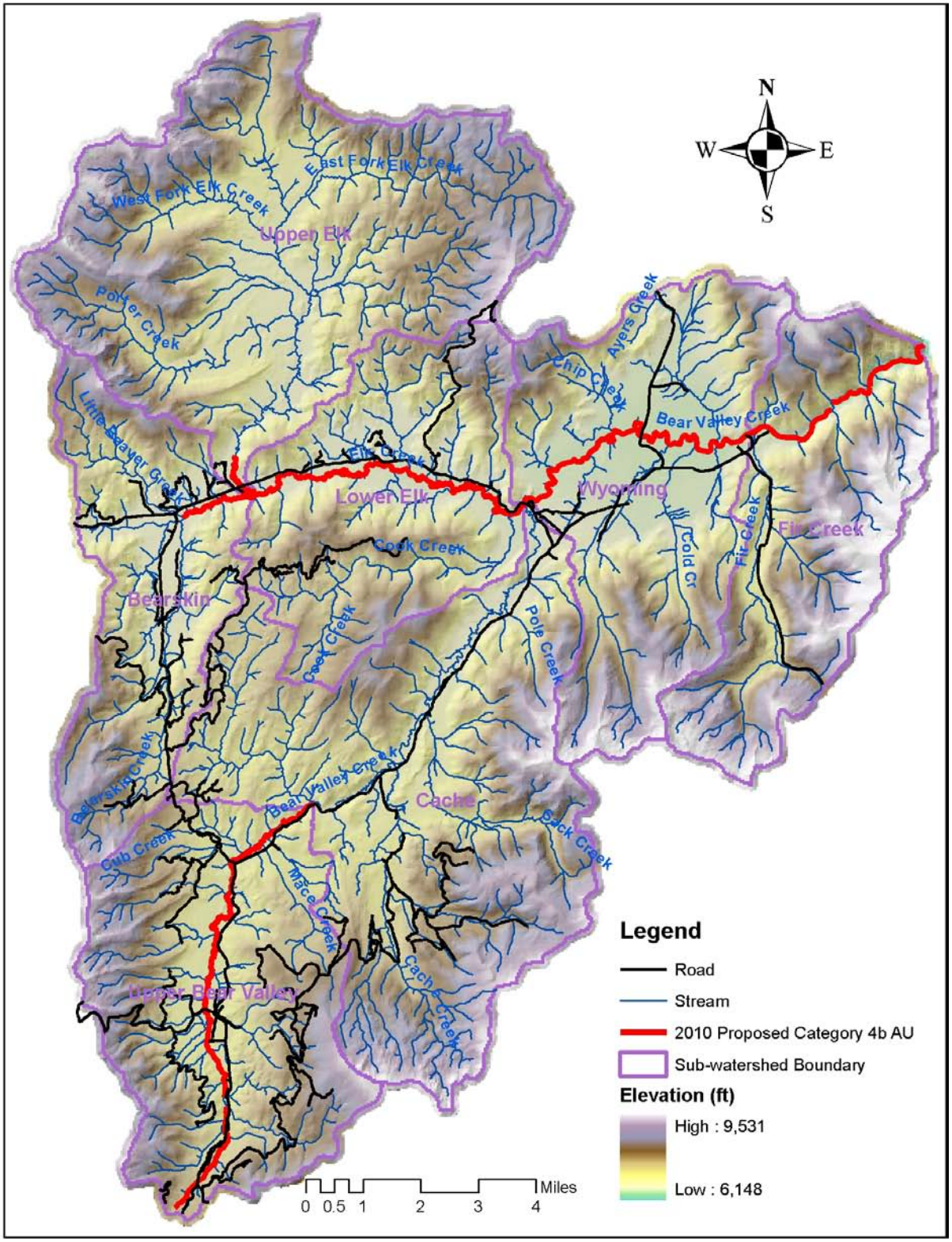


Figure 2.1 Bear Valley Watershed IDEQ 2010 Proposed Category 4b Assessment Units.

In the following sections, IDEQ BURP and USFS data are discussed that describe the AUs and the impairment within the AUs.

IDEQ BURP Data

IDEQ evaluates beneficial use support using indices for stream habitat, fisheries and insects: Biological data available for examination include macroinvertebrate, fish, and habitat data collected through BURP. The data are arranged in indices (Table 2.2 and Table 2.3) and scored to determine if the water body in question is supporting its beneficial uses. Three indices are considered when making a beneficial use support status determination. These indices are stream macroinvertebrate index, stream fish index, and a stream habitat index. The indices are classified using data collected during standardized sampling in accordance with BURP protocol (IDEQ 2007). Beneficial use support status determination is evaluated from comparison with reference conditions measured in similar bioregions. Index values are assigned based on the percentile range of the particular score in relation to the reference condition. Biological data available for examination include macroinvertebrate, fish, and habitat data collected through BURP. The data are arranged in indices and scored to determine if the water body in question is supporting its beneficial uses. Three indices, defined below, are considered when making a beneficial use support status determination.

The first index is the *Stream Macroinvertebrate Index* (SMI). By recording the abundance of macroinvertebrates known to live only in specific temperature conditions, the index is used as a direct biological measure of cold water aquatic life (Grafe et al. 2002).

The second index is the *Stream Fish Index* (SFI). This index is also considered a direct biological measure of cold water aquatic life and is used to determine how close the stream is to achieving the Clean Water Act “fishable” goal. The details of the development of this index can be found in Mebane (2000). Mebane developed this index based on least impacted and stressed sites. Fish counts are taken in each watershed and the index relates data found to known index, or reference sites.

The last index considered when determining beneficial use support is the *Stream Habitat Index* (SHI). The habitat index considers ten habitat metrics such as: instream cover, substrate composition, bank and canopy cover and zone of influence. SHI is not considered to be a direct biological measure; therefore it is recommended that it always be used in conjunction with at least one other index. This is due to significant variability in physical habitat measures (Grafe et al. 2002). Metrics tailored to forested areas were used for the SHI.

Each index uses a scale of one to three. The values resulting from each index are averaged to determine the support status of each waterbody as described in IDEQ's Water Body Assessment Guidance, Second Edition (Grafe et al. 2002). A score of three indicates the stream is most likely to fully support beneficial uses. Average values of two or greater indicate a water body that is in full support of its beneficial uses, however, the condition significantly varies from reference conditions and assessors can examine additional information, if available, to determine support status of the water body. Scores of less than two indicate that a water body is not supporting its beneficial uses. Scores from at least two indices are required to make a support status determination. As shown in the data below (Table 2.2), the first four AUs included in this 4b justification had BURP assessment scores of less than 2 in the most recent BURP survey. The second section of Table 2.2 shows AUs which fully support beneficial uses are therefore, not included in the 2010 4b listing.

Table 2.2 IDEQ BURP Scores for Bear Valley Sites

IDEQ Stream Site ID	Stream Fish Index	Stream Habitat Index	Stream Macro-invertebrate Index	Assess-ment Score	Beneficial Use Support Status
AUs Proposed for 2010 4b Listing Do Not Fully Support Beneficial Uses					
Bear Valley Creek (2 BURP Sites—scores averaged*) (012_02) 2008SBOIA035 2008SBOIA36	---	1	2	1.5	NFS**
Bear Valley Creek (012_05) 1997SBOIA063		1	1	1	NFS
Elk Creek (013_04) 2005SBOIA045	2	1	2	1.7	NFS
Bearskin Creek (013_03) 2007SBOIA138	1	1	1	1	NFS

* SMI and SHI scores were the same for both sites.

**NFS means not fully supporting beneficial uses.

Stream name	IDEQ Stream Site ID Assessment Unit	Stream Habitat Index	Stream Macro-invertebrate Index	Assessment Score
Assessment Units Fully Supporting Beneficial Uses & Not Included in the 2010 4b Listing				
Bear Valley Creek	(012_03) 2004SBOIA047	1	3	2
Bear Valley Creek	(012_04) 2008SBOIA033	3	1	2
Bearskin Creek	(013_02) 2008SBOIA037	3	3	3
Elk Creek Upper	(013_03a) 2008SBOIA038	3	2	2.5
Elk Creek Lower	(013_03a) 2008SBOIA041	3	2	2.5
Little EF Elk Creek	(013_02a) 2008SBOIA039	3	3	3
Porter Creek	(013_03a) 2008SBOIA042	3	2	2.5
Sheep Trail Creek	(014_02) 2008SBOIA034	3	2	2.5
Fir Creek	(017_02) 2008SBOIA031	2	2	2

Data source: IDEQ 2010
Note: No Stream Fish Index (SFI) on the AUs above because IDEQ did not electrofish these stream segments (beneficial use support can still be determined without the SFI).

Additional IDEQ data for Bear Valley Creek – 5th order: The 5th order AU of Bear Valley Creek (012_05) lies partly in an inventoried roadless area as well as adjacent to the wilderness area. There are no roads proximate to the creek in this assessment unit although roads cross the stream via a bridge in two locations. An IDEQ analysis of streambanks in 2007 in the 5th order section of Bear Valley Creek found that the banks were, on average, 79% stable, which while showing marked improvement since the 1990s is below the reference condition found in the natural conditions database (Overton et al 1995) of 84% stability. The natural conditions database is used only as a comparison to the current BVW conditions. Subsequently, a bank erosion hazard inventory was conducted which found that the

overall erosion rate was 35 % over the reference rate. As shown in Figure 2.2, percent surface fines average 22%, meeting the Natural Conditions database reference criteria.

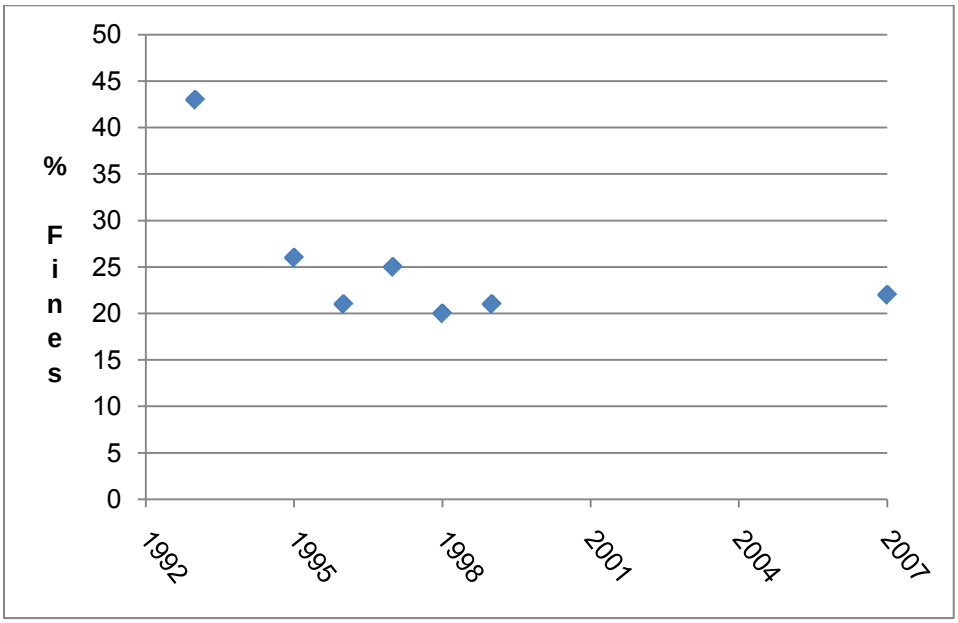


Figure 2.2 Bear Valley 5th Order % Surface Fines (IDEQ 2008)

A 2005 McNeil core survey in Bear Valley – 5th order (AU 012_05) downstream of the confluence of Bear Valley and Elk Creeks found 23% depth fines. McNeil core survey sites conducted in 2004 found average depth fines in the fifth order section of 34%. Core surveys conducted in 2001 in the 5th order section found average depth fines of 29% (IDEQ unpublished data).

Assessment Units Not Included in the 4b: In addition, data for assessments units not proposed for 4b listing is discussed in this document as the information illustrates the improving trend found in the Bear Valley Watershed. Segments not proposed for 4b justification include the following: Bear Valley Creek - 3rd order, Bear Valley Creek - 4th order, and Elk Creek - 3rd order. The IDEQ BURP scores show these assessment units were not proposed for listing in the 2010 4b listing because they are fully supporting beneficial uses (see Table 2.2). The 3rd order assessment unit (AU) of Bear Valley Creek starts at the confluence of Sheep Trail Creek and Bear Valley Creek, continuing downstream to the confluence of Cache Creek and Bear Valley Creek. The 4th order AU of Bear Valley Creek encompasses the subwatershed downstream from Cache Creek to the confluence with Elk Creek. The

3rd order assessment unit of Elk Creek includes the wilderness portion of the Elk Creek watershed, upstream of the confluence with Bearskin Creek.

Table 2.3 303(d) Listing History in Bear Valley and Elk Creeks

Assessment Unit	Stream name	Included in 2010 4b	Pollutant	Miles
012_02a	Upper Bear Valley Creek - 1st and 2nd order	Yes	Sediment	28.9
012_03	Bear Valley Creek- 3rd order	No	Sediment	2.1
012_04	Bear Valley Creek – 4th order	No	Sediment	7.4
013_03	Elk Creek – 3rd order	No	Sediment	5.1

The AUs listed in Table 2.3 are streams that have been included on past Section 303(d) lists. All but one AU, Bear Valley – 2nd order, are excluded from this 4b because IDEQ has determined that the AUs meet beneficial uses. In 2004, an IDEQ BURP assessment near Cache Creek showed that AU 012_03, fully supported beneficial uses (Table 2.3) and is not included in this Category 4b justification. This AU is proposed for delisting in the Middle Fork Salmon TMDL. The 4th order of Bear Valley Creek AU was determined to be meeting beneficial uses through BURP surveys in 2008 and the resulting index score of 2. The 3rd order of Elk Creek is mostly within the wilderness and was determined in 2008 also to meet beneficial uses, with a BURP assessment score of 2.5.

PIBO Data

The Forest Service's PACFISH/INFISH (USFWS 1998) (see glossary for definition) Biological Opinion (PIBO) Monitoring Effectiveness Program has collected stream habitat data in the Bear Valley Watershed since 2001. When compared to reference sites in the Upper Columbia River Basin, the PIBO data shows that fine sediment is high for the streams measured in the BVW.

The PIBO program started in 1998 when an interagency team of resource specialists convened to develop a plan that would monitor the effects of land use activities on aquatic and riparian resources. There were three components of the plan:

implementation monitoring, effectiveness monitoring, and validation monitoring. The PIBO group is responsible for managing the "effectiveness" monitoring component of the PACFISH/INFISH/Bull trout/steelhead monitoring plan (USFS and BLM 1995). The PIBO group's published monitoring plan gives a complete discussion of the program development and study plan (http://www.fs.fed.us/biology/fishecology/emp/).

The original PIBO study area is within the upper Columbia River basin and includes Forest Service lands within INFISH and PACFISH, and BLM lands within PACFISH or containing bull trout. A pilot study was started from 1998 to 2000 which concluded that the approach was logistically feasible, site conditions were successfully measured, and provided an effective foundation to guide future sampling efforts. In 2001, PIBO began the first 5-year sampling cycle. Approximately 125 subwatersheds were sampled in 2001 and in 2002 at half implementation. Full implementation began in 2003, which includes sampling 250 subwatersheds per year. An additional 50 subwatersheds (sentinel sites) are sampled annually to identify the effects of climate variability. In 2006 reaches were sampled that were originally sampled in 2001. Since then, the PIBO group has completed a number of analyses to address the objective of assessing change in resource conditions given current land management practices. Preliminary data analyses are available in annual reports (http://www.fs.fed.us/biology/fishecology/emp/).

One of PIBO's sentinel sites is established in Bearskin Creek AU (013_03) in the Elk Creek watershed. This site has been monitored annually, using the PIBO protocol described in Heitke et al (2008). Additionally, in 2006 and 2007, PIBO collected habitat data in the Bear Valley Creek –5th order AU (012_05) and the Elk Creek – 4th order AU (013_04). Table 2.4 displays a summary the percent fine sediment and bank stability data collected by PIBO within each Assessment Unit.

Table 2.4 PIBO Bank stability and Percent fines data (2001-2009), (PIBO 2009)

Assessment Unit	Stream	Year	Bank Stability (%)[1]	Percent Fine Sediment (< 6mm)[2]	Predicted Percent Fine Sediment[3]
Bearskin Creek– 3rd order	Bearskin	2001	100	ND	
	Bearskin	2002	91	72	
	Bearskin	2003	93	84	
	Bearskin	2004	98	95	
	Bearskin	2005	95	70	
	Bearskin	2006	95	84	
	Bearskin	2009	95	71	
	Average		***95***	***79***	***64***
Elk Creek – 4th order	Elk 3	2006	95	13	
	Elk 3	2007	100	ND	
	Average		**98**	**13**	**11**
	Elk 4	2006	86	65	
	Elk 4	2007	79	ND	
	Average		**82**	**65**	**7**
	Elk 5	2006	91	17	
	Elk 5	2007	93	ND	
	Average		**92**	**17**	**1**
Bear Valley Creek- 4th order	Upper Bear Valley 2	2006	98	12	
	Upper Bear Valley 2	2007	91	ND	
	Average		***95***	***12***	***10***
	Upper Bear Valley 3	2006	95	ND	
	Upper Bear Valley 3	2007	100	ND	
	Average		***98***		***4***
Bear Valley Creek-5th order	Lower Bear Valley 1	2006	83	ND	
	Lower Bear Valley 1	2007	98	ND	
	Average		***90***		

[1] *Bank Stability:* Percent stable banks were calculated using method of dividing 3 variables (number of covered stable, uncovered stable, and false bank measurements) by the total number of measurements.

[2] *Percent Fines:* Percent Pool tail Fines < 6mm.

[3] Predicted fines : Averaged by site, not by year. Predicted surface fines (%), using the regression equation in Table 2.6

ND = No Data or insufficient data available

Streambank stability in Bearskin Creek remained above 90% in the seven years of habitat data collection by PIBO. The Elk Creek 4th order AU was surveyed two years, with ranging from approximately 79% stability to 100% stability in 2006 and 2007 surveys. The Bear Valley 4th order AU (not an AU proposed for Category 4b) also remained over 90% stability. The Bear Valley 5th order AU ranged from 83% to 98% stability in 2006 and 2007 respectively.

