Portneuf River
Total Maximum Daily Load
Agricultural Implementation Plan

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Developed for the

Idaho Department of Environmental Quality

Prepared by the
Idaho Soil Conservation Commission

In Cooperation With
Caribou Soil Conservation District
Portneuf Soil and Water Conservation District
Idaho Association of Soil Conservation Districts
Idaho State Department of Agriculture
USDA-Natural Resources Conservation Service

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Executive Summary

The Portneuf River subbasin is located in southeastern Idaho and covers parts of Bannock, Bingham, Caribou and Power counties. The subbasin encompasses an area of 848,755 acres or 1,326 square miles. Soils are mainly silt loams on 0 to 20% slopes. The subbasin contains 576 miles of perennial streams, 903 miles of intermittent streams and 140 miles of canals. About 488,124 acres or 58% of the subbasin is privately owned. Crop land is the predominant private land use with 256,100 acres. Several watersheds are transitioning from agricultural to urban, residential or recreational land uses. Approximately 45,000 acres outside of the urban areas are zoned as rural subdivisions.

The goal of the Portneuf River Total Maximum Daily Load (TMDL) Agricultural Implementation Plan is to restore the impaired beneficial uses such as cold water biota, salmonid spawning, primary contact recreation and secondary contact recreation. This implementation plan identifies best management practices (BMPs) to improve approximately 223 miles of streams and 446,781 acres of private agricultural land.

The Portneuf River and ten of its tributaries are on the state of Idaho's 1998 §303(d) list. The Idaho Department of Environmental Quality (IDEQ) prepared the <u>Portneuf River TMDL: Water Body Assessment and Total Maximum Daily Load</u> in 1999. Pollutants from agricultural sources that are entering the river and its tributaries include total suspended sediment, total phosphorus, total inorganic nitrogen and fecal coliform bacteria.

BMPs have been implemented on approximately 118,000 acres. The estimated total cost of these BMPs is about $14 million. The 85,000 acres enrolled in the Conservation Reserve Program (CRP) have had the largest positive impact on water quality. The second largest impact on water quality was the completion of five State Agricultural Water Quality Program (SAWQP) projects that installed BMPs on 35,000 acres.

Agricultural sources of sediment include sheet and rill, gully, stream channel and irrigation-induced erosion. Large contributors such as Marsh, Rapid and Dempsey creeks are considered high priority for BMP application. The most effective BMPs for reducing these agricultural sediment sources include channel vegetation, conservation cover, critical area planting, prescribed grazing, residue management, riparian forest buffer, stream bank protection, terrace, tree/shrub establishment and use exclusion.

Bacterial sources from agricultural land include animal waste storage in animal feed operations and corrals, applications of animal waste on crop and pasture lands and livestock droppings on range lands or near water bodies. Rapid, Marsh and Twentyfourmile creeks have significant loads of fecal coliform bacteria and *E. coli*. There are approximately 250 animal facilities, corrals or pens in the subbasin. The most effective BMPs for reducing these agricultural bacteria sources include waste storage facility, watering facility, riparian forest buffer and use exclusion.

Application of fertilizer and animal waste to non-irrigated and irrigated crop or pasture land creates the potential for nitrogen and phosphorus loss by erosion and leaching. Manure from storage areas or animal droppings during grazing or watering are sources of nitrogen and phosphorus. The Portneuf River, Marsh and Rapid creeks have significant loads of total phosphorus and total inorganic nitrogen and are more than sufficient to support algae growth. Water quality sampling indicates nitrate to be the most widespread contaminant in Idaho's ground water. Two areas, Pocatello and Soda Springs/Bear River, were identified by IDEQ as nitrate priority areas with degraded ground water quality due to excessive nitrates. The most effective BMPs for reducing agricultural nitrogen and phosphorus sources are nutrient management, irrigation water management, waste storage facility, watering facility, riparian forest buffer and use exclusion.

Because the TMDL reductions are so substantial, it is estimated that 92% or 412,934 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. The watersheds or subwatersheds were ranked for implementation based upon their pollutant loads, percent contribution to the river and TMDL target exceedance.

Table ES-1. Priority Ranking for TMDL Agricultural BMP Implementation

Priority Category	Watershed or Subwatershed	Sediment Ranking	Bacteria Ranking	Phosphorus Ranking	Nitrogen Ranking
HIGH	Marsh Creek	1	3	3	3
	Upper Rapid Creek	2	1	2	5
	Dempsey-McCammon	3	6	6	6
	Lower Rapid Creek	4	4	1	4
MEDIUM	Twentyfourmile Creek	5	2	7	7
	Upper Portneuf River	6	8	4	1
	Lower Portneuf River	8	5	5	2
LOW	East Bench	7	7	9	9
	Pocatello Creek	9	9	8	8

Critical areas adjacent to the river and tributaries are considered high priority due to the direct impact on surface waters. Each critical area is split into treatment units with similar land uses, soils, productivity, resource concerns and treatment needs. About 80,000 acres enrolled in CRP, 38,000 acres of crop, pasture and range land, 74 acres of riparian areas and 10 animal facilities were removed from these critical areas because they meet resource quality criteria. Approximately 2,257 acres of riparian land, 134,860 acres of crop and pasture lands, 157,795 acres of range land and 245 animal facilities don't meet resource quality criteria and need to be treated to meet the recommended TMDL reductions.

In 1996, the Idaho Association of Soil Conservation District estimated the cost to implement the agricultural component of the Portneuf River TMDL was $33 million. Currently, the estimated cost for the agricultural portion of the TMDL is $51 million. This estimate is based on the proposed treatment unit amounts and applied to current BMP costs. These estimated costs were prepared by summing the implementation, administrative and technical costs for each watershed or subwatershed. The estimated BMP implementation cost-share is $29 million with $10 million of participant funds for a total BMP implementation cost of $39 million.

