

**Big Lost River Subbasin**  
**Total Maximum Daily Load**  
**Implementation Plan for Agriculture**



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## Introduction

The Big Lost River Watershed Subbasin Assessment and Total Maximum Daily Load (SBA-TMDL) was completed by the Idaho Department of Environmental Quality (IDEQ) and approved by the Environmental Protection Agency (EPA) in 2004. The Idaho State Soil and Water Conservation Commission (SWC) is responsible for preparing the Big Lost River Subbasin TMDL Implementation Plan for Agriculture.

## PURPOSE

The purpose of this plan is to recommend Best Management Practices (BMPs) that will improve or restore physical, chemical, and biological functions to impaired reaches in the Big Lost River subbasin. This plan will build upon past conservation accomplishments made through the Natural Resources Conservation Service (NRCS) and the Butte Soil and Water Conservation District (SWCD). Future projects will assist or compliment other efforts in restoring beneficial uses on 123,545 acres of private agricultural land in the Big Lost River subbasin.

The Big Lost River subbasin Total Maximum Daily Load (TMDL) Implementation Plan for Agriculture outlines an adaptive management approach for implementation of best management practices (BMPs) and resource management systems (RMS) on agricultural lands to meet the requirements of the Big Lost River SBA-TMDL.

## GOALS AND OBJECTIVES

The goal of this plan is to provide a strategy for agriculture to assist and/or complement other agency efforts in restoring and protecting beneficial uses for water quality impaired streams in the Big Lost River subbasin (Figure 1). These water quality impaired streams were identified in the 1998 §303(d) list for the Big Lost River subbasin, HUC 17040218 (Table 1). Dissolved oxygen, flow alteration, and habitat alteration were also concerns for some of these waterbodies. Two integrated reports have been produced since the 1998 §303(d) list. The most current report, the 2008 303(d)/305 (b) list has the Big Lost River, Pass Creek, Thousand Springs Creek, Willow Creek, Sage Creek, Bridge Creek, Wildhorse Creek, Warm Springs Creek, and Antelope Creek listed as impaired waters. Thirteen waterbodies currently have TMDLs developed for sediment and/or temperature in the Big Lost River subbasin (Table 2) (IDEQ 2009).

**Table 1. 1998 303(d) List for the Big Lost River Subbasin (IDEQ 1998)**

Waterbody	Listed Pollutants
Big Lost River	Nutrients, Sediment, Temperature
Spring Creek	Nutrients, Sediment, Temperature
Antelope Creek	Sediment, Temperature
Twin Bridges Creek	Nutrients, Sediment
East Fork Big Lost River	Sediment, Temperature
Little Boone Creek	Unknown Pollutants
Warm Springs Creek	Unknown Pollutants

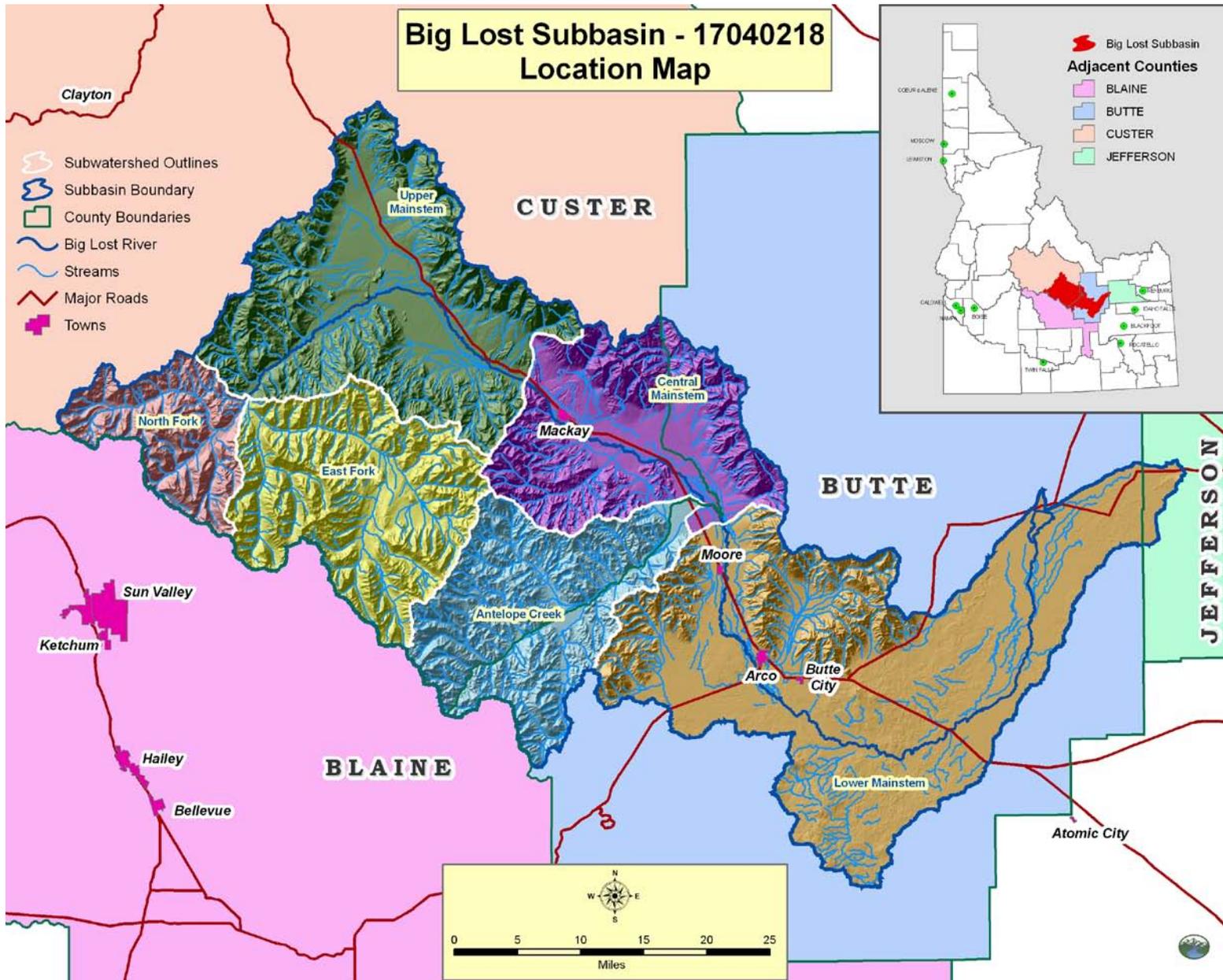


Figure 1. Location of the Big Lost River Subbasin in Idaho

## Big Lost Subbasin - 17040218 Impaired Streams

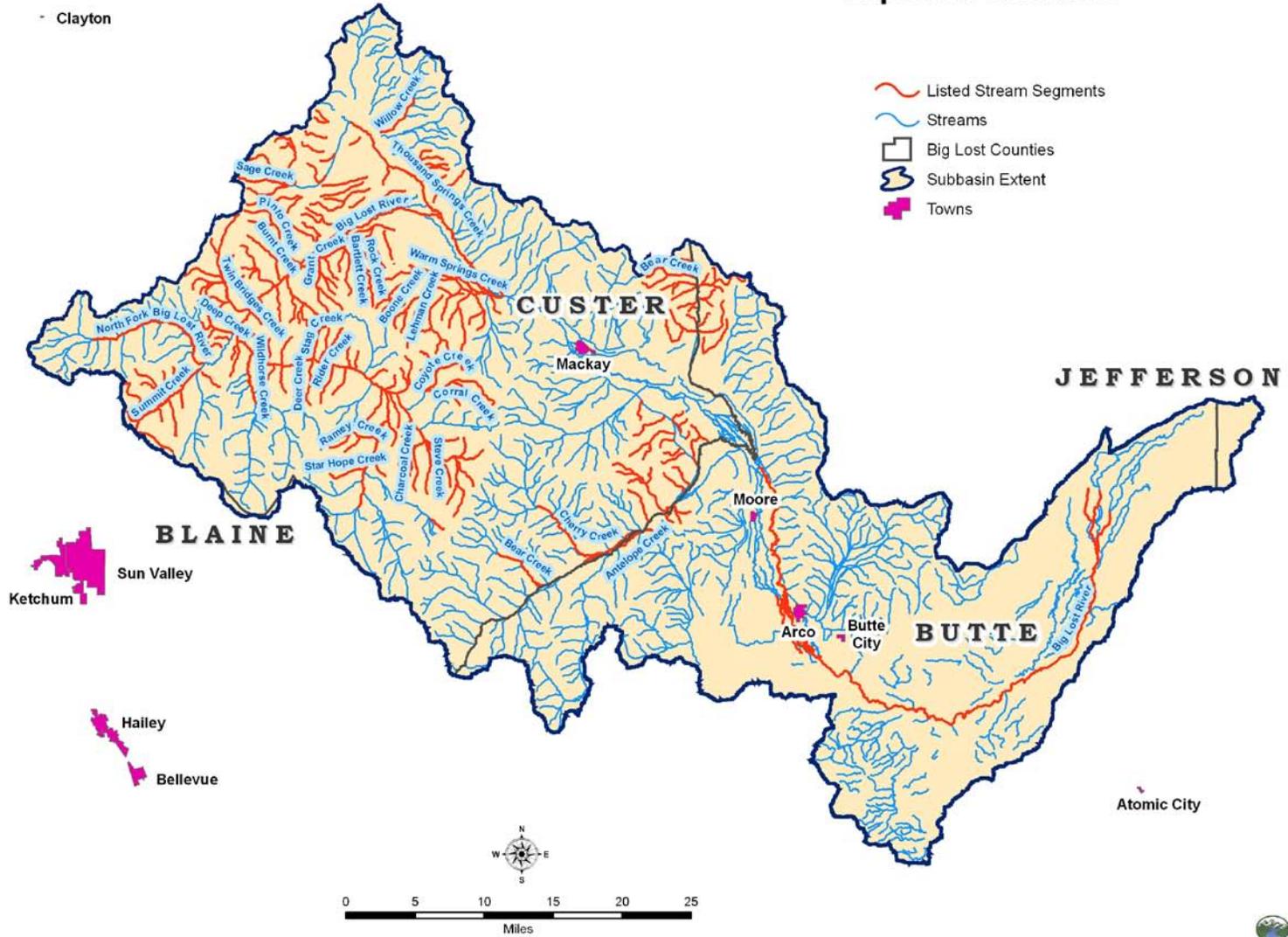


Figure 2. 2002 303(d)/305(b) listed streams in the Big Lost River Subbasin

**Table 2. Approved TMDLs for Waterbodies in the Big Lost River Subbasin (IDEQ 2008)**

Waterbody	Approved TMDL
East Fork Big Lost River	Sediment, Temperature
Corral Creek (East Fork Big Lost tributary)	Sediment, Temperature
Starhope Creek	Sediment, Temperature
Wildhorse Creek	Sediment, Temperature
North Fork Big Lost River	Sediment, Temperature
Summit Creek	Sediment, Temperature
Big Lost River: Source to Chilly Buttes	Temperature
Twin Bridges Creek	Sediment
Thousand Springs Creek	Sediment
Warm Springs Creek	Temperature
Antelope Creek (two segments)	Sediment, Temperature
Bear Creek	Sediment, Temperature
Cherry Creek	Sediment, Temperature

This implementation plan will provide guidance to the Butte Soil and Water Conservation District, Natural Resource Conservation Service, and agricultural producers in the Big Lost River subbasin on how to implement BMPs necessary to meet the requirements of the TMDLs on §303(d) listed streams. The objective of this plan is to reduce the amount of pollutants entering these water bodies from agricultural-related practices. Agricultural pollutant reductions will be achieved by on-farm conservation planning with individual operators and application of BMPs in agricultural critical areas. This plan recommends BMPs needed to meet TMDL targets in the Big Lost River subbasin, and suggests alternatives for reducing surface and ground water quality problems from agricultural related activities.

