Southern Middle Bear Subbasin

Huc # 16010202

Agricultural TMDL Implementation Plan

Developed for the

Idaho Department of Environmental Quality

Prepared by

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In Cooperation with the

Franklin Soil and Water Conservation District

Idaho Association of Soil Conservation Districts

USDA-Natural Resources Conservation Service

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Introduction

Purpose

The purpose of this plan is to recommend Best Management Practices (BMPs) that would improve or restore physical and biological functions of Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek (Figure 1).

This Agricultural Total Maximum Daily Load (TMDL) Implementation Plan will build upon past conservation accomplishments made through the Franklin Soil and Water Conservation District (FSWCD). These past and future projects will help to restore beneficial uses in Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek. This plan outlines an adaptive management approach for developing site-specific conservation plans with individual farmers and ranchers in order to recommend BMPs which will help meet the TMDL targets. Each site-specific conservation plan will outline how and when to install each of the BMPs listed in the conservation plan. An adaptive management process will be guided by follow up evaluations and monitoring.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments of Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek. The objectives of this plan are to identify critical areas along the listed stream segments and to recommend BMPs for reducing sediment and nutrient loading into §303(d) listed water bodies.

Background

Project Setting

The Agriculture TMDL Implementation Plan for the Middle Bear subbasin, HUC 16010202, (Figure 2) has been divided into three sections due to local similarities. These are the Cub River, Northern Middle Bear, and Southern Middle Bear. The Cub River is shown on the map for location purposes only. The Cub River Implementation Plan, which includes the Cub River, Maple Creek, and Worm Creek was written and submitted (Smith, S., 2006) separately because it flows directly in to Utah and has different loading requirements.
This implementation plan will cover the Southern Middle Bear Subbasin for planning purposes only. This area includes the 303(d) streams that enter the Bear River downstream of the Cottonwood Creek - Bear River confluence and above the Utah state line. These streams include the Bear River, Weston Creek, Fivemile Creek, Deep Creek, Strawberry Creek, and Battle Creek (Table 1). These streams drain the northern portion of Cache Valley and then flow into the Bear River in Idaho.

These streams provide a great economic benefit to the people of Franklin County, by providing recreation, irrigation water and scenic beauty to the area. There is evidence that Native Americans may have used hot springs along the Bear River to establish winter camps allowing them to stay in the Cache Valley year round. This could have had an impact on the natural resources in the area. Then with the arrival of the early settlers around the 1850s and the establishment of local communities, humans have had an impact on the natural resources of the

area for a long time. Some of the natural resource uses are culinary water, irrigation water, grazing and logging (USU, 2000).

Table 1. 303(d) listed streams in the Southern Middle Bear Subbasin.

Stream Name	Description	Listed Pollutants
Battle Creek	Headwaters to Bear River	Nutrients, Sediment
Bear River	Oneida Reservoir to Utah State Line	Flow, Nutrients, Sediment
Fivemile Creek	Headwaters to Bear River	Unknown
Deep Creek	Oxford Slough to Bear River	Unknown
Strawberry Creek	Forest Service boundary to Mink Creek	Unknown
Weston Creek	Headwaters to Bear River	Flow, Nutrients, Sediment

Subwatersheds

This agriculture TMDL implementation plan for the Southern Middle Bear will be divided into 6 subwatersheds. Each of these subwatersheds will be planned around each 303d listed stream segment. Thus the subwatershed and the stream have the same name; this will simplify the planning for each stream. It will also allow for planning and implantation to be documented and associated with a particular stream.

Topography

The Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek watersheds have a varied topography including: mountains, mountain valleys, foothills, stream terraces, alluvial fans, and valley plains. The northern part of the Cache Valley is surrounded by three mountain ranges. The Bear River range comprises the mountainous, eastern edge of the Cache Valley with most of its tributaries flowing west into the lower elevations of the basin within Cache Valley. The Portneuf Mountain Range lies to the north of the Cache valley with Bear River entering Cache Valley through a narrow canyon between the Portneuf Range and the Bear River Range. Two major tributaries flow south out of this area and these are Battle Creek and Deep Creek. These two streams flow across or through the Bear River delta. The northwestern edge of the Cache Valley is bounded by the Bannock Range. There are many small streams that flow east from this mountain range. Most of the streams are intermittent as they go dry part way through the summer. Elevations in northern Cache Valley range from 9,328 feet to 4,434 feet where Bear River enters Utah. The elevation difference, slope and southwest aspect allows the watershed to have two runoff periods, a low valley runoff in April and May and a highland runoff in June and July (IDEG, 2006).

Climate

The watershed is located in the intermountain region that is characterized by cold, snowy winters and hot, dry summers. Average annual precipitation, most of which accumulates as snow during the winter, ranges from about 10 inches in the western portions of the drainage to over 30 inches in the mountains to the east (Figure 3). The frost-free period varies from 120 to 140 days. The last frost in the spring can occur as late as May 20th and the first frost can be as early as September 20th. Temperatures range from minus 20°F in winter to 100°F in summer (ERI, 2000).

