Jacks Creek Watershed

Agricultural TMDL Implementation Plan

Table of Contents

1.0	Executive Summary		4
2.0	Introduction		6
3.0	Watershed Characterization		7
	3.1	Soils	7
	3.2	Climate	8
	3.3	Surface Hydrology	9
	3.4	Ground Water Hydrology	10
	3.5	Demographics and Economics	10
	3.6	Land Ownership and Land Use	11
4.0	Treatment Units		12
5.0	TMDL Objectives		13
	5.1	Recreational Uses-Bacteria Objectives	14
	5.2	Aquatic Life Uses- Phosphorus and Dissolved Oxygen Objectives	15
	5.3	Aquatic Life Uses-Sediment Objectives	15
6.0	Identification of Critical Acres		16
7.0	Implementation Plan BMPs		17
	7.1	Example Description of Alternatives for Surface Irrigated Cropland	18
	7.2	Example Description of Alternatives for Surface Irrigated Pasture	18
	7.3	Example Description of Alternatives for Sprinkler Irrigated Agricultural Land	18
	7.4	Example Description of Alternatives for CAFO/AFO	18
	7.5	Graphic Comparison of BMP Selection and Implementation Process	19
	7.6	BMP Costs	19
	7.7	Feedback Loop	19
8.0	Program of Implementation		20
	8.1	Installation and Financing	20
	8.2	Operation, Maintenance, and Replacement	21
	8.3	Water Quality Monitoring	21
9.0	References		22

APPENDIX 1. Agricultural Best Management Practices of Southwest Idaho

APPENDIX 2. Agricultural Cost Share Programs Available in Southwest Idaho

List of Figures

Figure **Page**

Figure 1. Jacks Creek Watershed Location 6

Figure 2. Bruneau Subbasin K Factor Classes 7

Figure 3. Bruneau Subbasin Slope Classes 8

Figure 4. Surface Hydrology 9

Figure 5. Land Ownership 11

Figure 6. Treatment Units Modified by the ISWCC to obtain compliance with Farm Bill Section 1619 13

Figure 7. Jacks Creek Watershed Priority Areas Modified by the ISWCC to obtain compliance with FB 1619 14

Figure 8. Location of Critical Acres Modified by the ISWCC to obtain compliance with Farm Bill Section 1619 16

List of Tables

Table **Page**

Table 1. 2001 Agricultural Data for Jacks Creek Watershed 10

Table 2. Land Ownership 11

Table 3. Agricultural Land Use 12

Table 4. Acres of TUs within Jacks Creek Watershed 12

Table 5. E. coli Reductions Required to Meet Load Allocation 14

Table 6. Phosphorus Reductions Required to Meet Load Allocation 15

Table 7. TSS Reductions Required to Meet Load Allocation 15

Table 8. Treatment Unit 1: Surface Irrigated Cropland 17

Table 9. Treatment Unit 2: Surface Irrigated Pasture 17

Table10. Treatment Unit 2: Sprinkler Irrigated Agricultural Land 17

Table 11. Treatment Unit 3: CAFO/AFO 17

Table 12. Estimated BMP Cost Summary for TU 1, Tier 1 (Surface Irrigated Cropland/Pasture: 1,502 acres) 20

Table 13. Estimated BMP Cost Summary for TU 1, Tier 2 (Surface Irrigated Cropland/Pasture: 2,773 acres) 20

Table 14. Estimated BMP Cost Summary for TU 2, Tier 3 (Sprinkler Irrigated: 13,785 acres) 20

Table 15. Estimated BMP Cost Summary for TU 3, (CAFO/AFO) 20

1.0 Executive Summary

Subwatershed: Jacks Creek Watershed
Total Scope: 209,265 acres
Agricultural Scope: 18,060 acres
Agricultural Critical Acres Scope: 4,275 acres

Location: South/southwest from CJ Strike Reservoir with southern boundary extending south along Highway 51 towards Grasmere and southwestern portion covering Little Valley; includes the following subwatersheds: Big Jacks Creek, Lower Jacks Creek, Sugar Creek, Deadman Gulch, and Halfway Gulch

Elevation: 5,952 feet near Sugarloaf in Big Jacks Creek subwatershed to 2,455 feet at CJ Strike Reservoir.

Priority Subwatershed: High

Cooperating Agricultural Agencies: Bruneau River Soil Conservation District (BRSCD)
Natural Resources Conservation Service (NRCS)
Idaho Association of Soil Conservation Districts (IASCD)
Idaho Soil Conservation Commission (ISCC)

Land Ownership:

Owner	Acres	Percent of Jacks Creek Watershed
BLM	181,823	87%
Private	19,208	9%
State of Idaho	8,234	4%
TOTAL	**209,265**	**100%**

Agricultural Land Use:

Irrigation Method	Acres	Percent of Jacks Creek Watershed
Sprinkler Irrigated Cropland/Pasture	13,785	7%
Surface Irrigated Cropland/Pasture	4,275	2%
CAFO/AFO	N/A	N/A
TOTAL	**18,060**	**9%**

Major Agricultural Products: Livestock and dairy products, alfalfa and clover for hay, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, and mint

TMDL Objectives: The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Bruneau River Subbasin. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Bruneau River, Jacks Creek (including Sugar Valley Wash), Clover Creek, and Three Creek. For Jacks Creek the TMDL established instream targets for total suspended solids (TSS), bacteria (E. coli), total phosporus (TP), and dissolved oxygen (DO). The targets are to be attained within Jacks Creek from the confluence of Little Jacks Creek and Big Jacks Creek to its mouth at CJ Strike Reservoir. The purpose of the instream TSS target is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The instream TP and DO targets were developed to reduce the impact from excessive plant growth in the creek and ensure sufficient levels of dissolved oxygen exist in the creek at all times. The purpose of the bacteria target is to protect human health and risks related to secondary contact recreation.

The TSS instream concentration target is a monthly average not to exceed 50 mg/L, and an 83 mg/L daily maximum. The TP and DO targets are interrelated. For TP the target is a monthly average not to exceed .05 mg/L and a daily maximum not to exceed .08 mg/L, while DO must remain at or above 5 mg/L at all times. The E. coli target for

secondary contact recreation requires a maximum geometric mean no greater than 126 cfu/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a) or a single sample no greater than 576 cfu/100mL.

Recent sampling conducted by ISDA near the mouth of Jacks Creek yielded a maximum sample of 4500 cfu/100mL and a monthly mean of 933 cfu/100mL for E. coli. For TP at the same site a maximum sample of .57 mg/L was recorded and only 3 out of 39 samples were below the target of .08 mg/L while the monthly mean was about .25 mg/L. The maximum TSS sample recorded by ISDA at the site was 100 mg/L, yet that was only one of two samples that exceeded the 83 mg/L daily maximum target.

Implementation Plan: This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Jacks Creek Watershed for BMP implementation to achieve the TMDL objectives within the Bruneau River Subbasin. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management[1], pest management, nutrient management, conservation tillage, critical area plantings, livestock watering facilities, fencing, riparian buffers, and livestock grazing management. These component practices as well as others not listed in this document are outlined in the Agricultural Pollution Abatement Plan (APAP) housed with the Idaho Soil Conservation Commission.

BMP implementation on private land is voluntary and will not be required for all landowners or all of the acreage within the watershed. Only those combinations of BMPs that are necessary for water quality improvements and feasible to individual participants will be voluntarily implemented. The Bruneau SCD and the Idaho Association of Soil Conservation Districts will assist producers who choose to develop a water quality or conservation plan suitable to their current operation. Plans that are developed in conjunction with any cost-share programs will be under contract to ensure that cost-share funding received by the producer will be used to achieve water quality and conservation benefits on the applicable land unit. The TMDL targets for Jacks Creek will be emphasized with each producer during the planning process, and each plan will be emphasize reducing nonpoint source pollution to help achieve the TMDL.