## **Background**

### **PROJECT SETTING**

The Big Lost River subbasin is located in south central Idaho (Figure 1). The largest city in the subbasin is Arco. The Big Lost River subbasin is one of four subbasins known as the Sinks Drainages because surface waters sink into the Snake River Plain Aquifer. Groundwater flow is in a southwest direction toward the Thousand Springs reach of the Snake River near Hagerman, Idaho. This subbasin is bounded on the southwest by the Pioneer and White Knob Mountains, the east by the Lost River Range, the northwest by the Boulder Mountains, and the north by the Salmon River Mountains. Elevations range from approximately 4,800 feet in the eastern portion of the watershed to 12,668 feet at Mount Borah, the highest point in Idaho.

### **WATERSHEDS**

The Big Lost River Subbasin contains nine watersheds, the East Fork Big Lost River, Star Hope Creek, North Fork Big Lost River, Upper Big Lost River, Big Lost River-Thousand Springs, Middle Big Lost River, Antelope Creek, Lower Big Lost River, and the Big Lost River Sinks. These watersheds correspond to the fifth field level HUCs in the Big Lost River subbasin. Figure 1 is a map of subbasin showing the boundaries of the nine fifth field HUC watersheds.

# Big Lost Subbasin - 17040218 Relief Map Showing Elevation Ranges

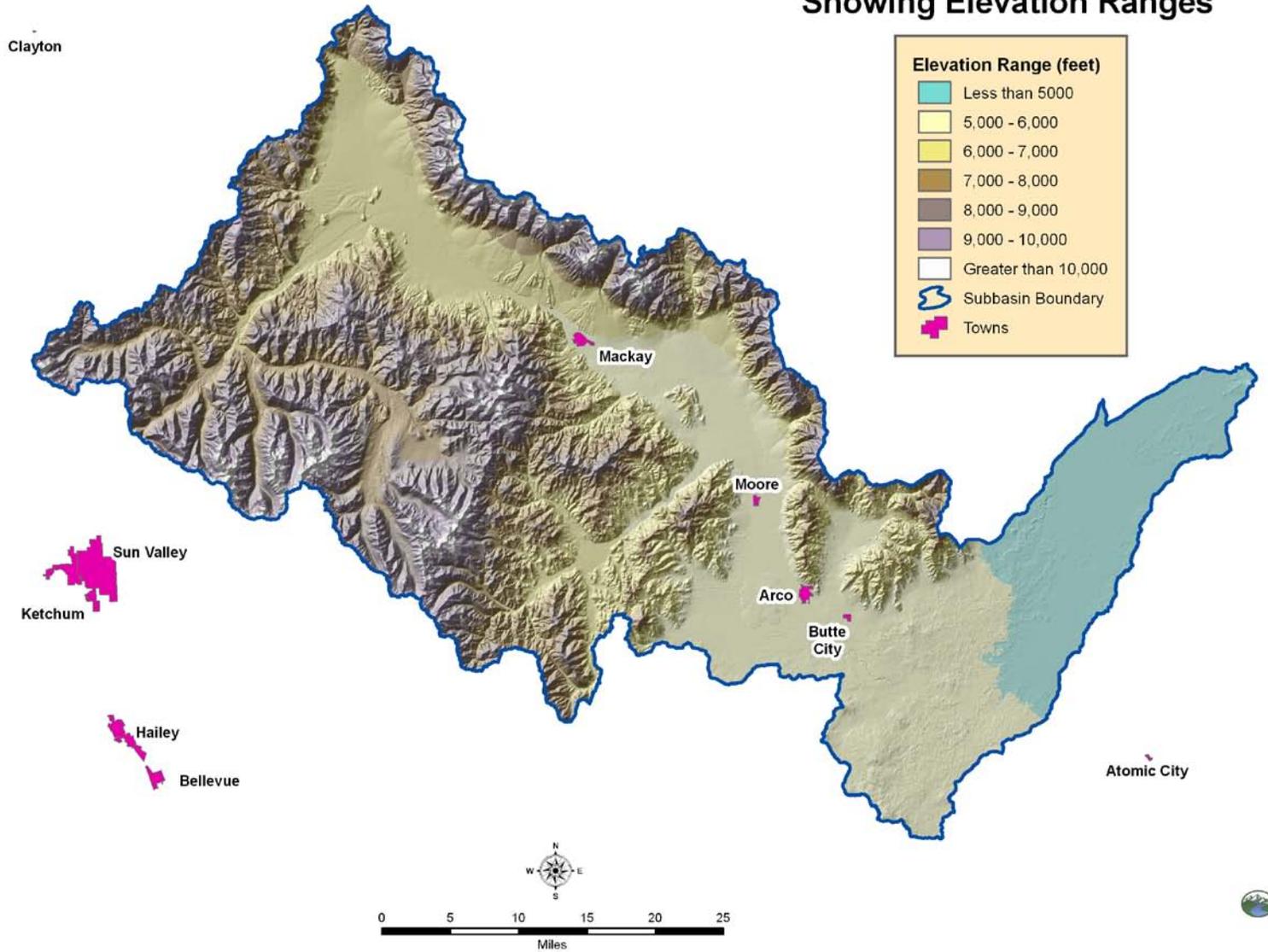


Figure 3. Elevation Ranges in the Big Lost River Subbasin

There are two provinces found in the subbasin: Temperate Steppe Regime Mountains and Intermountain Semi-Desert. Climate in the subbasin is a combination of semi-arid and temperate desert. Sagebrush steppe is found throughout the low elevation portions of the subbasin. Elevation ranges from approximately 5,000 feet in the valley bottoms to approximately 10,000 feet in mountains (Figure 3).

Average annual maximum temperature is approximately 55°F and average annual minimum temperature is 19°F to 28°F. Average annual precipitation is less than 15 inches/year in the lowlands along the Big Lost River. Precipitation is 25 to 45 inches/year in the mountains (Figure 4).

The Big Lost River subbasin 8-Digit Hydrologic Unit Code (HUC 17040218) is 1,274,806 acres and it drains 1,992 square miles. Custer County contains approximately 75 percent of the subbasin, while Butte County contains the remaining 25 percent. There is a very small area at the easternmost edge that is in Jefferson County.

For more information regarding the climate, hydrology, soils, vegetation, and other subbasin characteristics; please consult the Big Lost River SBA and TMDL (IDEQ 2004).

#### COMMON RESOURCE AREAS

The subbasin is comprised of four Major Land Resource Areas (MLRAs): Snake River Plains, Lost River Valleys and Mountains, Central Rocky Mountains, and Central Rocky and Blue Mountain Foothills (<http://soils.usda.gov/survey/geography/mlra/>). A description of the Common Resource Areas (CRA), subunits of MLRAs, of the Big Lost River subbasin are found below. A CRA is an area defined by similar vegetation, elevation, temperature, precipitation, frost free days, and soils ([http://www.id.nrcs.usda.gov/technical/soils/common\\_res\\_areas.html](http://www.id.nrcs.usda.gov/technical/soils/common_res_areas.html)). Information relating specifically to the Big Lost River subbasin has been inserted under each CRA heading based on available GIS layers for elevation, precipitation, and land use.

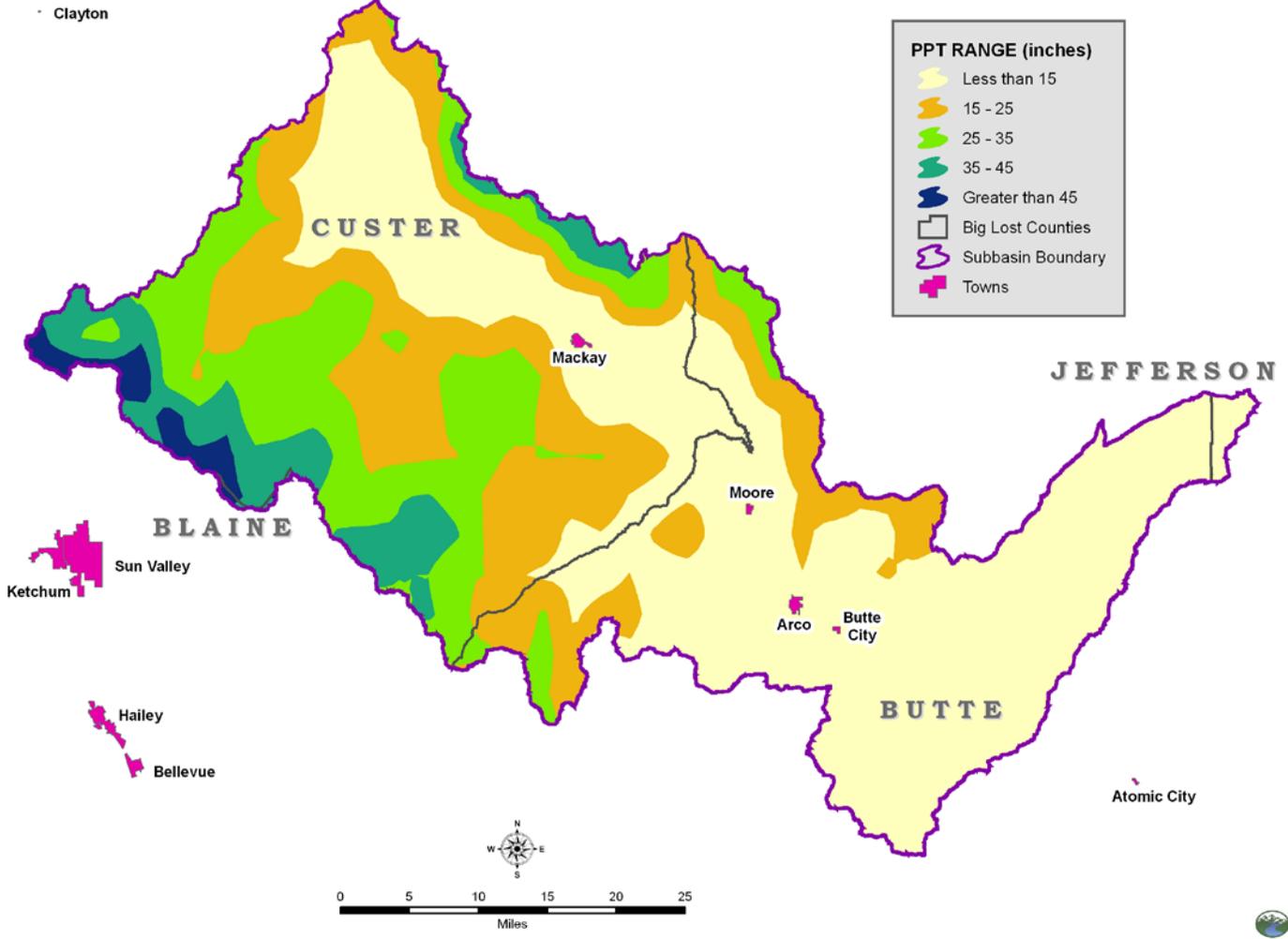
##### Central Rocky and Blue Mountain Foothills – Lava Fields (CRA 10.2)

There is no cropland in this unit. It is mostly barren or rangeland. Most of the dominant natural vegetation consists of sagebrush and perennial bunchgrasses. Elevation in this portion of the subbasin ranges from 4,000 feet to 5,000 feet. There is little topographic relief. Average annual temperature is 39 °F to 55 °F. Precipitation is 9" to 12", most of which falls in the winter and early spring. Average frost free days are broadly defined 60 to 165 days. Soils have a mesic or frigid temperature regime. This CRA is a very small portion of the southern part of the subbasin.