Figure 1. Southern Middle Bear Subwatersheds

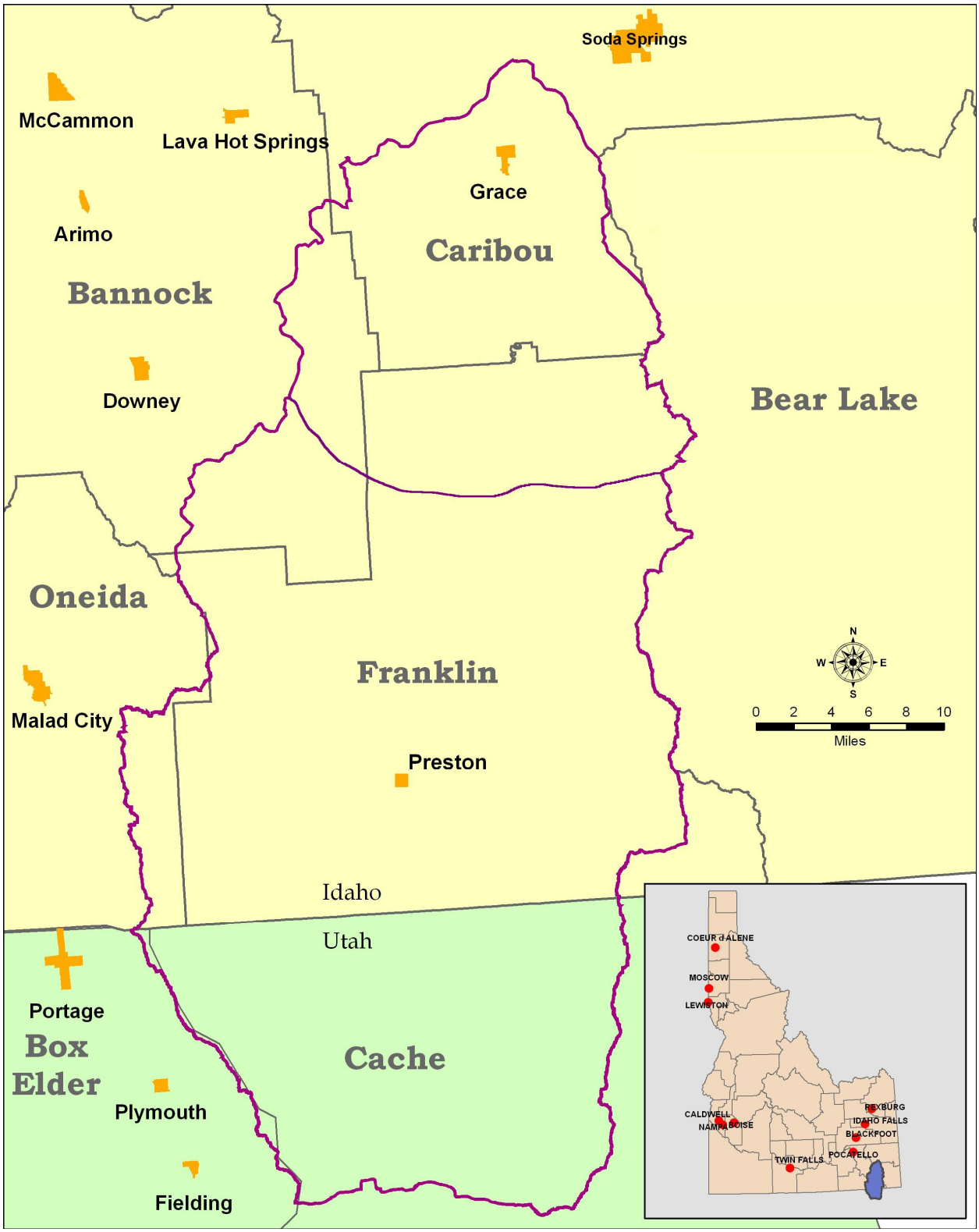

Figure 2. General location of the Southern Middle Bear Subbasin

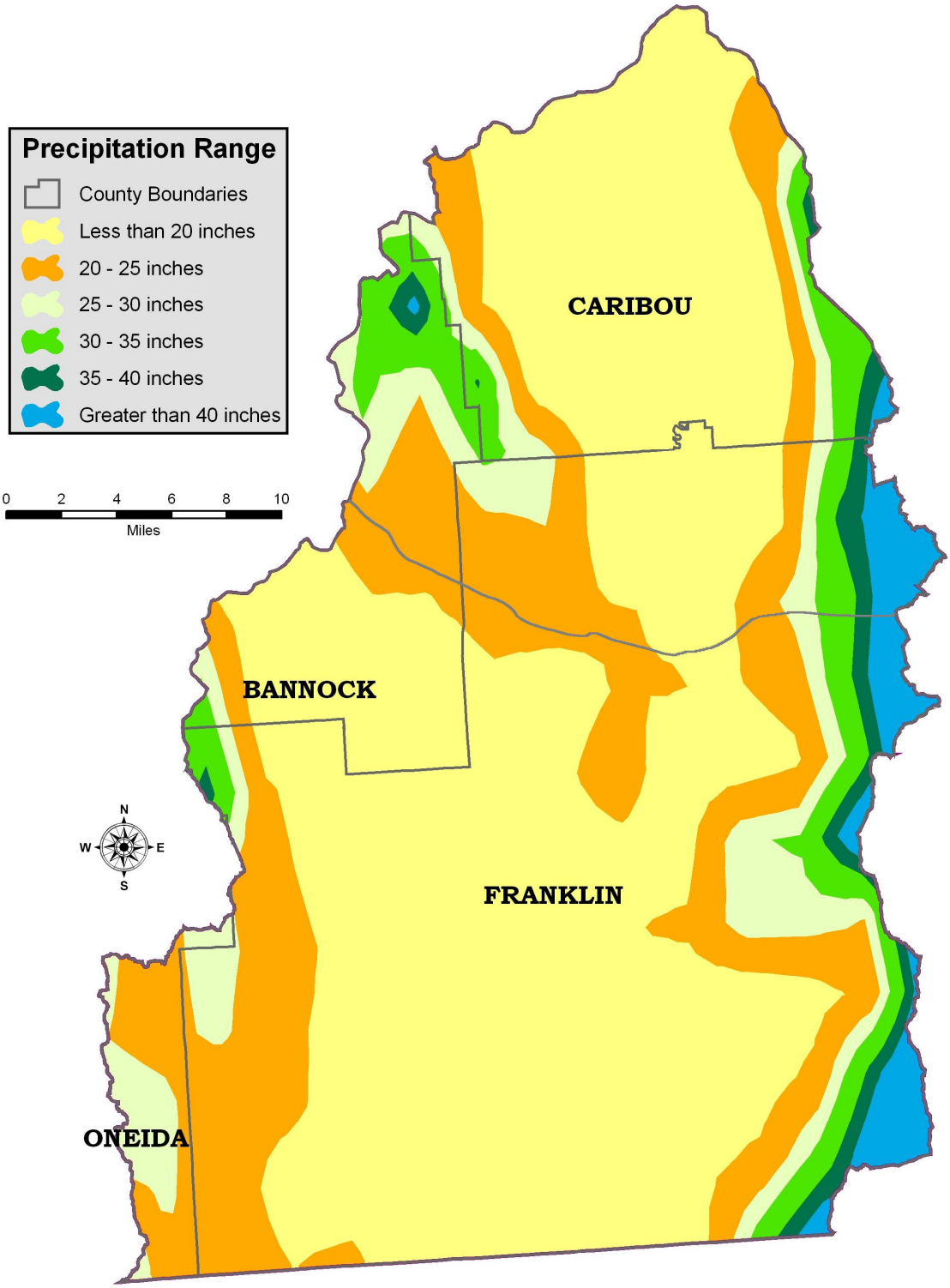

Figure 3. Precipitation in the Southern Middle Bear Subbasin

Geology

Ancient Lake Bonneville, of late Pleistocene times, was a large inland sea that covered much of Utah and the southeastern corner of Idaho, including much of the project area. The lake had two major stages, the Bonneville and Provo stage. The Bonneville was the earlier of the two, with an average elevation of 5090 feet above sea level. During the last ice age, conditions were generally wetter and as the lake continued to fill, it eventually spilled over the hard rocks near Red Rock Pass. Subsequently, it eroded through the rocks about 14,500 years ago, pouring a torrent of water three times the flow of the Amazon River through the pass north into the valley, then into the Snake River Plain. As the flood wore through the hard rocks of the pass and underlying soft rock, the lake restabilized at another accumulation of harder rock at the Provo level. The Provo stage of the lake was not only lower by 350 feet, but also covered less of a surface area. During the life of this giant lake, thick accumulations of sediments were deposited in the lake basin as surrounding mountains eroded.

There are two kinds of mountain building processes that are common to the area surrounding the ancient lake and are part of the current Bear River Basin. To the east and north sediments of the Bear River-Portneuf Mountain Ranges include quartzites and carbonates, such as limestone and dolomite (Precambrian and Paleozoic), which were folded and faulted during formation of the Rocky Mountains. To the west, the Bannock-Malad Mountain Ranges are composed of similar material. Following the folding, faulting, and subsequent erosion of sediments, a younger series of mountain building has been super-imposed on the older ranges. As the continental plate moved slowly over the spreading ridge section that extends from Mexico to Idaho, the resulting stretching has created the basin and range block fault mountains.

Tertiary rocks (volcanic tuffs, calcareous siltstone, claystone, and conglomerates) unconformably overlie the sediments and are exposed around the foothills of the old Lake Bonneville shoreline.