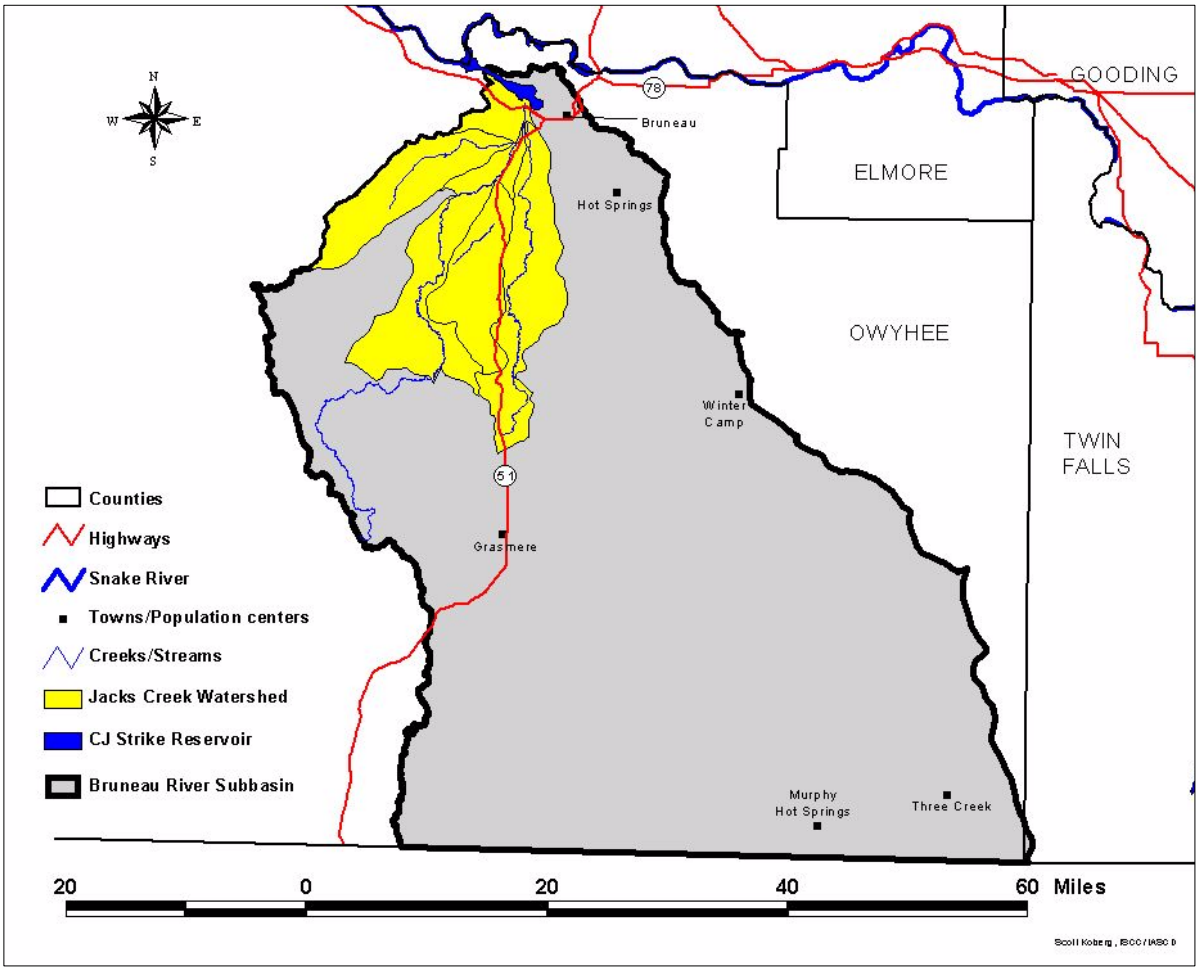
Three BMP installation alternatives are evaluated in this plan for each of the four different agricultural land use types (Treatment Units) within the Jacks Creek Watershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $5,157,250, Alternative 2 - $3,313,000; and Alternative 3 - $1,913,375. If BMP implementation at the moderate (alternative 2) level was to occur only on surface irrigated agricultural land and CAFO/AFO units, and not on sprinkler irrigated agricultural land, the total cost would be $2,623,750. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

[1] **Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency, as well as irrigation scheduling and soil moisture monitoring methods.**

2.0 Introduction

The Jacks Creek Watershed encompasses 209,265 acres. It includes Jacks Creek (downstream from Little Jacks/Big Jacks confluence), Halfway Gulch, Deadman Gulch, and Sugar Creek (including Sugar Valley Wash). Jacks Creek flows in a northeasterly direction from the canyon at the upper end of Little Valley and is joined by Deadman Gulch, Halfway Gulch, Pierce Drain, and Sugar Valley Wash before entering CJ Strike Reservoir north of Highway 78.

Figure 1. Jacks Creek Watershed Location



This implementation plan will address the nonpoint agricultural sources of sediment, nutrients, and bacteria that impact Jacks Creek. Within this plan the following elements are identified: pollutant problems within Jacks Creek Watershed, potential sources of those pollutants, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Jacks Creek Watershed will be necessary for the success of this plan and the reduction of pollutants necessary to meet the TMDL requirements in Jacks Creek. Sources of available funding for the installation of BMPs on private agricultural land are outlined in Appendix 2.

It is recommended that landowners within Jacks Creek Watershed contact the Bruneau River Soil Conservation District (BRSCD), Natural Resources Conservation Service (NRCS), or Idaho Association of Conservation Districts (IASCD) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a watershed approach for addressing water quality problems attributed to runoff from private agricultural lands.

3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, land ownership, and land use in Jacks Creek Watershed.

3.1 Soils

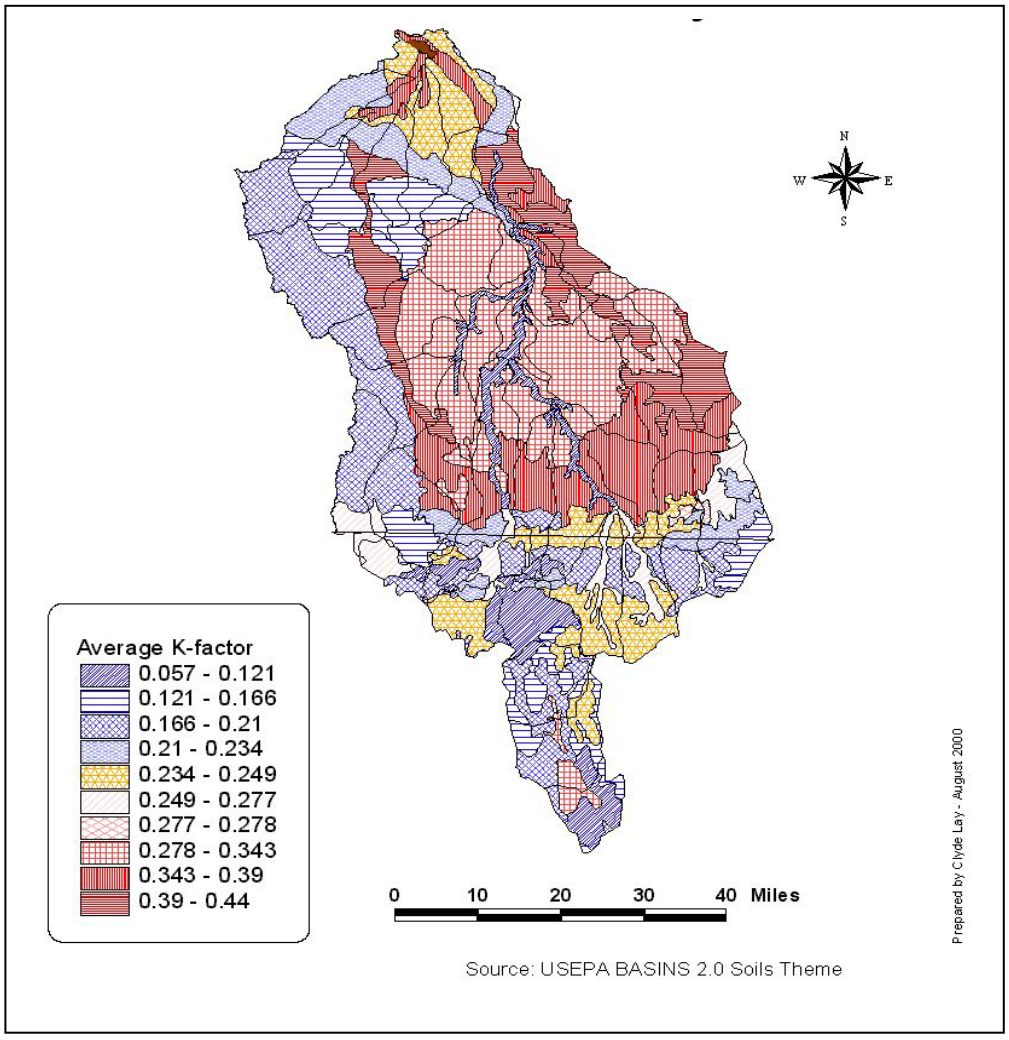
There are three major soil associations within the irrigated portion of Jacks Creek Watershed (USDA, 1991).