##### Central Rocky and Blue Mountain Foothills – Foothill Shrublands - Grasslands (CRA 10.7)

Rangeland and wildlife habitat are the dominant land uses. Most of the dominant natural vegetation consists of sagebrush, perennial bunchgrasses, and forbs. Elevation in this portion of the subbasin ranges from 8,000 feet to 9,300 feet. Average annual temperature is 39 °F to 55 °F. Precipitation is 28" to 32", most of which falls in winter and early spring. Average frost free days are 30 to 90 days. Soils are shallow to deep, well drained, formed in colluvium and slope alluvium from sandstone, siltstone and welded tuff. Soils have a mesic or frigid temperature regime. This CRA is a very small portion of the southern part of the subbasin that is composed of lava fields.

**Big Lost Subbasin - 17040218  
Average Annual Precipitation**



**Figure 4. Average Annual Precipitation in the Big Lost River Subbasin**

#### Snake River Plains – Eastern Snake River Basalt Plains (CRA 11.4)

Rangeland is the dominant land use with minor areas of grassland. Most of the dominant natural vegetation consists of sagebrush, perennial bunchgrasses, and forbs. Elevation in this portion of the subbasin ranges from 4,500 feet to 6,000 feet. Average annual temperature is 41 °F to 52 °F. Precipitation is 8" to 12", most of which falls in winter and early spring, outside the growing season. Average frost free days are broadly defined as 90 to 170 days. Soils are generally shallow and stony and unsuitable for cultivation. Soils have a mesic or frigid temperature regime. The Department of Energy (DOE), Idaho National Laboratory (INL) owns most of the land in this resource area.

#### Lost River Valley/Mountains – Dry Intermontane Sagebrush Valleys (CRA 12.1)

Major land uses are irrigated cropland, irrigated pasture, and rangeland located adjacent to the Big Lost River. Most of the irrigated acres in the Big Lost River subbasin are located in this resource area. Rangeland vegetation consists of sagebrush, perennial grasses, and forbs. Elevation in this portion of the subbasin ranges from <5,000 feet to 7,000 feet. Average annual temperature is 37 °F to 55 °F. Precipitation is 6" to 12", most of which falls in winter and early spring, outside the growing season. Topography varies from nearly level flats up to benches, rolling hills, and foothills. Soils are very deep, well drained and formed in mixed alluvium. Average frost free days are 80 to 110 days and every month in the mountains for this CRA.

#### Lost River Valley/Mountains – Gneissic – Volcanic Hills (CRA 12.2)

Rangeland is the largest land use for this resource area. Rangeland vegetation consists of sagebrush, perennial grasses, and forbs. Elevation in this portion of the subbasin ranges from approximately 5,000 feet to over 10,000 feet. Average annual temperature is 37 °F to 55 °F. Precipitation is 12" to 28", most of which falls in winter and early spring, outside the growing season. Topography varies from nearly level flats up to benches and rolling hills. Soils are loamy to gravelly. Average frost free days are 80 to 110 days for the valleys and every month in the mountains for this CRA.

#### Lost River Valley/Mountains – Barren Mountains (CRA 12.3)

Major land uses are forest, rangeland, and wildlife habitat. Forests are limited to a narrow elevational band and are most widespread on north-facing slopes. Vegetation consists of open-canopied Douglas fir/lodgepole pine/subalpine fir forests, aspen groves, sagebrush, and grasses. Elevation in this portion of the subbasin ranges from 9,000 feet to greater than 10,000 feet. Precipitation ranges from 28" to 48" or more on mountain crests, most of which falls in winter and early spring outside the growing season. Soils are formed in colluvium and slope alluvium from sandstone, siltstone, and welded tuff. Average frost free period ranges from 80 to 110 days for the valleys and every month in the mountains for this CRA.

#### Central Rocky Mountains – Dry, Partly Wooded Mountains (CRA 43B.3)

Major land uses are forest, rangeland, grassland, and wildlife habitat. Vegetation consists of a mosaic of shrubland, open Douglas-fir forest, and aspen. This region is in the rain shadow of high mountains. Rangeland vegetation consists of sagebrush, perennial grasses, and forbs. Elevations range from 8,000 feet to greater than 10,000 feet. Average annual temperature is 36 °F to 45 °F. Precipitation is 28" to 48" and greater, most of which falls as snow in winter and early spring outside the growing season. Topography consists of steep slopes and high mountain valleys. Soils are very deep, well drained formed in alluvium, slope alluvium, and colluvium from mixed sources. Average frost free period is broadly defined from 30 to 125 days.

## LAND USE

A majority of the subbasin is utilized as rangeland. Sixty three percent of the watershed is shrubland or rangeland; seventeen percent is grass, pasture, or hayland; thirteen percent of the basin is forest; and three percent is cropland. The remaining five percent is water, wetland, developed, barren, or perennial snow. Wetlands are commonly found throughout the Thousand Springs and Big Lost River Valleys (<http://www.fws.gov/wetlands/Data/index.html>). Forest is located in the northeastern and southwestern, high elevation, steep portions of the subbasin. The majority of the irrigated land (gravity flow and sprinkler) is located adjacent to the Big Lost River (Table 3 and Figure 5). A series of canals are found along the Big Lost River between the towns of Mackay and Arco. They are known as the Nelson Ditch, Hanson Ditch, Swauger Ditch, Darlington Ditch, Burnett Ditch, Blaine Canal, Moore Canal, and Arco Canal. Mackay Reservoir was built in the 1920s and it holds 45,050 acre-feet of water ([www.blm.gov/id/st/en/fo/challis/recreation\\_sites\\_/Joe\\_T\\_Fallini\\_Recreation\\_Site/history.html](http://www.blm.gov/id/st/en/fo/challis/recreation_sites_/Joe_T_Fallini_Recreation_Site/history.html)).

**Table 3. Land Use in the Big Lost River Subbasin.**

Land Use/Land Cover Category	Total Acres	Percent of Subbasin
Barren Land	25,674	2%
Cropland	36,797	3%
Developed	18,703	1%
Forest	160,408	13%
Grass/Pasture/Hay	206,650	17%
Shrub Rangelands	805,579	63%
Water/Wetlands/Perennial Snow	11,109	2%
TOTAL	1,274,806	100%

## LAND OWNERSHIP

The majority (69%) of land ownership in the Big Lost River Subbasin is public (Table 4 and Figure 6). The United States Forest Service manages the high elevation mountainous regions which totals 42% of the subbasin. The Bureau of Land Management manages the remaining 27% of the public land. Private land accounts for approximately 15% of the subbasin. The Department of Energy owns 15% of the subbasin. The remaining 1% of the land ownership is a mosaic of National Parks Service and state land.

**Table 4. Land Ownership in the Big Lost River Subbasin.**

Land Owner	Acres	Percent of Subbasin
BLM	345,730	27%
DOE	187,270	15%
NPS	2,160	0.2%
Private	186,700	15%
State/IDFG	16,025	1%
USFS	536,975	42%
TOTAL	1,274,860	100%