Once the weight of the water was removed by the retreat of the Provo stage of the lake, soft lake bottom sediments rebounded as crustal layers of the earth isostatically adjusted (the sediments that were in the deeper parts of the lake are now bowed upward).

At the same time the lake was retreating, ancestral Bear River and its tributaries, issuing from the mountains, dropped their sediment load as the terrain flattened out in the more level basin. Huge deltas of interfingering deposits of clay, silt and sand cap the upper/outer edges of the old lake shoreline in the Riverdale and Preston area. As the lake retreated, Bear River and its tributaries began to cut valleys in the soft lake bottom sediments. Although the sediments have dried and hardened over the last 15,000 years they are still easily eroded and prone to landsliding, especially when saturated, as the river cuts its way through the valley floor. While the current sliding and subsequent loading of sediment in the lower part of Bear River is part of a natural process, the activities of man have accelerated the erosion process. (IDEQ, 2006)

Land Ownership

There are approximately 218,944 acres of private land (Table 2) and 71,546 acres of land managed by Idaho Department of Lands (IDL), Bureau Land Management (BLM), U.S. Fish and Wildlife Service (USFWS) and Caribou Targhee National Forest (CTNF) in the Southern Middle Bear Subbasin (Figure 4).

Table 2. Land Ownership

Land Owners / Managers	Acres
Private Land	218,944
State of Idaho	9,949
Open water	1,475
B.L.M.	9,585
U.S. Fish & Wildlife	1,878
U.S. Forest Service	50,134

Land Use

Land use in the Southern Middle Bear Subbasin is widely varied from recreation, urban, rangeland, dry and irrigated cropland, irrigated pastures, and summer homes or ranchettes (Table 3). Recreation is centered on and around the reservoirs and streams and the adjacent mountain ranges. Ranchettes are becoming very common along Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, Fivemile Creek, and around the reservoirs. The cities of Preston and Franklin have municipal sewer systems but the cities of Weston, Dayton, and Clifton have individual septic systems at each dwelling.

Dry cropland is located in the uplands above the irrigation canal systems with typical crops of hay and small grain. Irrigated cropland is located between the irrigation canals and the streams in flat areas these have hay, grain, corn or grass pasture in the rotations (Figure 5).

Table 3. Private Land Uses in the Southern Middle Bear Subbasin

Land Use	Acres
Irrigated Cropland	66,544
Dry Cropland	51,534
Range Land	92,320
Open Water	1,475
Roads / Urban	6,052
Rivers & Creeks / Riparian	2,897
Total	218,944