The following alternatives were developed for consideration. The <u>no action</u> alternative continues the existing conservation programs without additional project activities. The <u>land treatment with BMPs on crop, pasture and range lands</u> alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce bacteria, nitrogen and phosphorus contamination from animal waste and fertilizer applications. The <u>riparian and stream channel restoration</u> alternative would reduce accelerated stream bank and bed erosion. It would also reduce bacteria, nitrogen and phosphorus contamination from entering the river and creeks. The <u>animal facility waste management</u> alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. The Portneuf Soil and Water Conservation and Caribou Soil Conservation districts selected a combination of the last three alternatives. These alternatives meet the objectives in their resource conservation plans. Past implementation efforts and a history of conservation has demonstrated that landowners are more likely to install BMPs when technical and financial assistance is available. There are several funding sources available for installation of BMPs. Historically, state and federal funds were used to install BMPs. However, state-funded programs have decreased due to declining revenues. In the future, it is very likely that federal funds will comprise the bulk of BMP installation. The proposed timeline for implementation over the next 25 years can only occur if all programs are fully funded and all landowners participate.

Introduction

Purpose

The purpose of this document is to identify best management practices (BMPs) that are needed to meet Total Maximum Daily Load (TMDL) targets on the Portneuf River and its tributaries. This implementation plan identifies BMPs to improve approximately 223 miles of streams and 446,781 acres of private agricultural land within the subbasin. This plan outlines an adaptive management approach for developing conservation plans and implementing BMPs to meet the recommendations for the TMDL.

Portneuf River TMDL

The Idaho Department of Environmental Quality (IDEQ) prepared the Portneuf River TMDL: Water Body Assessment and Total Maximum Daily Load in 1999. IDEQ submitted the Portneuf River TMDL to US Environmental Protection Agency (USEPA) in April 1999, then revised the TMDL in November 1999, and then amended it in November 2000. USEPA approved the TMDL on April 18, 2001. The TMDL addresses 26 segments for sediment, 13 segments for nutrients, 1 segment for bacteria and 1 segment for dissolved oxygen.

TMDL Pollutant Reductions

Total suspended sediment (TSS), total phosphorus (TP), total inorganic nitrogen (TIN), fecal coliform bacteria and *E. coli* are the significant pollutants entering the river and its tributaries from agricultural sources. The Portneuf River TMDL requires a 65% reduction of TSS, a 39% reduction of TP, a 66% reduction of TIN and an 89% reduction of fecal coliform bacteria at US Geological Survey's (USGS) gage in Pocatello.

TMDL Pollutant Targets

Sediment

TSS recommendations for the Portneuf River and tributaries are subject to both low and high flow targets. The TSS low flow target cannot exceed a 28-day average of greater than 50 milligrams per liter (mg/L). The TSS high flow target cannot exceed a 14-day average of greater than 80 mg/L (IDEQ, 1999).

The TMDL also recommends a target for sediment as percent depth fines in the stream bed. Subsurface stream bed sediment less than 6.25 mm not to exceed a 5-year mean of greater than 25% by volume in riffles. And subsurface streambed sediment less than 0.85 mm not to exceed a 5-year mean of greater than 10% by volume in streams with salmonid spawning as a beneficial use in riffles (IDEQ, 1999).

Nutrients

The TP target for the Portneuf River and tributaries shall not exceed 0.075 mg/L of phosphorus as total phosphorus in rivers and shall not exceed 0.025 mg/L of phosphorus as total phosphorus in Hawkins Reservoir. The TIN target for the Portneuf River and tributaries shall not exceed 0.3 mg/L of nitrogen as total inorganic nitrogen (IDEQ, 1999).

Bacteria

The fecal coliform bacteria target for rivers or creeks that have primary contact recreation (PCR) as a designated beneficial use is the water quality standard based on the PCR criteria (IDEQ, 1999). The current *E. coli* standard is set at a single sample of 406 organisms per 100 ml or a maximum geometric mean no greater than 126 organisms per 100 ml based on a minimum of five samples taken, every three to five days, over a thirty-day period (IDAPA 58.01.02.251.01).

The fecal coliform bacteria target for rivers or creeks that have secondary contact recreation (SCR) as a designated beneficial use is the water quality standard based on the secondary contact recreation criteria (IDEQ, 1999). The current *E. coli* standard is set at a single sample of 576 organisms per 100 ml or a maximum geometric mean no greater than 126 organisms per 100 ml based on a minimum of five samples taken, every three to five days, over a thirty-day period (IDAPA 58.01.02.251.01).

Goal

The goal of the Portneuf River TMDL Agricultural Implementation Plan is to restore the impaired beneficial uses such as cold water biota, salmonid spawning, primary contact recreation and secondary contact recreation.

Objectives

The objectives of this plan will reduce the amount of sediment, bacteria, phosphorus and nitrogen in the Portneuf River and its tributaries from agricultural sources. Several technical, educational and financial tasks will be needed to accomplish the objectives, which include:

- Reduce sediment from sheet/rill, gully, irrigation-induced & stream channel erosion on agricultural land
- Reduce nutrient runoff or leaching from fertilizer and animal waste applications on agricultural land
- Reduce fecal coliform bacteria runoff from animal facilities and waste applications on agricultural land
- Reduce impacts to aquatic habitat from human and livestock activities on agricultural land
- Monitor implementation progress and effectiveness

Installation costs for agricultural lands are estimated in this plan to provide landowners, local communities, government agencies, residents and stakeholders some perspective on the technical and economic demands of meeting the TMDL goals. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Table 37. This plan recommends that agricultural landowners contact the Portneuf Soil and Water Conservation District (PSWCD), Caribou Soil Conservation District (CSCD), Natural Resources Conservation Service (NRCS), Idaho Association of Soil Conservation Districts (IASCD), Idaho State Department of Agriculture (ISDA) or the Idaho Soil Conservation Commission (ISCC) for assistance. These agencies will help landowners determine the need to address water quality and other natural resource concerns on their property. This plan is not intended to identify which specific BMPs are appropriate for specific agricultural fields, but rather provides a subbasin approach to address water quality problems on agricultural lands.

Subbasin Assessment

General Description

The Portneuf River subbasin is located in southeastern Idaho and covers parts of Bannock, Bingham, Caribou and Power counties as shown in Figure 1. The subbasin encompasses 848,755 acres or 1,326 square miles as shown in Figure 2.