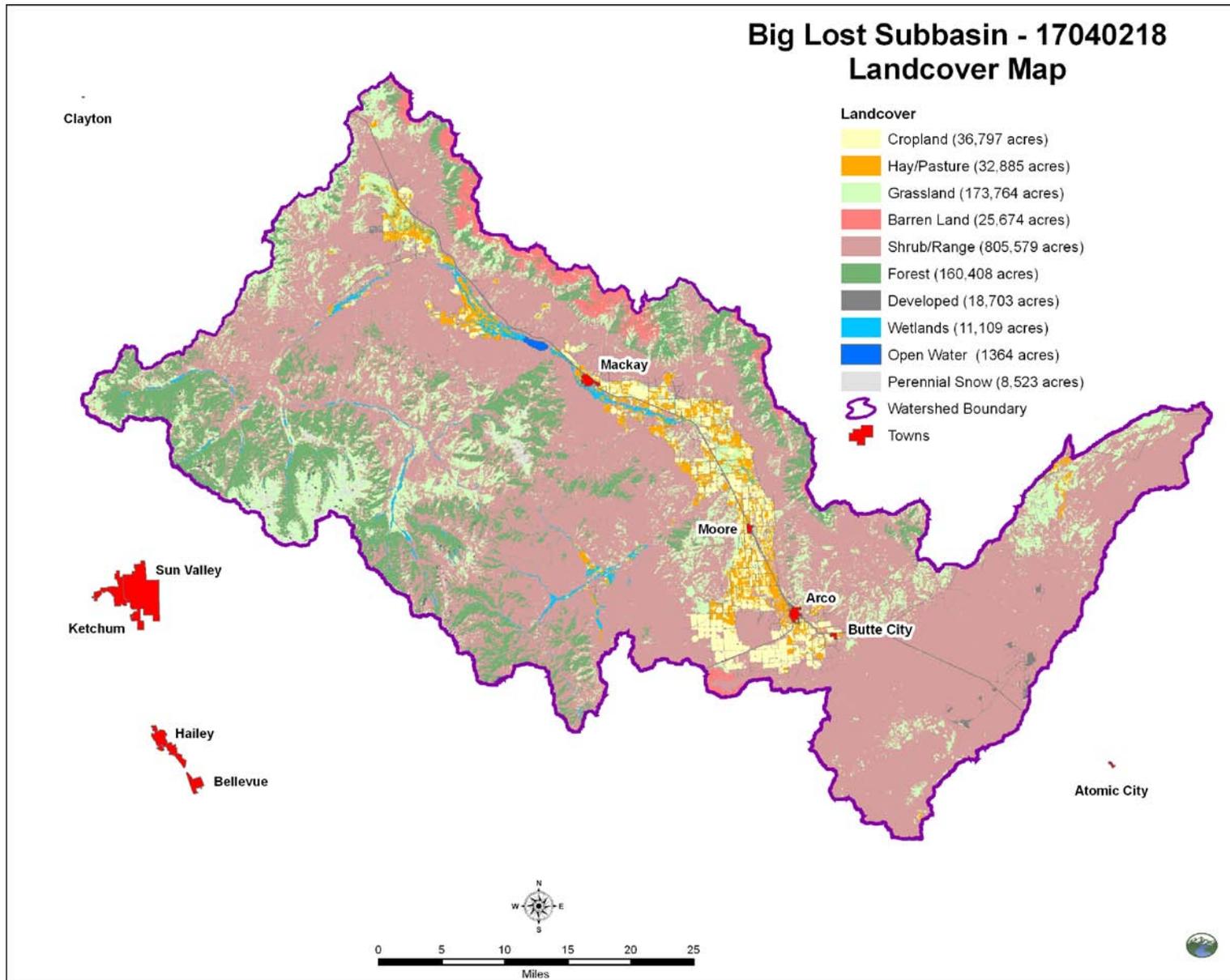


Figure 5. Land Use/Land Cover in the Big Lost River Subbasin

## Big Lost Subbasin - 17040218 Land Management Map

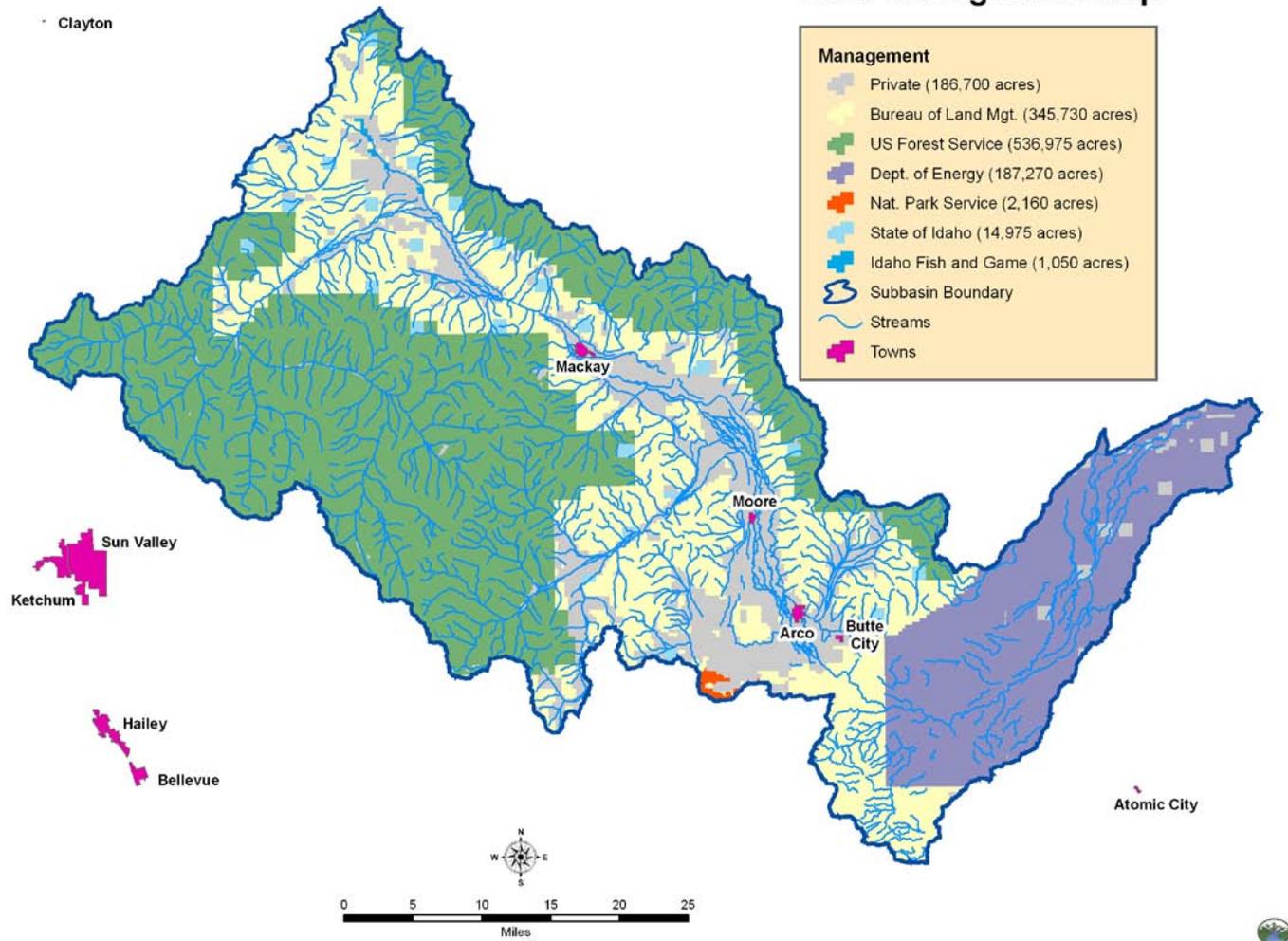


Figure 6. Land Ownership/Land Management in the Big Lost River Subbasin

## **CONSERVATION ACCOMPLISHMENT**

Conservation accomplishments are a result of a collaborative process between landowners, soil conservation districts, NRCS staff, and SWC staff. Accomplishments are recorded as applied best management practices (BMPs) and aim to reduce impacts to water quality from agricultural lands. Table 5 provides a summary of conservation accomplishments completed for fiscal years 2005 through 2010. Figure 7 displays the general location of BMPs applied throughout the subbasin. These BMPs were installed with technical assistance from local soil conservation districts, the NRCS, the IASCD, and the SWC to reduce impacts to water quality from agricultural lands in the subbasin. They have been funded through federal programs, such as the Conservation Reserve Program (CRP), Conservation Security Program (CSP), Environmental Quality Incentives Program (EQIP), and EQIP-Ground and Surface Water Conservation (GSWC).

BMPs applied were site specific and based on resource concerns for a particular land use. In general, BMPs applied to grazed rangeland included fence, pest management, pipeline, prescribed grazing, use exclusion, watering facilities, and water well. Management practices applied to hay and pasture lands were irrigation water management, nutrient management, and pest management. Fence, irrigation water conveyance, pasture and hayland planting, and sprinkler irrigation were also widely used practices for pasture and haylands. Lands designated for wildlife use were treated with tree/shrub establishment, use exclusion, and wetland enhancement.

Landowners working with the NRCS through the Conservation Security Program (CSP) have implemented the following BMPs in the Antelope Creek Project area in 2005.

- 6,800 acres of rotational grazing with riparian grazing management.
- 3,100 acres of irrigated cropland that meet quality criteria for soil, water plant and animal with riparian areas meeting quality criteria.

These lands also are under Integrated Pest Management (IPM). An additional 80 acres of wildlife habitat, near riparian areas was treated with delayed haying (delayed first cut until after July 15).

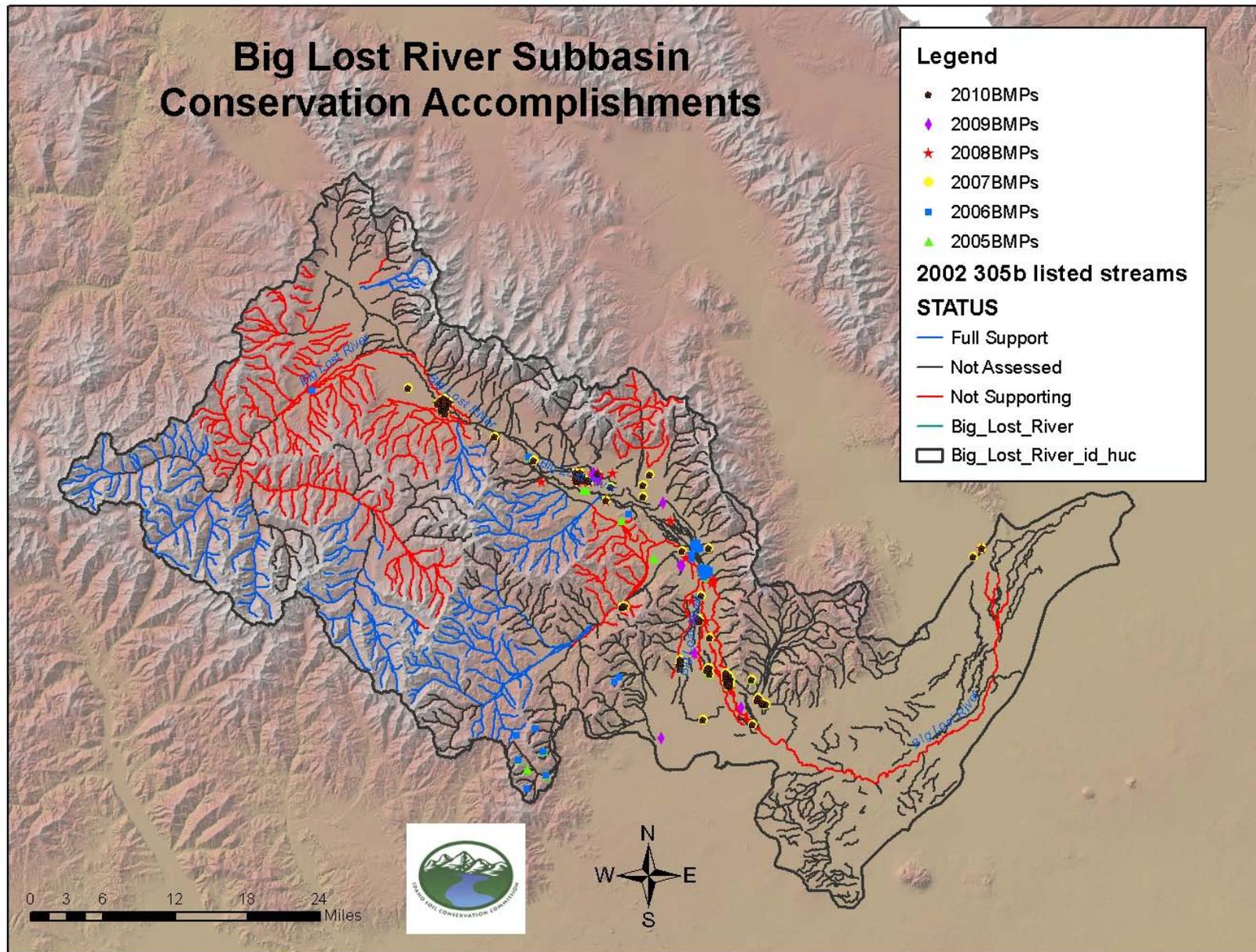
All CSP contracts in the project area are at the Tier III level. Tier III lands meet NRCS quality criteria for soil, water, plants and animals.

In addition to the CSP, private acreage has been placed in the Conservation Reserve Program. Since 2005, there have been 40,702 acres (3.2% of the subbasin) enrolled in the CRP program. Approximately 178 conservation plans have been arranged with landowners in the subbasin with technical assistance from the soil conservation districts, NRCS, and the SWC.

Conservation assistance is provided by the Butte Soil and Water Conservation District (SWCD). The High Country Resource Conservation and Development office provides additional assistance. The Butte SWCD was organized in 1953; in 1967 territory from the Custer SWCD was added to the Butte SWCD. The area that was added to the Butte SWCD is that portion of Custer County that is south of Willow Creek summit. This was done to align SWCD boundaries with the service area of the local NRCS and FSA offices. Areas excluded from the Butte SWCD include all incorporated villages, and land owned by the Department of Energy (DOE).

**Table 5. Completed Federal BMPs in the Big Lost River Subbasin.**

Practice name	Practice number	Unit	2005	2006	2007	2008	2009	2010	TOTAL
Access Road	560	feet				3,600			3,600.0
Conservation Completion Incentive	CCIA	number			3				3.0
Fence	382	feet	1,750	15,008	33,360	32,047	1,290	2,640	86,095.0
Fish Passage	396	miles						2	2.0
Forest Site Preparation	490	acre	6.4						6.4
Integrated Pest Management	595	acre						0.2	0.2
Irrigation Land Leveling	464	acre	6						6.0
Irrigation System Micro-irrigation	441	acre	6.4	28.9	1	14			50.3
Irrigation System Sprinkler	442	acre	2	399.1	328.4	182		34.9	946.4
Irrigation Water Conveyance, Pipeline, High Pressure, Underground, Plastic	430DD	feet	1,000	2,300	21,675	14,309	8,260	21,157	68,701.0
Irrigation Water Conveyance, Pipeline, Low Pressure, Underground, Plastic	430EE	feet				650			650.0
Irrigation Water Management	449	acre	497	317	644.4	369.8	29.6	56.4	1,914.2
Mulching	484	acre	6.4		9	12			27.4
Nutrient Management	590	acre			42.7	137		56.4	236.1
Pasture and Hayland Planting	512	acre		58.6	178.7		239		476.3
Pest Management	595	acre	259.7	653.8	842.8	224.1	1		1,981.4
Pipeline	516	feet			2,950			50	3,000.0
Prescribed Grazing	528	acre	57	9,939	1,202.3	1,082.7	152.3	156.8	12,590.1
Pumping Plant	533	number				6	2	1	9.0
Range Planting	550	acre			28.8		216		244.8
Riparian Forest Buffer	391	acre	29.9	71.3	237.8	12			351.0
Structure for Water Control	587	number				2		2	4.0
Tree/Shrub Establishment	612	acre	6.4	61	21				88.4
Tree/Shrub Site Preparation	490	acre		15	20				35.0
Upland Wildlife Habitat Management	645	acre	5,157	14.8	135.7		137		5,444.5
Use Exclusion	472	acre	36.3	47	237.8				321.1
Water Well	642	number			1	1			2.0
Watering Facility	614	number			1	1		1	3.0
Wetland Enhancement	659	acre	35.4		224.3				259.7
Windbreak/Shelterbelt Establishment	380	feet				1,948			1,948.0



**Figure 7. BMPS applied in the Big Lost River Subbasin**

## Water Quality Problems

### BENEFICIAL USE STATUS

Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). Beneficial uses can include existing uses, designated uses, and presumed existing uses. Designated uses are uses officially recognized by the state. In cases where designated uses have not been established by the state for a given water body, DEQ has established the presumed existing uses of supporting cold water aquatic life and either primary or secondary contact recreation. Additionally, all waters of the state are designated for agricultural and industrial water supplies, wildlife, and aesthetics. Beneficial uses for water bodies on the 303(d) list in the Big Lost River subbasin are listed below in Tables 6 and 7.