Fine sediment, as measured by the PIBO survey, is high (and the highest measured) in Bearskin Creek (ranging from 70% to 95%) and lowest in the 4th order AU of Bear Valley Creek (one year, measured at approximately 12% fines). Data is not available for several sites in 2007.



Photograph 2.1 Bearskin Creek, PIBO Monitoring site. 2007. *Low gradient, meandering stream. Although fine sediment is high, streambanks are mostly vegetated and stable.*

In 2010, the PIBO group developed an index of physical aquatic habitat condition using physical stream habitat and landscape data from reference reaches (Al-Chokhachy et al 2010). Reference reaches, as defined by PIBO monitoring protocols, include both wilderness areas and watersheds where there was no permitted livestock grazing in the last 30 years, minimal timber harvest (<10%), minimal road density (0.8 mi./mi^2) at the watershed scale and no roads within the proximate (0.62 mile) riparian buffer, and no evidence of historic mining within riparian areas (Kershner et al. 2004). This index approach can be used to monitor the status of the overall condition of physical habitat while accounting for natural variability and geoclimatic differences among reaches. The habitat index incorporates landscape and climatic covariates into multiple linear regression analyses to control for inherent differences in physical habitat attributes among reaches, and scores the overall condition of reaches with index scores ranging from 0 to 100, with 100 being closer to reference conditions (Al-Chokhachy et al, 2010). The regression model used to score percent fine sediment incorporated drainage area, stream gradient, precipitation, drainage density and dominant geology as covariates (Table 2.5). Incorporating the five covariates helps to explain approximately 36% of the variability among sites. Figure 2.3 displays the use of the index approach, specifically for percent fine sediment, comparing Bear Valley

streams with the approximately 250 PIBO reference site in the Upper Columbia River Basin.

Table 2.5 PIBO habitat index approach: Regression model used to score percent fine sediment (Al-Chokhachy et al 2010).

Attribute	Regression model[a]	Adj. R^2
Percent fine sediment (<6mm)[b]	0.76 – 0.004*(area) – 0.11*(grad) – 0.19*(precip) + 0.12*(drainage den) + 0.09*(ign)	0.36

[a]Area is catchment area,(km^2), precip. is average annual precipitation (m), drainage den is the density of streams within the catchment (km/km^2), ign. is a categorical variable denoting the dominant geology is or is not igneous, grad is reach gradient (%)

[b]Transformed using arcsine square root.

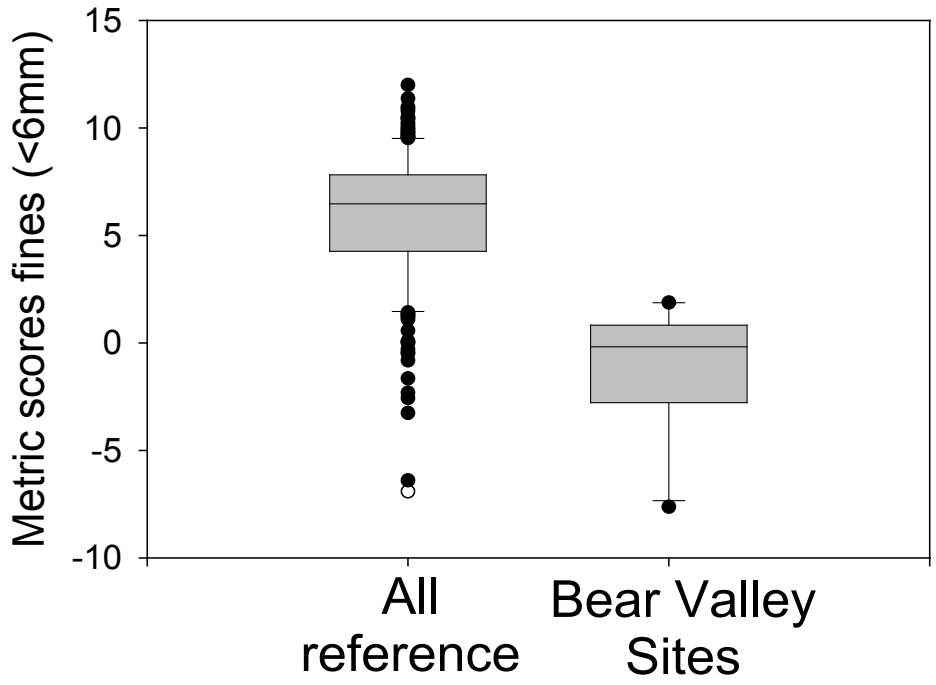


Figure 2.3 PIBO data: Percent fine sediment (<6mm) metric score for Bear Valley streams compared to all reference sites in the Upper Columbia River Basin[2].

[2] The box and whisker plot can be read as follows: the bottom and top of the box are always the 25th and 75th percentile (the lower and upper quartiles, respectively), and the band near the middle of the box is always the 50th percentile (the median). The whiskers (lines extending out of the box) represent the 10th and 90th percentile. Any data not included between the whiskers is plotted as an outlier with a dot.

Figure 2.3 displays that the Bear Valley managed sites score substantially lower (i.e. more departed) in the percent fine sediment metric score than the reference sites used for comparison. This data show that fine sediment is a concern in the Bear Valley area. Bearskin Creek (PIBO sentinel site) makes up the majority of the data used for this comparison. Additional PIBO data is available for the Bearskin site, namely temperature and macroinvertebrates.

Macroinvertebrates can be utilized as a useful indicator for biological integrity (Hawkins 2006). For the Bearskin site, the percent of "clingers"[3] was chosen as a representative measure of the macroinvertebrate data (Figure 2.4). The percent of clingers would be expected to decrease with increasing habitat perturbation. Similar to the percent fine sediment metric score, the percent clingers in Bearskin Creek are much lower than both the Boise National Forest reference and managed sites (Figure 2.4). Additionally, stream temperature was analyzed to determine if temperature may be a factor limiting macroinvertebrates in Bearskin Creek. The maximum weekly maximum stream temperatures range from 56^{o}F to 59^{o}F at the Bearskin site from 2001 through 2009. (PIBO unpublished data). This temperature range is not excessive; suggesting the fine sediment is high in Bearskin Creek and may be the limiting factor for the macroinvertebrate population. Though fine sediment is high in Bearskin Creek, stream channel condition is good (stable, vegetated banks) and stream gradient is low, as shown in Photograph 2.1. The amount of high sediment in the watershed may be a combination of natural high sediment loads and low stream gradients (41% response reaches) combined with past management activities that have yet to completely process.

[3] Macroinvertebrate behavior designation includes those organisms able to remain stationery on bottom substrates in flowing waters.

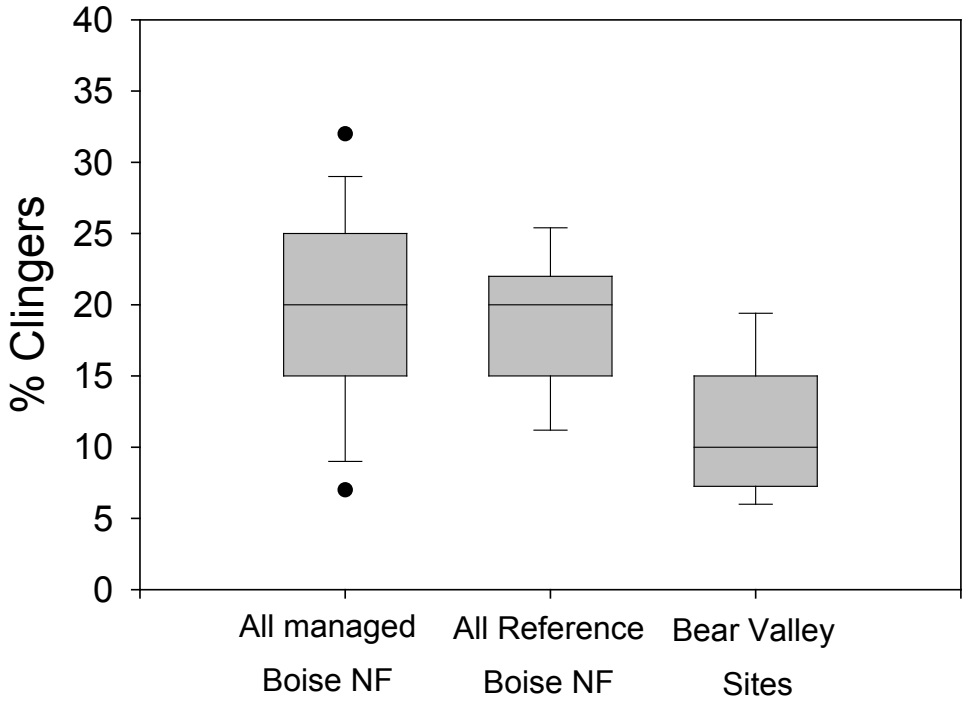


Figure 2.4 PIBO Macroinvertebrate Data for the Boise National Forest: Managed sites, Reference Sites and Bear Valley Sites (only Bearskin Creek)

Boise National Forest Bear Valley Riparian Monitoring Data

The Bear Valley monitoring program was designed to address issues related to livestock grazing in relation to water quality, riparian and aquatic habitats for chinook salmon, listed as threatened under the ESA. Bear Valley has experienced a long history of livestock grazing. The numbers of livestock gradually declined over the years and grazing management increased dramatically in the 1990s through 2001. The BNF monitoring program was instituted in 1994 and continued almost annually until 2001. This program monitored riparian condition at 23 sites. By 2001, grazing had ended and monitoring ceased. To assess the effects of non-grazing, a sample was collected at a subset of seven monitoring sites in 2008 (Burton 2010). The seven sites were chosen to represent a cross-section of pastures grazed at varying levels of intensity during the 1990s. The following paragraphs describe the results of the 2008 survey.

With respect to livestock grazing, the 2008 monitoring report (Burton 2010) found there is little evidence that the absence of livestock during the seven years immediately before the 2008 sample indicated a positive trend in riparian indicators.

For the most part, riparian indicators were the same in 2008 as compared with 2000 and 2001. There was a decline in bank stability during the late 1990s at some of the sites, but declines were also indicated at the reference sites (Fir and Porter creeks). This late 1990s decline may be due in part to a shift in the way bank stability was classified. Of greater interest are the trends in substrate indicators prior to 2000. As shown in Figure 2.5 , a least-squares fit to the averages for the monitoring sites prior to the year 2000 compared to all years shows a much steeper decline in the earlier time period. The substrate data suggest that much of the improvement to Bear Valley streams occurred during the years of intensive livestock management. By the end of the decade when all grazing ceased, little improvement has occurred. The same cannot be suggested for the other riparian indicators. Bank stability, for example, generally declined during the 1990s and then recovered slightly during the 2000s. Ecological status remained essentially static through the years. Winward stability rating increased over all years, but the 1990s did not see as steep a trend in the 1990s compared to the 2000s.

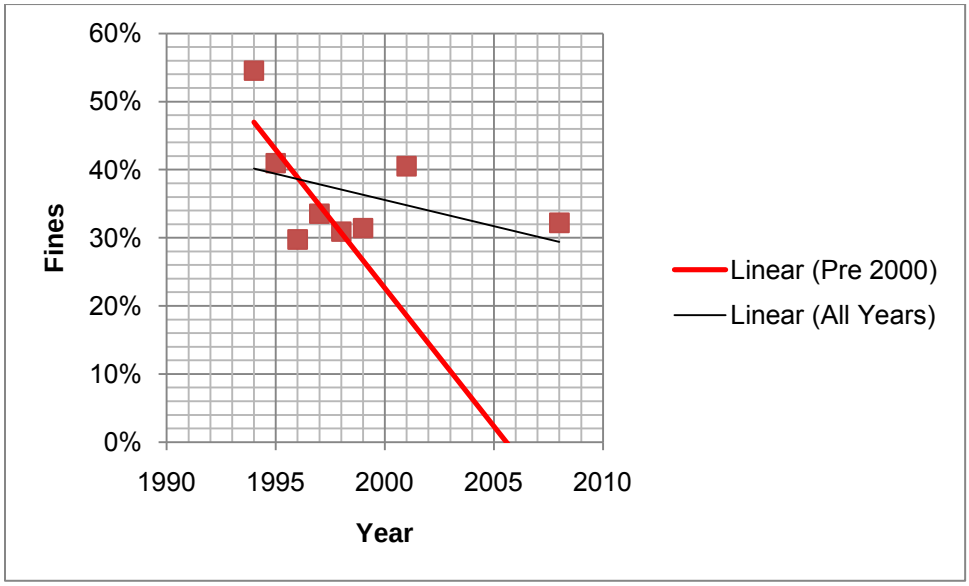


Figure 2.5 Trends in percent fines (least squares line fit) for monitoring sites in Bear Valley showing a steeper trend for years prior to 2000 than for the all years through 2008 (Burton 2008).

Trends in riparian indicators in Bear Valley Watershed may partly reflect the effects of streamflow on the streambank and riparian vegetation. Snow water equivalent, as measured at Banner Summit (NRCS Snotel site) (USDA 2010), shows and increasing trend during the mid and late 1990s with a decline in the 2000s (Figure 2.6). These trends are consistent with the decline in bank stabilities and substrate

fine sediments during the 1990s. The fact that fine sediments remained low in 2008, and bank stabilities recovered slightly by then suggests that the absence of additional land disturbance factors may have helped maintain these conditions in 2008. These higher snowpack conditions and resulting increased streamflows may also explain the increases in ecological status and Winward stability rating (defined below and in glossary) in the late 1990s with a slight decline by 2008 (Winward 2000).

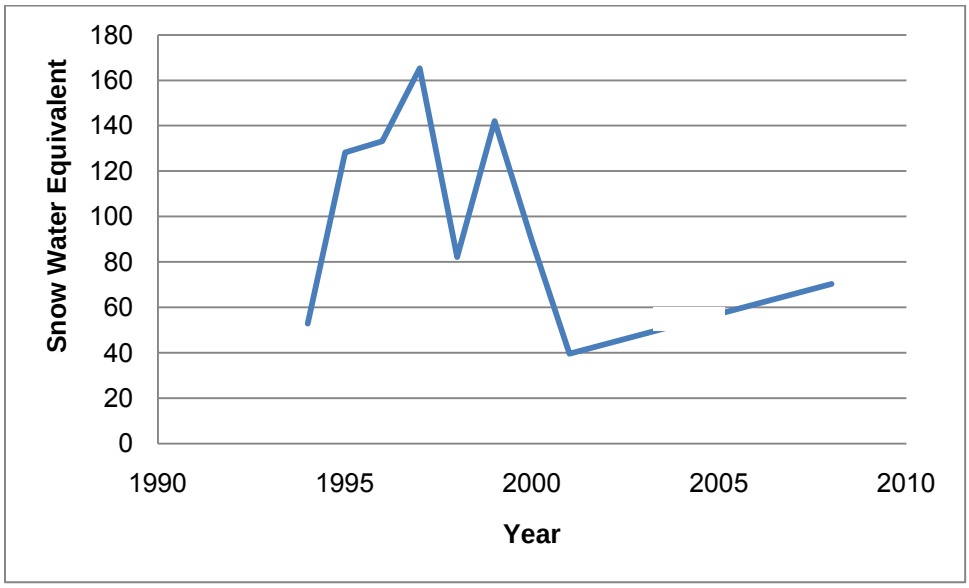


Figure 2.6 Snow water equivalent (inches) at the Banner Summit Snotel Station for years 1994 to 2001 and 2008, analogous to the monitoring years in Bear Valley (USDA SNOTEL 2010).

The condition of riparian indicators was generally lower than that for the reference sites. Many of those differences are statistically significant for Bear Valley and Elk Creeks. The tributaries are comparable to, or even better than the reference sites (e.g. ecological status). Conditions are summarized below:

> *Bank Stability*: Bear Valley Creek was variable from 70 to 90% and Elk Creek from 60 to 85% over all the years. Tributaries were in the 80s and references from 80 to 100%. The PACFISH riparian management objective for salmon streams was 80% and the PACFISH Biological Opinion of 1995 (USFS and BLM 1995) increased the objective to 90%. Because the bank stability protocol had a poor precision of plus and minus 10%, the variability at the reference sites – 80 to 100% may at least partly reflect observer error, and likely also the imprecision associated with the shift in the protocol during the mid 1990s (Figure 2.7).

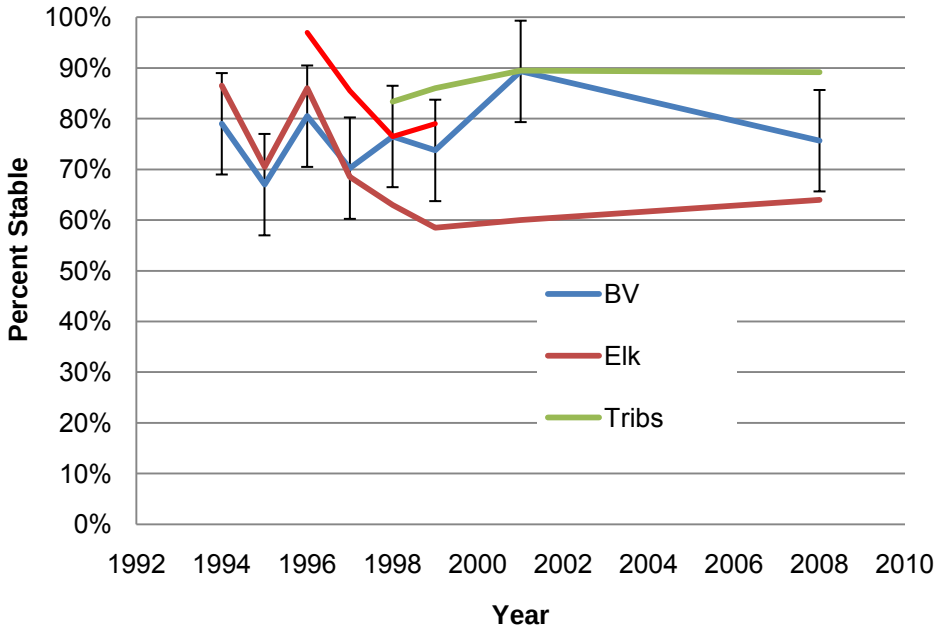


Figure 2.7 Trends in average streambank stability at monitoring sites on Bear Valley Creek (BV), Elk Creek (Elk), and tributaries (Tribs) as compared with trends at the reference sites Porter Creek and Fir Creek. Confidence intervals (vertical error bars) are shown for Bear Valley Creek indicating that the upward trend is not significant given the imprecision of the earlier methods (Burton 2010).