- *Bram-Mazuma-Grandview:* Somewhat poorly drained and moderately well drained soils on low stream terraces
- *Shoofly-Ornea-Abgese:* well drained soils on alluvial plains and fan terraces
- *Typic Torriorthents-Mazuma-Vanderhoff:* Well drained to excessively drained soils on dissected terraces

Soil "K Factor" classes help determine the erodibility potential of soils. The higher the K-Factor rating, the greater the potential for erosion. In Figure 2, K-Factor classes are identified for the entire Bruneau Subbasin. Jacks Watershed in the northwestern portion of the figure have K-factors ranging from 0.121 to 0.44, although the irrigated portion of the watershed near CJ Strike Reservoir typically fall within the 0.234 to 0.39 range.

In addition to K-Factor classes, soil slope classes provide another indication of erosion potential. As with K-Factor classes, the greater the percentage of slope, the greater the potential for erosion (Figure 3). Jacks Creek Watershed, again in the northwestern portion of the figure, exhibits a wide range of slopes; however, the majority of irrigated land within the watershed falls between 0-2% slope.

Figure 2. Bruneau Subbasin K Factor Classes



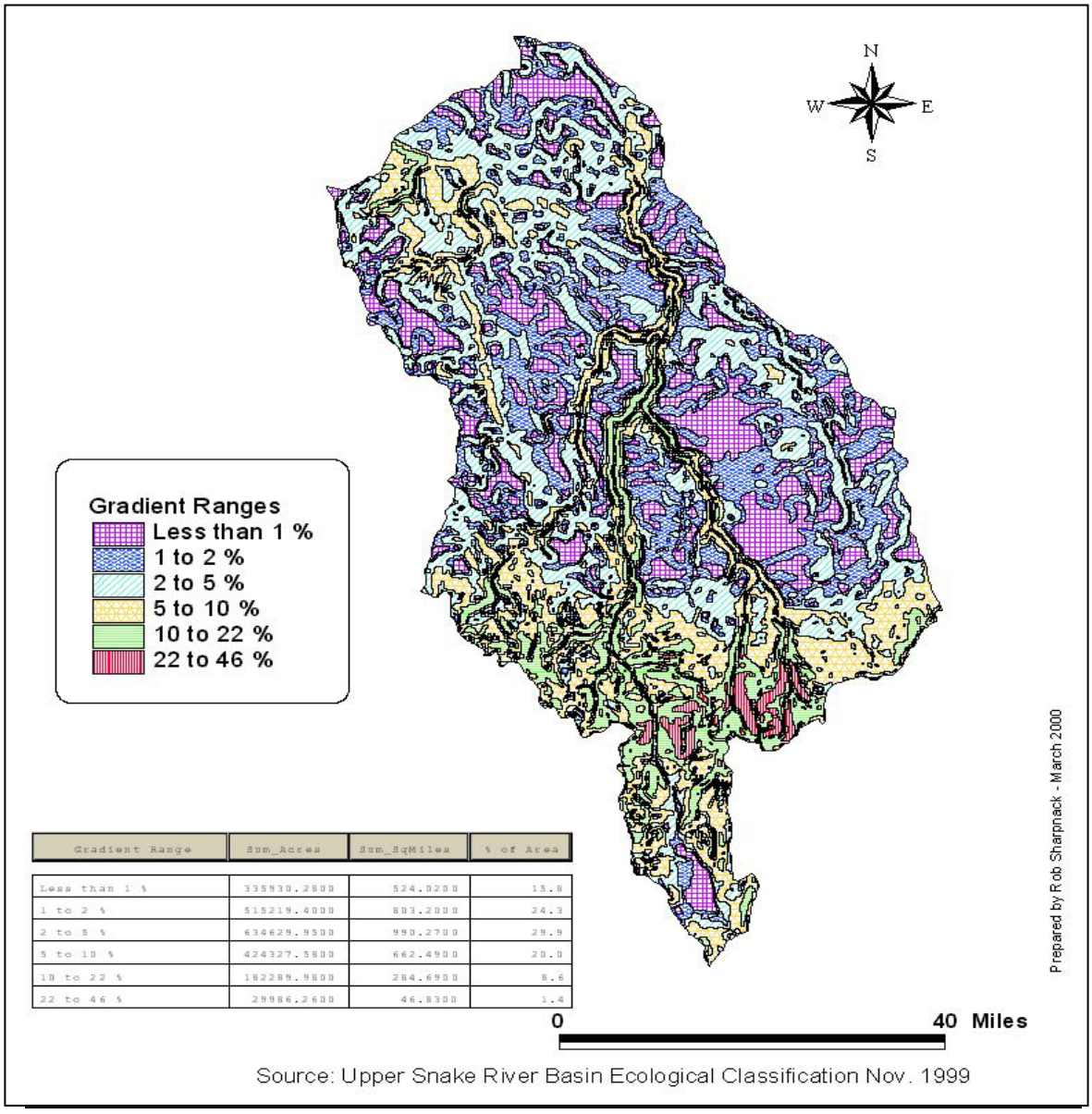
3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature during the summer in nearby Grandview, Idaho is 87.0°Fahrenheit, while the average daily minimum temperature during the winter is 22.0°Fahrenheit. Temperatures as warm as 110.0°Fahrenheit have been recorded at Grand View (USDA, 1991).

Long term average annual precipitation for Grandview is 7.10 inches. Approximately 47 percent of the yearly precipitation occurs during the period from November through March. Average precipitation during the April to September growing season is less than 4 inches, and extended periods without precipitation occur annually during the summer months USDA, 1991).

The average consecutive frost-free period (above 32 degrees) is 140 days, based on the Grandview long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 118 days for this area. The average last frost (32 degrees) in the spring is around May 8 and the average first frost (32 degrees) in the fall is around September 25 (USDA, 1991).

Figure 3. Bruneau Subbasin Watershed Slope Classes



Gradient Range	Sum_Acres	Sum_SqMiles	% of Area
Less than 1 %	335930.2800	524.8200	15.8
1 to 2 %	515219.4000	803.2000	24.3
2 to 5 %	634629.9500	990.2700	29.9
5 to 10 %	424327.5800	662.4900	20.0
10 to 22 %	182289.9800	284.6900	8.6
22 to 46 %	29986.2600	46.8300	1.4