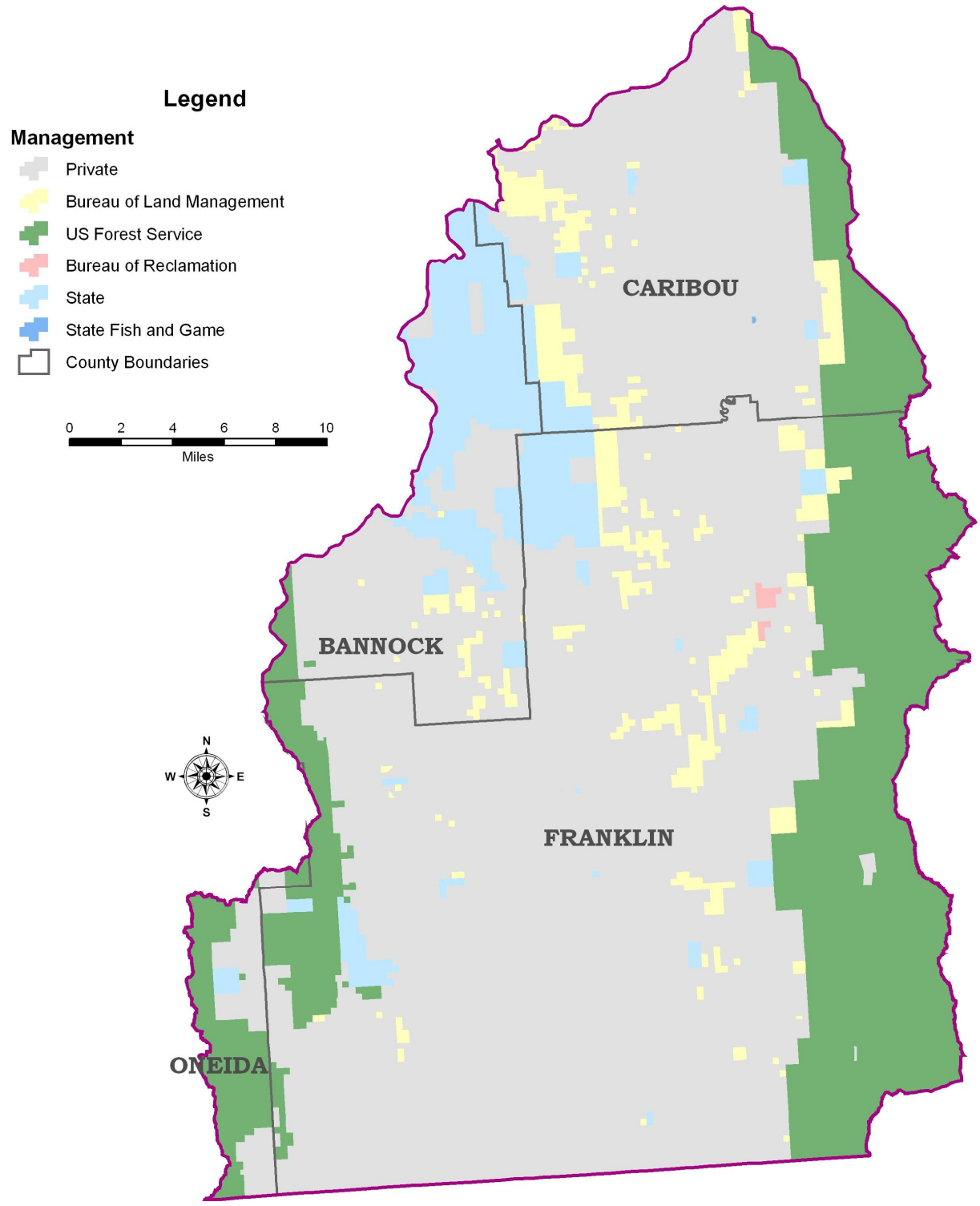

Figure 4. Land Ownership in the Southern Middle Bear Subbasin

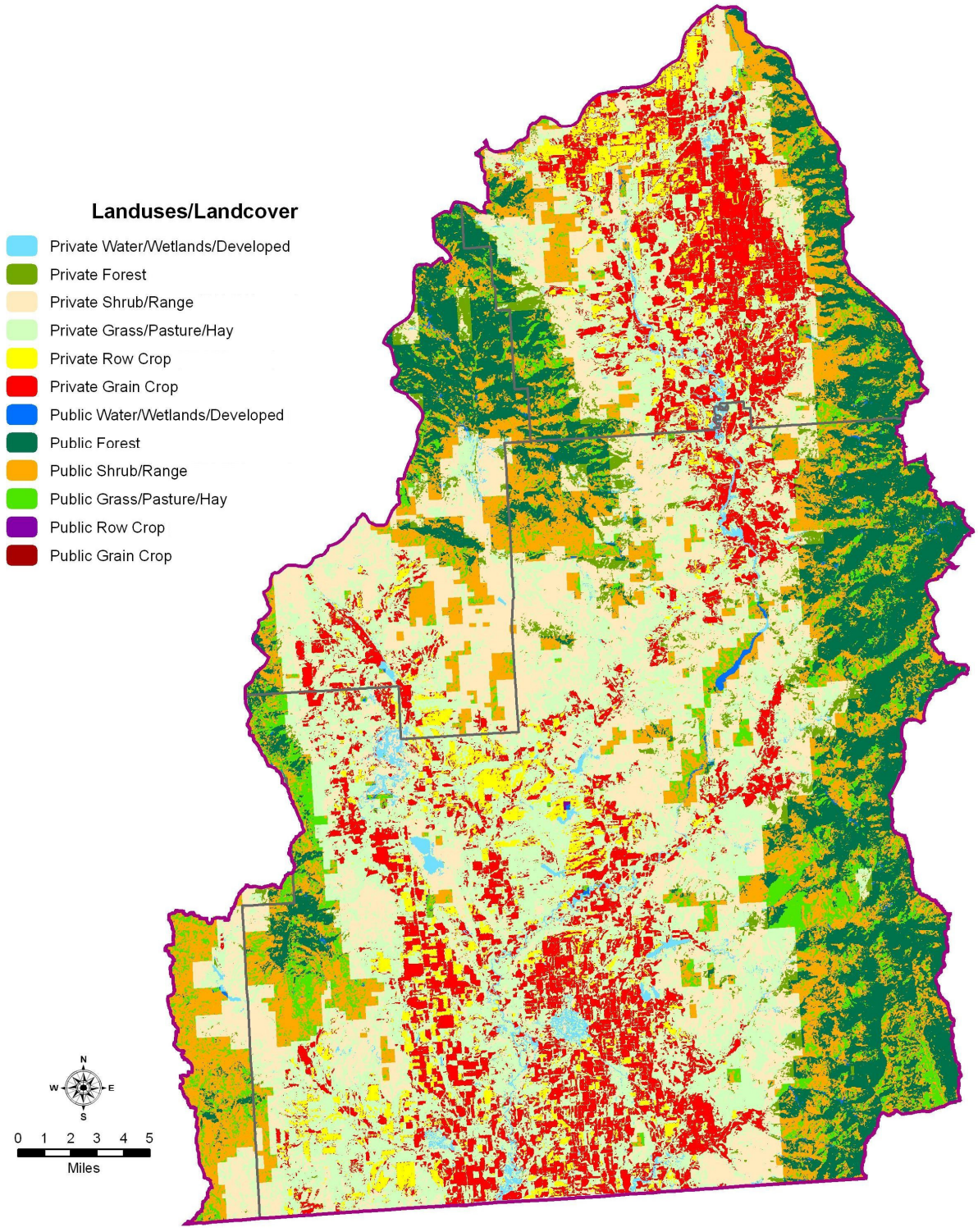

Figure 5. Land use in the Southern Middle Bear Subbasin

Urbanization

As of the 2000 census there were 11,329 people residing in Franklin County. Figure 7 shows the population distribution for the subbasin and surrounding cities. In this area, the growth rate from 1990 to 2000 was 22.7 % (Figure 6). Data points for 2010 and 2020 are projected (FCFD, 2004). Most of the growth is occurring around the towns and along the tributaries to the Bear River with lot sizes ranging between 1 to 15 acres. The Idaho and Utah Transportation Departments completed a four lane road between Logan, Utah and Preston, Idaho in the fall of 2006. This expansion has the potential to increase the growth rate of the county even higher. Many of the people moving in to the county work in Utah with commutes ranging from 30 minutes to 2 hours.

Since the early 1990's there has been a lot of urbanization occurring in the watershed. With this urbanization there has been a greater emphasis on water quality. Utah Division of Water Quality contracted with Ecosystem Research Institute (ERI) to develop the Lower Bear River Water Quality Management Plan (UDWQ, 1995), which was accepted as the TMDL plan for the Utah portion of the Bear River. This plan reported that high loads of sediment and nutrients are impairing the ability of the Bear River to support its beneficial uses.

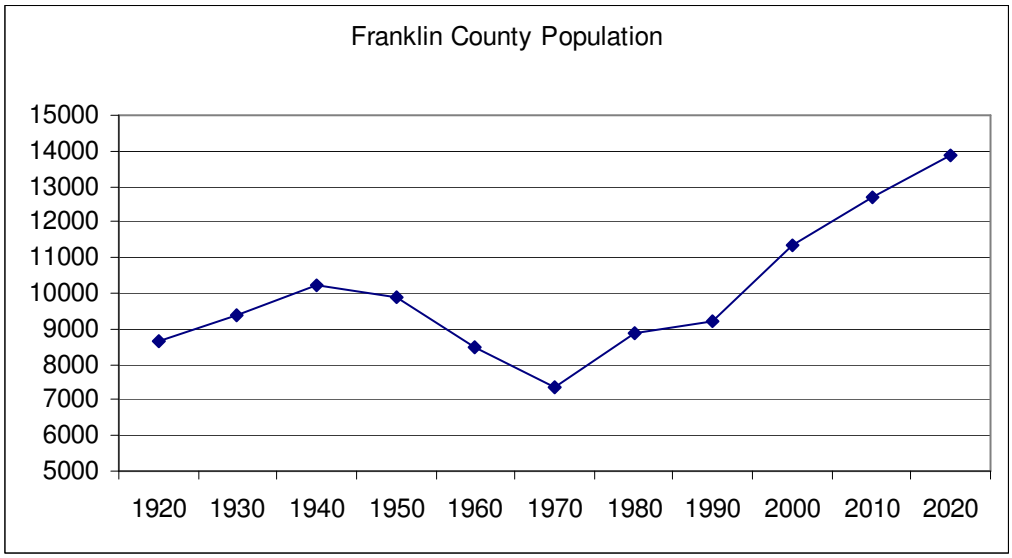

Figure 6. Census Data 1920-2000

Water Use

There are primarily three irrigation systems: Twin Lakes Irrigation serving about 12,500 acres, Weston Creek Irrigation serving about 6,000 acres, and Strong Arm Irrigation serving about 1,700 acres. There are some other irrigation systems that serve small areas of the watershed. Weston Creek Irrigation stores water in Weston reservoir and runs the irrigation water through a pipe through Weston Canyon and serves the area from the mouth of the canyon to the area around the city of Weston. This pipe line has saved a lot of water due to losses in the old canal which ran across a very gravely area. Many of the small lateral ditches are in the process of being converted to pipe and this will increase the efficiency of the system and allow them to leave more water in the reservoir thorough the winter and then be able to spill water in the spring when the reservoir is full. The sources of water for Twin Lakes Irrigation are Mink Creek and Deep Creek. They have three reservoirs, Winder, Condie and Twin Lakes for water storage through the winter. The water is used in Riverdale, Winder, Clifton, Dayton and ends at Weston. The sources of water for Strong Arm Irrigation are Battle Creek and Cottonwood Creek. Water is stored in two reservoirs, Strong Arm and Treasureton for use throughout the Banida area.