Figure 1. Location of the Portneuf River Subbasin

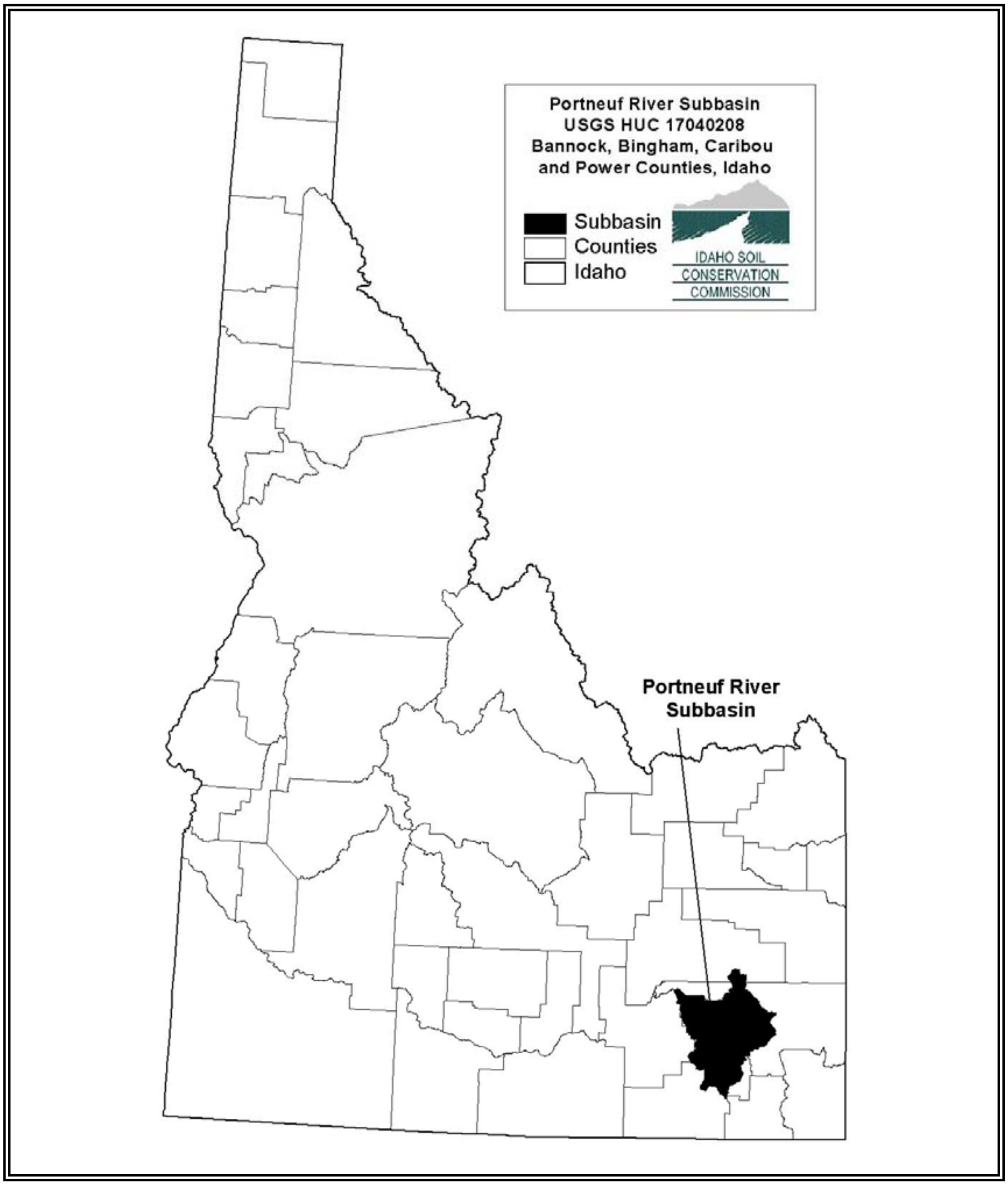
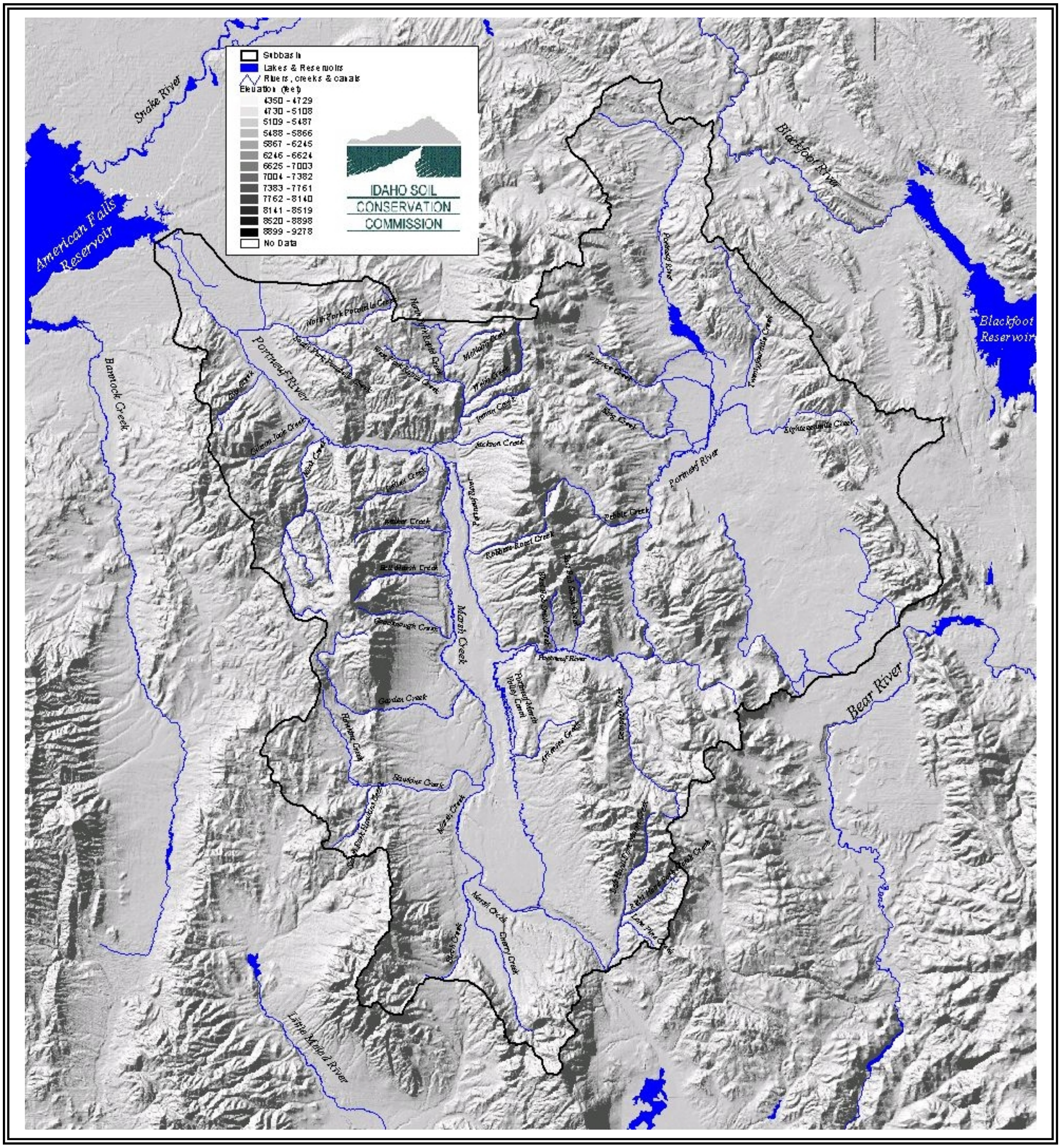