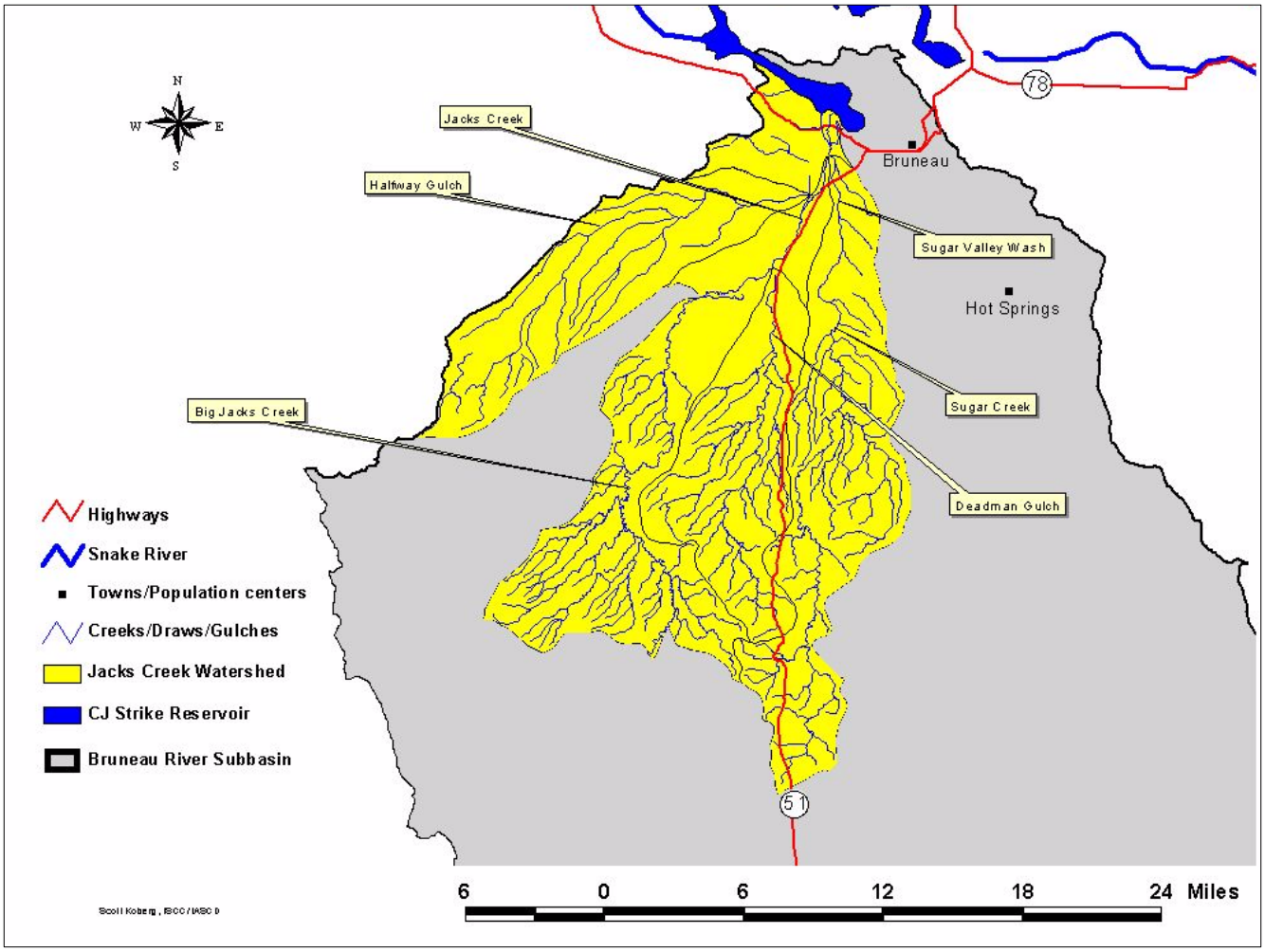
3.3 Surface Hydrology

The following is an excerpt from *Bruneau Subbasin Assessment and Total Maximum Daily Loads of the 303(d) Water Bodies:*

> Jacks Creek begins at the confluence of Big Jacks Creek and Little Jacks Creek… No perennial streams enter Jacks Creek below the confluence of Big and Little Jacks Creeks. The Sugar Valley Wash, an ephemeral stream, joins Jacks Creek approximately [2 miles] above the mouth of Jacks Creek… Two final sources of water add to the discharge in Jacks Creek to an unknown extent. These sources are hot spring water effluent from a warm water fish hatchery and agriculture wastewater from field runoff and flowing wells. Water from these source enter Jacks [C]reek beginning approximately [5 miles] from the mouth. In many cases, the runoff from the agricultural fields is from geothermal wells used for irrigation.

In short, there isn't much surface water available to irrigators in Jacks Creek, and most of the water that is made available must either be pumped from warm water wells or diverted from Jacks Creek or the nearby Bruneau River.

Figure 4. Surface Hydrology



3.4 Ground Water Hydrology

There are at least ten different springs in the irrigated portion of Jacks Creek Watershed, the majority of which are warm or hot springs. In addition, all of the irrigated land in the watershed lies within the Bruneau-Grandview aquifer in which the depth to groundwater was estimated at 100 feet in the spring of 1980 (IDEQ, 2000). The water used for irrigation of cropland is often pumped from the ground at temperatures much warmer than normal surface water temperatures. According to IDEQ, one local farmer indicated that his well water that was used for irrigation surfaced at over 100°F.

3.5 Demographics and Economics

The following is an excerpt from *Bruneau Subbasin Assessment and Total Maximum Daily Loads of the 303(d) Water Bodies:*

> The population in Owyhee County was about 8,392 in 1990 (www.idoc.state.id.us 2000) and was estimated at 10,227 in 1998. The majority of the county population lives outside of the subbasin. For example, in 1998, the Homedale and Marsing populations were estimated at 3,311, most other towns were too small to be listed. The Bruneau SCD, which covers most of the subbasin, estimates the population of the district at 2,000 full time residents (McBride 2000). The largest municipality in the subbasin is the town of Bruneau. Other small towns include Grassmere, Three Creek, and Murphy Hot Springs (Figure 12). The underlying foundation for economic activity in the area is agriculture, which is mainly derived from ranching and farming.
>
> Most of the initial agricultural activity in the area was ranching and grazing. Decreed surface water rights for irrigation in the Bruneau area began in 1875, while decreed stock watering rights began in 1860.

The Little Valley area in which the irrigated portion of Jacks Creek Watershed is located is west of Bruneau and does not contain any other towns or cities. The population within Jacks Creek Watershed is very small (under 200 residents) and consists mostly of farmers and ranchers and their families in a rural setting.

Table 1. 2001 Agricultural Data for Jacks Creek Watershed

Inventory: Farms & Cropland	Jacks Creek Watershed
Total # of Farms (FSA Tracts)	68
Total Acres of Farms	18,060
Average Farm Size (acres)	265.6

3.6 Land Ownership and Land Use

The majority of land (87%) within Jacks Creek Watershed is owned by the Bureau of Land Management (BLM) and operates as rangeland. The irrigated portion of Jacks Creek Watershed is synonymous with the privately owned and operated land within the watershed and covers 9% of the total watershed acreage (Table 2). Most of the privately owned land is in the vicinity of Little Valley and Sugar Valley to the south and southwest of CJ Strike Reservoir.

Sprinkler irrigated cropland and pasture is by far the largest agricultural use within the irrigated portion at 13,785 acres, while surface irrigated cropland and pasture is a distant second at 4,275 acres. There are also a number of Confined Animal Feeding Operations (CAFOs) and Animal Feeding Operations (AFOs) within the irrigated portion, although their combined acreage is unknown (Table 3).

Table 2. Land Ownership

Owner	Acres	Percent of Jacks Creek Watershed
BLM	181,823	87%
Private	19,208	9%
State of Idaho	8,234	4%
TOTAL	**209,265**	**100%**