Greenline Vegetation Winward stability rating: Winward Stability Rating historically referred to as the vegetative stability rating, estimates the contribution of the roots of streamside vegetation to bank stability. Species have varying abilities to resist erosion based upon their rooting characteristics, both density and depth or extent. A good description of this rating is contained in the Rocky Mountain Research Station publication General Technical Report 47 (Winward 2000). The ratings for Bear Valley and Elk Creeks fall mostly in the "Mid" stability class and for the tributaries and references in "High" stability class. However the confidence interval on this rating makes it difficult to definitively conclude that vegetation stability is actually in or below either class. This is because most of the ratings fall in the 6.0 to 7.0 range and the change from "Mid" to "High" is at 6.5 (Figure 2.8).

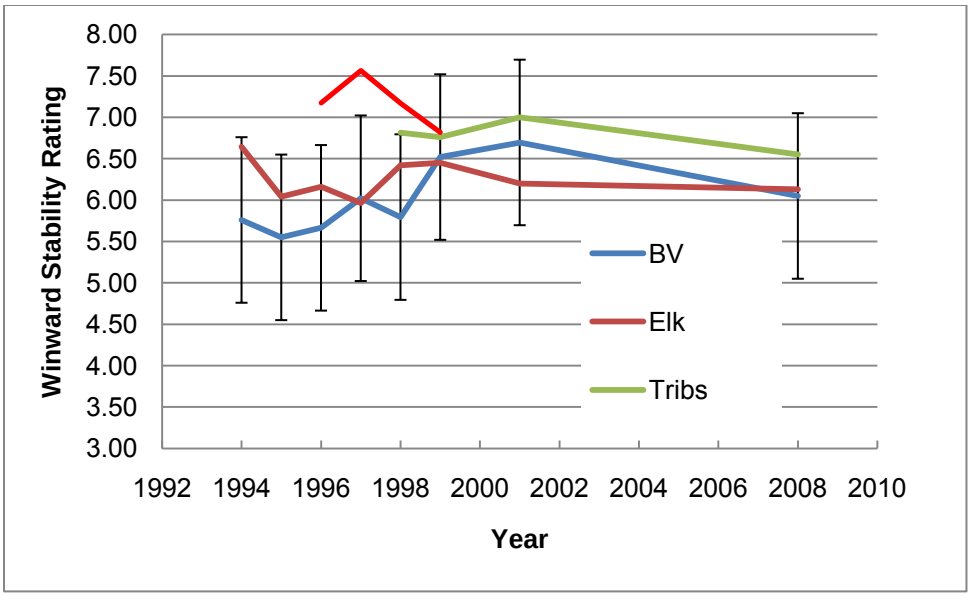


Figure 2.8 Trends in Winward Stability Ratings as compared with trends at reference sites for stations in Bear Valley Creek (BV), Elk Creek (ELK), and tributaries (Tribs). Confidence intervals are displayed for the Bear Valley (BV) data (Burton 2010).

Greenline Vegetation Ecological Status: Ecological status tends to average in the 75 to 95 range on Bear Valley and Elk Creeks. The lower half of this range, 75 to 85 is in the "Late" category and above that in the "Potential Natural Community" or PNC category. Reference sites and tributaries were consistently in the PNC category. These conditions reflect the predominance of late seral species on the greenlines in Bear Valley (Figure 2.9).

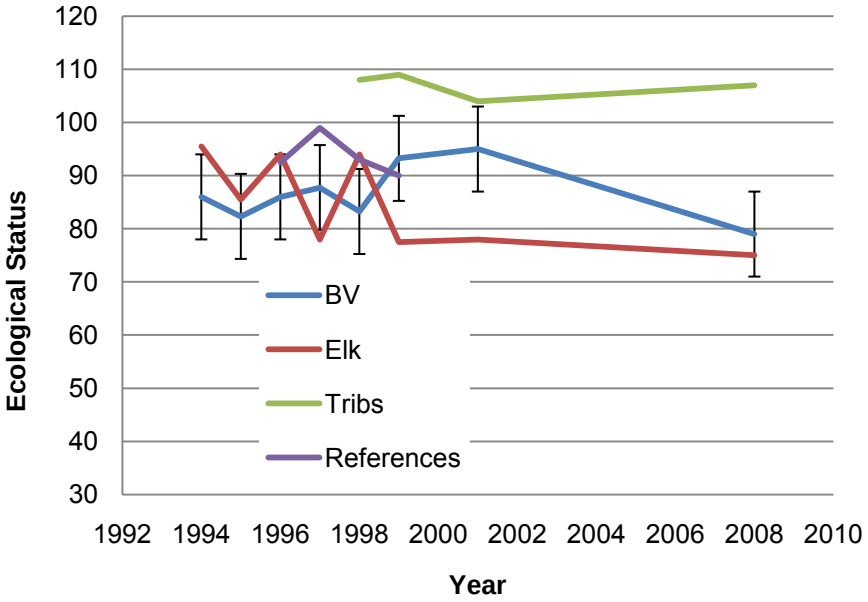


Figure 2.9 Ecological status trends at monitoring sites in Bear Valley Creek (BV), Elk Creek (Elk), and tributaries (Tribs) showing trends in comparison to trends at the reference sites (purple). Vertical error bars display confidence intervals on Bear Valley data (Burton 2010).

Substrate Fines: The analysis indicates that substrate fines were higher at the monitoring sites than at reference sites during the 1990s. By 2008, these conditions had reversed at many sites, where they were now comparable to or less than the average reference condition. In the early 1990s percent fines were in the 45 to 55 percent range on Bear Valley and Elk Creeks. By 2008 substrate fines were in the 20's. Reference site conditions in the 1990s were in the 15 to 25% range. The PACFISH Biological Opinion (USFWS 1998) suggested that for salmon spawning streams, the objective for substrate percent fines should be less than 20%, which should be used only as a comparison (Figure 2.10).

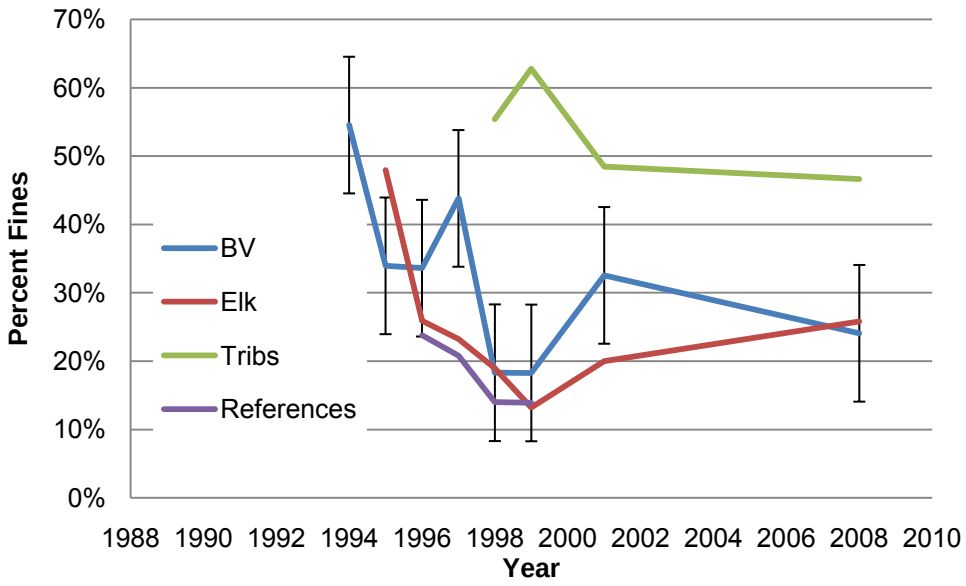


Figure 2.10 Substrate fine sediment trends at monitoring sites in Bear Valley Creek (BV), Elk Creek (Elk), and tributaries (Tribs) as compared to trends at the reference sites. Error bars indicate the confidence intervals of plus and minus 10% fines (Burton 2010).



Photographs 2.2 Transfer Cabin site on Bear Valley Creek, located about ½ mile upstream of BV7a**.** *This was a traditional point of cattle concentration where a major crossing of the channel was used while herding livestock. The photo at top was taken in 1986, the one in the center in 1999, and at bottom in 2008. The rail post fence was installed in the early 1990s to deflect cattle concentrations at this location, but the establishment of a riparian pasture here greatly improved riparian conditions at this point during the 1990s. There is evidence; however that hydric vegetation continued to encroach into the channel between 1999 and 2008.*





Photograph 2.3 Bear Valley Creek, Point bar near Site BV7b. *Top photo was taken in 2000, bottom photo in 2008. This bar is gradually being covered by perennial vegetation, evidence of vegetative encroachment in the Big Meadow on upper Bear Valley Creek.*

Sources of Pollutants causing Impairment

As discussed through analysis of the IDEQ BURP and USFS data, fine sediment in the BVW appears to be high. Additionally, fine sediment in the BVW appears to be higher than reference streams in the Upper Columbia River Basin. However, it is difficult to find an adequate number of reference sites that have similar geoclimatic settings (i.e.> 6,000 feet elevation, broad, flat valleys, and gentle, low gradient streams) as Bear Valley to make a true comparison of stream conditions (Eric Archer, PIBO group, personal communication, 2009). There is a shared estimation by the land managers familiar with the BVW, that the watershed may naturally carry

a high sediment load because of the low gradients streams, meandering through glacial and lacustrine deposits. The low relief and broad valleys create an aquatic ecosystem where fine sediment is processed and transported more slowly than neighboring basins such as the Stanley basin and the Payette River basin.

This document also acknowledges that there are several anthropomorphic disturbances that have contributed to a high sediment load within the BVW. As discussed in ***Section 1***, excess sediment in Bear Valley Creek is primarily attributed to the historic dredge mining that took place in the 1950s and the failed reclamation attempt in the 1960s that resulted in large sediment inputs to the creek, most notably in a flood in 1984. An estimated 800 to 1,400 cubic yards of sediment per year was mobilized, transported, stored and is still being processed as a result of the mining activity. The historic dredge mining is believed to be the most significant source of sediment in the Bear Valley Creek portion of the BVW.

This is not the case, however, in the Elk Creek watershed where dredge mining did not take place. In the Elk Creek portion of the BVW, as well as other tributaries unaffected by mining, historic livestock grazing and existing roads have contributed sediment to streams. Historic livestock grazing contributed to unstable streambanks and diminished some riparian areas, resulting in streambank erosion and subsequent excess sediment delivery to the watershed. Livestock have not grazed in the Bear Valley watershed since 2001. Additionally, there are approximately 167 miles of roads within the BVW, some of which currently contribute sediment to streams. Since mining activities and livestock grazing have ceased within the BVW, existing problem roads are the dominant known anthropomorphic source of sediment still present in the BVW.

The following sections describe existing data on each of the sediment sources, past and current.

Sediment from Mining

Past mining is considered to be the largest source of sediment in the BVW, specifically in and downstream of AU 012_02a in Bear Valley Creek. The second order section of Upper Bear Valley Creek (headwaters to Sheep Trail Creek) AU 012_02a contains the section of Bear Valley Creek restored following the historic dredging operation (also referred to as the enhancement reach). The following information shows pre and post monitoring conditions for chinook salmon redds, macroinvertebrates, and percent fines. All parameters generally show an upward trend. While trends in fishery abundance are particularly hard to link to habitat improvement because

factors outside the Bear Valley Watershed greatly influence the fish populations, it is clear that greater utilization of habitat in the restoration area is taking place (Figure 2.11).

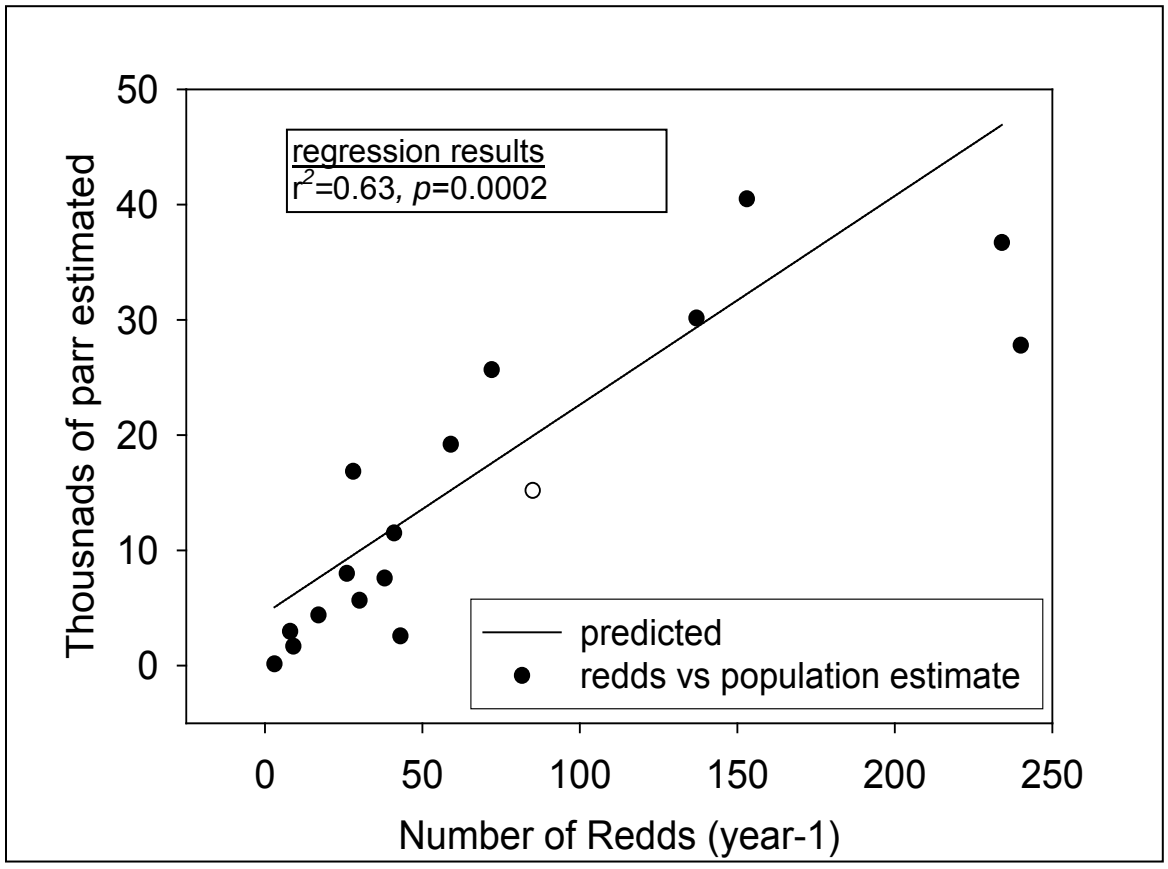


Figure 2.11 Relationship between the number of age 0+ Chinook salmon parr and the number of redds the previous year from 1989-2003 in Upper Bear Valley Creek AU ID17060205SL012_02a. (H.Ray, Shosone Bannock Tribes, personal communication 2005)

Macroinvertebrate sampling by the Shoshone-Bannock Tribes has shown that since rehabilitating the dredged area that the relative abundance of macroinvertebrate species intolerant to fine sediment has increased. A significant increase in the Order of macroinvertebrates: Emphemeroptera, Plecoptera, Trichoptera (EPT) species, a more favored food species for salmonids, has also occurred (Figure 2.12 and 2.13).

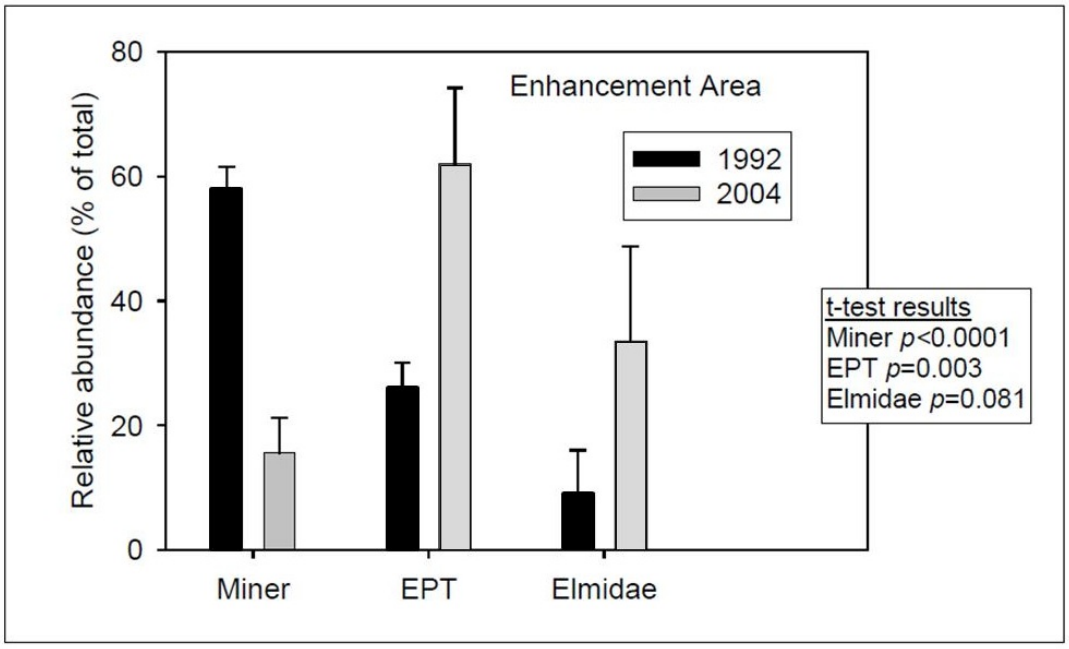


Figure 2.12 Relative abundance of macroinvertebrate groups within the enhancement area pre (1992) and post (2004) enhancement in Upper Bear Valley Creek (H.Ray, Shoshone-Bannock Tribes, personal communication 2005)

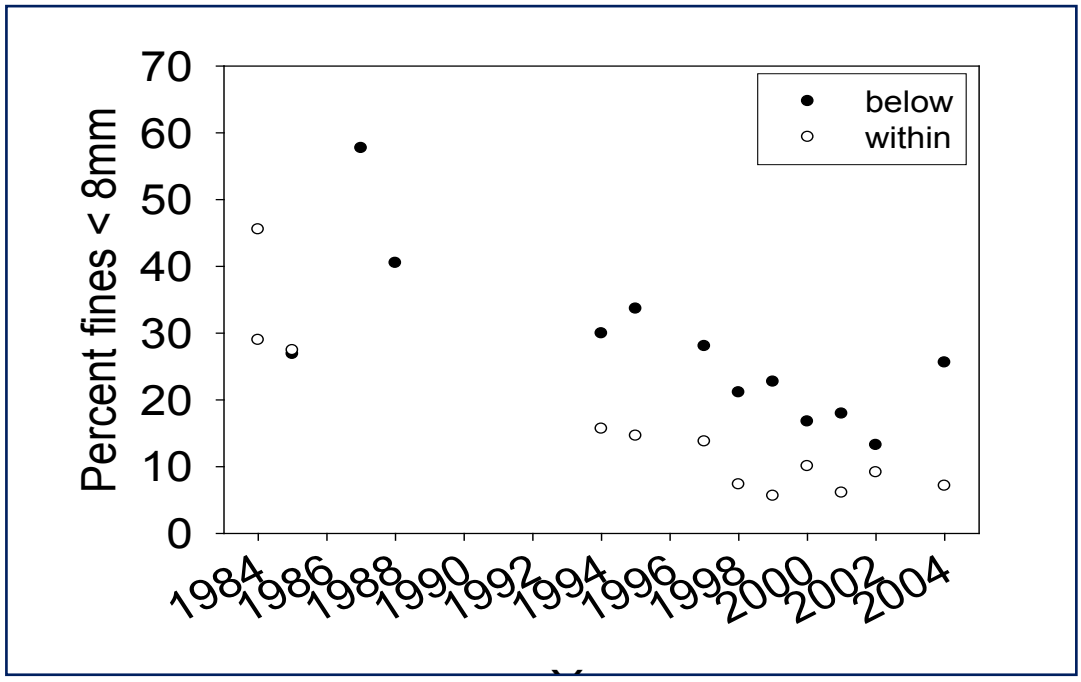


Figure 2.13 Average percent surface fine sediment < 8 mm below and within the enhancement area in Upper Bear Valley Creek between 1984 and 2004 (H. Ray, Shoshone-Bannock Tribes personal communication 2005).