Accomplishments

The FSWCD is currently implementing two §319 grants one in the Deep Creek Watershed and one in Battle Creek and Mink Creek watersheds. They have also implemented a U.S. Fish and Wildlife Service Partners grant along the Bear River. The District has utilized two programs funded through the ISCC to implement range improvements and improve irrigation systems. The Natural Resource Conservation Service (NRCS) has implemented EQIP and other projects along Weston Creek, Fivemile Creek, Deep Creek, Battle Creek, and the Bear River. These projects administrated by NRCS are summarized in a Rapid Watershed Assessment for the Middle Bear River Subbasin (NRCS, 2007). The practices administrated by the Franklin Soil and Water Conservation District are summarized in Table 4.

Table 4. Completed BMP's and Costs in the Southern Middle Bear Subbasin

Program	Practice	Amount	Cost Share	Land Owner	Total
319	Fence (Corral)	570 ft	$5,130	$3,420	$8,550
319	Fence (Barb)	300 ft	$360	$240	$600
319	Pipe line	4,680 ft	$5,616	$3,744	$9,360
319	Pumping Plant	1 ea	$4,094	$2,730	$6,824
319	Watering facility (Troughs)	5 ea	$3,000	$2,000	$5,000
319	Watering facility (Storage)	3840 gal	$2,023	$1,349	$3,372
319	Spring Development	1 ea	$1,380	$920	$2,300
U.S. Partners	Streambank Protection	700 ft	$9,800	$9,800	$19,600
U.S. Partners	Fence	2,500 ft	$2,250	$2,250	$4,500
U.S. Partners	Pipeline	3,200 ft	$3,200	$3,200	$6,400
U.S. Partners	Water Facility	2 ea	$800	$800	$1,600
CIG	Spring Development	1 ea	$400	$400	$800
CIG	Pipeline	5,000 ft	$5,625	$5,625	$11,250
CIG	Watering Facility	3 ea	$1,600	$1,600	$3,200
CIG	Fence	4,000 ft	$4,000	$4,000	$8,000
RCRDP Loan	Irrigation System (Pivots)	4 ea	$0.0	$212,000	$212,000
BOR, IDWR	Irrigation delivery Pipeline	6 Miles	$307,000	$593,000	$900,000
RCRDP Grant	Irrigation delivery Pipeline	9 Miles	$100,000	$150,150	$250,150
RCRDP Grant	Irrigation delivery Pipeline	2.5 Miles	$30,000	$101,601	$131,601
Total			$486,278	$1,098,829	$1,585,107

Water Quality Problems

Beneficial Use Status

The Idaho Department of Environmental Quality (IDEQ) designates beneficial uses on rivers, creeks, lakes, and reservoirs to meet the requirements of the Federal Clean Water Act. Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek (Table 5) are listed on the State of Idaho's §303(d) list of water quality impaired water bodies (IDEQ, 1998).

Table 5. Beneficial Use Status of 1998 303 (d) listed streams

	Beneficial Uses								
Stream	CWAL	SS	PCR	SCR	DWS	AWS	IWS	WH	AESTHETICS
Bear River	Impaired	Impaired	X	n/a	n/a	X	X	X	X
Battle Creek	Impaired	n/a	n/a	X	n/a	X	X	X	X
Deep Creek	Impaired	n/a	n/a	X	n/a	X	X	X	X
Fivemile Creek	Impaired	n/a	n/a	X	n/a	X	X	X	X
Strawberry Creek	Impaired	n/a	n/a	X	n/a	X	X	X	X
Weston Creek	Impaired	n/a	n/a	X	n/a	X	X	X	X

X = stream is meeting Beneficial uses, n/a = not a Beneficial use in that stream (IDEQ, 2006).

Pollutants of Concern

The Subbasin Assessment for the Bear River / Malad Subbasin specified that streams listed for sediment are Bear River, Weston Creek, and Battle Creek and streams listed for nutrients are Bear River, Weston Creek, Battle Creek and streams listed for Flow alteration include Bear River and Weston Creek and streams listed for unknown pollutants are Deep Creek, Strawberry Creek and Fivemile Creek (IDEQ, 2006). These pollutants are degrading the water quality and the wildlife habitat in and along these 303d listed stream reaches. The excess sediment and nutrients added to the system along these streams is accelerating eutrophication of Cutler Reservoir and lowering the water quality in the streams.

Table 6. Identified pollutants and required reductions for Impaired Streams

Water Body	303(d) Listed Pollutants	Required Reduction to meet TMDL
Battle Creek	Nutrients Sediment	3,597 lbs TP per yr 2,999,744 lbs TSS per yr
Bear River	Nutrients Sediment	80,255 lbs TP per yr 0.0 lbs. TSS pr yr
Deep Creek	Unknown pollutants	6,492 lbs TP per yr 4,252,611 lbs TSS per yr
Fivemile Creek	Unknown pollutants	375 lbs TP per yr 0.0 lbs TSS per yr
Strawberry Creek	Unknown pollutants	No Load Reduction set
Weston Creek	Nutrients Sediment	1,545 lbs TP per yr 0.0 lbs TSS per yr

Past Water Quality Monitoring

IASCD and ISDA recently completed a water quality monitoring project on eight streams in the Middle Bear subbasin: Densmore, Whiskey, Williams, Cottonwood, Battle, Deep, Fivemile, and Weston creeks (Jenkins, 2007). The goal of the monitoring was to quantify pollutant concentrations in the streams to help the Franklin and Caribou SCDs prioritize areas for BMP implementation. Water quality samples were collected from 2005-2006 and were analyzed for suspended sediment, phosphorus, and nitrogen.

The results of the monitoring indicated that six of the eight streams experienced elevated pollutant levels, especially during spring runoff events. Fivemile and Battle Creeks typically had the highest pollutant concentrations, while Deep and Weston Creeks had the highest pollutant loads. As a result, IASCD recommended that Fivemile, Battle, Deep, and Weston Creeks be considered priority areas for water quality improvement projects in the subbasin. IDEQ has continued monitoring on a quarterly basis as part of a tri-state effort that will be conducted through 2011. A number of water quality studies were conducted in the subbasin by USU (Clyde 1953, Sorenson et al. 1984, 1986). These studies indicated that elevated sediment and nutrient loads in the Bear River below Oneida Narrows Reservoir were largely due to tributary inputs. Limited tributary data have been collected by ERI and IDEQ in the Middle Bear Subbasin (Jenkins, 2007).

Identified Problems

Based on all the available water quality monitoring data the FSWCD identified the following problems in the watershed. These include stream bank modifications, confined animal feeding operations, over utilized pastures, freeze/thaw cycles of streambanks, sheet and rill erosion, classic and ephemeral gully erosion, irrigation induced erosion, and streambank erosion. Critical erosion periods are lower basin and upper basin spring runoff. These two runoff periods seem to have different sources of pollutants (FSWCD, 1993).

Agricultural Water Quality Monitoring and Evaluation

Riparian

Introduction

Due to rising concerns for the Bonneville Cutthroat Trout (BCT) and its habitat in the Bear River drainage, numerous efforts have been initiated to understand the fish movement and distribution. By knowing where the fish are throughout the year projects could be implemented to address specific types of habitat. An effort to evaluate agriculture impacts was a SAWQP planning study conducted from 1990 to 1993. This study looked at sediment sources on agriculture lands and stream banks. Level II field assessments were conducted by walking the streams to document characteristics such as geology, stream order, gradient, stream flow, adjacent land use.