Figure 2. Area Map of the Portneuf River Subbasin



Soils

The Bannock County Soil Survey was completed in 1987 by the US Department of Agriculture (USDA) Soil Conservation Service (SCS) and covers about 60% of the subbasin. Soils in the subbasin are mainly silt loams on 0 to 20% slopes, however a variety of soils are present as shown in Table 1 and Figure 3. Highly erodible soils cover about two-thirds of the private land, which are shown in Figure 4. In order to determine soils information regarding specific fields or properties within the subbasin, please refer to the soil survey published by NRCS for Bannock County (SCS, 1987). There is no published soil survey in Caribou County. Soils information can be obtained by contacting the NRCS field office in Soda Springs.

Table 1. General Soil Associations in the Portneuf River Subbasin

Soil Association	Description
Downata-Bear Lake-Tendoy	Very deep, very poorly drained and poorly drained soils that formed in silty alluvium and organic material and are subject to flooding
Inkom-Joevar	Very deep, moderately well drained and well drained soils that formed in silty alluvium
Arimo-Downey-Bahem	Very deep, well drained soils that formed in loess and silty alluvium overlying alluvial sand, gravel, cobbles and stones
Lava flows-McCarey-McCarey Variant	Lava flows and moderately deep and shallow, well drained soils that formed in loess, silty alluvium and material weathered from basalt
Ririe-Rexburg-Lanoak	Very deep, well drained soils that formed in loess and in silty alluvium derived from loess
Camelback-Hades-Valmar	Very deep to moderately deep, well drained, noncalcareous soils that formed in alluvium, colluvium and residuum derived from quartzite and related rock
Cedarhill-Ireland	Very deep and moderately deep, well drained, calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite and related rock
Sedgeway-Pavohroo-Harkness	Very deep, well drained, cold soils that formed in alluvium and colluvium derived from sedimentary and metasedimentary rock and in alluvium derived from loess
Bear Lake-Lago-Merkley	Very deep, moderately well to very poorly drained, soils formed in mixed alluvium
Rexburg-Ririe-Iphil	Deep and very deep, well drained soils formed in loess and silty alluvium from loess
Blacknoll-Sadorous	Moderately deep, well drained soils formed in eolian sands with some influence from silty loess and silty alluvium from loess
Bancroft-Paulson-Lanark	Very deep, well drained soils formed in loess and mixed alluvium
Ireland-Cedarhill-Pavohroo	Moderately deep to very deep, well drained soils formed in residuum and alluvium from limestone and dolomite
Lanark-Dranyon-Nielson	Shallow to very deep, well drained soils formed in loess and mixed alluvium
Yeate Hollow-Ant Flat-Frenchollow	Very deep, well drained and moderately well drained soils formed in residuum and alluvium from sandstone, conglomerate and quartzite