**Table 6. Designated Beneficial Uses for 1998 303(d) listed Stream Segments in the Big Lost River Subbasin.**

Stream	Boundaries	Designated Uses
Big Lost River	Spring Creek to Big Lost River Sinks	CWAL, SS, PCR, DWS, SRW
Big Lost River	Jones Creek to Mackay Reservoir	CWAL, SS, PCR, DWS, SRW
Big Lost River	Thousand Springs Creek to Jones Creek	CWAL, SS, PCR, DWS, SRW

**Table 7. Existing/Presumed Beneficial Uses for 1998 303(d) listed Stream Segments in the Big Lost River Subbasin.**

Stream	Boundaries	Existing/Presumed Uses
Spring Creek	Lower Pass Creek to Big Lost River	CWAL and PCR or SCR
Antelope Creek	Spring Creek to Mouth	CWAL and PCR or SCR
Twin Bridges Creek	Source to Mouth	CWAL and PCR or SCR
East Fork Big Lost River	Source to Cabin Creek	CWAL and PCR or SCR
East Fork Big Lost River	Cabin Creek to Mouth	CWAL and PCR or SCR
Boone Creek	Source to Mouth	CWAL and PCR or SCR
Warm Springs Creek	Source to Mouth	CWAL and PCR or SCR

CWAL – Cold Water Aquatic Life, SS – Salmonid Spawning, PCR – Primary Contact Recreation, SCR – Secondary Contact Recreation, AWS – Agricultural Water Supply, DWS – Domestic Water Supply

A majority of the streams are not supporting cold water aquatic life. A few streams, such as the Big Lost River (Summit Creek to Thousand Springs), East Fork Big Lost River, Star Hope Creek, Corral Creek, Cherry Creek, and Bear Creek are also not supporting salmonid spawning. Sage Creek does not support secondary contact recreation. The East Fork Big Lost River (Cabin Creek to mouth) does not support primary contact recreation (<http://global.deq.idaho.gov/Website/wq2004/viewer.htm>).

## **POLLUTANTS**

This section focuses on particular pollutants that result in streams failing to meet beneficial use(s). Seven streams in the Big Lost River subbasin were listed on the 1998 303(d) list for nutrients, sediment, and/or temperature. Dissolved oxygen, flow alteration, and habitat alteration were not included under the pollutant category, but they were water quality concerns. Section 5 of the 2002 Integrated Report showed that four additional streams were listed as impaired and one stream was removed from the list. In the 2008 Integrated Report, Thousand Springs Creek, Big Lost River, Bridge Creek, N.F. Big Lost River, Summit Creek, Wildhorse Creek, E.F. Big Lost River, Star Hope Creek, Corral Creek, Warm Springs Creek, Antelope Creek, Cherry Creek, and Bear Creek had approved TMDLs for sedimentation/siltation and/or water temperature. Load allocations and reductions outlined in the Big Lost River SBA-TMDL are shown in Table 8. Streams listed for sedimentation/siltation and/or water temperature and/or unknown and/or combined biota/habitat bioassessments, and/or fecal coliform in Section 5 of the 2008 Integrated Report were the Big Lost River, Pass Creek, Thousand Springs Creek, Willow Creek, Sage Creek, Bridge Creek, Wildhorse River, Warm Springs Creek, and Antelope Creek.

The Big Lost River Subbasin SBA-TMDL states that:

The primary source of nonpoint source pollution to streams in the Big Lost River subbasin is sediment from streambank erosion and solar radiation from riparian habitat destruction. As near-stream vegetation is degraded, overall stream cooling is reduced. There is a direct relationship between streambank erosion and loss of riparian vegetation. As stabilizing vegetation is removed, streambanks become unstable and bank erosion follows. As streambank erosion progresses, depositional features form in the channel that redirect current and further reduce bank stability. This process continues until the stream forms a new flood plain and deposition forms new streambanks that become colonized with stabilizing vegetation. This process can take many years to play out once channel alteration begins. As near stream vegetation is degraded overall stream cooling is reduced. In addition, channel morphology is highly influenced by land cover by affecting the floodplain and instream roughness, which, in turn, influences bank stability, stream substrate composition, and sedimentation.

Land use, as previously discussed, is primarily agricultural adjacent to streams impaired by temperature and sediment. The agricultural use that has the greatest effect on streambank stability is grazing. Grazing occurs throughout the subbasin in riparian areas (IDEQ 2005).

Other sources of nonpoint source sediment pollution can include roads and erosion from cultivated fields (IDEQ 2005).

### Pollutant Transport

The bulk of the sediment comes from streambank erosion during several weeks of high spring flow. However, in some instances, the transport and delivery of pollutants within and between perennial streams is limited because of the lack of connectivity between streams. Some streams infiltrate, or are diverted before they have confluence with other surface waters, even during snowmelt. Groundwater transport of pollutants has not been shown to be a significant conduit of pollutants (IDEQ 2005).

As riparian vegetation is removed from the stream, the stream cooling capabilities of that vegetation is reduced and solar radiation increases. Stream temperatures are cumulative where the conditions at a site contribute to heating of already heated water (IDEQ 2005).

**Table 8. Load Allocations and Reductions for Streams with approved TMDLs (IDEQ 2004)**

<b>Stream</b>	<b>Estimated current load (tons/year)</b>	<b>Load allocation (tons/year)</b>	<b>Load reductions (tons/year)</b>
East Fork Big Lost River	1218	172	1046
Corral Creek	250	39	211
Starhope Creek	249	69	180
Wildhorse Creek	103	28.5	74.5
North Fork Big Lost River	285	54.3	230.7
Summit Creek	45	14.	31
Twin Bridges Creek	536	33.1	502.9
Thousand Springs Creek	13	3.5	9.5
Warm Springs Creek	12.8	26.6	-13.8
Antelope Creek	888	118	770
Bear Creek	52	17	35
Cherry Creek	156	53.2	102.8

## WATER QUALITY MONITORING

Water quality monitoring data referenced in Big Lost River SBA-TMDL was primarily collected through the IDEQ Beneficial Use Reconnaissance Program (BURP) from 1993 to 2002. BURP sites were scattered throughout the subbasin, but a majority of the sites were located in the East Fork Big Lost River watershed (IDEQ 2004). Fish, temperature, flow, and sediment data from the IDFG, USFS, INEEL, ISU, and BLM were also included into the SBA-TMDL.

In 2006, the Butte Soil and Water Conservation District (Butte SCD) requested that water quality monitoring be performed by the Idaho Association of Soil Conservation District (IASCD). Two watersheds to the Big Lost River were identified as areas of concern. These areas were: the Big Lost River above Mackey Reservoir and the Antelope Creek. Three sites were chosen from each area. Monitoring of these sites started in April 2006 and continued through March 2007 (Monek 2007).

Water quality monitoring began in April 2006 and continued through March 2007. Six sites were identified and monitored bi-monthly April through October and then monthly from November through March (when accessible). The sites chosen were as follows: two sites on the Big Lost River, one site on Twin Bridges Creek, two sites on Antelope Creek and one site on Cherry Creek (Monek 2007). Samples were analyzed for total suspended sediment, total phosphorus, ortho phosphate, and *E.coli*.

Overall water quality in the Big Lost subbasin was consistently good. Average SSC concentrations ranged from 5.6 mg/L – 9.0 mg/L. The highest instantaneous measurement (39.8) was only *half* of the DEQ target of 80 mg/L found elsewhere in the state. Although sediment does not seem to be a problem in itself, per se, analysis has shown a strong relationship between sediment and phosphorous concentrations within the basin (Monek 2007).

Total phosphorous seemed to be a slight issue. All monitoring locations except the upper monitoring location on Antelope Creek exceeded the instantaneous target set by the Big Lost River TMDL at least once; however, average TP only ranged between 0.02 – 0.05 mg/L. The peaks in instantaneous TP seem to reflect high sediment levels at the time of sampling. The stream with the most TP exceedances (64%) was Twin Bridges Creek largely because of the more stringent level of 0.05 mg/L (Monek 2007).

Temperature, dissolve oxygen, and bacteria seem to be of minor concern. Reducing cattle access on the smaller streams such as Cherry Creek could improve riparian communities and have positive impact on stream temperature and bacteria levels (Monek 2007).

Surface water quality monitoring has occurred in the subbasin since publication of the Big Lost River Subbasin SBA-TMDL. The IDEQ Beneficial Use Reconnaissance Program (BURP) has collected water quality and habitat data in an effort to monitor and assess stream condition. This data is not included in this TMDL implementation plan for agriculture.

According to 2008 data, nitrate priority areas and groundwater concern areas do not exist within the Big Lost River Subbasin ([http://www.deq.idaho.gov/water/prog\\_issues/ground\\_water/nitrate.cfm](http://www.deq.idaho.gov/water/prog_issues/ground_water/nitrate.cfm) [http://www.idwr.idaho.gov/gisdata/gis\\_data.htm](http://www.idwr.idaho.gov/gisdata/gis_data.htm)).

## **AGRICULTURAL WATER QUALITY INVENTORY AND EVALUATION**

The following information is based on the Soil Survey of Butte and Bingham County Areas, Idaho (Winward and Jeppesen 2009) and conservation system guides for Butte and Clark counties (<https://csg.sc.egov.usda.gov/CSGReporteFOTG.aspx>).

### **Stream Corridor and Riparian**

#### **Riparian Inventory and Evaluation**

DEQ (2005) stated that grazing is the principal land use that causes the greatest effect to streambanks in the Big Lost River Subbasin. During the SVAP inventory overgrazing of streambanks was only observed on one segment.

#### **Resource Setting**

Riparian areas are found throughout the subbasin, so they exist in every CRA. A detailed description of Common Resource Areas was provided under the Project Setting portion of this plan. Each watershed contains at least two CRAs within its boundaries. The watersheds with listed reaches and their respective CRAs are as follows. The East Fork Big Lost River watershed has listed reaches in CRA 43B.3 *Central Rocky Mountains-Dry, Partly Wooded Mountains* and 12.2 *Lost River Valley/Mountains-Gneissic-Volcanic Hills*. The Headwaters Big Lost River watershed has listed reaches in CRA 12.2 *Lost River Valley/Mountains-Gneissic-Volcanic Hills* and 12.3 *Lost River Valley/Mountains-Barren Mountains*. The Upper Big Lost River has listed reaches in CRA 12.1 *Lost River Valley/Mountains-Dry Intermontane Sagebrush Valleys*. Antelope Creek watershed has listed reaches in 12.1 *Lost River Valley/Mountains-Dry Intermontane Sagebrush Valleys* and 12.2 *Lost River Valley/Mountains-Gneissic-Volcanic Hills*. The Lower Big Lost River watershed has listed reaches in 12.1 *Lost River Valley/Mountains-Dry Intermontane Sagebrush Valleys*.

#### **Riparian Assessment and Current Condition**

Riparian conditions on the Big Lost River are in fair to good condition with slight to severe erosion. Severe erosion was observed on one reach of the Big Lost River. This reach length accounted for only ten percent of the total length assessed. In 2006, SWC used the Stream Visual Assessment Protocol (SVAP) and the Streambank Erosion Condition Inventory (SECI) to assess conditions on ten reaches on 17.1 miles of the Big Lost River (Tables 9 and 10). Seven of the assessed reaches had slight erosion, two had moderate erosion, and one had severe erosion. Other reaches were not assessed because permission was not granted.