Sediment from Roads

Existing problem roads are likely the largest current human-caused threat of sediment delivery in the BVW. In 2009, the EPA funded a site-specific road sediment inventory for the Bear Valley and Elk Creek watersheds. This inventory specifically quantified the extent and location of sediment contributions from roads to streams, using the Geomorphic Road Analysis and Inventory Package (GRAIP, Prasad et al. 2007, http://www.fs.fed.us/GRAIP). This suite of robust inventory and analysis tools evaluates the following road impacts and risks: road-stream hydrologic connectivity, fine sediment production and delivery, upstream sediment accumulation, drain point condition, stream crossing failure risk, gully initiation risk, and shallow landslide risk. A complete report, the Bear Valley Road Inventory (GRAIP) report (Fly et al. 2011), was prepared that details the GRAIP survey and model results, specific for the Bear Valley Watershed. A summary of the report's findings is included below.

GRAIP model results show a total of 146 miles of road were surveyed using the GRAIP methodology in 2009. Taken collectively, inventory results indicate that forest roads in the Bear Valley and Elk Creek watersheds do result in some hydrogeomorphic impacts and risks to water quality and the aquatic ecosystems. Relative to road sediment production, however, overall sediment delivery is low. Areas of high sediment delivery could be reconstructed or otherwise improved in order to substantially reduce road-to-stream sediment transport. GRAIP predictions can be used to address the needs of specific road segments and drain points in the design phase of future road restoration/maintenance projects.

Road-stream connectivity was calculated to be 18 miles (12.5%). The total amount of fine sediment from roads accumulating in Bear Valley Creek, Elk Creek, and their tributaries was 255 tons/year (Table 2.6), which accounts for 9% of all the sediment produced on Bear Valley roads. The predicted sediment delivery rate as a result of roads (1.3 tons/mi^2/yr, Table 2.6) suggests a 5% increase above the natural reference sediment erosion rate as predicted by the BOISED model (Fly et al. 2011).

Approxomately 10% of road drainage features were recorded to be in poor condition or in need of maintenance. The risk of stream crossings becoming plugged was evaluated based on a stream blocking index (SBI) where 1

indicates virtually no risk and 4 indicates high risk. The average SBI for stream crossings in this survey was 2. A total of 21% of all stream crossings have some potential to divert down the road prism if the pipe is blocked.

Table 2.6 GRAIP Stream sediment load values by subwatershed (HUC6).

Subwater-shed	Accumulated Road Sediment (GRAIP)		Natural Reference Sediment Yield (BOISED)		Road Density (Rd mi/mi^2)
	Total Sediment Yield* (Tons/yr)	Rate per Unit Area* (Tons/mi^2/yr)	Total Sediment Yield* (Tons/yr)	Rate per Unit Area* (Tons/mi^2/yr)	
Wyoming	4.0	0.2	540.6	21	0.5
Fir Creek	18.0	0.9	605.3	30	0.3
Cache	35.7	0.9	879.3	22	0.9
Upper Bear Valley	130.9	5.0	788.3	30	2.1
Upper Elk	1.2	0.0	979.4	24	0.1
Lower Elk	12.4	0.6	602.9	29	1.0
Bearskin	53.1	3.0	474.6	27	1.7
Combined Total	**255.3**	**1.3**	**4,870.4**	**25.5**	**0.9**

* The values in this table represent predicted model values and not absolutes.

Quantification of reference sediment production rates A quantitative model (BOISED) was used to calculate the natural reference sediment production rates. The model is used by the BNF to evaluate and compare the effects of certain land management scenarios on surface erosion and sediment production. The model is adapted specifically for forested watersheds in the Idaho Batholith (BNF 1991). BOISED is not intended to estimate absolute sediment quantities, but rather is a tool to quantify relative sediment production. Natural sediment production rates for undisturbed conditions are determined for each landtype delineated in a subwatershed. Landtypes found within Bear Valley are described in the Lowman Ranger District Soil-Hydrologic Reconnaissance Survey (Wendt et al, 1973). Total quantitative sediment production is calculated using coefficient and input variables contained within the model that are specific to each landtype.

Estimated background sediment production ranges between a minimum of 474 tons/year for Bearskin Creek subwatershed to a maximum of 979 tons/year for Upper Elk Creek subwatershed. Unit-area sediment production estimates range between a minimum of 21 tons/mi^2/yr in Wyoming Creek subwatershed,

to a maximum of 30 tons/mi^2/yr for Fir and Upper Beaver Creek subwatersheds. Table 2.6 displays total and per-unit area estimates of reference sediment production rates by subwatershed.

Sediment delivery from roads in the BVW appears to be dispersed throughout the area (Table 2.6). Specific locations where clusters of drain points with high sediment delivery exist are few with varying characteristics. Initial analysis suggests that the data do not show patterns of consistently similar characteristics among separate areas of high sediment delivery. One observation made in reviewing GRAIP data is that stream delivery often occurred at or near live stream crossings. When a road bends around a draw where a stream is present and water drains on or near that bend, road sediment regularly reaches the stream, whether at the stream crossing or another drainage feature.

Drain points draining extended lengths of road, if connected to the stream, are likely to deliver a large quantity of sediment (Figure 2.7) displays the top 25 sediment-delivering drain points throughout the entire BVW. These 25 drain points deliver a total of 86.5 tons/year of sediment to streams, which equals 33% of the total amount of road sediment reaching streams. The average length of road draining to the top 25 sediment-delivering drain points was 490 feet compared to an overall average of 200 feet per drain point. All but one of these features were within 650 feet of a stream crossing or a stream running parallel to the road and 14 were within 175 feet. Shortening the length between drain points may reduce the amount of sediment produced within these 25 drain points.

There are some road segments that have relatively high levels of stream connectivity and sediment delivery. Road surface sediment delivery and the accumulated sediment delivered through drain points is shown for portions of forest roads 569, 563, 579, 582, and 502 in Figure 2.14 (Fly et al. 2011).

Table 2.7 below summarizes the amount of sediment from roads accumulated in the stream channels within the respective, not cumulative, Assessment Unit, as estimated through the GRAIP model.

Table 2.7 GRAIP Stream sediment load values by Assessment Unit.

Assessment Unit	Stream name	Accumulated Road Sediment Rate (GRAIP) (tons/mi^2/yr)
012_02a	Bear Valley Creek – 1st and 2nd order	4.9
012_05	Bear Valley Creek – 5th order	1.3
013_03	Bearskin Creek – 3rd order	3.0
013_04	Elk Creek – 4th order	0.8

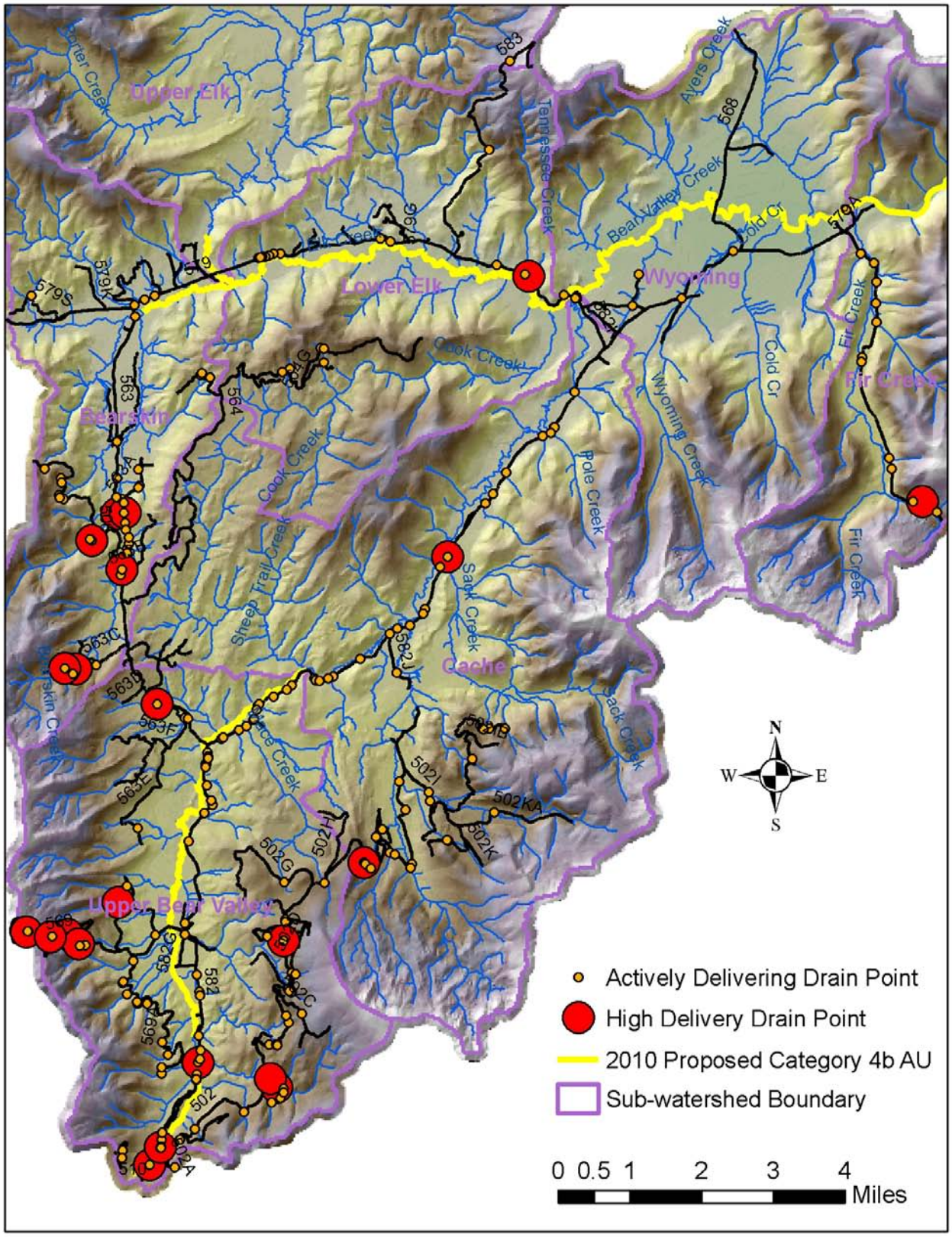


Figure 2.14 GRAIP Drain points actively delivering sediment (Fly et al 2011)

Sediment from Wildfire

Although not considered an anthropogenic source of sediment, wildfires have been prevalent within the BVW. In the last 25 years, a total of 59% of the BVW has burned in wildfires, 30% of that during the 2006 Red Mountain fire and the 2007 Sheep Trail fire. Approximately 49% of the recent fires burned with a moderate soil burn severity[4] and 4% burned with a high soil burn severity. Management actions to reduce runoff and subsequent surface erosion post-fire included rehabilitation of all hand firelines (no dozer lines or roads were constructed during 2006/7 fire suppression activities), spike camps and parking areas. Additionally, through the Burned Area Emergency Response (BAER) of 2006 Red Mountain Fire, approximately 1,500 acres received a helicopter straw mulching treatments to reduce surface erosion and sediment delivery to streams.

Surface erosion related to wildfires is assumed to be negligible after five years (BOISED, User's Guide, BNF 1991). Monitoring was conducted in the three years following the 2006 Red Mountain wildfire (2007-2009) on Wyoming Creek, Cold Creek, Cook Creek and Fir Creek (Green 2009). During the 2007 through 2009 field seasons, modified R1/R4 surveys and electrofishing surveys were completed on reaches of Wyoming Creek, Cold Creek and Cook Creek. A summary of the monitoring results related to sediment is described below.

Surface erosion from the burned areas occurred most recently in July 2008, during an intense thunderstorm in the BVW area. Surface runoff and some riling occurred, but no mass wasting or gullying was detected during observation flights over the burned area following the storm event (Grover-Wier, personal communication 2009).

Reconnaissance of the East Fork of Wyoming Creek in 2009 revealed a continued influx of large woody debris from the 2006 Red Mountain Fire, several large woody debris jams, no evidence of major channel changes due to wildfire, and some minor channel changes primarily due to log jams. Excellent bank stability and riparian vegetation since the 2006 fire, with an

[4] A moderate-soil burn severity fire is defined as one in which up to 40% of the area's soil surface litter and humus (effective ground cover) have been destroyed, and the A horizon has been subjected to intense heating. Severely scorched soils may become water repellent, leading to a reduced infiltration capacity that promotes overland flow, which can result in accelerated surface erosion. A high soil burn severity is where 40% of more of the areas soil surface litter and humus has been destroyed.

average 95% bank stability in 2009. Surface fines appear to have stayed the same in the East Fork of Wyoming Creek since the 2006 fire as measured by the fines grid (Table 2.9) (Green 2009). Wyoming Creek has had no major channel changes evident in monitoring reach, however just downstream of reach, there are some logjams and side channel changes. The riparian area is recovering well and there have been some new inputs of large woody debris from the 2006 fire. The surface fines have increased since the fire in 2006 in Wyoming Creek.

Wildfire intensity was high within the Cold Creek drainage. The two sites monitored responded differently over time in percent surface fine sediment; the upstream site went from 32% to 21% and was 28% in 2009. The downstream site increased its fine sediments from 80 to 90% with a peak of 95% in 2008, which is a significant increase since measurements were taken with a fines grid in 1999 (48%) and 55% in 2001.

Cook Creek data is inconsistent with the upstream monitoring site changing from 20.3% surface fines in 2007, to 8.7% in 2008 and up to 57% in 2009. The upstream site on Cook Creek is in a meandering "E" channel type meadow with high natural fine sediment (Table 2.8). The significant change in measured grid fines in 2009 may be due to different personnel monitoring that particular site in 2009 versus the other sites where the same person completed the monitoring in 2007-2009 (Grover Wier, personal communication 2010). The downstream site has much less sediment at 11-4% over the last 3 years (Green 2009).

Table 2.8 Percent Surface Fines in Four Streams affected by the Red Mountain Fire.

Location	1999	2001	2007	2008	2009
East Fork Wyoming Creek			25	25	24.5
Cold Creek (downstream)	48	55	80	95	90
Cold Creek (upstream)			32	21	28
Cook Creek (upstream)			20.3	8.7	57
Cook Creek (downstream)			11	5.2	4
Fir Creek (upper)		56		56	
Fir Creek (lower)		10		8	

2. Description of Pollution Controls and How they will Achieve Water Quality Standards

Excess sediment is described by narrative criteria (IDAPA 58.01.02.200.08): "Sediment shall not exceed quantities specified in Sections 250 and 252 or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350." Beneficial uses for streams in Bear Valley are described in Table 2.1.

Water Quality Goal

The water quality goal selected for this 4b justification focuses on sediment as the pollutant of concern. Since the state of Idaho has narrative sediment criteria, it is necessary to develop numeric goals for sediment for attainment beneficial uses (USEPA 2006). The BVW has a unique geoclimatic setting, including gentle hillslopes, low gradient streams, geology dominated by the granitic Idaho Batholith, and high elevation (6,000 feet) meadows. This geoclimatic setting has created broad valleys with low energy streams, meandering through glacial and lacustrine deposits. The low relief and broad valleys create an aquatic ecosystem where fine sediment is processed and transported more slowly than neighboring basins such as the Stanley basin and the Payette River basin. Because of this uniqueness, it is difficult to identify an adequate number of surveyed sites, in similar settings, in an undisturbed "reference" condition from which to discern in-channel water quality indicators (such as fine sediment and bank stability). Within the BVW itself, the majority of the watershed was grazed by livestock at some time in the last 30 years and was not considered appropriate for reference conditions.

Therefore, in place of an adequate in-channel indicator, sediment delivery from roads to streams (using the GRAIP model) was chosen as the indicator to measure achievement towards water quality goals for the BVW. Due to the progression of restoration activities (including stream improvement projects, the cessation of livestock grazing and mining, and a change in Forest Service management direction), roads appear to be the remaining stressor to the aquatic environment for which there is some level of anthropomorphic control (i.e. still improvement left to accomplish).

To develop the sediment indicator, the current sediment accumulation from roads to streams (using the GRAIP model) was compared to inherent reference sediment

(using the BOISED model). It is possible and appropriate to use the two models for comparison as the inherent sediment rates from BOISED are incorporated into the GRAIP model. Current sediment accumulation from roads to streams was discussed in detail in ***Section 1*** of this justification and is presented, by AU, in Table 2.7.