Current Condition

The results of this study indicated that mass wasting in the deep narrow canyons was a major source of sediment to Battle Creek, Deep Creek, Fivemile Creek, and Weston Creek. Severe streambank erosion from the Riverdale Bridge to the Utah State line was a constant source of sediment to the Bear River as well as sediment pulses from the above mentioned tributaries that enter into the Bear River trough this section.

The riparian assessment completed in 1992 used the stream erosion inventory to assess the health of the streams and adjacent riparian areas. This showed that 51% of the sediment loading was coming from streambanks of tributary streams through eroding banks and mass wasting of the steep canyon walls. Due to the terrain and physical features of the tributary canyons traditional streambank restoration would not be practical (Kidwell 1993, Franklin SWCD, 1993).

In the summer of 2007 ISCC revisited some of the sites that were evaluated in the previous 1993 study to compare the results and the condition of the stream. It was found that the streams were in about the same condition with channel bottom and bank channel shape the two factors that seemed to vary the most. It was determined that the deep narrow canyons were still a major source of sediment and that the conclusions from the previous reports could still be used to direct restoration efforts is these tributary streams.

In 2007 ISCC and NRCS evaluated a portion of the main stem Bear River between Fivemile and Deep Creeks. Many of the eroding banks identified in the 1992 canoe trip were stabilized and not supplying the amount of sediment that was calculated in the earlier study. This may be from the requirements set by the Federal Energy Regulatory Commission in the relicense agreement for the power plants on the Bear River. This relicense agreement set requirements on the speed and amount of fluctuation that could occur below the dams on the Bear River. This has reduced the amount of water flowing out of the banks when the water was lowered reducing the susceptibility of the stream banks.

Resource Concerns

Facilitation practices may be needed for riparian area improvement. These concerns include plant productivity, health and vigor; streambank erosion; noxious and invasive plants; plant establishment and growth; inadequate domestic stock water; and inadequate cover/shelter for wildlife. All resource concerns will be evaluated on a site-specific basis in accordance with NRCS' Conservation Planning Process.

Crop and Pasture Lands

Irrigated Cropland

There are 66,544 acres of irrigated cropland and irrigated pasture. The irrigated crop and irrigated pasture were planned together because they have similar management. This management requires the addition of fertilizer and irrigation water to supplement the nutrient and water requirements of the crops. The addition of irrigation water can produce some problems by increasing sheet and rill erosion and causing deep percolation of nutrients into ground water. Part of the Bear River, Weston Creek, Deep Creek, Battle Creek, and Fivemile Creek watersheds are included in the Preston/Cache Valley nitrate priority area. Irrigation water management plans and nutrient management plans are practices that may be used to reduce the deep percolation of nutrients into groundwater. Crop rotations on irrigated lands include wheat, barley, oats, corn, alfalfa, and grass pasture.

Dry Cropland

There are 51,534 acres of dry cropland in the southern middle bear planning area. The non-irrigated land is typically winter wheat or barley with some fallowed fields; annually cropped spring wheat or barley; and some dry land alfalfa. Some of the non-irrigated fields with highly erodible soil have been enrolled in CRP which requires the field to be planted to permanent cover, typically introduced grasses with some type of legume and shrub. There has been a movement to plant native grasses, but they have been very difficult to get established.

Range Land

MLRA's and Common Resource Areas
Great Salt Lake – Northern Agriculture Valleys (CRA 28A.5)
Eastern Idaho Plateaus – Sagebrush Steppe and Woodland Covered Hills and Low Mountains & High Elevation Forests and Shrublands & Sagebrush Steppe Valleys (CRA 13.4 & 13.5 & 13.6)
Wasatch and Uinta Mountains – Semiarid foothills, Eastern Idaho (CRA 47.3)

Resource Setting – Rangeland vegetation consists of sagebrush and perennial grasses. Precipitation is 12" to 24", most of which falls as snow in winter and early spring. Elevations are from 4,800 to 8,200 feet. Topography consists of steep slopes and high mountain valleys. Soils are loamy to gravelly. Frost free period ranges from 50 to 120 days. Fencing is generally an existing practice.

Rangeland Assessment – Rangeland WQI worksheets were completed on multiple sites in each of the common resource areas in the Southern Middle Bear subbasin. The Range WQI provides a way to evaluate and score the condition of 8 factors on rangelands to determine water quality impacts and to rate the area in excellent, good, fair, or poor condition

Current Condition – Approximately 73,856 acres of the private rangeland assessed in the Southern Middle Bear subbasin is in fair condition and has minimal impact on the water quality

in Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek. The remaining 18,464 acres are in poor condition and could have a negative impact on water quality. According to the results of the WQI, some sheet and rill erosion and classic gullies are evident on gravelly loam soils. Runoff potential is high to moderate in sagebrush steppe communities. Depending upon valley type and the location of the stream within that valley, natural vegetation buffers vary in width between 25 and 200 feet. Current grazing management results in 70 to 90% grass/shrub cover, with few bare areas. Grazing animals have unlimited access to creeks and springs with minimal sources of livestock watering facilities. Animal productivity and health has no apparent issues under current management schemes.

Water Quality Impacts – The erosion potential is considerable with the moderately to steep slopes (8-35%), fine grained to gravelly texture, and erodible soils with rills and gullies from spring snowmelt and storm events. Additional water impacts may include sediment, nutrients, and bacteria from the unlimited access of livestock to creeks and to springs for livestock watering.

Resource Concerns – Existing grazing management may not meet NRCS resource quality criteria or landowner objectives. Facilitation practices may be needed for range improvement and livestock distribution. These concerns include plant productivity, health and vigor; noxious and invasive plants; plant establishment and growth; inadequate domestic stock water; inadequate quantity/quality of feed and forage for domestic animals; and inadequate cover/shelter for wildlife. All resource concerns will be evaluated on a site-specific basis in accordance with NRCS' Conservation Planning Process.

Suggested BMPs on Rangelands in the Sothern Middle Bear Subbasin
The most common rangeland problem is the lack of proper distribution of livestock grazing. The second most prolific problem is the lack of livestock watering facilities, which worsens the distribution problem. Drought periods and wildfires can cause problems with resulting forage shortages. Moreover, federal grazing allotment policy can create problems because additional private grazing must be secured or animals must stay longer on private rangelands. Consequently, the following BMPs are needed for rangelands in the Southern Middle Bear subbasin: Prescribed Grazing (528A); 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).

Animal Facilities

The Idaho Legislature enacted Idaho law, *I.C. §37-401, Title 37, Chapter 4, Sanitary Inspections of Dairy Products*, which requires sanitary inspections and nutrient management plans for all dairy farms. Existing dairy farms were required to submit a nutrient management plan for approval to ISDA on or before July 1, 2001. In 2000, the Idaho Legislature passed Idaho law, *I.C. §22-4906, Title 22, Chapter 49, Beef Cattle Environmental Control Act*. Beef cattle animal feed operations are required to submit a nutrient management plan to ISDA for approval no later than January 1, 2005.

Field inventories identified 22 sites along the following streams which have a negative influence on the Bear River: Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek or tributaries. Livestock at these animal facilities have direct access to the streams because

they have no off stream water sources and these facilities have insufficient waste structures to contain corral or site runoff.