Riparian conditions on Antelope Creek are in good condition with slight erosion. In 2006, SWC and used the Stream Visual Assessment Protocol (SVAP) and the Streambank Erosion Condition Inventory (SECI) to assess conditions on five reaches on 7.4 miles of Antelope Creek (Table x and Figure x). All of the assessed reaches were in good and had slight erosion. Other reaches were not assessed because permission was not granted.

While conducting SVAP on the Big Lost River several high, in excess of ten feet, eroding banks were observed. This is a natural phenomenon, as the eroding banks define the boundary of the valley floor. The top of these banks are abandoned terraces left behind through the process of natural channel evolution. In certain locations as many as four abandoned terraces can be observed from one vantage point.

**Table 9. SECI Results for Streams in the Big Lost River Subbasin**

Big Lost River Subbasin-Stream Erosion Condition Inventory (SECI)																
Reach	Length (ft)	Bank Height (ft)	Bulk Density (lbs/ft3)	Bank Erosion	Bank Stability	Bank Cover	Lateral Stability	Channel Bottom	Deposition	Erosion Severity	LRR Index Value	Slight Erosion Length	Moderate Erosion Length	Severe Erosion Length	Lateral Recession Rate (ft/yr)	Erosion Rate (tons/yr)
BL 3	6,298	5	87.0	1	0	0	0.5	0	1	<b>Slight</b>	2.5	6298	0	0	<b>0.03</b>	<b>39</b>
BL 5	16,233	4	87.0	1	0	0	0.5	0	1	<b>Slight</b>	2.5	16233	0	0	<b>0.03</b>	<b>80</b>
BL 7	7,446	4	87.0	1	1	0.5	0.5	0.5	1	<b>Slight</b>	4.5	7446	0	0	<b>0.08</b>	<b>107</b>
BL 9	3,397	4	87.0	1	1	1	1.5	0	1	<b>Moderate</b>	5.5	0	3397	0	<b>0.12</b>	<b>70</b>
BL 11	18,103		87.0							<b>DRY</b>						<b>0</b>
BL 12	11,899	4	87.0	1	1	0.5	0	0	0	<b>Slight</b>	2.5	11899	0	0	<b>0.03</b>	<b>59</b>
BL 13	2,826	4	87.0	1	0.5	0	0.5	0	0.5	<b>Slight</b>	2.5	2826	0	0	<b>0.03</b>	<b>14</b>
BL 14	8,437	4.5	87.0	1	1	0.5	2	0	1	<b>Moderate</b>	5.5	0	8437	0	<b>0.12</b>	<b>197</b>
BL 16	6,185	4	87.0	1	0.5	0.5	0.5	1	0.5	<b>Slight</b>	4.0	6185	0	0	<b>0.07</b>	<b>72</b>
BL 100	9,481	4	87.0	3	1.5	3	2	1	0.5	<b>Severe</b>	11.0	0	0	9481	<b>0.42</b>	<b>692</b>
AC 10	9,308	1.7	87.0	0	0	0	0	0	0.5	<b>Slight</b>	0.5	9308	0	0	<b>0.00</b>	<b>1</b>
AC 12	9,217	2	87.0	0.5	0	0	0	0	0.5	<b>Slight</b>	1.0	9217	0	0	<b>0.01</b>	<b>4</b>
AC 15	9,357	3	87.0	0.5	0.5	0.5	0	0	0.5	<b>Slight</b>	2.0	9357	0	0	<b>0.02</b>	<b>23</b>
SFAC3	1,225									<b>DRY</b>						
SFAC4	10,034									<b>DRY</b>						
	<b>24.5</b>	<b>Miles</b>	Percent of stream with a Slight Erosion Problem						<b>61%</b>			<b>78,769</b>	<b>11,834</b>	<b>9,481</b>		<b>1,332</b>
			Percent of stream with a Moderate Erosion Problem						<b>9%</b>							
			Percent of stream with a Severe Erosion Problem						<b>7%</b>							
			Total Percent of Stream assessed						<b>77%</b>							

**Table 10. SVAP Results for Streams in the Big Lost River Subbasin**

<b>Big Lost River Subbasin-Stream Visual Assessment Protocol (SVAP)</b>																
Reach	Channel Length (ft)	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Fish Barriers	Instream Fish Cover	Pools	Invertebrate Habitat	Manure Presence	Canopy Cover	SVAP Rating	Total Score	Overall Score
BL 3	6,298	8	8	9	7	10	9	10	8	8	9			<b>Good</b>	86.0	8.6
BL 5	16,233	8	8	9	7	10	9	9	9	8	9			<b>Good</b>	86.0	8.6
BL 7	7,446	7	5	9	6	10	9	1	8	8	9	5		<b>Fair</b>	77.0	7.0
BL 9	3,397	7	3	5	7	10	9	3	6	7	7	5		<b>Fair</b>	69.0	6.3
BL 11	18,103	<b>Dry</b>												<b>Dry</b>		
BL 12	11,899	7	7	8	6	10	8	8	8	7	7	5		<b>Fair</b>	81.0	7.4
BL 13	2,826	7	8	9	8	10	9	10	8	8	8	5		<b>Good</b>	90.0	8.2
BL 14	8,437	7	7	8	5	10	9	8	8	8	7	5		<b>Good</b>	82.0	7.5
BL 16	6,185	7	7	9	7	10	9	1	8	8	9	5		<b>Fair</b>	80.0	7.3
BL 100	9,481	3	5	1	4	10	9	5	3	7	3	5		<b>Poor</b>	55.0	5.0
AC 10	9,308	9	8	9	9	10	9	10	9	9	9	5	2	<b>Good</b>	98.0	8.2
AC 12	9,217	9	8	8	8	10	9	9	6	8	8	5		<b>Good</b>	88.0	8.0
AC 15	9,357	8	7	8	8	10	9	10	8	9	8	5		<b>Good</b>	90.0	8.2
SFAC3	1,225	<b>Dry</b>												<b>Dry</b>		
SFAC4	10,034	<b>Dry</b>												<b>Dry</b>		
	<b>24.5</b>	<b>Total Miles</b>		Percent of stream in Poor Condition						<b>7%</b>	<b>Average for all reaches</b>			<b>Good</b>	<b>81.8</b>	<b>7.5</b>
				Percent of stream in Fair Condition						<b>22%</b>						
				Percent of stream in Good Condition						<b>48%</b>						
				Percent of stream in Excellent Condition						<b>0%</b>						
				Total Percent of Stream assessed						<b>77%</b>						

The Big Lost River experiences dynamic changes in flow above the Mackay Reservoir depending on the time of the year. Residents have learned to live with the river and thus there is much less encroachment of buildings above the reservoir as compared to below the reservoir.

### **Suggested BMPs**

Streambank stabilization and riparian vegetation could be improved on portions of the Big Lost River and Antelope Creek. Fencing, prescribed grazing, and use exclusion are practices that may be used to alleviate grazing pressure in riparian areas and to allow for revegetation of areas lacking canopy cover.

NRCS practices which may be used for treatment of riparian areas are: Channel Bank Vegetation (372), Fence (382), Heavy Use Area Protection (561), Prescribed Grazing (528), Riparian Forest Buffer (391), Streambank and Shoreline Protection (580), Channel Stabilization (584), Tree/Shrub Establishment (612), and Use Exclusion (472).

### **Irrigated Cropland (Sprinkler Irrigated)**

#### **Cropland Inventory and Evaluation**

Conventionally tilled, sprinkler irrigated (hand or wheel line) cropland is planted with hay, grains, sugar beets, or potatoes. Rotations may include grain, grain/potato, spring wheat/winter wheat/potatoes/beets, or alfalfa in combination with other crops. Fertilizers and pesticides are applied.

#### **Resource Setting**

A large majority of the cropland is located along the Big Lost River, in the valley. Soils are loamy sands or other fine textured soils. The soils are used for cropland, pastureland, and hayland. Slope may range from 0 to 12 percent. Elevation ranges from less than 1,900 feet to 2,000 feet. Precipitation ranges from less than 8 inches to 14 inches.

#### **Suggested BMPs**

Resource concerns described in conservation system guides for Butte and Custer counties are soil condition, inefficient water use on irrigated land, sheet and rill erosion, ephemeral gully erosion, irrigation-induced erosion (sprinkler), surface water quality (pesticides, nutrients and organics, suspended sediment), ground water quality (pesticides, nutrients and organics), and wind erosion.

NRCS practices which may be used to treat the above concern on irrigated cropland are: (327) Conservation Cover, (328) Conservation Crop Rotation, (344) Residue Management, Seasonal, (345) Residue Management, Mulch Till, (442) Irrigation System, Sprinkler, (449) Irrigation Water Management, (590) Nutrient Management, (595) Pest Management, (609) Surface Roughening, (645) Upland Wildlife Habitat Management

## Rangeland

### **Rangeland Inventory and Evaluation**

The subbasin contains 210,000 of rangeland. Upland rangeland and adjacent riparian corridors are grazed predominantly by cattle and sheep. A significant portion of the range is BLM on the lower areas and US Forest Service in the higher areas.

Planned grazing systems commonly include riding, where riders maintain a herd and the stock are moved regularly. The goal of this grazing system is to graze a high proportion of the forage and then allow the area to rest until the next year. This provides soils and vegetation with more than adequate rest and greatly reduces overgrazing and overresting which damage diversity and productivity. Typical range management plans contain prescribed grazing, fencing, stock water developments with pipelines and troughs, integrated pest management the range and occasionally stock wells.

Wildlife habitat management considerations which are priority are management of riparian areas for sage grouse and whitefish and improving or enhancing habitat for mule deer, which are on the decline. Sage grouse are appearing to be greatly increasing in number the past 2 years. Elk calving areas (avoidance during calving time) are also a common consideration.

### **Resource Setting**

Rangeland occurs throughout the subbasin. Elevations typically range from 6,000 to 8,500 feet. Annual precipitation ranges from 9 to 24 inches. Most of the soils have 10 to 60 % slopes. Soil rating in this area may be from slight to very severe erosion potential.

### **Rangeland Resources Assessment/Condition**

Resource inventories conducted on areas of the watershed for USDA programs and other uses, show much of the range in lower elevations to be in fair to good condition. Range in higher elevations is somewhat better on average. Plants and soils inventories show a real need to improve and protect valuable riparian areas, where riparian area soil and channel conditions are below or well below NRCS quality criteria. Rangeland biodiversity is also wanting on many deeded rangelands, where percent bare soils are high, and water, mineral and energy cycles are poor or fair.

It is common on private and public range that areas are overgrazed and areas are undergrazed. Both markedly reduce biodiversity. With good monitoring, herding stock can be effective at reducing both (Cote, 2003).

### **Suggested BMPs**

Livestock water development or increased water distribution is a major need. It has been recommended for stock to be herded and settled onto more pastures (larger areas are subdivided, and stock don't return to previously grazed areas-avoiding overgrazing especially in the growing season). Access to certain watering points may be reduced or eliminated for at least part of the grazing season when pastures are subdivided. Planned grazing and facilitating practices including; fencing, stream crossings, range planting, brush and pest management will help to improve stock distribution and to provide adequate water and forage. Sage grouse are a wildlife species of concern which will have to be considered when applying any rangeland or riparian BMPs in the subbasin.

NRCS practices which are needed on the rangeland are: Prescribed Grazing (528A); Firebreak (394); Watering Facility (614); Water Well (642); Pumping Plant (533); Spring Development (574);

Pipeline (516); Range Planting (550); Prescribed Burning (338); Brush Management (314); Fence (382); and Pest Management (595).