Comparison of sediment accumulated from roads and natural reference sediment is described as a "percent over reference". The "percent over reference" was calculated for the nine AUs that are currently meeting beneficial uses. The "percent over reference" was weighted by the area of the AU. The combined weighted average for the nine AUs meeting beneficial uses is 6% over reference. The range is 0 to 14%. This means, that on average weighted by the AU area, sediment accumulated from roads to streams is 6% greater than natural reference sediment for the nine AUs meeting beneficial uses. In comparison, for the four AUs not meeting beneficial uses, there is a 9% increase in sediment from roads to streams as compared to reference conditions. The range is 3 to 16%. Table 2.9 displays "percent over reference" for the nine AUs meeting beneficial uses.

A water quality goal of reaching a "percent over reference" accumulated road sediment within the range (0 to 14%) and near the average (6%) of the AUs supporting beneficial uses is determined appropriate for the BVW, based on the analysis displayed in Table 2.9 and agreement among the IDEQ, EPA and USFS.

Table 2.9 Percent Accumulated Road Sediment over Inherent Reference Sediment (tons/mi^2/yr) by Assessment Unit Meeting Beneficial Uses.

IDEQ AU	Stream name	Subwatershed(s) Draining to Assessment Unit	Accumulated Road Sediment (GRAIP)		Natural Reference Sediment Yield (BOISED)		Percent Accumulated Road Sediment over Natural Reference Sediment Yield*
			Total Sediment Yield (tons/yr)*	Rate per Unit Area (tons/mi^2/yr)*	Total Sediment Yield (tons/yr)*	Rate per Unit Area (tons/mi^2/yr)*	
012_02	Lower Bear Valley Creek—1st and 2nd order	Cache, Wyoming, Fir Creek	9	0.2	971	24	**1%**
012_03	Bear Valley Creek—3rd order	Cache, Upper Bear Valley	136	3.8	1,003	28	**14%**
012_04	Bear Valley Creek—4th order	Cache, Upper Bear Valley	167	2.5	1,652	25	**10%**
013_02	Elk Creek—2nd order (includes Bearskin Creek and other tributaries)	Bearskin, Lower Elk	61	1.9	890	28	**7%**
014_02	Sheep Trail Creek	Cache	0	0.0	154	22	**0%**
015_02	Cub Creek	Upper Bear Valley	6	2.1	83	30	**7%**
016_02	Cache Creek—2nd order	Cache	6	0.6	222	22	**3%**
016_03	Cache Creek—3rd order	Cache	18	1.4	277	22	**6%**
017_02	Fir Creek	Fir Creek	18	1.6	335	30	**5%**
AVG.	**-**	**-**	**-**	**1.6**	**-**	**26**	**6%**

* The values in this table represent predicted model values and not absolutes.

Of the four AUs proposed for 4b, all but one AU (012_02a) are within the 0 to 14% range, though AU 013_03 is at 11%, over the 6% average, as displayed in Table 2.10.

There are two important caveats regarding the sediment goal of a range of 0 to 14% and average of 6% over natural reference sediment. First, the goal focuses solely on road-related sediment. It does not include other sediment sources within the watershed. Second, the goal is based on two predictive models (BOISED and GRAIP) that, while based on site-specific data, do not reflect absolute sediment production quantities. While keeping the two caveats in mind, the sediment goal does provide a useful tool for identifying current road-related sediment in comparison to natural reference values. As described in ***Section 5***, later in this document, the BURP survey will be the ultimate tool used to monitor the achievement of water quality standards.

Table 2.10 Percent Accumulated Road Sediment over Natural Reference Sediment (tons/mi^2/yr) by Assessment Unit included in 4b.

IDEQ AU	Stream name	Subwatershed Draining to Assessment Unit	Accumulated Road Sediment *(GRAIP)*		Natural Reference Sediment Yield *(BOISED)*		Percent Accumulated Road Sediment over Natural Reference Sediment Yield*
			Total Sediment Yield (tons/yr)*	Rate per Unit Area (tons/mi^2/yr)*	Total Sediment Yield (tons/yr)*	Rate per Unit Area (tons/mi^2/yr)*	
012_02a	Upper Bear Valley Creek–1st and 2nd order	Upper Bear Valley	131	4.9	807	30	16%
012_05	Bear Valley Creek –5th order	Fir Creek, Wyoming, Cache, Upper Bear Valley, Lower Elk, Upper Elk, Bearskin	255	1.3	4,763	25	5%
013_03	Bearskin Creek – 3rd order	Bearskin	53	3.0	483	27	11%
013_04	Elk Creek – 4th order	Lower Elk, Bearskin	67	0.8	2,295	29	3%
Average	**-**	**-**	**-**	**2.5**	**-**	**28**	**9%**

* The values in this table represent predicted model values and not absolutes.

Controls that will achieve Water Quality Standards

Controls already in place: The IDEQ and the BNF assert that the major anthropogenic causes of excess sediment delivery have been removed with the 1980s rehabilitation of the dredge mine site in Bear Valley Creek (Figure 1.10) and the 2001 cessation of livestock grazing (Figure 1.9) throughout the BVW. These actions alone will likely result in the attainment of water quality standards within several decades. There has also been a progression of stream improvement projects over the last 20 years (Table 2.11 and Appendix 1). Additionally, the BNF made a significant change in Forest Service management direction of the watershed (Table 1.3, Figures 1.2 and 1.3, Appendix 3, USDA 2003 Boise Forest Plan, pg. III-8 to III-77). These actions have generally resulted in steady water quality improvement within the listed AUs and even the full support of beneficial uses in most of AUs (Table 2.2) within BVW.

Table 2.11 General Summary of Pollution Controls Already in Place *(See Appendix 1 for detailed list).*

- Rehabilitation of Big Meadows dredge mine site
- Cessation of livestock grazing throughout the watershed
- Twenty years of stream habitat and riparian restoration projects
- Change in Forest Service management direction that emphasizes restoration and maintenance of aquatic, terrestrial and watershed resources.

- Rehabilitation of Big Meadows dredge mine site: In the 1950s, dredge mining for uranium and other rare earth elements near the headwaters of Bear Valley Creek left large amounts of unconsolidated overburden along 1.4 miles of the stream's floodplain. From the end of the 1950s until the late 1980s, this sediment was eroded and transported downstream in Bear Valley Creek. The resulting impairment of downstream aquatic habitat caused by excess recruitment of coarse and fine sediment was massive and long-lasting. Extensive rehabilitation of the mine site began was conducted from 1985 to 1989. The stream rehabilitation work did not contribute measurable sediment to Bear Valley Creek during the construction period (1985-1989). Rehabilitation work included grading and vegetating the high, erodible cut banks and creating a new floodplain along 1.5 miles of stream. Restoration of the mined reach of Bear Valley Creek has been successful. Macroinvertebrate sampling by the Shoshone-Bannock Tribes has shown that since rehabilitating the dredged area that the relative abundance of macroinvertebrate species intolerant to fine sediment has increased (Figure 2.5). A significant increase in EPT species, a more favored food species for salmonids, has also occurred. In the last 5 years, beaver have moved into the

restoration reach (Grover Wier personal communication, 2010), re-charging the floodplain and improving riparian health. This reach is expected to continue an improving trend of stream health.

- Cessation of Livestock Grazing, watershed-wide: Livestock grazing (cattle and some sheep) occurred in the BVW starting in the early 1900s and continuing until 2001. Although there is little definitive information on early livestock grazing in the BVW, the large numbers of cattle and sheep that initially grazed there certainly resulted in a changes of plant cover, loss of effective soil ground cover, and damage to the riparian habitat. This downward trend likely continued through the 1970s, even though efforts were made to reverse the trend through range fence/pasture management changes. Through the 1980s, there was a 27% reduction in the actual use; this plus management efforts to reduce effects on riparian areas, appears to have slowed the downward trend at the time. From 1990 through 1998, there was an additional 42% reduction in actual use (USDA 2010, Bear Valley Watershed Analysis). This reduction, along with implementation of the riparian pastures and construction of riparian enclosures, brought an improving trend. Many of these changes were due to the ESA-listing of the spring chinook salmon and the subsequent change in management. By the 2001, livestock grazing was completely ceased in the watershed. The BPA funded the purchase of all grazing privileges (through issued permits) in order to protect the listed salmon.

  Since the cessation of livestock grazing in 2001, visual changes in riparian condition are evident (Photographs 2.2 and 2.3). Riparian monitoring to assess the impacts due to livestock grazing was conducted in the BVW from 1994 through 2001. A survey of a subset of the monitoring sites was conducted in 2008 to assess the changes in riparian condition since livestock grazing was removed (Burton 2010). The indicators analyzed with the 2008 data include bank stability, fine sediment, ecological status, and Winward stability rating. Of interest in the monitoring results are the trends in substrate indicators (percent fine sediment) prior to 2000. A least-squares fit to the averages for the monitoring sites prior to the year 2000 compared to all years shows a much steeper decline in the earlier time period (1994-2000). The substrate data suggest that much of the improvement to Bear Valley streams occurred during the years of intensive livestock management (mid to late 1990s) following the ESA-listing of the chinook salmon. By the end of the decade, when all grazing ceased, little improvement has occurred. The same cannot be suggested for the other riparian indicators. Bank stability, for example, generally declined during the 1990s and then recovered slightly during the 2000s. Ecological status remained essentially static through the years. Winward stability rating increased

over all years, but the 1990s did not see as steep a compared to the 2000s. One hypothesis is that the changes in riparian conditions were more pronounced between the pre-1990s -less -restrictive grazing and the mid-1990s- more-managed grazing than changes between more- managed grazing and no grazing. Following that hypothesis, the changes in riparian condition may be slow to significantly display since the cessation of livestock grazing in the high elevation meadows of in the BVW (Burton 2010).

- Stream Habitat Improvement and Riparian Restoration Projects: The BVW has a long history of water quality improvement projects (see Appendix 1) from various government agencies, tribal entities and private interests. As seen in Appendix 1, projects were primarily initiated in the late 1980s, throughout the 1990s as well as in 2004-2005 to address both streambank stability and riparian degradation. Often unstable areas and degraded riparian systems are found in the same place. Areas of instability and/or degraded riparian areas were identified by the US Forest Service and water quality improvement projects implemented to improve stability, increase riparian cover and thus ultimately improve fish habitat and support attainment of beneficial uses. Improving bank stability not only keeps excess sediment out of the stream, resulting in lower excess fines, but also keeps the channel from widening unnaturally and allows reestablishment of vegetation either through planting or natural colonization processes.

  In 2001, a review of the projects in the 1990s was conducted (USFS 2001). The report concluded was that projects involving structural measures such as barbs or revetments, were often causing more damage than they were benefitting. A move toward more passive restoration (i.e. riparian planting) was made after this report came out. IDEQ concludes, based on the upward trend in sediment parameter data and the best professional judgment of USFS hydrologists that this passive approach is effective and will result in attainment of water quality standards.

  The BVW Analysis (USFS 2000, updated USFS 2010) was conducted because of the need of an ecosystem assessment to help guide federal land managers in their watershed decision making as it pertains to the presence of wild steelhead, chinook salmon and resident bull trout. This watershed is key to the conservation of resident fish species and anadromous stocks. Although not currently a designated beneficial use, salmonid spawning is the most sensitive use and thus, decisions made to protect and enhance the salmonid fishery will also likely lead to the achievement of water quality standards. Recommendations for stream habitat improvement and riparian restoration from

the Bear Valley Watershed Analysis are listed in Appendix 2. Several of the recommendations have been implemented and additional projects are listed as "planned" on the table of improvement projects included in Appendix 1.

Change in Forest Service Management Direction: As described in Section 1 of this document, the 2003 Boise Forest Plan established new management direction for the Bear Valley Watershed. Appendix 3 shows the management directives outlined in the 2003 Boise Forest Plan as it relates to protecting the watershed's water quality and aquatic resources. These directives show the management guidelines for Forest Service activities to ensure that road, recreation and vegetation management activities do not adversely affect fisheries as well as the Forest Service's directive to attain water quality standards. The Boise National Forest's 2003 Forest Plan removed the Bear Valley Watershed area from the suited timber basis and made the restoration and maintenance of aquatic, terrestrial and hydrologic resources the focus (Figure 1.3).

***Controls Scheduled for Implementation*:** Because the majority of the anthropomorphic causes of sediment have been eliminated or managed, the IDEQ and the Forest Service contend there is little additional work to be implemented that will significantly increase water quality in the four AUs proposed for Category 4b. Instead, passive restoration (including maintaining existing improving riparian conditions) and continued monitoring will sustain the trend toward achieving water quality goals. As described earlier, the BVW's gentle relief, broad valleys and low gradient, meandering streams create an aquatic environment where fine sediment is processed and transported more slowly than neighboring basins such as the Stanley basin and the Payette River basin. Part of the passive approach to restoration in this area is allowing adequate time for sediment to be processed and transported in and through the system. Included in the little additional work to be implemented are planned road improvements and stream restoration, both described below.

Reduction of Road-related Sediment : Although the GRAIP survey described sediment from roads to streams as low (Fly et al 2011), this sediment source does exist and the GRAIP survey results suggest that road improvements would certainly result in direct reduction of sediment delivery to streams. For the four AUs included in this 4b, roads add 3% to 16% over natural sediment (Table 2.12) to streams.

National Forest System (NFS) road 569 has the single highest sediment-delivering drain point and several other high delivery drain points within its length. NFS roads 502, 582, 563, and 579 have frequent drain points which are actively delivering fine sediment to streams. Road-stream connection often occurs at or near live stream

crossings on roads. Although these predicted locations of high sediment delivery are based on thorough field observations and careful data processing, additional and detailed field surveys of the indicated road segments and drain points would need to be completed in order to prescribe effective restorative management plans. Reconstruction of such sites is possible and feasible in most cases. In order to decrease sediment delivery, road improvements may involve the addition of more frequent road drainage features, leaving a shorter distance between features. This would decrease the energy of concentrated flow to individual drain points, thus shortening the distance that water and sediment travels down the hillslope. Treatments may also include re-surfacing the road with a crushed rock aggregate or another type of surface which is less erosive (Fly et al. 2011).

Project work planned by the BNF in 2011 will eliminate a portion of the sediment from roads to streams. Approximately 3 miles of road (distributed among many road segments) are proposed for road improvements, including all the high delivery drain points identified on Figure 2.14. Specific road treatments will be determined by the BNF in summer of 2010 through pre-implementation planning. Approximately $125,000 of funds have been secured through the Forest Service for road improvements in Bear Valley[5]. Table 2.12 below displays the sediment reduction expected to be realized once road improvements are implemented, as predicted by the GRAIP model. Specifically, in the four AUs listed in this 4b, road improvements proposed in the next five years are predicted to reduce accumulated sediment to a range of 2% to 10%. Reductions as a result of erosion mitigation factors as described in BOISED (USFS 1991) and assume a moderate level of erosion mitigation (40% reduction) from road improvements such as installing additional cross-drains, installing additional ditch relief culverts, adding road surfacing materials, and/or providing a (vegetative or rocked) filter at the outlet of drainpoints.

Under a 40% reduction scenario, all of the four 4b AUs are estimated to meet the sediment goal of reaching the “percent over reference” range of the fully supporting AUs. It is the intent of the Forest Service to implement all practical road improvement measures within the next five years. Monitoring would take place within the 10 year monitoring term (see ***Section 3*** below) to determine if the implemented road improvements are maintaining an improving trend and moving towards achievement of water quality standards. However, restoration of full beneficial uses and achievement of water quality standards may still take decades in this particular AU. The AU (012_2a) includes the portion of Bear Valley Creek directly downstream of the Big Meadows mine site. Although this AU is on a

[5] These are USFS Legacy Roads funds budgeted for 2011 and include the replacement of the Tennessee Creek culvert for fish and debris passage.

restoring trend, the legacy of high sediment loads and the channel impacts are slow to completely recover. Monitoring this particular AU, using both BURP and PIBO surveys, is planned and monitoring results will help better define the trend toward achieving water quality standards.

In addition, road improvements are planned on roads within AUs currently meeting beneficial uses in 2011 and improvements in the 4b AUs will also reduce (downstream) accumulated sediment in the AUs meeting beneficial uses. Sediment reduction through road improvements within the AUs currently meeting beneficial uses, will contribute to meeting water quality standards in the watershed as a whole. Table 2.13 displays the resulting "percent over reference" for the nine AUs currently meeting beneficial uses.

Table 2.12 Predicted Change in Percent Accumulated Road Sediment over Natural Reference Sediment as a result of Road Improvement Actions for the 4b Assessment Units.

IDEQ Assessment Unit	Stream name	Subwatershed(s) Draining to Assessment Unit	Total Accumulated Road Sediment Yield (tons/yr)*		Percent Accumulated Road Sediment over Natural Reference Sediment Yield*		Predicted Reduction (%) of Total Accumulated Road Sediment Yield after Road Improvements
			Before	After	Before	After	
012_02a	Upper Bear Valley Creek–1st and 2nd order	Upper Bear Valley	131	79	16%	10%	40%
012_05	Bear Valley Creek –5th order	Fir Creek, Wyoming, Cache, Upper Bear Valley, Lower Elk, Upper Elk, Bearskin	255	153	5%	3%	40%
013_03	Bearskin Creek – 3rd order	Bearskin	53	32	11%	7%	40%
013_04	Elk Creek – 4th order	Lower Elk, Bearskin	67	40	3%	2%	40%

* The values in this table represent predicted model values and not absolutes.

Table 2.13 Predicted Change in Percent Accumulated Road Sediment over Natural Reference Sediment as a result of Road Improvement Actions for the Assessment Units Meeting Beneficial Uses.