Threatened and Endangered Species

The threatened and endangered species present in Franklin County include: Canada lynx *(Lynx canadensis)*. Franklin County has one candidate species Yellow-billed cuckoo *(Coccyzus americanus)* and no proposed species & designated/proposed critical habitat (NRCS, 2008). There is one endemic aquatic species of concern the Bonneville cutthroat trout (*Oncorhynchus clarki utah*) that has received special attention by many different agencies within the Bear River basin.

Treatment

Critical Areas

Those areas having the most significant impact on the water quality of the receiving water body are critical areas. These critical areas include pollutant source and transport areas. The watershed consists of approximately 218,944 acres of private land with the predominant private land uses being 118,078 acres of cropland and 92,320 acres of rangeland.

Tiers

Critical areas adjacent to the Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek in Tier 1 are considered highest priority for implementation due to their increased potential to directly impact surface water quality. There are three tiers delineated within the subwatershed. These tiers were determined by the proximity of the critical areas to the §303(d) listed stream segments.

Tier 1 Unstable and erosive stream channels and riparian areas or adjacent fields and facilities that have a direct and substantial negative influence on the stream

Tier 2 Fields or facilities with an indirect, yet substantial negative influence on the stream

Tier 3 Upland areas or facilities that indirectly influence the stream

Treatment Units

The watershed is divided into four treatment units that have similar land uses, soils, productivity, resource concerns and treatment needs. These six subwatersheds will be targeted to receive project funds as they can be secured.

Riparian

This treatment unit covers the land adjacent to streams that have riparian or aquatic plants as the primary plant life. This area is singled out because of its importance to stream health and its management needs.

Cropland

This treatment unit lies between the riparian and rangeland areas, ranging in elevation from 4,400 and 6,000 feet. This area has flat or rolling hills and has soil suitable for producing crops.

This land varies from area to area in slope, elevation, soils, precipitation, management, and production. Major crops raised are alfalfa hay, barley, wheat, grass hay, grass pasture, and corn. Irrigated land generally lies on flat to gently rolling foothills, on lower Lake Bonneville terraces, or on the Bear River delta. Non-irrigated cropland generally occurs on the upper Lake Bonneville terraces and foothills with steeper slopes.

Rangeland

Land in this treatment unit is characterized by the presence of upland vegetation. Vegetation may include native grasses, forbs, shrubs, and trees. The topography is flat to steep with slopes ranging from 0-60 percent.

Animal Facilities

Livestock production is a major industry in area; confined feeding operations exist throughout the project area. Most of the livestock sites are located on or adjacent to a natural or constructed drainage system. These sites represent all types of livestock operations at all levels of management and use. Dairies have been left out of this treatment unit because they all have regulations that require them to contain any waste.

Implementation Priority

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:
No action
Land treatment with non-structural BMPs on crop and rangelands
Land treatment with structural and non-structural BMPs on crop and rangelands
Riparian and stream channel restoration
Animal facility waste management

Description of Alternatives

Alternative 1 - No action
This alternative continues the existing conservation programs without additional project activities. The identified problems would continue to negatively impact beneficial uses in Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek.

Alternative 2 - Land treatment with non-structural BMPs on crop and rangelands
This alternative would reduce accelerated sheet and rill, and gully erosion this will improve water quality in the watershed and reduce pollutant loading to the Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek. Beneficial uses may be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Land treatment with structural and non-structural BMPs on crop and rangelands
This alternative would reduce accelerated sheet and rill, and gully erosion. It is anticipated this alternative will reduce soil erosion to "T". This will improve water quality in the watershed and reduce pollutant loading to the Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek. Beneficial uses would be improved or achieved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 – Riparian and stream channel restoration
This alternative would reduce accelerated streambank and bed erosion. This alternative would improve water quality, riparian vegetation, aquatic habitat, and fish passage in the watershed. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 5 – Animal facilities
This alternative would reduce sediment and nutrient runoff from animal facilities. This would improve water quality in the watershed and reduce pollutant loading to the Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The FSWCD selected Alternatives 3, 4 and 5 for this watershed. These three alternatives together meet the objectives set forth in the FSWCD five year plan by improving water quality in the Bear River, Weston Creek, Deep Creek, Battle Creek, Strawberry Creek, and Fivemile Creek watersheds (FSWCD, 2006). Table 7 is an outline of the implementation of alternatives from planning to effectiveness monitoring.

Table 7. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Develop conservation plans and contracts	Completed contract agreements	2013
Finalize BMP designs	Completed BMP plans and designs	2016
Design and install approved BMPs	Certify BMP installations	2022
Track BMP installation	Implementation progress report	2023
Evaluate BMP & project effectiveness	Complete project effectiveness report	2025

Estimated BMP Implementation Costs

Conservation efforts to date in the watershed have demonstrated that landowners will install BMPs when technical and financial assistance is available. The proposed treatment for pollutant reduction will be to implement BMPs through conservation plans. Table 8 lists some of the BMPs, which may be used to treat the resource concerns with their unit amounts and costs. With implementation of these BMPs, beneficial uses in the watershed may be obtained.

Table 8. Estimated BMP Installation Costs for the Southern Middle Bear Subbasin

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	Unit Amount	Total Funds
TU1 Stream Channels & Riparian 853 ac	Channel Vegetation	acre	$2,100	65	136,500
	Conservation Cover	acre	$60	185	11,100
	Critical Area Planting	acre	$250	73	18,250
	Fence, 4-wire	ft.	$2	27,992	55,984
	Heavy Use Area Protection	acre	$50	25	1,250
	Pest Management	acre	$20	428	8,560
	Prescribed Grazing	acre	$5	853	4,265
	Riparian Forest Buffer	acre	$185	189	34,965
	Stream Bank Protection	ft.	$20	7,524	150,480
	Stream Channel Stabilization	ft.	$35	2,952	103,320
	Tree/Shrub Establishment	acre	$290	89	25,810
	Use Exclusion (Riparian)	acre	$100	192	19,200
				Subtotal	569,684
TU2 Crop Lands 57,788 ac	Contour Farming	acre	$3	41,721	125,163
	Conservation Crop Rotation	acre	$2	43,341	86,682
	Field Border	acre	$88	3,208	282,304
	Critical Area Planting	acre	$200	1,913	382,600
	Deep Tillage	acre	$16	33,158	530,528
	Drip Irrigation	No.	$2	47,520	95,040
	Irrigation Water Management	acre	$1	18	18
	Nutrient Management	acre	$3	57,788	173,364
	Pasture & Hayland Planting	acre	$100	1,156	115,600
	Pest Management	acre	$20	12,535	250,700
	Residue Management	acre	$20	24,115	482,300
	Water & Sediment Control Basin	No.	$800	768	614,400
	Windbreak/Shelterbelt	ft.	$4	47,520	190,080
				Subtotal	3,328,779
TU3 Range Lands 37,092 ac	Brush Management	acre	$30	6,016	180,480
	Fence, 4-wire	ft.	$2	74,923	149,846
	Pest Management	acre	$20	5,530	110,600
	Pipeline, PE 100 psi, 2.0"	ft.	$2	131,433	262,866
	Prescribed Grazing	acre	$3	18,547	55,641
	Pumping plant for water control	No.	$5,000	60	300,000
	Range Planting	acre	$80	6,233	498,640
	Spring Development	No.	$2,400	45	108,000
	Structure For Water Control	No.	$3,000	33	99,000