Figure 5. Land Ownership

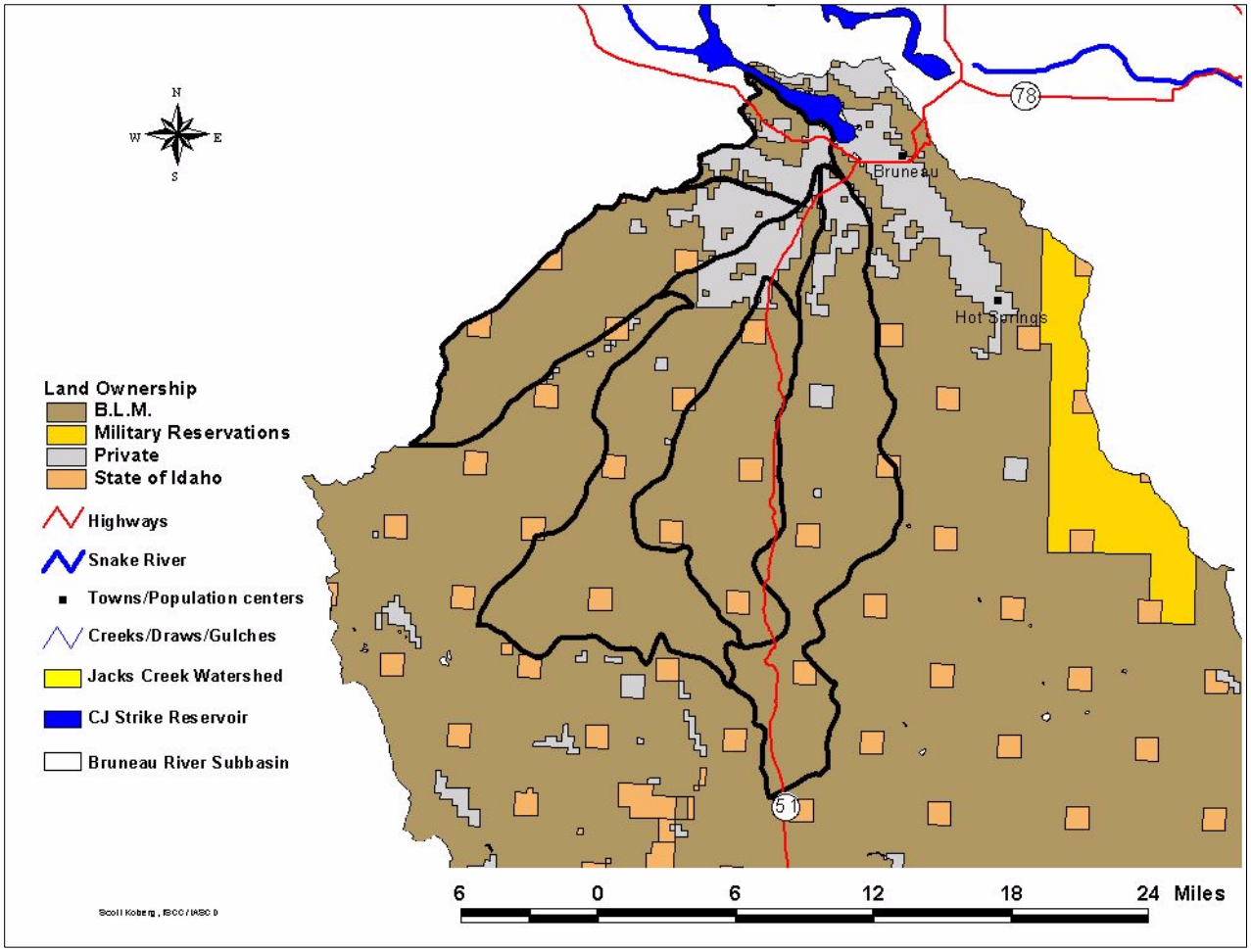


Table 3. Agricultural Land Use

Irrigation Method	Acres	Percent of Jacks Creek Watershed
Sprinkler Irrigated Cropland/Pasture	13,785	7%
Surface Irrigated Cropland/Pasture	4,275	2%
CAFO/AFO	N/A	N/A
TOTAL	**18,060**	**9%**

4.0 Treatment Units

This section presents information on the individual agricultural land uses within the Jacks Creek Watershed. Each land use is divided into one or more Treatment Units (TUs) (Figures 6 and 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for addressing the identified problems.

- **Treatment Unit #1 – Surface Irrigated Cropland and Pasture: 4,275 acres**

  Surface irrigation occurs on sandy loam and loam soils on slopes from 0-3%. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, mint, and corn. Surface irrigation for pastures occurs on the same soil types. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Pastures and some cropland fields are used for feeding areas for large herds of livestock during the winter. Irrigation wastewater and runoff from storm events typically enters Jacks Creek or one of the small tributaries to Jacks Creek.

- **Treatment Unit #2 – Sprinkler Irrigated Cropland and Pasture: 13,785 acres**

  This unit is occurs throughout the watershed, but is primarily located on the lowlands and terraces to the west of Little Valley. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, mint, and corn. With the exception of fields that have above average runoff rates for typical sprinkler systems, this area has little or no impact on Jacks Creek water quality due to high irrigation efficiencies.

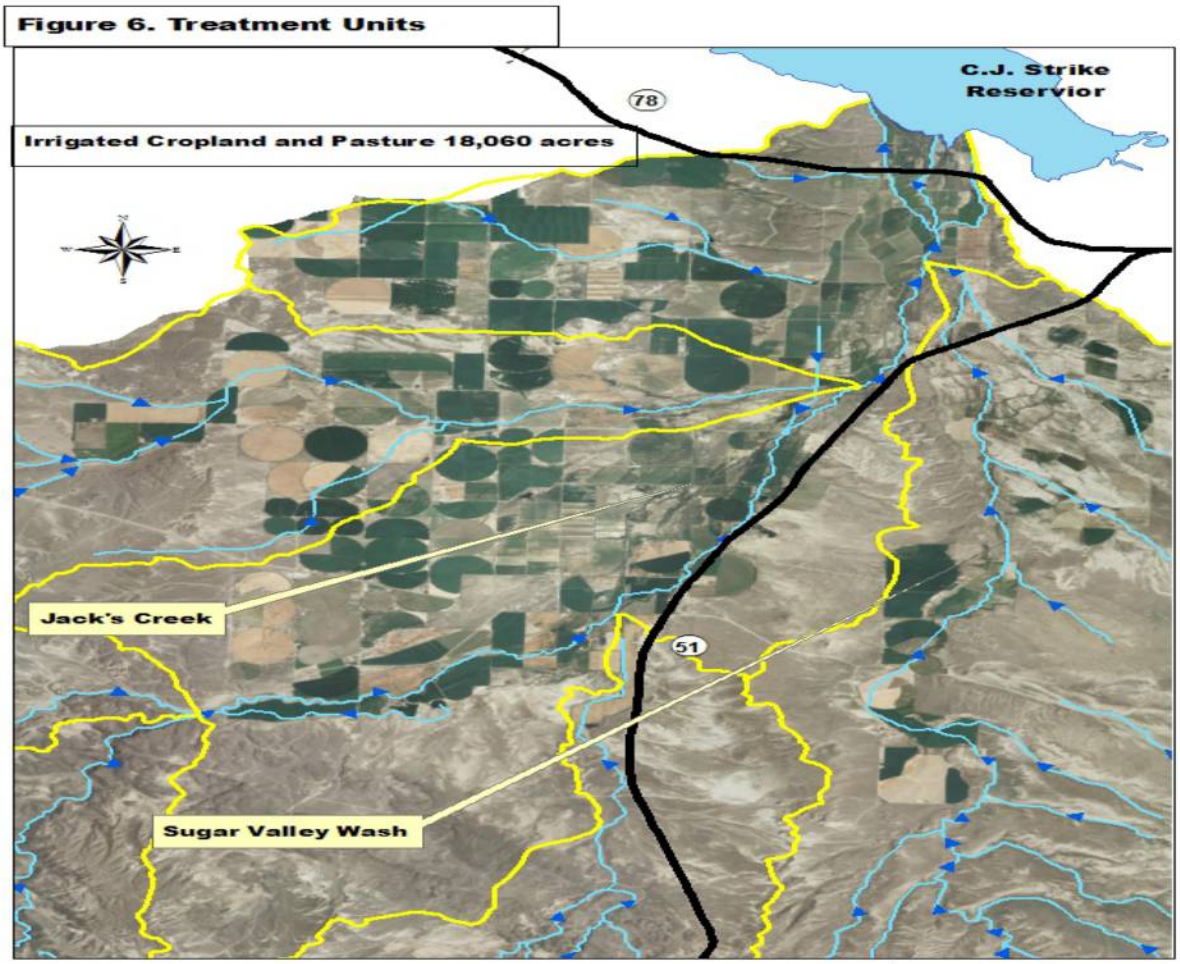
- **Treatment Unit #3 – CAFO/AFO**

  Feedlots are typically smaller than average farm fields in land area and are generally occupied by cattle during the winter and spring months (November through April), with most located near farmsteads or in feedlots. Idaho dairies have already been required to meet the current state standards set by ISDA for dairies which includes completion of a certified Nutrient Management Plan for all facilities. Idaho feedlots will be required to meet similar requirements by the year 2005. Both types of regulation by the ISDA require facilities to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities.

Table 4. Acres of TUs within Jacks Creek Watershed.

Treatment Units	Acres
Treatment Unit 1	4,275
Treatment Unit 2	13,785
Treatment Unit 3	N/A
TOTAL	**18,060**

(Koberg, 2001)