IDEQ Assessment Unit	Stream name	Subwatershed(s) Draining to Assessment Unit	Total Accumulated Road Sediment Yield (tons/yr)*		Percent Accumulated Road Sediment over Natural Reference Sediment Yield*		Predicted Reduction (%) of Total Accumulated Road Sediment Yield after Road Improvements*
			Before	After	Before	After	
012_02	Lower Bear Valley Creek—1st and 2nd order	Cache, Wyoming, Fir Creek	9	5	1%	1%	0%
012_03	Bear Valley Creek—3rd order	Cache, Upper Bear Valley	136	80	14%	8%	41%
012_04	Bear Valley Creek—4th order	Cache, Upper Bear Valley	167	102	10%	6%	39%
013_02	Elk Creek—2nd order (includes Bearskin Creek and tributaries)	Bearskin, Lower Elk	61	37	7%	5%	32%
014_02	Sheep Trail Creek	Cache	0	0	0%	0%	N/A
015_02	Cub Creek	Upper Bear Valley	6	3	7%	7%	0%
016_02	Cache Creek—2nd order	Cache	6	4	3%	3%	0%
016_03	Cache Creek—3rd order	Cache	18	11	6%	6%	0%
017_02	Fir Creek	Fir Creek	18	8	5%	2%	54%

Casner Creek Stream Restoration: In 2010, the Forest Service, the IDEQ, the Southwest Idaho Resource Advisory Committee (RAC) and Trout Unlimited initiated a partnership with the Casner Creek Restoration project. This project started restoration activities on a 0.5 mile reach of Casner Creek, which was converted into a ditch during the dredge mining activities in the 1950s in the Big Meadows Area. Implementation of the restoration activities removed a berm along the west streambank, which restricted overbank flows during spring runoff, and installed ten biolog structures. The project is intended to set in motion natural meander formation and in the long-term reduce sediment inputs from Casner Creek to Bear Valley Creek, improving water quality in the Bear Valley Creek – 2nd order AU.

The IDEQ's BURP surveys are the identified tool to determine if water quality standards have been met through the implementation of pollution controls listed above. The Monitoring section (***Section 5***) of this 4b describes the planned BURP surveys in more detail.

Description of requirements under which pollution controls will be implemented

The Forest Service believes that the pollution controls proposed above will maintain an improving trend in water quality and aquatic habitat in the four AUs proposed for Category 4b. Clearly, the Forest Service and its partners have taken an active role in restoring full beneficial use support to most of the AUs within the BVW (Table 2.3) and are already on track for this to occur in the remaining four AUs.

Millions of dollars have been spent on water quality improvement projects in the BVW since the 1980s. As shown in Appendix 1, projects have been ongoing in the watershed for three decades. In addition, there are new projects planned (Appendix 1). Federal funding for the watershed is determined on a year to year basis, as approved by the U.S. Congress. However, the BNF's emphasis on water quality and aquatic habitat, restoration, combined with the importance of this area as a stronghold for anadromous fish and bull trout, make the BVW a high priority for restoration funds. In recent years (2008, 2009), the BNF identified special monies for the maintenance of roads within the 2006 and 2007 burned areas. In 2010, the Forest Service, the IDEQ, the Southwest Idaho RAC and Trout Unlimited partnered in the Casner Creek Restoration project. In 2011, two additional PIBO survey sites will be established to monitor trends in water quality and aquatic habitat conditions. Also in 2011, the Forest Service has allocated funds to repair road problems identified through the 2009 GRAIP survey. The Forest Service will continue to request funding on an annual basis, as needed, for projects in Bear Valley Watershed.

3. Estimated or Projected Time When Water Quality Standards will be Met

It is the stated intent of the Forest Service to take all the practical management actions possible to move the BVW towards meeting water quality standards in 10 years. Sediment reduction from roads to streams should be realized within one field season of implementing road improvements. However, it may take up to 20 years for the sediment reduction from roads to streams to display as a reduction of

instream fine sediment as monitored through BURP surveys. The USFS and the IDEQ believe that ten years is a reasonable timeframe to identify trends of improvement and evaluate instream sediment in relation to the water quality goal as described in Table 2.12.

If improvement is static or actually shows a decline, this should initiate an investigation into whether or not declines are due to factors that are not within the realm of natural variability and whether or not a natural event (i.e. wildfire) has contributed to that decline. Subsequent implementation of water quality improvement projects may follow.

Large streamflow events could accelerate the attainment of water quality standards by increasing the rate of transport of fines that are already in the system out of the affected reach although a relationship between the magnitude of flow and amount of sediment that would be transported is unknown.

Updates of monitoring and implementation activities, as well as an assessment of moving towards

4. Schedule for Implementing Pollution Controls

The most effective pollution control measures are already in place in the BVW (cessation of grazing and mine rehabilitation). In the 10-year monitoring period the following pollution controls are planned for implementation (Table 2.14):

Table 2.14 Schedule for Implementing Pollution Controls, 2010-2020.

Pollution Control	Existing Control	Implementation of new Control (Year)
Cessation of livestock grazing	Will continue.	
Boise Forest Plan, Restoration Management Direction	Will continue	
Casner Creek Stream Restoration		2010
Road Improvements (GRAIP-identified)		2011-2016

5. Monitoring Plan to Track Effectiveness of Pollution Controls

Stream habitat monitoring and the use of multidimensional indices, will be applied to monitor trends in fine sediment in the four AUs proposed for Category 4b. There are two specific monitoring protocols that will be utilized to track the effectiveness of pollution controls; the BURP survey and the PIBO survey. The IDEQ BURP monitoring will be the ultimate tool used to determine if water quality standards are achieved. However, the PIBO data may be used to help determine support of beneficial uses in the future. These data have been collected in the BVW (Section 1 of this document) and will continue to be collected. Both data sets utilize a combined index or condition score. Monitoring efforts will focus on providing the feedback loop necessary to ensure that water quality improvement continues in the BVW.

BURP Indices: The BURP index will be used to determine support of beneficial uses. The BURP Index incorporates three metrics: stream macroinvertebrate index, stream fish index, and a stream habitat index (Grafe et al. 2002). The indices are classified using data collected during standardized sampling in accordance with BURP protocol (IDEQ 2007). Collection of the BURP data will depend on IDEQ funding, but is proposed for at least two times in the 10-year monitoring timeframe.

PIBO Condition Score: The PIBO stream condition score also incorporates three metrics: a habitat condition index, a temperature index and a macroinvertebrate index (Table 2.15). The PIBO condition score differs notably from the BURP index in that it incorporates covariates to reduce natural variability among different geoclimatic settings.

Habitat Score: The habitat condition index (Al-Chokhachy et al 2010) incorporates undercut streambanks, bank angle, substrate size, fine sediment, large woody debris volume and frequency, residual pool depth and pool frequency. Habitat scores range from 1 to 100, with 100 being closer to reference conditions, using following regression models:

Table 2.15 Parameter estimates, model structure, and model fit from reference-reach multiple regression models used to score individual metrics for each dependent variable in the index (Al-Chokhachy et al 2010).

Attribute	Regression model	Adj. R^2
Percent undercut(%)[b]	0.98 - 0.06*(grad) - 0.15 (precip) – 0.002*(area) + 0.08*(ign) - 0.18*(sed)	0.35
Bank angle (°)	58.1 + 6.7*(grad) + 14.8*(precip) + 0.29*(area) + 0.2*(segment slope) -8.9*(ign) + 11.7*(sed)	0.39
d_{50}[c]	-5.5 + 0.63*(grad) + 0.65*(precip) + 0.02*(area) – 0.43*(drainage den) - 0.32*(ign) + 0.0003*(elev)	0.56
Percent fine sediment (<6mm)[b]	0.76 – 0.004*(area) – 0.11*(grad) – 0.19*(precip) + 0.12*(drainage den) + 0.09*(ign)	0.36
LWD volume (m^3/km)[c]	5.1 + 0.02(% segment forested) – 0.02*(segment slope) – 0.001*(elev)	0.17
LWD frequency (pieces/km)[c]	4.1 + 0.02*(% segment forested) – 0.02*(segment slope) + 0.48*(drainage den)	0.14
Residual pool depth (m)[c]	-1.1 – 0.24*(grad) + 0.004*(area) + 0.25*(precip)	0.33
Percent pool (%)[b]	1.6 – 0.2*(grad) – 0.003*(area) – 0.0001*(elev) – 0.20*(precip)	0.44

[a]Area is catchment area,(km^2), precip is average annual precipitation (m), drainage den is the density of streams within the catchment (km/km^2), ign is a categorical variable denoting the dominant geology is or is not igneous, grad is reach gradient (%), elev is the elevation of the bottom of the reach (m), % segment forested is the percent of the riparian buffer (%; 90 m on each side of stream) that is forested 1 km upstream from the bottom of reach, and sed is a categorical variable denoting the dominant geology is or is not sedimentary.
[b]Transformed using arcsine square root.
[c]Log (natural) transformed

Temperature Score: Stream temperature is analyzed using a stream temperature model (Reiman et al. 2007) developed by the Forest Service Rocky Mountain Research Station.

Macroinvertebrate Score: Macroinvertebrate populations are scored based on taxonomic completeness or the proportion of expected taxa that were observed, referred to as *O/E* (observed/expected). Using this method (Hawkins 2006), the closer the *O/E* is to 1, the higher the biological integrity of that stream reach.

The PIBO data will continue to be collected annually at the Bearskin Creek sentinel site. Additional sites will be added in 2010 and 2011 to increase the dataset and the ability to utilize the PIBO habitat condition score to monitor trends in stream habitat. The additional sites will be co-located with the existing

BURP sites whenever possible, and will be tied to the 4 AUs proposed for Category 4b.

Other Monitoring Efforts: Additional monitoring will continue in the BVW. Chinook salmon redd monitoring occurs annually, through a cooperative effort between the IDFG and the Forest Service. The Shoshone-Bannock Tribes also conduct annual redd monitoring. The Forest Service conducts focused monitoring related to specific projects (such as culvert replacement and stream restoration projects) which provide a good method of quickly catching perturbations related to human actions. The periodic monitoring takes into account the need to revisit implementation project areas to determine efficacy and make changes as necessary. This monitoring will allow resource managers to investigate any static or declining trends in habitat metrics to determine if additional remedial actions need to be taken. The Forest Service continues to deploy temperature loggers in the watershed on a semi-annual basis. The Forest Service will also monitor a subset of the Bear Valley riparian monitoring sites within the ten years.

6. Commitment to Revise Pollution Controls as Necessary

If monitoring indicates a downward trend in stream health, the Forest Service will determine whether additional controls are necessary and provide a plan for implementing these controls. Currently, the BVW is showing an upward trend with the pollution controls that are currently in place.

The US Forest Service has already demonstrated their commitment to revising pollution controls as necessary by analyzing the effectiveness of their stream stabilization techniques in 2001. As a result of this study, the Forest Service changed their habitat improvement approach towards more passive restoration methods. The Forest Service recognizes the importance of allowing streams in the BVW time for natural restoration and processing existing high sediment loads. When there is excess sediment in a stream type like Bear Valley Creek, the stream can increase in sinuosity and belt width. If structural restoration activities, such as barbs or revetments are applied too early in this process, the result can be accelerated erosion due to restriction of natural stream channel processes, particularly in a meadow ecosystem.

The IDEQ and USFS will commit to revisiting the pollution controls, as necessary, if progress toward meeting water quality standards is not achieved within 10 years. If BURP indices do not show a trend moving toward water quality goals within 10

years and if there is an increase in percent fines over the target levels, IDEQ may choose to develop a TMDL.

Table 2.16 below displays the proposed monitoring and assessment activities within the next 10 years based on the following anticipated commitments from the IDEQ, USFS and EPA:

- BURP survey: every 5 years (starting in 2008).
- PIBO survey: sentinel (Bearskin) site, every 2 years, other sites every 5 years.
- GRAIP survey: redo in 2019 (10 years following the 2009 survey)
- Bear Valley Riparian Monitoring: 4 sites every 3 years.
- 4b Plan: update every 2 years, based on any changed conditions or monitoring completed.
- Chinnook redd surveys: These surveys occur annually as a cooperative effort between the Idaho Department of Fish and Game and the USFS.

It is the intent of the IDEQ and the USFS to strive to complete the monitoring listed below. However, monitoring will depend on future funding not yet secured.

Table 2.16 Proposed IDEQ, USFS, EPA Monitoring and Assessment Schedule

Year	Planned Monitoring	Other Planned Activities	Assessment
2011	2 new PIBO sites, PIBO sentinel site Chinook redd surveys,	Complete 4b Plan, Complete Road Improvement prescriptions, Monitor Casner Creek Restoration Project Begin Road Improvement project Complete Tennessee Creek culvert replacement	
2012	PIBO sentinel site, Chinook redd surveys, BV Riparian monitoring (4 sites), Chinook redd surveys		
2013	BURP survey, PIBO survey, Chinook red surveys	4b plan update	Implementation progress, Assess Water quality trends
2014	PIBO sentinel site, Chinook redd surveys,		
2015	PIBO survey, Chinook redd surveys	4b plan update	Implementation progress, Assess Water quality trends
2016	PIBO sentinel site, Chinook redd surveys, BV Riparian monitoring (4 sites)		
2017	Chinook redd surveys,	4b plan update	Implementation progress, Assess water quality trends
2018	PIBO sentinel site, Chinook redd surveys, BURP survey		
2019	Chinook redd surveys, GRAIP survey, BV Riparian monitoring (4 sites)	4b plan update	Implementation progress, Assess water quality standards
2020	PIBO Sentinel site, PIBO survey, Chinook redd surveys		GRAIP Report

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GIS Coverages

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Glossary

§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.
Active restoration	Active restoration is generally where capital investments and ground disturbing activities are necessary in the attempt to improve degraded systems and secure a network of connected habitats. Typically, active restoration is required where the habitat is degraded to the point that natural recovery would not be enough to get it to the desired condition or in an appropriate amount of time.
allotment (grazing)	Area designated for the use of a certain number and kind of livestock for a prescribed period of time.
Anti-Degradation	Refers to the U.S. Environmental Protection Agency’s interpretation of the Clean Water Act goal that states and tribes maintain, as well as restore, water quality. This applies to waters that meet or are of higher water quality than required by state standards. State rules provide that the quality of those high quality waters may be lowered only to allow important social or economic development and only after adequate public participation (IDAPA 58.01.02.051). In all cases, the existing beneficial uses must be maintained. State rules further define lowered water quality to be 1) a measurable change, 2) a change adverse to a use, and 3) a change in a pollutant relevant to the water’s uses (IDAPA 58.01.02.003.61).

Assessment Unit (AU)	A segment of a water body that is treated as a homogenous unit, meaning that any designated uses, the rating of these uses, and any associated causes and sources must be applied to the entirety of the unit.
Burned Area Emergency Response (BAER)	A procedure used by the federal government to restore watershed conditions following large wildfires. The objective of BAER is to provide for immediate rehabilitation by stabilizing soils, and controlling water, sediment, and debris movement.
Batholith	A large body of intrusive igneous rock that has more than 40 square miles of surface exposure and no known floor. A batholith usually consists of coarse-grained rocks such as granite.
Beneficial Use	Any of the various uses of water, including, but not limited to, aquatic life, recreation, water supply, wildlife habitat, and aesthetics, which are recognized in water quality standards.
Beneficial Use Reconnaissance Program (BURP)	A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wade able streams and rivers
Best Professional Judgment	A conclusion and/or interpretation derived by a trained and/or technically competent individual by applying interpretation and synthesizing information.
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.

Culturally Induced Erosion	Erosion caused by increased runoff or wind action due to the work of humans in deforestation, cultivation of the land, overgrazing, and disturbance of natural drainages; the excess of erosion over the normal for an area (also see Erosion).
Depth Fines	Percent by weight of particles of small size within a vertical core of volume of a streambed or lake bottom sediment. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 6.5 millimeters depending on the observer and methodology used. The depth sampled varies but is typically about one foot (30 centimeters).
Designated Uses	Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act.
Disturbance	Any event or series of events that disrupts ecosystem, community, or population structure and alters the physical environment.
Endangered Species Act (ESA)	An act passed by Congress in 1973 intended to protect species and subspecies of plants and animals that are of "aesthetic, ecological, educational, historical, recreational, and scientific value". It may also protect the listed species' critical habitat, the geographic area occupied by or essential to the species. The FWS (USFWS) and NMFS share authority to list endangered species, determine critical habitat, and develop species' recovery plans.
Existing Beneficial Use or Existing Use	A beneficial use actually attained in waters on or after November 28, 1975, whether or not the use is designated for the waters in Idaho's *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02).
Exotic Species	A species that is not native (indigenous) to a region.

Extrapolation	Estimation of unknown values by extending or projecting from known values.
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. 2002).
Fully Supporting Cold Water	Reliable data indicate functioning, sustainable cold water biological assemblages (e.g., fish, macroinvertebrates, or algae), none of which have been modified significantly beyond the natural range of reference conditions.
Fully Supporting but Threatened	An intermediate assessment category describing water bodies that fully support beneficial uses, but have a declining trend in water quality conditions, which if not addressed, will lead to a “not fully supporting” status.
Habitat	The living place of an organism or community.
Headwater	The origin or beginning of a stream.
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.
INFISH	Interim Inland Native Fish Strategy for Intermountain, Northern, and Pacific Northwest Regions (USDA Forest Service).
Key Watershed	A watershed that has been designated in Idaho Governor Batt's *State of Idaho Bull Trout Conservation Plan* (1996) as critical to the long-term persistence of regionally important trout populations.
Macroinvertebrate	An invertebrate animal (without a backbone) large enough to be seen without magnification and retained by a 500µm mesh (U.S. #30) screen.
Management Prescription Category (MPC)	MPCs comprise a range of management prescriptions, from wilderness preservation to concentrated development, that can be applied across the Forest to indicate specific management emphasis in different areas.
Metric	1) A discrete measure of something, such as an ecological indicator (e.g., number of distinct taxon). 2) The metric system of measurement.
Monitoring	A periodic or continuous measurement of the properties or conditions of some medium of interest, such as monitoring a water body.
Mouth	The location where flowing water enters into a larger water body.