	Water Well	No.	$8,250	47	387,750
	Watering Facility	No.	$1,150	267	307,050
				Subtotal	2,459,873
Tu4 Animal Facility 22 ea	Corral Fence	Ft.	$15	33,000	495,000
	Nutrient Management	acre	$3	440	1,320
	Pipeline	Ft.	$2	22,000	44,000
	Pumping Plant for water Facility	No.	$3,000	22	66,000
	Watering Facility	No.	$1,000	66	66,000
	Water Well	No.	$8,250	22	181,500
	Waste Storage Facility	No.	$20,000	22	440,000
				Subtotal	1,293,820
				Total	7,652,156

Funding

Financial and technical assistance for installation of BMPs is needed to ensure success of this implementation plan. There are many potential sources for funding that will be actively pursued by the Franklin SWCD to implement water quality improvements on private agriculture and grazing lands. Some of the sources are listed below:

CWA 319: These are EPA funds, which are allocated to the State of Idaho DEQ to be distributed on a competitive basis. These funds are used to treat non-point sources identified in the TMDL implementation plan.
http://www.deq.idaho.gov/water/prog_issues/surface_water/nonpoint.cfm#management

HIP: IDFG objective is 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

The Partners for Fish and Wildlife Program in Idaho began as a small "on-the-ground" restoration program in 1988. The program has grown at a steady pace since then. In Idaho, the focus has been on the restoration of degraded riparian areas along streams, and shallow wetland restoration. Recently, there has been increasing interest for in-stream restoration.
http://www.fws.gov/partners/pdfs/ID-needs.pdf

WQPA: The ISCC administers The Water Quality Program for Agriculture cost-share program. This program is also coordinated with the TMDL implementation plan, which identifies the highest priority areas. http://www.scc.state.id.us/programs.htm

RCRDP: The ISCC administers the Resource Conservation and Rangeland Development Program. This program is offers low interest loans with terms up to 15 years.
http://www.scc.state.id.us/programs.htm

Conservation Improvement Grants, administered by the ISCC, are 50% grants which have a 1 to 2 year contract. http://www.scc.state.id.us/programs.htm

SRF: The ISCC administers the State Revolving Fund. This program offers loans for the installation of BMPs. Loans have a minimum of $500,000 with a maximum term of 20 years. http://www.scc.state.id.us/programs.htm

CRP: The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners. Through CRP, you can receive annual rental payments and cost-share assistance to establish long-term, resource-conserving covers on eligible farmland. FSA makes annual rental payments based on the agriculture rental value of the land, and it provides cost-share assistance for up to 50% of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years. http://www.fsa.usda.gov/dafp/cepd/crp.htm

EQIP: Environmental Quality Incentives Program is a voluntary conservation program from the Natural Resources Conservation Service (NRCS). Through EQIP, farmers may receive financial and technical help with structural and management conservation practices on agricultural land. http://www.id.nrcs.usda.gov/programs/eqip/index.html

WHIP: The Wildlife Habitat Incentives Program is a voluntary program from the NRCS. People who want to develop and improve wildlife habitat primarily on private land can receive technical assistance and up to 75% cost-share assistance. http://www.id.nrcs.usda.gov/programs/whip/index.html

WRP: The Wetland Reserve Program is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The NRCS provides technical and financial support to help landowners with their wetland restoration efforts. WRP offers three enrollment options: Permanent easement, 30-year easement; and Restoration cost-share agreement. http://www.id.nrcs.usda.gov/programs/wrp/index.html

GRP: The Grassland Reserve Program is a voluntary program offering landowners the opportunity to protect, restore and enhance grasslands on their property. The NRCS, FSA, and Forest Service are coordinating implementation of GRP, which helps landowners restore and protect grass, range, pasture, shrub lands and certain other lands and provides assistance for rehabilitating grasslands. http://www.id.nrcs.usda.gov/programs/grp/index.html

PL-566: Small Watershed program administered by the NRCS.

CTA: NRCS provides free technical assistance to help farmers and ranchers identify and solve natural resource related problems on their farms and ranches. This may come as advice and counsel, through the design and implementation of a practice or treatment, or part of an active conservation plan. This is provided through the local Soil Conservation District and NRCS. http://www.id.nrcs.usda.gov/

GLCI: The Grazing Land Conservation Initiative was established in 1991 by a coalition of livestock producer organizations, scientific and professional grazing resource organizations, conservation and environmental groups, and state and federal natural resource and agriculture

agencies 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/index.htm

Outreach

Conservation partners in the Sothern Middle Bear subbasin will use their combined resources to provide information about BMPs to improve water quality to agricultural landowners and operators within the subbasin. Newspaper articles, project tours, and one-on-one personal contact may be used as outreach tools.

Monitoring and Evaluation

Field Level

At the field level annual contract status reviews will be conducted to insure that the contract is on schedule and that BMPs are being installed according to standards and specifications. BMP effectiveness monitoring will be conducted on installed BMPs to determine adequacy of installation, consistency of operation and maintenance, and relative effectiveness of installed BMPs in reducing water quality impacts and the effectiveness of BMPs in controlling agriculture nonpoint source pollution. These BMP effectiveness evaluations will be conducted according to the protocols out lined in the Agriculture Pollution Abatement Plan and the ISCC Field Guide for Evaluating BMP Effectiveness.

RUSLE and SISL are used to predict sheet and rill erosion on non-irrigated and irrigated lands. The Alutin method, Imhoff Cones and direct volume measurements are used to measure sheet and rill, irrigation-induced and gully erosion. SVAP and SECI are used to assess aquatic habitat and streambank erosion and lateral recession rates. Idaho OnePlan, 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 to subbasin level, there are many government and private groups involved with water quality monitoring. The IDEQ uses BURP is 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.

For funded projects annual project reviews will be conducted to insure the project is kept on schedule. With many projects being implemented across the state the ISCC developed a software program to the track costs and the amount of each BMP installed. This program can show what has been installed by project or the watershed level and as well as at the subbasin level and state level. These project and program reviews will insure that TMDL implementation is 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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Abbreviations

FSWCD	Franklin Soil and Water Conservation District
BLM	Bureau of Land Management
CTNF	Caribou Targhee National Forest
IDL	Idaho Department of Lands
IDEQ	Idaho Department of Environmental Quality
ISDA	Idaho State Department of Agriculture
NRCS	Natural Resource Conservation Service
ISCC	Idaho Soil Conservation Commission
IASCD	Idaho Association of Soil Conservation Districts
USU	Utah State University
UACD	Utah Association of Conservation Districts
USGS	United States Geological Survey
§303(d)	Section in the Clean Water Act requiring states to list water quality limited waters
§319	Nonpoint Source Management Program
BURP	Beneficial Use Reconnaissance Program
BMP	Best Management Practice
SAWQP	State Agriculture Water Quality Program
TMDL	Total Maximum Daily Load
TU	Treatment Unit
"T"	Tolerable Soil Loss Rate
TSS	Total Suspended Sediment
CFS	Cubic Feet per Second
SVAP	Stream Visual Assessment Protocol
CRP	Conservation Reserve Program
CAFO	Confined Animal Feeding Operation
AFO	Animal Feeding Operation
SECI	Stream Erosion Condition Inventory
RUSLE	Revised Universal Soil Loss Equation
SISL	Surface Irrigation Soil Loss
FCFD	Franklin County Fire District