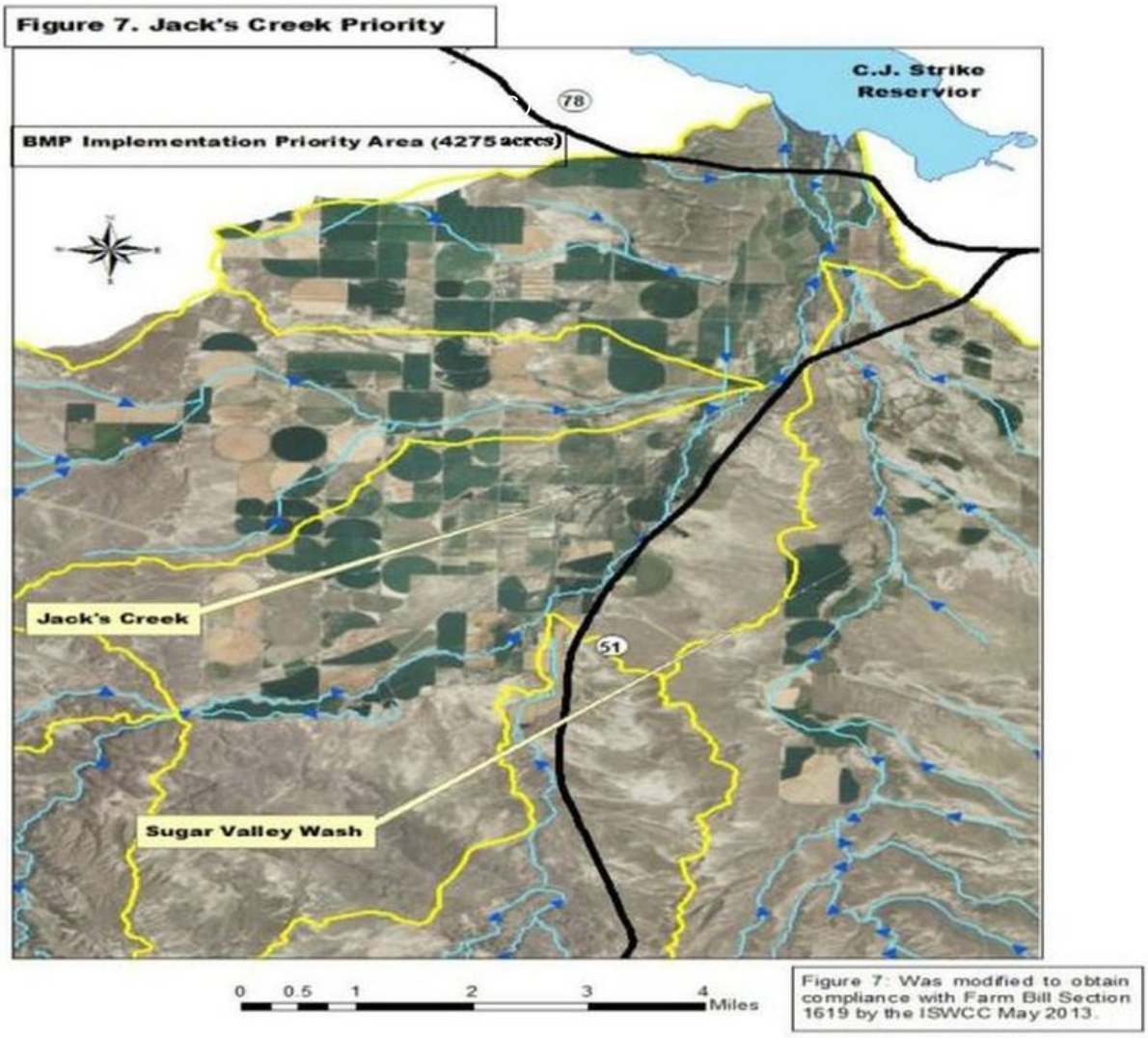
5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated within the Bruneau Subbasin, including Jacks Creek. To support the designated beneficial uses in Jacks Creek (warm water biota and secondary contact recreation), the TMDL established targets for TSS, TP, DO, and E. coli.

The TMDL process recognizes that the targets and load reductions established in the Subbasin Assessment may be revised as additional data is collected, as understanding of water quality in Jacks Creek improves, and as state water quality standards adapt to reflect new developments. Water quality monitoring in Jacks Creek has occurred since completion of the TMDL, and will continue to occur on a periodic basis. Any new information or data collected for this stream segment that indicate a discrepancy with the TMDL allocation and current conditions or trends should be used to make adjustments to this implementation plan accordingly.

Agricultural sources of sediment (TSS), bacteria (E. coli), and nutrients (TP) include runoff from surface irrigated cropland and pastures, animal feedlots and/or dairies, and livestock grazing on or near Jacks Creek and its tributaries. BMPs can be implemented to address the following:

- Irrigation induced erosion
- Irrigation wastewater delivery to receiving Jacks Creek
- Lack of adequate vegetation adjacent to waterways necessary for reducing sediment, nutrients, and bacteria from wastewater runoff
- Animal feedlots in and adjacent to waterways potentially delivering excess sediment, nutrients, and bacteria



5.1 Recreational Uses – Bacteria Objectives

According to the Bruneau TMDL Subbasin Assessment, the bacteria (E. coli) reduction target in Jacks Creek is approximately 84%. This is based on a geometric mean of 806 cfu/100mL measured by IDEQ in Jacks Creek during the year 2000, and the subsequent reduction required to achieve the geomean target of 126 cfu/100mL for secondary contact recreation. It is important to recognize, however, that the geomean criteria for E. coli requires that five samples are taken during a 30 day period, and the geomean for Jacks Creek during the year 2000 was derived using only three samples (Table 5).

Table 5. E. coli Reductions Required to Meet Load Allocation

Name	Secondary Geo-Mean CFU/100 ml (current)	Secondary Geo-mean CFU/100 ml (allocation)	Percent Reduction Required to Meet TMDL	Single Sample Maximum CFU/100 ml (current)	Single Sample Maximum CFU/100 ml (allocation)	Percent Reduction Required to Meet TMDL
Jacks Creek	**806**	**126**	**84%**	**2400**	**576**	**76%**

5.2 Aquatic Life Uses – Phosphorus and Dissolved Oxygen Objectives

The phosphorus (TP) load allocation established for Jacks Creek, according to the Bruneau TMDL Subbasin Assessment, requires a 73% reduction in TP. This is based on a 0.187 mg/L monthly average measured by IDEQ in Jacks Creek during the year 2000, and the subsequent reduction required to achieve the monthly average target of 0.05 mg/L (Table 6). There continues to arise some discussion in the Jacks Creek area regarding the potential impact that the only two point sources (warm water fish farms) may have on the creek in terms of phosphorus loading. Currently, there is not much consistently collected data to support any claims of TP loading to the creek from these sources. In August of 2000, however, ISDA collected a single sample at the site of one of the fish farms effluent that yielded 0.48 mg/L TP at a discharge rate of 2.98 cfs.

Table 6. Phosphorus Reductions Required to Meet Load Allocation

Name	Monthly Average mg/L (current)	Monthly Average mg/L (allocation)	Percent Reduction Required to Meet TMDL	Single Sample Maximum mg/L (current)	Single Sample Maximum mg/L (allocation)	Percent Reduction Required to Meet TMDL
Jacks Creek	**0.187**	**0.05**	**73%**	**0.302**	**0.08**	**74%**

Water quality monitoring conducted by both IDEQ and ISDA from 1999 through 2001in Jacks Creek did not yield any samples that exceeded the criteria for dissolved oxygen (DO). Of 78 samples collected by ISDA during this period, the closest sample to the target of no less that 5m/L was 6.41 mg/L in September of 1999. All data, however, was collected during the day; and according to ISDA visual observations at the sampling site, there exists a high possibility of oxygen depletion during the night due to decreases in photosynthetic activity of aquatic plants.

5.3 Aquatic Life Uses – Sediment Objectives

The sediment (TSS) load allocation established for Jacks Creek, according to the Bruneau TMDL Subbasin Assessment, is a monthly average not to exceed 50 mg/L with a daily maximum not to exceed 83 mg/L. Monitoring data collected by ISDA from 1999 to 2001near the mouth of Jacks Creek yielded only two samples out of 39 above the daily maximum of 83 mg/L. The TSS mean from April 1999 to March 2001 at the Jacks Creek downstream site was 38 mg/L, well below the monthly average target of 50 mg/L. IDEQ yielded similar results during their year 2000 monitoring with an annual average of 40 mg/L and one sample (96 mg/L) above the daily maximum target (Table 7).

Although it does not appear that a TSS problem exists in Jacks Creek, site specific BMPs installed to decrease irrigation induced erosion and sediment delivery will also reduce phosphorus delivery potential to Jacks Creek. Therefore, BMPs typically intended to reduce sediment delivery potential are included in this plan to help achieve the TMDL target for total phosphorus.