Figure 3. Soil Surface Texture in the Portneuf River Subbasin

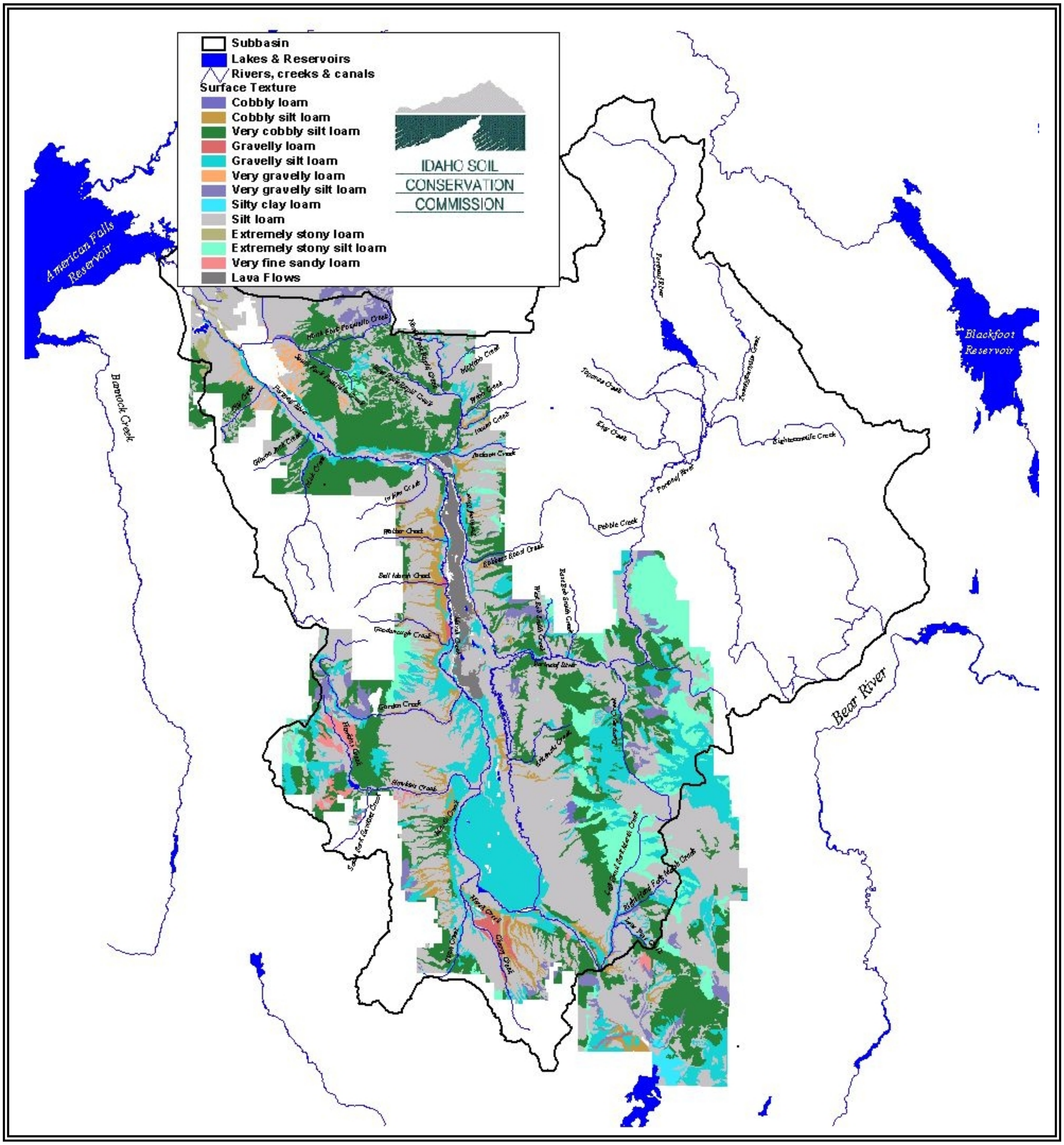
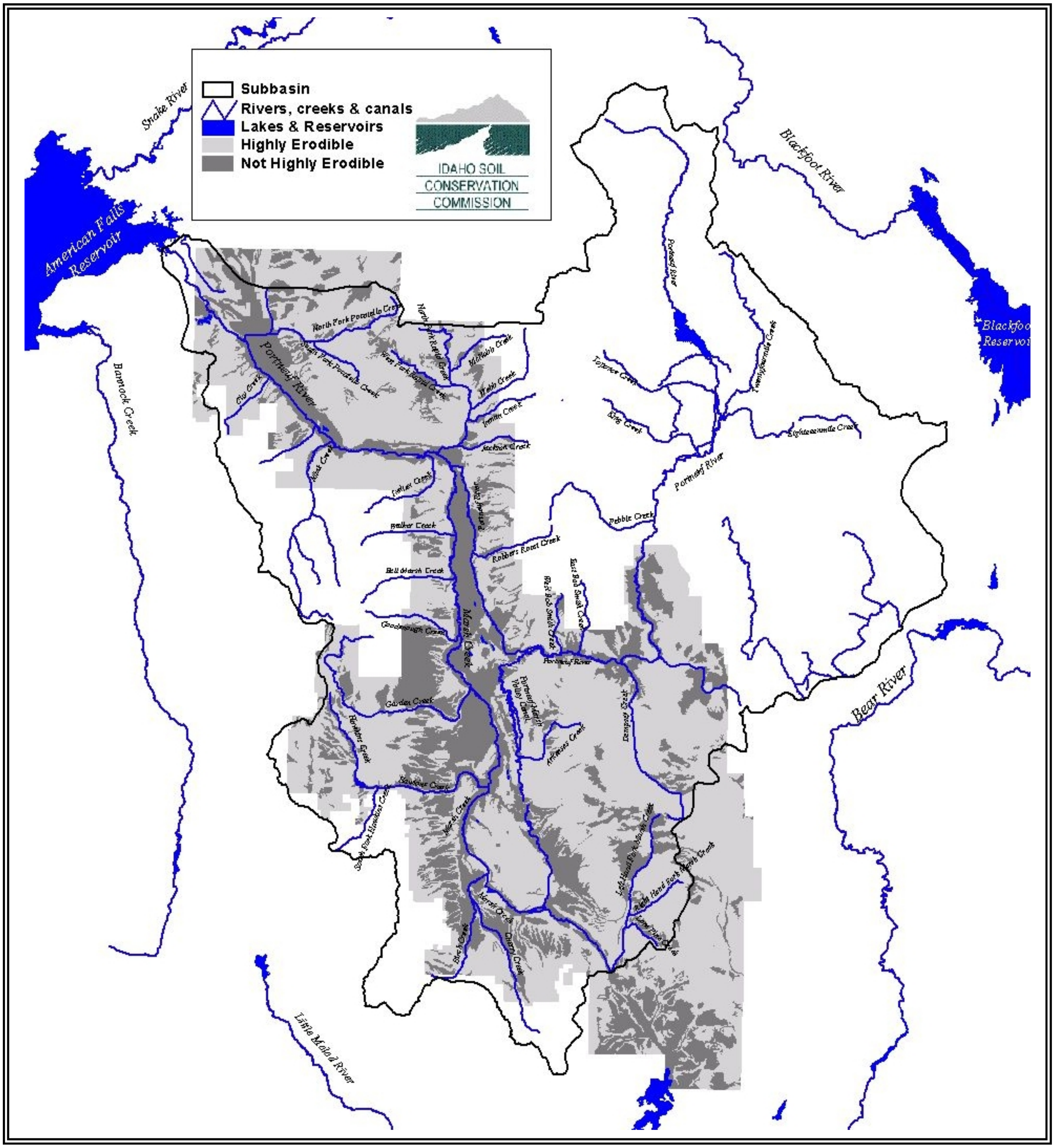