### Pasture/Hayland

Hay production for winter feed and for fall and winter grazing is the primary use of irrigated land in the Antelope Valley. Perennial grasses and legumes are raised in an average rotation of about 8 years hay with 2 years in forage barley or oats and peas. This is a strongly soil improving crop rotation according to analysis and results in the NRCS agronomy program RUSLEII in the Soil Condition Index section. Erosion analysis in this program shows negligible erosion rates (below T). NRCS standards for nutrient management are being met on hayland, pastureland, and the grain portion of the rotation. Commercial fertilizers are applied but application of fertilizer is below Southern Idaho management guidelines, due to cost. Integrated Pest Management, at the lower intensity level is also being applied and the valley has had intensive assistance from the Butte County Weed Dept. and Extension Service due to prior infestations of leafy spurge. Irrigation water management also meets standards on most of the valley's haylands and pastures, as indicated by CSP analysis of conveyance system, system loss of water and water application efficiency, resulting in a percent efficiency rating, utilizing an NRCS engineering program. Some of these hayland acres are sold out of the valley for use as dairy hay but this is a variable and small percentage. About 800 acres of irrigated pasture are primarily used for cattle. Most of the pasture is irrigated but a few hundred acres rely upon subirrigation from a high water table.

### Animal Feeding Operations

In 2000, the Idaho Legislature passed Idaho law, *I.C. §22-4906, Title 22, Chapter 49, Beef Cattle Environmental Control Act*. Beef cattle AFOs are required to submit a nutrient management plan to the Idaho State Department of Agriculture (ISDA) for approval no later than January 1, 2005.

In 2006, ISDA and IASCD conducted an inventory of AFOs in the subbasin. Eleven animal feed operations and two dairies were found in the subbasin. Only one facility needs to be addressed while the other ten are in compliance with ISDA regulations and have approved nutrient management plans.

## THREATENED AND ENDANGERED SPECIES

Table 8 lists the threatened species that may be found in Butte and Custer counties as lynx, *Lynx canadensis*, and the bull trout, *Salvelinus confluentus* (<http://fishandgame.idaho.gov/cdc/t&e.cfm>). However bull trout are not known to be located in the Big Lost River subbasin according to fish distribution data (<http://map.streamnet.org/website/bluesnetmapper/viewer.htm>).

**Table 8. Threatened and Endangered Species in the Big Lost River Subbasin.**

Common name	Scientific name	Status
Lynx	<i>Lynx canadensis</i>	Threatened
Bull trout	<i>Salvelinus confluentus</i>	Threatened

These threatened and endangered species will be addressed in site-specific conservation planning, during implementation of BMPs with individual landowners and operators, and in ways that will benefit any listed species in a project area. Future projects will potentially be funded using Partners for Wildlife, Farm Bill, and state cost share programs. Technical assistance will be provided by the NRCS, SWC, IASCD, and ISDA.

Agricultural conservation planning will be coordinated with other species recovery and protection efforts in the subbasin to improve listed species' habitats and address any potential impacts from BMP implementation. Improvements in water quality, achieved from BMPs installed on agricultural lands, are not expected to adversely affect these listed species and should improve or enhance their habitat. Any BMP implementation that will affect T&E species or habitat will follow Endangered Species Act (ESA) consultation requirements.

## Treatment

For this plan we assessed impacts to water quality on 303(d) listed streams from agricultural lands and recommended priorities for installing BMPs to meet water quality objectives stated in the SBA-TMDL. Water quality monitoring data, field inventory and evaluations, SBA-TMDL information, and input from landowners, local soil conservation district staff, and NRCS staff were used to identify critical agricultural areas affecting water quality and set priorities for treatment.

## CRITICAL AREAS

Areas of agricultural lands that contribute excessive pollutants to waterbodies are defined as critical areas for BMP implementation. Critical areas are prioritized for treatment based on their proximity to a waterbody of concern and the potential for pollutant transport and delivery to the receiving waterbody. The subbasin consists of approximately 186,700 acres of private land with the predominant private land uses being cropland (36,428 acres), grassland (21,443 acres) pasture/hayland (31,516 acres), and rangeland (75,660 acres). Critical areas in this plan are irrigated lands (cropland, hayland, and pastureland), rangeland, and riparian areas adjacent to the Big Lost River and its tributaries, which may serve as a direct pathway for nutrient, sediment, and temperature loading into these creeks. Because temperature TMDLs have been completed for all of the listed

streams (except Twin Bridges and Thousand Springs Creek); BMPs applied to riparian areas will focus on decreasing temperature loading and increasing canopy cover.

Critical areas by land use:

- Irrigated cropland with irrigation induced erosion and/or poor nutrient management
- Hayland/pastureland with inefficient water use and/or poor nutrient management
- Overgrazed rangeland, rangeland with noxious weed problems
- Unstable and erosive stream banks, riparian areas with a lack of canopy cover

## **TREATMENT UNITS (TU)**

The following Treatment Units (TUs) describe areas in the Big Lost River subbasin with similar land uses, soils, productivity, resource concerns, and treatment needs. These TUs not only provide a method for delineating and describing land use, but are also used to evaluate land use impacts to water quality and in the formulation of alternatives for solving water quality problems. BMPs to improve water quality are suggested for each treatment unit. The Big Lost River subbasin has been broken into three treatment units: 1) Irrigated Lands, 2) Rangeland, and 3) Unstable and Erosive Streambanks/Riparian Areas (Table 9).

The irrigated lands and rangeland critical acres were calculated in ArcGIS using NAIP imagery to verify a USGS National Land Cover Dataset, selecting private lands from a BLM land status layer, and then by removing lands that were previously treated with BMPs. The riparian critical acres was delineated as two times an average channel width (to approximate a buffer of one channel width on each side of the stream) based on information from SVAP protocol which considers this the best ranking for a natural riparian corridor width. Critical acres were calculated in ArcGIS by selecting water quality impaired streams from the DEQ stream layer and then adding a one hundred foot buffer width around the listed streams.

ArcView GIS 9.3 software, NAIP imagery, topographic maps, land use/land cover, land ownership, field investigations, previously treated areas, soils survey reports, and cropland units were used to delineate treatment units and critical acres. The USDA Farm Service Agency's crop land unit (CLU) layer was used as a guide where appropriate. Soils descriptions, slope, frost-free days, precipitation, and temperature data were gathered from soil surveys titled Soil Survey of Custer-Lemhi Area, Idaho and Soil Survey of Butte County, Idaho, Parts of Butte and Bingham counties.

**Table 9. Treatment Units in the Big Lost River subbasin.**

Treatment Unit #1 - Irrigated Lands-0 to 12% slopes, 1,900 to 2,000 feet elevation, average precipitation from 8 to 14 inches, 34 to 45 °F, 20 to 110 frost-free days			
Total Acres	Estimated Critical Acres	Soils	Resource Problems
243,447	45,876	Bartonflat very gravelly sandy loam, Big Lost Copperbasin Complex, Wiskisprings-Big Lost complex, Wiskisprings-Big Lost-Copperbasin complex, Bockston loam, Breitenbach gravelly loam, Mooretown-Blackfoot-Borah complex, Mooretown-Borco complex, Mooretown-Borah complex Arco silt loam, Snowslide gravelly loam, dry, Soen gravelly loam	soil condition, inefficient water use on irrigated land, sheet and rill erosion, ephemeral gully erosion, irrigation-induced erosion (sprinkler), surface water quality (pesticides, nutrients and organics, suspended sediment), ground water quality (pesticides, nutrients and organics), and wind erosion
Treatment Unit #2 – Rangeland- 5 to 60% slopes, 2,000 to 2,800 feet elevation, average precipitation from 8 to 26 inches, 34 to 45 °F, 30 to 90 frost-free days			
Total Acres	Estimated Critical Acres	Soils	Resource Problems
805,579	75,108	Zer-Snowslide-Soen, Simeroi-Sparmo-Fallert, Nargon-Coffee-Atom, McCarey-Beartrap-Techicknot, Portino-Thornock, Malm-Matheson-Stan	plant productivity, range condition, soil loss, overgrazing
Treatment Unit #3 - Riparian Areas- 0 to 4% slopes, 1,900 to 2,000 feet, average precipitation from 8 to 14 inches, 34 to 45 °F, 25 to 90 frost-free days			
Total Acres	Estimated Critical Acres	Soils	Resource Problems
11,109	2,561	Mooretown-Borah complex, Mooretown-Borco complex, Mooretown-Dickeypeak-Thosand, Mooretown-Tohobit-Bursteadt, Simeroi-Whitecloud-Ringle, Biglost-Copperbasin-Thosand, Arbus-Fandow-Mountainboy, Chamberlain-Wiggleton-Busterback	streambank instability and erosion, lack of riparian cover, surface water quality (pesticides, nutrients and organics, suspended sediment), flow alteration

## Implementation Priority

### RECOMMENDED PRIORITIES FOR BMP IMPLEMENTATION

Table 10 lists the watersheds prioritized for treatment and the rationale for their prioritization. Watersheds in the Big Lost River subbasin were ranked based on TMDLs reductions, field evaluation and inventory, streambank stability, and water quality data for impaired streams contained within those watersheds. Streams with a high priority ranking had a greater sediment load reduction needed to meet TMDL, poorer water quality, a poor to fair SVAP rating, and a moderate SECI rating (or greater potential for sediment deposition), etc.

Best management practices (BMPs) are defined as a practice or combination of component practices determined to be the most effective, workable means of preventing or reducing pollutant(s) entry into 303 (d) listed streams from non-point sources within the targeted watersheds.

Nonpoint source loads are largely driven by climatic conditions and the effects of some best management practices (bank stabilization, etc.) may take years to be effective. The agricultural implementation plan should be viewed as a dynamic document, subject to change as current conditions dictate. The primary focus of this implementation plan is to address nonpoint pollution sources.

**Table 10. Priority Ranking by Watershed for BMP Implementation**

Priority Ranking	Watershed	TMDL Reduction Required	Rationale
1	Antelope Creek	83% sediment 40% temperature	Sediment reduction needed; flow altered; impacts to riparian area from livestock grazing, and irrigated cropland adjacent to stream; predominantly private land.
2	Upper Big Lost River	73% sediment 38% temperature	Sediment reduction needed on Thousand Springs; impacts to riparian area from livestock grazing, and irrigated cropland adjacent to stream. Temperature reduction needed on Warm Springs; predominantly private land adjacent to stream.
3	Headwaters Big Lost River	94% sediment	Topography of canyon limits riparian corridor width; total phosphorus exceeded; TMDL developed for sediment; predominantly federal with some private land adjacent to stream.
4	East Fork Big Lost River	85% sediment 40% temperature	Predominant land use consists of rangeland (cattle impacts), predominantly federal with some private land.
5	Star Hope Creek	72% sediment 34% temperature	Predominant land use consists of rangeland (cattle impacts), predominantly federal with some private land.
6	North Fork Big Lost River	92% sediment 30% temperature	Predominant land use consists of rangeland (cattle impacts), predominantly federal with some private land.

## Recommended Bmps and Estimated Costs

There are several BMPs that may be applied to the above described treatment units to improve water quality. Individual conservation planning with willing landowners will determine the most appropriate BMPs to install on a case by case basis. The information included in Table 11 provides an estimate only of the BMPs recommended for treatment and their approximate costs. A more precise estimate of quantities of each BMP recommended to install will be determined at the time of conservation planning for a particular landowner.