Table 7. TSS Reductions Required to Meet Load Allocation

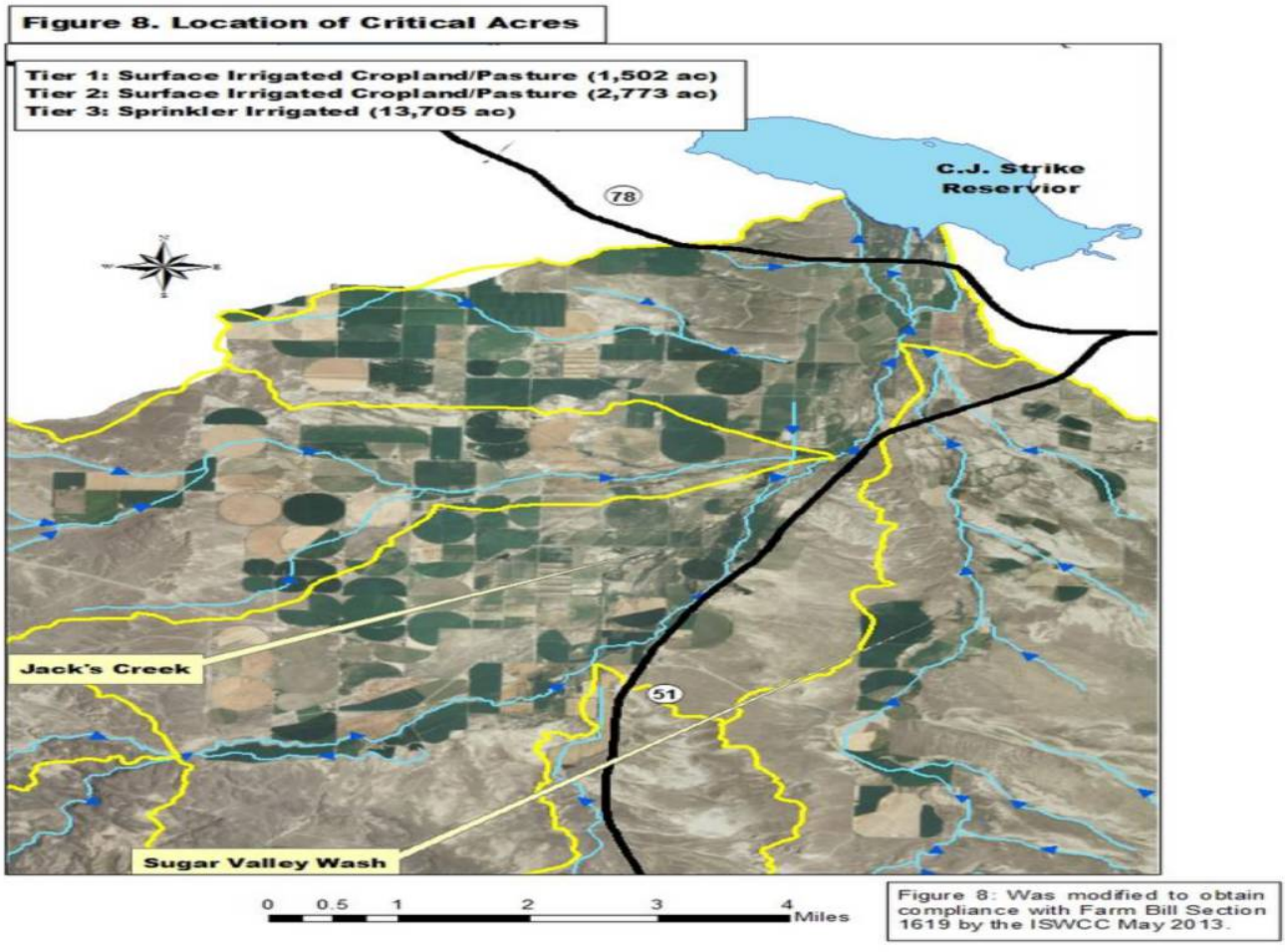
Name	Monthly Average mg/L (current)	Monthly Average mg/L (allocation)	Percent Reduction Required to Meet TMDL	Single Sample Maximum mg/L (current)	Single Sample Maximum mg/L (allocation)	Percent Reduction Required to Meet TMDL
Jacks Creek	**40**	**50**	**0%**	**96**	**83**	**14%**

6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Jacks Creek. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that likely have the greatest impact on the water quality in Jacks Creek.

Land treatment though BMP installation will be pursued in three tiers. Surface irrigated agricultural land that drains directly into Jacks Creek is included in Tier 1. Tier 1 lands have the most immediate impact on Jacks Creek water quality due to their proximity to the creek and access to the riparian area. In addition to the Tier 1 surface irrigated agricultural land, all CAFOs and AFOs within the irrigated portion of the watershed are considered high priority for BMP implementation due to their potential bacteria and phosphorus contributions to Jacks Creek.

Unlike Tier 1 lands, Tier 2 includes surface irrigated lands that are not directly adjacent to Jacks Creek, and the wastewater from Tier 2 acreage has the potential to be reused by Tier 1 acreage before entering the creek. Tier 3 acreage includes all sprinkler irrigated agricultural land within Jacks Creek Watershed and is located in various areas of the irrigated portion. In terms of BMP implementation Tier 1 is high priority, Tier 2 is medium priority, and Tier 3 is low priority (Figure 8).



Critical Acres within each Treatment Unit:

Treatment Unit 1	1,502 acres of Tier 1 surface irrigated cropland/pasture 2,773 acres of Tier 2 surface irrigated cropland/pasture
Treatment Unit 2	13,785 acres of Tier 3 sprinkler irrigated agricultural land
Treatment Unit 3	CAFO/AFO (unknown units)

7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. Wide scale adoption and implementation of these BMPs will improve the quality of surface waters in the project area and reduce pollutant loading to Jacks Creek.

Tables 7 through 10 provide the types of voluntary BMPs that are available to producers within the watershed that will improve site specific wastewater quality with proper design, installation, and/or implementation based on applicable NRCS standards and specifications. Only those combinations of BMPs necessary for water quality improvements, which are feasible to the participant, will be voluntarily implemented.

BMPs include, but are not limited, to the following:

Table 8. Treatment Unit 1: Surface Irrigated Cropland

Agro-Tillage	Conservation Cropping Sequence
Conservation Tillage	Cover and Green Manure Crop
Filter Strips	Grassed Waterway
Surge Irrigation System	Sprinkler Irrigation System
Tailwater Recovery System	Irrigation Water Management
Straw Mulching	Nutrient Management
Pest Management	Sediment Basin
Underground Outlet	Chiseling and Subsoiling
Waste Utilization	Channel Vegetation
Drip Irrigation System	PAM
Irrigation Water Conveyance	

Table 9. Treatment Unit 1: Surface Irrigated Pasture

Fencing	Stream channel stabilization
Heavy use area protection	Offsite watering
Filter strips	Waste Utilization
Spring water development	Waste Storage System
Irrigation systems	Nutrient Management
Pasture and Hayland Planting	Planned Grazing System
Livestock Watering Facility	Pasture and Hayland Management
Irrigation Water Management	Pest Management

Table 10. Treatment Unit 2: Sprinkler Irrigated Agricultural Land

Agro-Tillage	Conservation Cropping Sequence
Conservation Tillage	Cover and Green Manure Crop
Irrigation Water Management	Nutrient Management
Straw Mulching	Pest Management
Chiseling and Subsoiling	Waste Utilization
Channel Vegetation	Filter strips

Table 11. Treatment Unit 3: CAFO/AFO

Waste Management System	Heavy use area protection
Filter strips	Livestock Watering Facility
Nutrient Management	Fencing

7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct resource inventory/site assessment, evaluate data, develop site specific BMP alternatives

SITE SPECIFIC BMP Alternative #1 ($800/ acre)	SITE SPECIFIC BMP Alternative #2 ($500/ acre)	SITE SPECIFIC BMP Alternative #3 ($250/ acre)
Sprinkler Irrigation System	Irrigation Water Management	Irrigation Water Management
Irrigation Water Mgmt.	Surface Irrigation System	Concrete Ditch
Nutrient Management	Gated Pipe	Filter Strip
Pest Management	Tail Water Recovery System	PAM
Conservation Crop Rotation	Nutrient Management	Sediment Basin
	Pest Management	Nutrient Management
	Conservation Crop Rotation	Pest Management
		Conservation Crop Rotation

7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct resource inventory/site assessment, evaluate data, develop site specific BMP alternatives

SITE SPECIFIC BMP Alternative #1 ($500/ acre)	SITE SPECIFIC BMP Alternative #2 ($400/ acre)	SITE SPECIFIC BMP Alternative #3 ($300/ acre)
Fencing	Fencing	Fencing
Planned Grazing System	Planned Grazing System	Pasture & Hayland Mgmt.
Pasture & Hayland Management	Pasture & Hayland Management	Nutrient Management.
Nutrient Management	Nutrient Management	Livestock Watering Facility
Heavy Use Area Protection	Pest Management	Irrigation Water Management
Pest Management	Livestock Watering Facility	Pest Management
Livestock Watering Facility	Irrigation Water Management	Filter Strip
Irrigation Water Management	Gated Pipe	
Gated Pipe		

7.3 Example Description of Alternatives for Sprinkler Irrigated Agricultural Land

Procedure: Conduct resource inventory/site assessment, evaluate data, develop site specific BMP alternatives

SITE SPECIFIC BMP Alternative #1 ($100/ acre)	SITE SPECIFIC BMP Alternative #2 ($50/ acre)	SITE SPECIFIC BMP Alternative #3 ($25/ acre)
Nutrient Management	Nutrient Management	Nutrient Management
Irrigation Water Management	Irrigation Water Management	Irrigation Water Management
Pest Management	Pest Management	Pest Management
Filter strips	Filter strips	
Conservation Crop Rotation		