Natural Condition	The condition that exists with little or no anthropogenic influence.
Nonpoint Source	A dispersed source of pollutants, generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and non-irrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.
Not Assessed (NA)	A concept and an assessment category describing water bodies that have been studied, but are missing critical information needed to complete an assessment.
Not Attainable	A concept and an assessment category describing water bodies that demonstrate characteristics that make it unlikely that a beneficial use can be attained (e.g., a stream that is dry but designated for salmonid spawning).
Not Fully Supporting	Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002).
Not Fully Supporting Cold Water	At least one biological assemblage has been significantly modified beyond the natural range of its reference condition
Outstandingly remarkable values (ORV)	Outstandingly remarkable values. In the Wild and Scenic Rivers Act, river values identified include scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values and their immediate environments. The Act does not further define outstandingly remarkable values. The Intermountain Region defines outstandingly remarkable value as, "Characteristic of a river segment that is judged to be a rare, unique, or exemplary feature

	that is significant at a regional or national scale (USFS 2003)*".*
PACFISH	Interim strategies for managing Pacific anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California
Parameter	A variable, measurable property whose value is a determinant of the characteristics of a system, such as temperature, dissolved oxygen, and fish populations are parameters of a stream or lake.
Passive Restoration	Passive restoration is where only management adjustments are required to allow aquatic habitat, water quality and subwatershed functions to restore at its natural rate of recovery.
Perennial Stream	A stream that flows year-around in most years.
Pollutant	Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.
Reach	A stream section with fairly homogenous physical characteristics.
Reference	A physical or chemical quantity whose value is known and thus is used to calibrate or standardize instruments.
Reference Condition	1) A condition that fully supports applicable beneficial uses with little affect from human activity and represents the highest level of support attainable. 2) A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The

	reference condition can be determined through examining regional reference sites, historical conditions, quantitative models, and expert judgment (Hughes 1995).
Reference Site	A specific locality on a water body that is minimally impaired and is representative of reference conditions for similar water bodies.
Resident	A term that describes fish that do not migrate.
Riffle	A relatively shallow, gravelly area of a streambed with a locally fast current, recognized by surface choppiness. Also an area of higher streambed gradient and roughness.
Riparian	Associated with aquatic (stream, river, lake) habitats. Living or located on the bank of a water body.
Riparian Habitat Conservation Area (RHCA)	A U.S. Forest Service description of land within the following number of feet up-slope of each of the banks of streams: ▪ 300 feet from perennial fish-bearing streams ▪ 150 feet from perennial non-fish-bearing streams ▪ 100 feet from intermittent streams, wetlands, and ponds in priority watersheds.
River	A large, natural, or human-modified stream that flows in a defined course or channel or in a series of diverging and converging channels.
Runoff	The portion of rainfall, melted snow, or irrigation water that flows across the surface, through shallow underground zones (interflow), and through ground water to creates streams.
Sediment Delivery	An output of the GRAIP model that is a prediction of the amount of fine sediment added to the stream network as

	a direct result of the existence of roads. This figure is derived from observed attributes of drain point and road line features collected during the GRAIP field inventory, particularly whether or not water draining at a given drain point reaches a stream channel (stream connection).
Sediment Production	An output of the GRAIP model that is a prediction of the amount of fine sediment produced on a given road segment. This figure is derived from observed attributes of road line features collected during the GRAIP field inventory (i.e. surface type and flow path vegetation), the slope and length of a road segment, and a base rate of road sediment production.
Sediments	Deposits of fragmented materials from weathered rocks and organic material that were suspended in, transported by, and eventually deposited by water or air.
Stenothermal	Unable to tolerate a wide temperature range.
Stream	A natural water course containing flowing water, at least part of the year. Together with dissolved and suspended materials, a stream normally supports communities of plants and animals within the channel and the riparian vegetation zone.
Stream Crossing	A type of drain point collected during the GRAIP field inventory characterized by a stream channel that intersects a road and flows for at least part of most years. These features may drain water from the road or cutslope, but their primary purpose is to route water flowing down the hillslope in natural stream channels under (and occasionally over) the road. In order to be classified as a stream crossing, the channel must be continuous above and below the road, have defined banks, be at least one foot wide, have a bed armored with gravel, rock, or sand, and display evidence of flow, even if dry at the time of survey.

Stream Order	Hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Under Strahler's (1957) system, higher order streams result from the joining of two streams of the same order.
Subbasin	A large watershed of several hundred thousand acres. This is the name commonly given to 4th field hydrologic units (also see Hydrologic Unit).
Subbasin Assessment (SBA)	A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.
Subwatershed	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6th field hydrologic units.
Surface Fines	Sediments of small size deposited on the surface of a streambed or lake bottom. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 605 millimeters depending on the observer and methodology used. Results are typically expressed as a percentage of observation points with fine sediment.
Surface Runoff	Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of nonpoint source pollutants in rivers, streams, and lakes. Surface runoff is also called overland flow.
Surface Water	All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors that are directly influenced by surface water.

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.
Threatened, endangered, proposed/petitioned, candidate and sensitive species (TEPCS)	Threatened, endangered, proposed/petitioned, candidate and sensitive species
Total Maximum Daily Load (TMDL)	TMDL is the sum of waste load allocations for point sources, non-point sources, natural background, and a margin of safety. A TMDL specifies the amount of a pollutant that needs to be reduced to meet water quality standards set by the state. TMDL is used in a process to attain water quality standards that (1) identifies water quality problems and contributing pollutant sources, (2) allocates pollution control responsibilities among sources in the watershed, and (3) provides a basis for taking actions needed to restore a water body.
Tributary	A stream feeding into a larger stream or lake.
Water Body	A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.
Water Column	Water between the interface with the air at the surface and the interface with the sediment layer at the bottom. The idea derives from a vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.
Water Pollution	Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental, or injurious to public health, safety, or welfare; to fish and wildlife; or to

	domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.
Water Quality	A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.
Water Quality Criteria	Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, or industrial processes.
Water Quality Limited	A label that describes water bodies for which one or more water quality criterion is not met or beneficial uses are not fully supported. Water quality limited segments may or may not be on a §303(d) list.
Water Quality Standards	State-adopted and U.S. Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.
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. This term is often associated with the 5th hydrologic code.
Watershed Condition Indicator (WCI)	WCIs are an integrated suite of aquatic (including biophysical components), riparian (including riparian – associated vegetation species), and hydrologic (including uplands) condition measures that are intended to be used at the variety of watershed scales. They assist in

determining the current condition of a watershed and should be used to help design appropriate management actions, or to alter or mitigate proposed and or ongoing actions, to move watersheds toward desired conditions. WCIs represent a diagnostic means to determine factors of current condition and assist in determining future conditions associated with implementing management actions or natural restoration over time.

Winward Stability Rating

This rating, historically referred to as the vegetative stability rating, estimates the contribution of the roots of streamside vegetation to bank stability. Species have varying abilities to resist erosion based upon their rooting characteristics, both density and depth or extent.

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Appendices

Appendix 1 Past and Present Pollution Control Efforts

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
1987	Bearskin	Bearskin Creek Oxbow	BNF, BPA	• Control erosion at the oxbow and headcutting sites. • Design erosion control structures to move fine sediment out of treatment area. • Create juvenile rearing habitat in the process of providing passage	Project constructed a "cut-off" channel to bypass the existing oxbow (with eroding cutbank) of Bearskin Cr, stabilized the breach with boulder weirs and bank armor and build rock structures to reduce stream headcutting.		Cut-off filled with sediment in approx. 10 years. Pool below 1st sill scoured and was "rocked" (in 1990?). Old cutoff channel revegetated on its own. Should be considered as an effective short-term repair. However, the project reduced meander length and reduced low flow habitat in the oxbow.
1987	Bearskin	Bearskin Dry Channel	BNF,BPA	• Stop sediment flow to Bearskin Cr. By controlling headcutting and sheet erosion	• Base level control structures between road and borrow pit.		Probably not totally necessary. But now that intermittent channel incorporates borrow pit … combined projects may be contributing something…

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
1988	Lower Elk, Cache	Juniper Revetment	BNF, BPA	• Control streambank erosion of "dry" naturally unstable vegetation community types. • Increase bank cover, store sediment to allow establishment of riparian species.	• Three sites were treated on Elk Creek and seven sites treated on Bear Valley Creek. • 1900 Juniper were anchored into eroding banks with rebar or duckbill anchors and then held into place with fence posts and wire in the upper bank. • Top end of the tree was placed into or near the water and the butt end extending above the bank. The tree were placed both perpendicular and parallel to the bank. • 1291 feet of hitching rail fence constructed and one 40 ft gully filled with junipers.	1573 feet total	Probably 30% of structures were effective in slowing erosion processes to allow revegetation. As-built report with air photos, diagrams of specific sites and maps in Watershed Files
1988	Bearskin	Bearskin Wet Meadows (above 563 road)		• Control headcutting and lowering of channel bed elevation in deeply incised channel.	• Culvert installed below grade and caused channel to downcut and migrate up valley • Constructed ruble/rock structures to dissipate energy and raise ground water table		Temporary fix worked in reducing channel adjustments as a result of road related adverse effects (downstream where 563 crosses channel)

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
1985-1989	Upper Bear Valley	Big Meadows Mine Rehabilitation	Shoshone-Bannock Tribes, BPA	• Stabilize streambanks and stream channels, and control or reduce erosion to near natural levels. • Reduce deposition and/or downstream transport of sediment. • Minimize turbidity and maintain or improve water quality. • Improve aesthetics through revegetation and recontouring of the mined areas. • Create or improve chinook salmon spawning and rearing habitat	• Generally treatment included: Stabilization and revegetation of three stream reaches and two adjacent areas, stream channel alignment revegetation of constructed floodplain and disturbed areas and fencing around enhancement area. • Vertical banks in mined areas were excavated back to provide a floodplain for stream meandering and snowmelt runoff flows. • Banks defining the floodplain limits were stabilized with geotextile fabric, erosion control blanket, vegetation and riprap. • Stream channel realignment was completed on approximately 7,500 feet of channel., to provide a floodplain and meandering channel. This involved excavation of approximately 280,000 cubic yards of material.	7,920 ft	Long term monitoring and walking stream annually shows channel through Big Meadows is processing accelerated sediment. Widening and shallowing from mine to 563 has been slowed/reversed. Combined mine rehab., fencing and allotment management have contributed to improving trend. No one project can be considered as “the fix”. Feasibility and alternative reports by Montgomery Engineering in Watershed Files

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
1989	Bearskin	Bearskin Dry Meadow Gully stabilization	BNF, BPA	• Raise water table and stabilize eroding channel with rock and log sediment-trapping structures. • Utilize base-level control structures to dissipate stream energy and prevent headcuts (in forested reach). • Stabilize eroding banks, improve growing condition for vegetation on first bench above active channel.	• Log structures constructed in 1989 totally failed (see 1990) • 16 rock check dams and 4 log control structures installed in dry stream bed. 1700 ft of erosion control blanket was placed to help stabilize banks. 4 large check dams and 12 small check dams were installed on another portion of the channel, to the north.		No results – failed structures.
1989	Wyoming	Bear Valley Creek (campground) Barbs	BNF, BPA	• Control excessive streambank scouring, turn flow away from toe-slope to reduce stream energy on streambank, provide for establishment of riparian species.	• Installed two rock barbs to deflect high flows away from the unstable streambank.		Contributed to reducing energy on streambank , allowing veg. to establish on water's edge. Also created riffle-pool complexity in reaches providing spawning and holding areas.
1989	Lower Elk	Elk Creek Rock/Log Structures	BNF, BPA	• Increase instream habitat complexity (pools and cover) while treating sediment sources.	• 5 rock and large wood structures		Uncertain effectiveness
1989	Lower Elk	Elk Creek Oxbow – new channel construction	BNF, BPA	• Cut off large influx of sediment from intermittent channel within oxbow during runoff. • Promote revegetation of riparian species on unstable, unvegetated streambank. • Store sediment in new cutoff channel, provide for off-channel rearing habitat	• A 217 feet channel was constructed at narrowest part of the point bar to relieve high flow pressure on a 600 foot long eroding bank. The old channel was blocked with a low rock berm to trap sediment and to provide rearing habitat for juvenile chinook.	217 feet of channel	Uncertain. High maintenance project. May be related to change in stream dynamics. Project actually shortened length of reach – likely increased energy and erosion on new channel

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
1989-1990	Upper Bear Valley	Willow planting	BNF, BPA	• Plant willows to provide optimum riparian vegetation for channel stability and streambank cover on designated sites on Bear Valley Creek, Big Meadws	• 2500 willows were cut, rooted and planted.		
1990	Bearskin	Bearskin borrow pit	BNF, BPA	• Divert intermittent flow into borrow pit for sediment storage. Construct base-level control structures to dissipate energy and prevent headcutting upstream toward pit.	• 4 rock check dams were constructed to divert intermittent stream into abandoned borrow pit.		Previous work in 1987 to stop headcutting and diversion of intermittent channel into borrow pit can be considered effective in reducing sediment transported into Bearskin Creek.
1990	Bearskin	Bearskin Dry Meadow	BNF, BPA (?)	• Replace rock/log sediment dams constructed in 1989 with rock dams. • Sediment storage, raise ground water table, establish riparian vegetation.	• 16 rock check dams, 9 rock structures and anchoring of woody debris along 400 ft of scoured streambank .	400 ft of channel	Dams, revetments and fencing has set in motion trend to establish “vegetated gully” or longer/increased flow through meadow
1990	Bearskin	Bearskin Electric Let-down fence		• Allow protection/restoration of eroding channel when allotment is grazed.		1 mile	“ “
1990	Bearskin	Bearskin Meadows – west Headcuts		• Control headcutting and lowering of ground water table, stabilize sediment source.	• Rock placed in channel to stop migrating headcuts		“ “
1990	Wyoming	Bruce Meadows Gully Erosion	BNF, BPA	• Rehabilitate gully erosion and stabilize active headcutting. • This projects was first initiated in 1980. removal of diversion ditch from Cold Creek, reshaped and seed gully, road obliteration and fence construction.	• Triangle pasture – treated one large headcut and 6 smaller headcuts.		Band-aid approach, but effective

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
1990/ 1992	Upper Bear Valley, Cache	Bear Valley Creek Alpine Fir Revetments	BVFF/TU. IDFG. BNF	• Stabilize sediment source adjacent to Bear Valley Creek (between Mace and Sheep Trail). • Store sediment to allow establishment of riparian species along toe slope.	• Planted willow cuttings behind revetments	300 feet	
1990/ 1991	Upper Bear Valley	Bear Valley Creek Habitat Diversity Structures (rock/log)	BNF, BPA	• Increase instream habitat complexity (pools and cover) while treating sediment sources.	• 21 log and rock structures on BV Creek between Cub Creek and Sheep Trail Creek. • Intent of structures was to increase habitat complexity but actually constructed for bank stability.		Projects worked well at storing sediment between log and water's edge. Vegetation eventually pioneered new deposits. Led to bank stabilization and narrowing of channel.
1990	Wyoming	Lower Bear Valley Creek Barbs (above Fir Cr)	BNF, BPA	• Control excessive streambank scouring, turn flow away from tow-slope to reduce stream energy on streambank, provide for establishment of riparian species	• Constructed 3 barbs – large	One outside meander	Upstream barb moved thalweg and basically limited effectiveness of lower two. Effective in reducing energy on streambank and dropping sediment, allowing veg. to re-establish.
1990-1991	Upper Bear Valley	Bear Valley Creek Willow Planting	BNF, BPA	• Provide optimum riparian vegetation for channel stability and streambank cover.	• Contract work;4576 willows were cut, rooted and planted (the following spring) on Bear Valley Creek in the transfer cabin area.		Approximately 60-70% of plants survived.
1991	Lower Elk	Elk Creek Oxbow sedge planting & willow planting	BNF, BPA	• Stabilize sediment sources in vicinity of oxbow project. • Provide optimum riparian vegetation for channel stability and streambank cover.	• Planted in streambanks of new channel, especially upstream banks that were actively eroding.		See 1989 results for Elk Creek Oxbow

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
1991	Upper Bear Valley, Cache	Bear Valley tree deflectors/ planting	BPA, BNF	• Utilize tree deflectors to focus flow away from eroding streambanks	• This was a YCC project which included willow planting and alpine fir revetments for bank stabilization. • Mace Cr to Sheep Trail, misc. bank armoring	400 ft	Highly variable in effectiveness
1991	Wyoming	IDEQ's " adopt-a-stream" project on Bear Valley Creek	BVFF, TU, IDF&G, IDEQ, BNF	• Establish riparian vegetation	• Planted willow cutting and anchored logs along Bear Valley Creek between Poker Meadow Bridge and Fir Creek.		
1991	Cache	Bear Valley Creek habitat complexity	BPA	• Increase habitat complexity on Bear Valley Creek.	• 57 rock and log structures installed on Bear Valley Creek downstream from Sheep Trail		
1991	Wyoming	Cold Creek (Bruce Meadows)	BPA, BNF	• Sediment reduction	• 2 rock check dams constructed in Cold Crek (Bruce Meadow). • Relocated 300 feet of Wyoming Creek road to prevent sediment transport to stream.		
1992	Wyoming	Ayer Meadow Enclosure fence	BNF, BPA	• Allow for protection/restoration of eroding channel when allotment is grazed. • Promote streambank stability by increasing vigor of existing riparian vegetation and allowing for establishment of riparian species where they are not present.	• Constructed fence in Ayers Meadow	2.25 miles	

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
1992	Upper Bear Valley	Big Meadows Enclosure fence	BPA, BNF	• Allow for protection/restoration of eroding channel when allotment is grazed. • Promote streambank stability by increasing vigor of existing riparian vegetation and allowing for establishment of riparian species where they are not present.	• Constructed fence in Big Meadowss	5.25 miles	
1993	Wyoming	Poker Meadows Enclosure fence	BPA, BNF	• Allow for protection/restoration of eroding channel when allotment is grazed. • Promote streambank stability by increasing vigor of existing riparian vegetation and allowing for establishment of riparian species where they are not present.	• Constructed fence in Poker Meadows	2.3 miles	
1993		Willow, sedge, rush planting	BVFF/TU. IDFG, BNF	• Establish riparian vegetation			
1993		Willow planting	IDFG, BNF	• Establish riparian vegetation			
1994		Willow, sedge, rush planting	IDFG, BNF	• Establish riparian vegetation			
1997 1998	Lower Elk, Cache	Bear Valley and Elk Creek log barbs	BNF, TU	• Encourage bank building along 6 different reaches of Bear Valley Creek and Elk Creek.	• Log barbs installed along cutbank with hand labor. Single logs placed at an angle to flow and secured in place with fence post and wire onto bank. • 4 reaches treated on Bear Valley Creek, 2 reaches treated on Elk Creek	6 reaches (length?)	Some barbs (about half) have led to successful bank stabilization and vegetative recovery. Others have been ineffective. Proper barb angle is needed to affect positive changes in bank stability.
2001	All 6th HUCs		BPA/USFS	• All grazing allotments retired	• Grazing permit purchased by BPA and allotment retired	48,000 acres	See 2010 Bear Valley Riparian Monitoring Report

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
2004	Cache, Wyoming	Bear Valley Creek - Five Star Restoration Project/NOAA Community based Restoration Program	IDFG, TU, Borah High School, USFS, NAA	• enhance streamside vegetation and improve streambank stability along Bear Valley Creek in previously grazed areas.	• Planted willow and potentilla on 10 hardened livestock stream crossings.		Successful. See IDFG accomplishment report
2004	Fir Creek	Fir Creek Campground Riparian Protection	USFS	• Protect Bear Valley Creek streambanks from excessive damage from campers accessing the river.	• Fence constructed and river access areas designated along Bear Valley Creek at Fir Creek campground. • Riparian shrubs planted along Bear Valley Creek	0.25 mi	Successful. Access to the river reduced to specific locations.
2005	Upper Bear Valley	Casner Creek Culvert Replacement	USFS	• Fish passage restoration • Accommodation of 100-year flow	• Replaced fish barrier culvert with an open bottom arch at the 582 road crossing of Casner Creek,	1 crossing treated, Improved access to 4 mi of upstream habitat	Successful. Improved habitat access upstream to 4 additional miles. See Casner and Cub Creek culvert Replacement Turbidity Monitoring Report.
2005	Upper Bear Valley	Cub Creek Culvert Replacement	USFS	• Fish passage restoration • Accommodation of 100-year flow	• Replaced fish barrier culvert with an open bottom arch at the 563 road crossing of Cub Creek,	1 crossing treated, Improved access to 2 mi of upstream habitat	Successful. Improved habitat access to an additional 2 miles of habitat upstream. See Casner and Cub Creek culvert Replacement Turbidity Monitoring Report.
2005	Upper Bear Valley	Casner spur culvert removal	USFS	• Fish passage restoration • Accommodation of 100-year flow	• Removed multiple culverts at one crossing upstream of the 582 crossing of Casner Creek. • Established a natural streambank and transplanted riparian vegetation.	1 crossing treated	Successful. Improved habitat access upstream. Restored riparian area.