**Table 11. Recommended BMPs and Estimated Costs by Treatment Unit.**

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU #1 Irrigated Lands	(442) Irrigation System-Sprinkler	ac	\$700.00	3,000	\$1,050,000	\$1,050,000	\$2,100,000
	(430DD) Irrigation Water Conveyance Pipeline	ft	\$10.00	500,000	\$2,500,000	\$2,500,000	\$5,000,000
	(587) Structure for Water Control-steel	3 cfs	\$3,000.00	500	\$750,000	\$750,000	\$1,500,000
	(449) Irrigation Water Management	ac	\$12.00	6,000	\$36,000	\$36,000	\$72,000
	(512) Pasture and Hayland Planting	ac	\$100.00	25,000	\$1,250,000	\$1,250,000	\$2,500,000
	(595) Pest Management	ac	\$30.00	30,000	\$450,000	\$450,000	\$900,000
	(590) Nutrient Management	ac	\$15.00	5,000	\$37,500	\$37,500	\$75,000
	(533) Pumping Plant	no.	\$8,500.00	250	\$1,062,500	\$1,062,500	\$2,125,000
	(580) Streambank & Shoreline Protection	ft	\$80.00	10,000	\$400,000	\$400,000	\$800,000
	(614) Watering Facility	no.	\$1,340.00	250	\$167,500	\$167,500	\$335,000
	(516) Pipeline	ft	\$3.60	50,000	\$90,000	\$90,000	\$180,000
	(382) Fence-Barbed Wire	ft	\$3.30	25,000	\$41,250	\$41,250	\$82,500
		<b>Subtotal</b>				<b>\$7,834,750</b>	<b>\$7,834,750</b>

Treatment Unit	Best Management Praticce	Unit Type	Unit Cost	Unit Amount	C/S Funds	Participant Funds	Total Funds	
TU #2 Rangeland	(528) Prescribed Grazing	ac	\$2.00	12,000	\$12,000	\$12,000	\$24,000	
	(645) Upland Wildlife Habitat Management	ac	\$15.00	600	\$4,500	\$4,500	\$9,000	
	(516) Pipeline	ft	\$3.60	40,000	\$72,000	\$72,000	\$144,000	
	(574) Spring Development	no.	\$2,260.00	20	\$22,600	\$22,600	\$45,200	
	(382) Fence-Barbed Wire	ft	\$3.90	50,000	\$97,500	\$97,500	\$195,000	
	(382) Fence-Jack	ft	\$5.50	10,000	\$27,500	\$27,500	\$55,000	
	(614) Watering Facility	no.	\$1,340.00	25	\$16,750	\$16,750	\$33,500	
	(533) Pumping Plant	3hp	\$2,500.00	8	\$10,000	\$10,000	\$20,000	
	(642) Watering Well	ft	\$48.00	1,200	\$28,800	\$28,800	\$57,600	
	(382) Fence-Corral	ft	\$18.00	5,000	\$45,000	\$45,000	\$90,000	
	(313) Waste Storage Facility	no.	\$25,000.00	2	\$25,000	\$25,000	\$50,000	
	<b>Subtotal</b>					<b>\$361,650</b>	<b>\$361,650</b>	<b>\$723,300</b>
	TU #3 Riparian	(528) Prescribed Grazing	ac	\$2.00	600	\$600	\$600	\$1,200
(382) Fence-Barbed Wire		ft	\$3.30	20,000	\$33,000	\$33,000	\$66,000	
(382) Fence-Jack		ft	\$5.50	15,000	\$41,250	\$41,250	\$82,500	
(580) Streambank & Shoreline Protetction		ft	\$80.00	25,000	\$1,000,000	\$1,000,000	\$2,000,000	
(595) Pest Management		ac	\$12.00	300	\$1,800	\$1,800	\$3,600	
(578) Stream Crossing		no.	\$2,960.00	3	\$4,440	\$4,440	\$8,880	
(612) Tree/Shrub Establishment		no.	\$1.55	5,000	\$3,875	\$3,875	\$7,750	
(391) Riparian Forest Buffer		ac	\$3,480.00	50	\$87,000	\$87,000	\$174,000	
(472) Access Control		ac	\$23.00	250	\$2,875	\$2,875	\$5,750	
(390) Riparian Herbaceous Cover		ac	\$2,010.00	20	\$20,100	\$20,100	\$40,200	
<b>Subtotal</b>						<b>\$1,194,940</b>	<b>\$1,194,940</b>	<b>\$2,389,880</b>
<b>TOTAL</b>					<b>\$9,391,340</b>	<b>\$9,391,340</b>	<b>\$18,782,680</b>	

## TREATMENT ALTERNATIVES

The priorities outlined in the annual plan of work for the Butte Soil and Water Conservation District are water quality and quantity, cropland pasture and range, animal feeding operations, and riparian areas. Implementation of BMPs will involve ongoing cooperation with the Butte SWCD to evaluate and carry out implementation. The chosen treatment alternative will be alternative #4.

Description of alternatives

1. No action
2. Implement all recommended BMPs per Table 11.
3. Implement BMPs for only one treatment unit.
4. Implement BMPs based on available funding and landowner interest.

## Funding

Financial and technical assistance for installation of BMPs is needed to ensure success of this implementation plan. The Butte and Custer Soil and Water Conservation Districts will actively pursue multiple potential funding sources to implement water quality improvements on private agricultural and grazing lands. Many of these programs can be used in combination with each other to implement BMPs.

These sources include (but are not limited to):

**CWA 319** –These are Environmental Protection Agency funds allocated to the Nez Perce Tribe and the State of Idaho. The Idaho Department of Environmental Quality (DEQ) administers the Clean Water Act §319 Non-point Source Management Program for areas outside the Nez Perce Reservation. Funds focus on projects to improve water quality and are usually related to the TMDL process. The Nez Perce tribe has CWA 319 funds available for projects on Tribal lands on a competitive basis.

[http://www.deq.idaho.gov/water/prog\\_issues/surface\\_water/nonpoint.cfm#management](http://www.deq.idaho.gov/water/prog_issues/surface_water/nonpoint.cfm#management)

**Water Quality Program for Agriculture (WQPA)** –The WQPA is administered by the Idaho State Soil and Water Conservation Commission (SWC). This program is also coordinated with the TMDL process. <http://www.scc.state.id.us/programs.htm>

**Resource Conservation and Rangeland Development Program (RCRDP)** –The RCRDP is a loan program administered by the SWC for implementation of agricultural and rangeland best management practices or loans to purchase equipment to increase conservation.

<http://www.scc.state.id.us/programs.htm>

**Conservation Improvement Grants** – These grants are administered by the SWC.

<http://www.scc.state.id.us/programs.htm>

**PL-566** –This is the small watershed program administered by the USDA Natural Resources Conservation Service (NRCS).

**Agricultural Management Assistance (AMA)** –The AMA provides cost-share assistance to agricultural producers for constructing or improving water management structures or irrigation structures; planting trees for windbreaks or to improve water quality; and mitigating risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming.  
<http://www.nrcs.usda.gov/programs/ama/>

**Conservation Reserve Program (CRP)** –The CRP is a land retirement program for blocks of land or strips of land that protect the soil and water resources, such as buffers and grassed waterways.  
<http://www.nrcs.usda.gov/programs/crp/>

**Conservation Technical Assistance (CTA)** –The CTA provides free technical assistance to help farmers and ranchers identify and solve natural resource problems on their farms and ranches. This might come as advice and counsel, through the design and implementation of a practice or treatment, or as part of an active conservation plan. <http://www.nrcs.usda.gov/programs/cta/>

**Environmental Quality Incentives Program (EQIP):** EQIP offers cost-share and incentive payments and technical help to assist eligible participants in installing or implementing structural and management practices on eligible agricultural land. <http://www.nrcs.usda.gov/programs/eqip/>

**Wetlands Reserve Program (WRP)** –The WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. Easements and restoration payments are offered as part of the program. <http://www.nrcs.usda.gov/programs/wrp/>

**Wildlife Habitat Incentives Program (WHIP)** –WHIP is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Cost-share payments for construction or re-establishment of wetlands may be included.  
<http://www.nrcs.usda.gov/programs/whip/>

**State Revolving Loan Funds (SRF)** –These funds are administered through the SWC.  
<http://www.scc.state.id.us/programs.htm>

**Grassland Reserve Program (GRP)** –The GRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands on their property.  
<http://www.nrcs.usda.gov/programs/GRP/>

**Conservation Security Program (CSP)** –CSP is a voluntary program that rewards the Nation's premier farm and ranch land conservationists who meet the highest standards of conservation environmental management. <http://www.nrcs.usda.gov>

**Grazing Land Conservation Initiative (GLCI)** –The GLCI's mission is to provide high quality technical assistance on privately owned grazing lands on a voluntary basis and to increase the awareness of the importance of grazing land resources. <http://www.glci.org/>

**HIP** – This is an Idaho Department of Fish and Game program to provide technical and financial assistance to private landowners and public land managers who want to enhance upland game bird and waterfowl habitat. Funds are available for cost sharing on habitat projects in partnership with

private landowners, non-profit organizations, and state and federal agencies.  
<http://fishandgame.idaho.gov/cms/wildlife/hip/default.cfm>

**Partners for Fish and Wildlife Program in Idaho** – This is a U.S. Fish and Wildlife program providing funds for the restoration of degraded riparian areas along streams, and shallow wetland restoration. <http://www.fws.gov/partners/pdfs/ID-needs.pdf>

## Outreach

Conservation partners in the Big Lost River subbasin will use their combined resources to provide information about BMPs to agricultural landowners and operators within the subbasin in order to improve water quality. A local outreach plan may be developed. Newspaper articles, district newsletters, watershed and project tours, landowner meetings and one-on-one personal contact may be used as outreach tools.

Outreach efforts will:

- Provide information about the TMDL process
- Supply water quality monitoring results
- Accelerate the development of conservation plans and program participation
- Distribute progress reports
- Enhance technology transfer related to BMP implementation
- Increase public understanding of agriculture's contribution to conserve and enhance natural resources
- Improve public appreciation of agriculture's commitment to meeting the TMDL challenge
- Organize an informational tour bringing together irrigation districts' Board of Directors and Soil Conservation Districts' Board of Supervisors.
- Identify and encourage the use of BMPs for recreation activities on the sub-basin

## Monitoring and Evaluation

### FIELD LEVEL

At the field level, annual status reviews will be conducted to insure that the contracts are on schedule and that BMPs are being installed according to standards and specifications. BMP effectiveness monitoring will be conducted on installed projects to determine installation adequacy, operation consistency and maintenance, and the relative effectiveness of implemented BMPs in reducing water quality impacts. This monitoring will also measure the effectiveness of BMPs in controlling agricultural nonpoint-source pollution. These BMP effectiveness evaluations will be conducted according to the protocols outlined in the Agriculture Pollution Abatement Plan and the SWC Field Guide for Evaluating BMP Effectiveness.

The Revised Universal Soil Loss Equation (RUSLE) and Surface Irrigation Soil Loss (SISL) Equation are used to predict sheet and rill erosion on non-irrigated and irrigated lands. The Alutrin Method, Imhoff Cones, and direct-volume measurements are used to determine sheet and rill irrigation-induced and gully erosion. Stream Visual Assessment Protocol (SVAP) and Streambank Erosion Condition Inventory (SECI) are used to assess aquatic habitat, stream bank erosion, and

lateral recession rates. The Idaho OnePlan's CAFO/AFO Assessment Worksheet is used to evaluate livestock waste, feeding, storage, and application areas. The Water Quality Indicators Guide is utilized to assess nitrogen, phosphorus, sediment, and bacteria contamination from agricultural land.

## **WATERSHED LEVEL**

At the watershed level, there are many governmental and private groups involved with water quality monitoring. The Idaho Department of Environmental Quality uses the Beneficial Use Reconnaissance Protocol (BURP) to collect and measure key water quality variables that aid in determining the beneficial use support status of Idaho's water bodies. The determination will tell if a water body is in compliance with water quality standards and criteria. In addition, IDEQ will be conducting five-year TMDL reviews.

Annual reviews for funded projects will be conducted to insure the project is kept on schedule. With many projects being implemented across the state, SWC developed a software program to track the costs and other details of each BMP installed. This program can show what has been installed by project, by watershed level, by sub-basin level, and by state level. These project and program reviews will insure that TMDL implementation remains on schedule and on target. Monitoring BMPs and projects will be the key to a successful application of the adaptive watershed planning and implementation process.

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