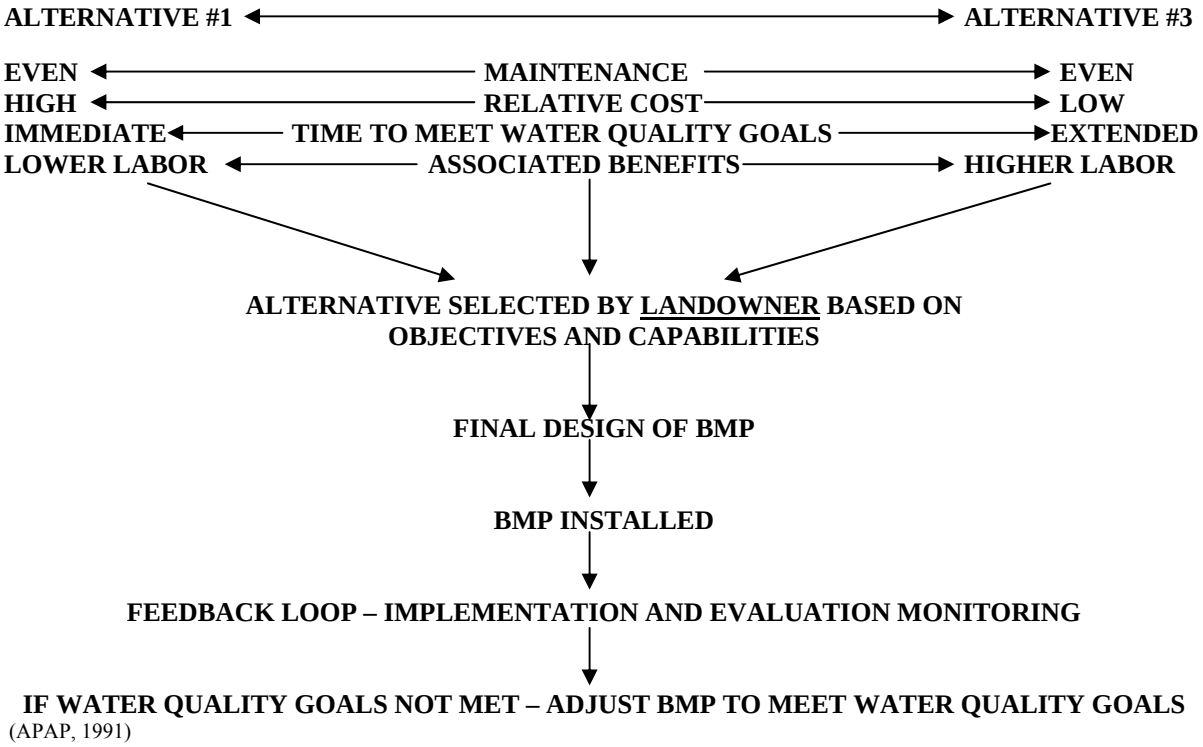
7.4 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct resource inventory/site assessment, evaluate data, develop site specific BMP alternatives

SITE SPECIFIC BMP Alternative #1 ($50,000/ each)	SITE SPECIFIC BMP Alternative #2 ($35,000/ each)	SITE SPECIFIC BMP Alternative #3 ($25,000/ each)
Nutrient Management	Waste Management System	Waste Management System
Heavy Use Area Protection	Nutrient Management	Nutrient Management
Livestock Watering Facility	Livestock Watering Facility	Filter strips
Filter strips	Filter strips	Heavy Use Area Protection
Waste Management System	Heavy Use Area Protection	
Dike		

7.5 Graphic Comparison of BMP Selection and Implementation Process

The site specific BMP Alternative is chosen based on a variety of factors, but typically reflect the producer's objectives in conjunction with the resource concerns identified by the assisting agency. The following flow chart provides a graphic representation of selection process and some comparisons between Alternative #1(high cost), Alternative #2 (moderate cost), and Alternative #3 (low cost) for the various treatment units. The chart applies to each of the three treatment units identified in sections 7.1 through 7.3.



(APAP, 1991)

7.6 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than similar yearly costs for Alternative 1 BMPs.

7.7 Feedback Loop

The feedback loop is a process used to evaluate and refine installed BMPs. Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards (APAP, 1991). The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

8.0 Program of Implementation

The Bruneau River Soil Conservation District has selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient, bacteria, and sediment control systems, and management practices. There are currently no sources of funding available for cost-share assistance specifically within the Jacks Creek Watershed priority area. While there are a handful of federal and state site-specific programs available to interested participants on a farm by farm basis, Jacks Creek has yet to be selected as a priority area with its own specific project area. Should funding become available for use specifically in the Jacks Creek Watershed, the implementation of BMPs and distribution of incentive payments will be focused within the privately owned, irrigated portion of the watershed.

8.1 Installation and Financing

Landowners can enter into voluntary water quality contracts or cost-share contracts with the Bruneau SCD (once project area funding becomes available) in order to reduce out of pocket expenses for BMP implementation. In lieu of a contract, a water quality plan or conservation plan can be developed that describes the objectives of the producer and provides site-specific BMP implementation information. NRCS, IASCD, and the Bruneau SCD will provide the same level of technical assistance to producers during the development of a conservation plan or water quality plan regardless of the producers intent to pursue or not pursue cost-share assistance.

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Association of Soil Conservation Districts (IASCD), and Bruneau SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. Where cost-share incentives are contracted through a state or federal program, NRCS and IASCD will assist Bruneau SCD with certification of installed BMPs, filing payment applications, completing annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Producers who choose to enter into a cost share contract with the SCD, IASCD, or NRCS will be responsible for installing the BMPs according to a schedule determined within their contract. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

Table 12. Estimated BMP Cost Summary for TU 1, Tier 1 (Surface Irrigated Cropland/Pasture: 1,502 acres)

ALTERNATIVE		ACRES	TOTAL COST
Alternative 1	$650/AC	1502	$ 976,300
Alternative 2	$450/AC	1502	$ 675,900
Alternative 3	$275/AC	1502	$ 375,500

Table 13. Estimated BMP Cost Summary for TU 1, Tier 2 (Surface Irrigated Cropland/Pasture: 2,773 acres)

ALTERNATIVE		ACRES	TOTAL COSTS
Alternative 1	$650/AC	2773	$ 1,802,450
Alternative 2	$450/AC	2773	$ 1,247,850
Alternative 3	$275/AC	2773	$ 693,250

Table 14. Estimated BMP Cost Summary for TU 2, Tier 3 (Sprinkler Irrigated: 13,785 acres)

ALTERNATIVE		ACRES	TOTAL COSTS
Alternative 1	$100/AC	13,785	$ 1,378,500
Alternative 2	$50/AC	13,785	$ 689,250
Alternative 3	$25/AC	13,785	$ 344,625

Table 15. Estimated BMP Cost Summary for TU 3, (CAFO/AFO)

ALTERNATIVE		UNITS	TOTAL COSTS
Alternative 1	$50,000/each	20	$ 1,000,000
Alternative 2	$35,000/each	20	$ 700,000
Alternative 3	$25,000/each	20	$ 500,000

8.2 Operation, Maintenance, and Replacement

Participants who install BMPs in conjunction with a state or federal cost-share incentive program will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Landowners are encouraged to maintain installed BMPs after the contract expires. Participants who install BMPs on their own or without the benefit of a cost-share incentive program are not under contract to maintain the BMPs. If the BMPs are installed in response to a conservation plan completed with them by the assisting agencies, landowners are encouraged to maintain the BMPs and incorporate them into their annual operations. It is not required, however, unless they are under contract.

Inspections of BMPs installed in conjunction with a cost-share incentive program will be made on an annual basis by Bruneau SCD, NRCS, IASCD, and the participant. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant.

8.3 Water Quality Monitoring

The Idaho State Department of Agriculture (ISDA) collected water quality samples at two sites in Jacks Creek upon request from a landowner from April 1999 through March of 2001. During development of the Bruneau Subbasin TMDL, IDEQ conducted monitoring in Jacks Creek during the 2000 irrigation season. Most samples collected by the various agencies occur on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the Jacks Creek for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

9.0 References

U. S. Department of the Agriculture, Soil Conservation Service (Natural Resources Conservation Service). 1991. *Soil Survey of Elmore County Area, Idaho.*

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Idaho Department of Environmental Quality, 2000. *Bruneau Subbasin Assessment and Total Maximum Daily Loads of the 303(d) Water Bodies.*

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