Figure 4. Highly Erodible Soils in the Portneuf River Subbasin



Climate

The subbasin's semi-arid climate is the result of the Cascade and Sierra Mountains to the west and the Bitterroot and Rocky Mountains to the north which effectively block Pacific moisture (NWS, 2002). Annual precipitation, shown in Figure 5, averages 12 inches at Pocatello to 16 inches at McCammon, Grace and Soda Springs (Abramovich et al., 1999). Mountainous regions above 7,000 feet average 20 to 30 inches annually. The subbasin is characterized by cold winters and hot dry summers. Average annual temperature is 41 °F at Pocatello and McCammon and 46 °F at Grace. Temperature extremes range from -40 to 104 °F. The average growing season length varies from 125 days at Grace to 148 days at Pocatello. The last freeze is usually May 5th at Pocatello and May 19th at Grace. The first freeze is usually September 22nd at Grace and October 1st at Pocatello (Abramovich et al., 1999).

Surface Water

The subbasin is located in the Snake River basin. The Portneuf River originates at 6,100 feet elevation and flows 111 miles descending to 4,350 feet elevation where the river empties into the American Falls Reservoir. The river begins on Shoshone-Bannock Tribal land and flows south for 18 miles to Chesterfield Reservoir. The river then flows south for 25 miles to Lava Hot Springs. The river then flows west for 10 miles and turns north for 16 miles to Inkom. At this point Marsh Creek enters the river and flows west for 10 miles. Just south of Pocatello near the Portneuf Gap the river flows northwesterly for 21 miles until it enters American Falls Reservoir. The Portneuf River is a fifth-order stream, with one fourth-order tributary and nine third-order tributaries. For purposes of this plan, the watersheds and subwatersheds, in Figure 6, were delineated. The subbasin contains 576 miles of perennial streams, 903 miles of intermittent streams and 140 miles of canals that are shown in Figure 7. In addition, there are eight reservoirs with 23,000 acre-feet of storage covering about 1,600 acres.

Water Quantity

Water yield in the subbasin averages 202,000 acre-feet annually with a high of 509,000 acre-feet in 1984 and a low of 77,000 acre-feet in 1934 (USGS, 2002). Discharge measurements at the Pocatello USGS gage indicated that the river and its tributaries are typical of rivers in the intermountain west. The river's discharge peaks in late April or early May as the snowpack melts and irrigation water is released from storage reservoirs. Flows during the rest of the year tend to be low and constant.

Portneuf River flows at the Pocatello USGS gage from 1950 to 2001 averaged 298 cfs, with a low of 0.23 cfs and a peak runoff high of 2,850 cfs. The average peak flow during that same period was 1,030 cfs and normally occurred the last week in April (USGS, 2002). Portneuf River flows during 1950 to 1998 at the Topaz USGS gage, below Lava Hot Springs, averaged 205 cfs, ranging between 46 cfs to 3,250 cfs. The average peak flow during that same period was 712 cfs and usually occurred during the last week of April. Marsh Creek flows from 1954 to 2001 at the Marsh Creek USGS gage, near McCammon, averaged 86 cfs, ranging between 11 cfs and 1,100 cfs. The average peak flow during that same period was 344 cfs and usually occurred during the last week of March (USGS, 2002).

The flow in the Portneuf River is regulated by Chesterfield Reservoir, an earthen dam completed in 1912 and raised seven feet in 1950 with a storage capacity of 20,504 acre-feet. Twentyfourmile Reservoir has a storage capacity of 700 acre-feet. Hawkins Reservoir stores about 880 acre-feet and Wiregrass Reservoir stores about 71 acre-feet. There are flow diversions above the Pocatello USGS gage for about 55,000 irrigated acres, of which about 13,000 acres are irrigated by ground water withdrawals (USGS, 2002). The largest of these is the Portneuf-Marsh Valley Canal Company (PMVCC) diversion above McCammon on the Portneuf River.