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
2006	Upper Bear Valley Creek	Cub/Casner culvert Replacement Revegetation	USFS	• Re-establish riparian vegetation in culvert replacement areas	• Planted native shrubs on streambanks disturbed during the culvert replacement projects on Cub and Casner Creeks.	2 acres	Successful. Riparian vegetation density improving each year following culvert replacement projects.
2006	Wyoming, Lower Elk, Cache	Red Mountain Burned Area Emergency Rehabilitation	USFS	• Erosion prevention	• Aerial straw mulching of high severity burned slopes to prevent erosion.		Successful in treated areas. BAER aquatic habitat monitoring report 2007-2009.
2008	Fir Creek, Wyoming	Campground revegetation		• Re-establish grass and forbs within the Fir Creek and Bear Valley Creek campground areas	• Spread native grass seed and fertilizer in the campground areas recently disturbed by Mountain Pine Beetle prevention project.	3 acres	Some success, will continue revegetation efforts.
2009	Fir Creek	Fir Creek Culvert Replacement	USFS, NOAA	• Fish passage restoration • Accommodation of 100-year flow	• Removed culvert and replaced with a bridge on the 579 crossing of Fir Creek	1 bridge installation	Successful. Improved access to upstream habitat, removed potential for channel blockage (culvert).
2010	Upper Bear Valley	Casner Creek Stream Rehabilitation Project	USFS, IDEQ, SW Idaho RAC, Trout Unlimited	• Mitigation of straightening of creek during dredging era	• Removal of berm along west streambank (1500 cubic yards) and installation of 10 biolog structures to allow creek to overflow banks and begin meander initiation	0.5 mile	Casner Creek Restoration Monitoring Report (CH2M Hill, Trout Unlimited), includes cross-sections, longitudinal profile, photo points, and riparian vegetation monitoring.
2010	Cache	Sack Creek Culvert Replacement	USFS, USFWS, Valley County	• Fish passage restoration • Accommodation of 100-year flow	• Removed triple culvert crossing of the 582 road over Sack Creek and replace with a bridge.	1 bridge installation	Successful. Improved access to upstream habitat, removed potential for channel blockage (culvert).
2011 Planned	Upper Bear Valley, Cache, Wyoming, Fir, Lower Elk, Bearskin	Road Reconstruction and Heavy Maintenance	USFS	• Reduce sediment delivery from roads to streams.	• Repair road segments identified in 2009 GRAIP survey		

Year	6th Field HUC name	Project	Partners	Objectives	Actions	Length/ Area Treated	Subjective Results and Reports
2011 Planned	Lower Elk	Tennessee Culvert Replacement	USFS, Valley County	• Fish passage restoration • Accommodation of 100-year flow	• Replace existing culvert with a bottomless arch at the 579 crossing of Tennessee Creek	1 crossing	

Appendix 2. Additional USFS Completed Actions and Recommended Actions (Bear Valley Watershed Analysis 2000) in Bear Valley Creek Watershed to Improve Riparian Habitat but Not Necessary for Attainment of Water Quality Standards

Action	Completed
The 300 foot allowance of vehicles in proximity to streams may not be consistent with RCA objectives • Inventory tracks and wheel ruts in all meadows and highlight those in wet meadows • Determine those that need to have access blocked	No-(work not started or scheduled)
Construct proper parking, sanitary facilities and stock unloading/holding areas on the flat east of the Fir Creek Bridge. Improve all trailhead parking areas and access roads to design standards that prevent vehicle damage to road surfaces and adjacent areas	No -(work not started or scheduled)
Inventory the dispersed campsites and access routes. Determine which meet area recreation/watershed goals, and which are or will become damaging.	In process
Educate the public as a strategy to protect meadows from further off road vehicle use	Yes- Education through direct contact, signs in meadows has resulted in a decrease in traffic onto meadow
Highlight Bear Valley's importance as a fragile stronghold for anadromous fish in the Snake River Basin, its unique meadow system and important fish, wildlife and recreation resources and their relationships. Inform the public of their responsibilities as users of public lands as well as their opportunities to maintain and improve the environment	Yes - Completed and ongoing Kiosks in place at Cape Horn and Bruce Meadows Rest Stops
Gain control of off road dispersed campsites and access roads	In process
Initiate a system that allows use of only those campsites and routes where use is permissible	In progress. District Motor Vehicle Use Map restricts access to designated routes only.
Reconstruct the Bear Valley and Fir Creek campgrounds in a manner that will control traffic flow and improve road and parking surfaces. Replace the sanitary facilities	Yes -sanitary facilities replaced with vault toilets and boulders added to restrict vehicles.
Replace the sanitary facilities at the Bruce Meadows Rest Area	Yes – new vault toilets installed.

Appendix 3. Boise Forest Plan Management Area 12 (Bear Valley) Direction (USDA Forest Service 2003a).

**The comprehensive Forestwide Management Direction Goals, Objectives, Standards and Guides can be found in Volume 1 of the Boise National Forest Plan (2003). Many of these are expressly dealing with working with IDEQ and the attainment beneficial uses and delisting of 303(d) impaired water bodies.*

MPC/Resource Area	Direction	Number	Management Direction Description
MPC 1.2 Recommended Wilderness	General Standard	1202	Management actions, including wildland fire use and prescribed fire, must be designed and implemented in a manner that maintains wilderness values, as defined in the Wilderness Act.
	Vegetation Standard	1203	Mechanical vegetation treatments, including salvage harvest, are prohibited.
	Recreation Standard	1204	No new motorized or mechanical uses will be allowed, except where these uses must be allowed in response to reserved or outstanding rights, statute or treaty.
	Recreation Standard	1205	Existing motorized or mechanical uses are allowed only if they do not lead to long-term adverse changes in wilderness values.
MPC 1.2 Recommended Wilderness	Road Standard	1206	Road construction or reconstruction may only occur where needed: a) To provide access related to reserved or outstanding rights, or b) To respond to statute or treaty.
	Fire Guideline	1207	The full range of fire suppression strategies may be used to suppress wildfires. Fire suppression tactics should minimize impacts to wilderness values.
	General Standard	1208	Manage the Bear Valley Creek and Elk Creek eligible river corridors to their assigned classification standards, and preserve their ORVs and free-flowing status until the segments undergo a suitability study and the study finds them suitable for designation by Congress, or releases them from further consideration as Wild and Scenic Rivers.
MPC 2.1 Wild and Scenic Rivers	Vegetation Guideline	1209	In Scenic or Recreational corridors, mechanical vegetation treatments, including salvage harvest, may be used as long as ORVs are maintained within the river corridor.
	Fire Guideline	1210	Prescribed fire and wildland fire use may be used as long as ORVs are maintained within the corridor.
	Fire Guideline	1211	The full range of fire suppression strategies may be used to suppress wildfires. Emphasize tactics that minimize the impacts of suppression activities on river classifications and ORVs.

MPC/Resource Area	Direction	Number	Management Direction Description
	General Standard	1212	Management actions, including salvage harvest, may only degrade aquatic, terrestrial, and watershed resource conditions in the temporary time period (up to 3 years), and must be designed to avoid resource degradation in the short term (3-15 years) and long term (greater than 15 years).
MPC 3.1 Passive Restoration and Maintenance of Aquatic, Terrestrial, and Watershed Resources	Vegetation Standard	1213	Mechanical vegetation treatments, excluding salvage harvest, may only occur where: a) The responsible official determines that wildland fire use or prescribed fire would result in unreasonable risk to public safety and structures, investments, or undesirable resource affects; and b) They maintain or restore water quality needed to fully support beneficial uses and habitat for native and desired non-native fish species; or c) They maintain or restore habitat for native and desired non-native wildlife and plant species.
	Fire Standard	1214	Wildland fire use and prescribed fire may only be used where they: a) Maintain or restore water quality needed to fully support beneficial uses and habitat for native and desired non-native fish species, or b) Maintain or restore habitat for native and desired non-native wildlife and plant species.
	Road Standard	1215	Road construction or reconstruction may only occur where needed: a) To provide access related to reserved or outstanding rights, or b) To respond to statute or treaty, or c) To address immediate response situations where, if the action is not taken, unacceptable impacts to hydrologic, aquatic, riparian or terrestrial resources, or health and safety, would result.
	Fire Guideline	1216	The full range of fire suppression strategies may be used to suppress wildfires. Emphasize suppression strategies and tactics that minimize impacts on aquatic, terrestrial, or watershed resources.
MPC 3.1	General Standard	1217	Management actions, including salvage harvest, may only degrade aquatic, terrestrial, and watershed resource conditions in the temporary (up to 3 years) or short-term (3-15 years) time periods, and must be designed to avoid degradation of existing conditions in the long-term (greater than 15 years).

MPC/Resource Area	Direction	Number	Management Direction Description
MPC 3.2 Active Restoration and Maintenance of Aquatic, Terrestrial, and Watershed Resources	Vegetation Standard	1218	Vegetation restoration or maintenance treatments—including wildland fire use, mechanical, and prescribed fire—may only occur where they: a) Maintain or restore water quality needed to fully support beneficial uses and habitat for native and desired non-native fish species; or b) Maintain or restore habitat for native and desired non-native wildlife and plant species; or c) Reduce risk of impacts from wildland fire to human life, structures, and investments.
	Road Standard	1219	Road construction or reconstruction may only occur where needed: a) To provide access related to reserved or outstanding rights, or b) To respond to statute or treaty, or c) To support aquatic, terrestrial, and watershed restoration activities, or d) To address immediate response situations where, if the action is not taken, unacceptable impacts to hydrologic, aquatic, riparian or terrestrial resources, or health and safety, would result.
	Fire Guideline	1220	The full range of fire suppression strategies may be used to suppress wildfires. Emphasize suppression strategies and tactics that minimize impacts on aquatic, terrestrial, or watershed resources.
	Objective	1221	Implement opportunities identified in the Bear Valley Watershed Analysis.
Soil, Water, Riparian, and Aquatic Resources	Objective	1222	De-list Bear Valley Creek and Elk Creek from the State of Idaho's impaired water bodies list by applying appropriate vegetation manipulation, road management, and active watershed restoration to reduce sediment, which is the identified pollutant source.
	Objective	1223	Remove barriers that are impeding migration of anadromous and resident native fish in Upper Bear Valley Creek subwatershed. Restore channel integrity from past land management activities.
	Objective	1224	Reconstruct or relocate Forest Road 582 in Upper Bear Valley Creek subwatershed to reduce impacts to fish habitat and water quality.
	Objective	1225	Restore and maintain riparian function and allow the stream channels to return to their natural condition. Prioritize restoration where impacts to chinook salmon, steelhead trout, and bull trout spawning/rearing habitats can be quickly reduced, and benefits to water quality and fish species can be maximized.
	Objective	1226	Restore and maintain habitat connectivity for all species of native fish throughout the Bear Valley drainage.
	Objective	1227	Work with Idaho Department of Fish and Game to maintain the genetic integrity of native trout populations in the high mountain lakes at the headwaters of Cache Creek.

MPC/Resource Area	Direction	Number	Management Direction Description
	Objective	1228	Maintain habitat conditions to contribute to the strong bull trout populations in the Wyoming, Cache, and Bearskin subwatersheds.
Soil, Water, Riparian, and Aquatic Resources	Objective	1229	Reduce sediment by improving road alignment, drainage, and surface materials.
	Objective	1230	Restore the desired composition and structure in lodgepole pine areas (as described in Appendix A) to create a mosaic pattern of age classes, and to reduce the risk of uncharacteristic disturbance.
Vegetation	Objective	1231	Restore the early seral aspen component in the forested vegetation groups, as described in Appendix A, to restore wildlife habitat and improve visual quality.
	Objective	1232	Maintain or restore known populations and occupied habitats of TEPCS plant species, including Blandow's helodium, to contribute to the long-term viability of these species.
Botanical Resources	Objective	1233	Eradicate existing infestations of noxious weeds, and prevent new infestations from occurring.
Non-native Plants	Objective	1234	Cooperate with the Idaho Department of Fish and Game to promote a Watchable Wildlife Program related to the high-elevation mountain meadow complexes.
Wildlife Resources	Objective	1235	Restore wildlife habitat and wildlife forage by reducing lodgepole pine density in meadows that is occurring due to the lack of fire and natural disturbance processes.
	Objective	1236	Improve Fir Creek and Bear Valley Campgrounds to protect fisheries resources.
Recreation Resources	Objective	1237	Improve Fir Creek, Wyoming Creek, and Lost Lake trailheads to enhance trail access and recreation opportunities, while reducing current resource impacts.
	Objective	1238	Inventory and evaluate dispersed sites to determine whether there is a need to close them or improve them through hardening, barrier placement, or other means.
	Objective	1239	Maintain the current motorized access on the trail system.
	Objective	1240	Continue the permit system to the use the Cook Ridge and Wilson Creek road network for disabled hunting.
	Objective	1241	Evaluate the need to restore the existing Sack Creek motorized trail. If the evaluation determines that restoration is needed, develop a plan to complete trail restoration.

<table>
<tr><th>MPC/Resource Area</th><th>Direction</th><th>Number</th><th>Management Direction Description</th></tr>
<tr><td rowspan="2"></td><td>Objective</td><td>1242</td><td>Achieve or maintain the following ROS strategy:

<table><tr><th rowspan="2">ROS Class</th><th colspan="2">Percent of Mgt. Area</th></tr><tr><th>Summer</th><th>Winter</th></tr><tr><td>Semi-Primitive Non-Motorized</td><td>32%</td><td>8%</td></tr><tr><td>Semi-Primitive Motorized</td><td>7%</td><td>92%</td></tr><tr><td>Roaded Natural</td><td>30%</td><td>0%</td></tr><tr><td>Roaded Modified</td><td>31%</td><td>0%</td></tr></table>
The above numbers reflect current travel regulations. These numbers may change as a result of future travel regulation planning.</td></tr>
<tr><td>Objective</td><td>1243</td><td>Identify, protect, and interpret historic properties in the management area, specifically prehistoric sites in Bear Valley.</td></tr>
<tr><td>Cultural Resources</td><td>Objective</td><td>1244</td><td>Maintain the National Register status of Elk Creek Guard Station, which is on the Forest’s cabin rental program, Bear Valley Lookout, and other eligible properties in the area. Monitor the conditions of National Register eligible properties in the management area.</td></tr>
<tr><td rowspan="4">Cultural Resources</td><td>Objective</td><td>1245</td><td>Conduct an inventory to identify the camas meadows and associated prehistoric sites in Bear Valley.</td></tr>
<tr><td>Objective</td><td>1246</td><td>Nominate Elk Creek Guard Station and Bear Valley Lookout to the NRHP. Develop maintenance plans for these facilities, and interpretive materials for visitors using the guard station.</td></tr>
<tr><td>Objective</td><td>1247</td><td>Provide interpretation at Bruce Meadows Rest Area and campgrounds about the people and events that shaped Bear Valley’s history.</td></tr>
<tr><td>Objective</td><td>1248</td><td>Cooperate with the Shoshone/Bannock Tribe for habitat restoration of aquatic and wildlife species.</td></tr>
<tr><td rowspan="2">Tribal Rights And Interests</td><td>Objective</td><td>1249</td><td>Continue to consult with the Shoshone/Bannock Tribe during project development, design, and implementation.</td></tr>
<tr><td>Objective</td><td>1250</td><td>Complete the reclamation of the Casner Creek mining ditch to reduce impacts to other Forest resources.</td></tr>
</table>

MPC/Resource Area	Direction	Number	Management Direction Description
Mineral Resources	Objective	1251	Identify areas appropriate for wildland fire use, focusing on the Inventoried Roadless Areas, particularly those assigned MPC 1.2. Use wildand fire to restore or maintain vegetative desired conditions and to reduce fuel loadings.
Fire Management	Guideline	1252	Coordinate with the Salmon-Challis National Forest to develop compatible wildland fire suppression and wildland fire use strategies.
	Objective	1253	Maintain Bear Valley Mountain Lookout as a communication site.
Lands and Special Uses	Objective	1254	Reduce unauthorized ATV use and enforce existing travel restrictions to reduce recreation impacts to wildlife, soil, and water resources.
Facilities and Roads	Objective	1255	Cooperate with the State of Idaho on maintenance of the Bruce Meadows airfield to efficiently maintain this transportation facility.
	Objective	1256	Evaluate vehicle-related impacts to help determine the level and type of vehicle use appropriate for the area, both on and off the existing network of roads and trails.
	Objective	1257	Maintain the scenic values of high-elevation meadow complexes.
Scenic Environment	Standard	1258	Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors:
	General Standard	1201	Defer implementation of any development within the Bluebunch Inventoried Roadless Area pending re-evaluation for wilderness recommendation by the Salmon-Challis National Forest.