Figure 5. Annual Precipitation in the Portneuf River Subbasin

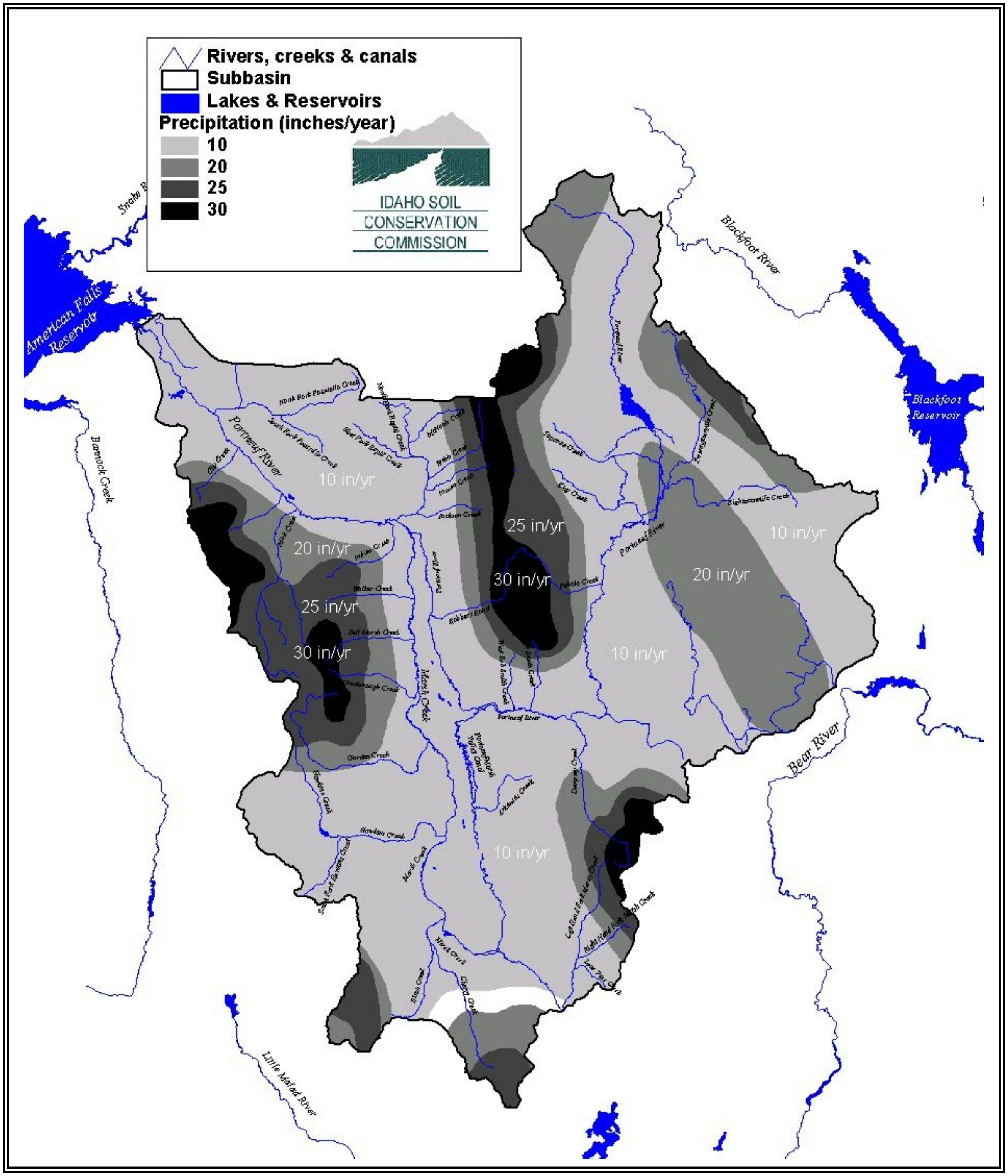


Figure 6. Watersheds and Subwatersheds in the Portneuf River Subbasin

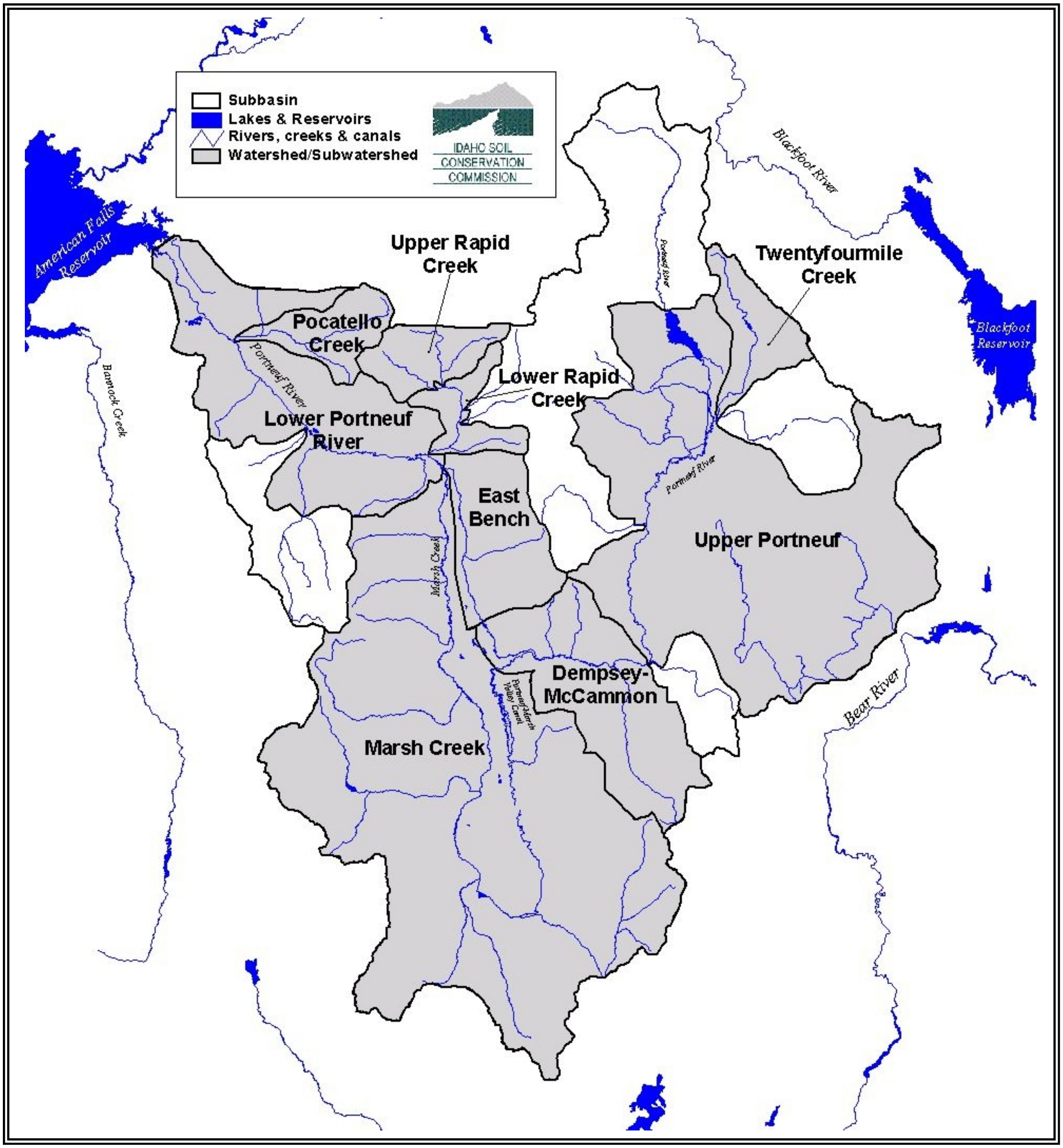


Figure 7. Surface Hydrology in the Portneuf River Subbasin

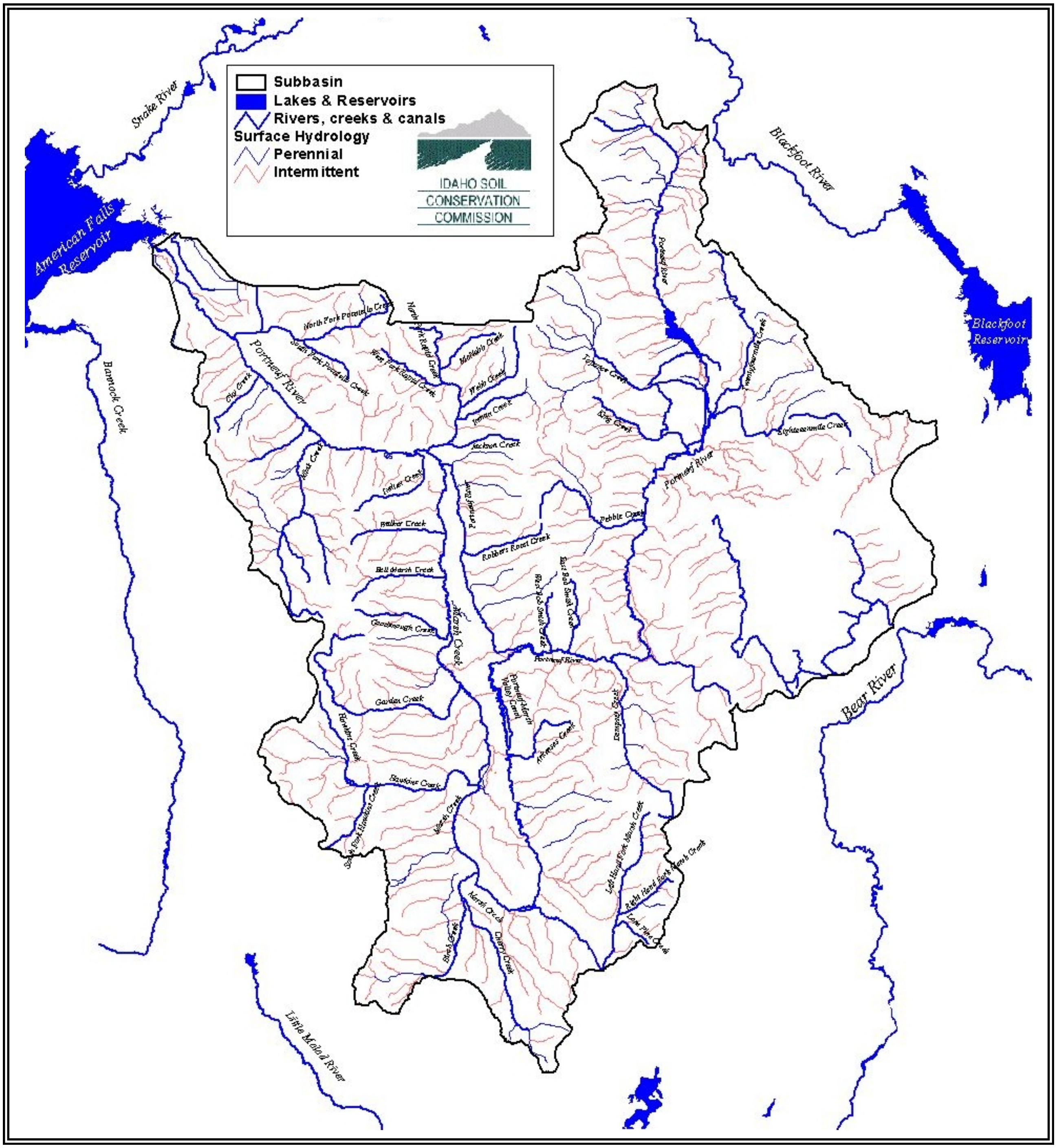


Table 2. USGS Gages in the Portneuf River Subbasin

Agency	Site Number	Site Description	Period of Record
USGS	13070000	Portneuf River above Reservoir near Chesterfield	1912 to 1914
USGS	13070500	Portneuf Div Channel near Chesterfield	1914
USGS	13071000	Portneuf River below Reservoir near Chesterfield	1912 to 1915
USGS	13071500	Toponce Creek near Chesterfield	1912 to 1914
USGS	13072000	Portneuf River near Pebble	1912 to 1977
USGS	13072500	Pebble Creek near Pebble	1911 to 1914
USGS	13073000	Portneuf River at Topaz	1913 to 2000
USGS	13073500	Portneuf River at McCammon	1896
USGS	13074000	Birch Creek near Downey	1912 to 1949
USGS	13075000	Marsh Creek near McCammon	1954 to 2001
USGS	13075100	Rapid Creek near Inkom	1979 to 1986
USGS	13075500	Portneuf River at Pocatello	1897 to 2001
USGS	13075700	South Fork Pocatello Creek near Pocatello	1960 to 1970
USGS	13075900	Fort Hall/Michaud Canal near Pocatello	1964 to 1983
USGS	13075910	Portneuf River near Tyhee	1985 to 1994

Table 3. IDWR Regulated Dams in the Portneuf River Subbasin

IDWR Dam	Dam Name	County	River	Purpose	Capacity (acre feet)	Height (ft)
29-0430	Hawkins	Bannock	Hawkins Creek	Irrigation	880	29.0
29-7459	Lava Ranch	Bannock	Deer Creek	Stockwater & Fish Propagation	15	17.0
29-7071	Perkins	Caribou	Tributary to Portneuf River	Irrigation	99	8.028.
29-2065	Portneuf (Chesterfield)	Caribou	Portneuf River	Domestic & Irrigation	20,504	47.0
29-7437	Simplot Effluent Irrig	Bannock	Tributary to Ft Hall Canal & Effluent	Irrigation	860	25.0
29-2563	Thompson	Bannock	Yago Creek	Irrigation	8	13.6
29-2558	Twenty Four Mile	Caribou	Twentyfourmile Creek	Domestic & Irrigation	700	23.4
29-2560	Wiregrass	Bannock	Wiregrass Creek	Irrigation	71	14.0

CAPACITY - storage capacity in acre-feet at maximum water storage elevation
HEIGHT - Hydraulic height in feet from toe to maximum water storage elevation

Water Quality

Water quality in the subbasin has been the subject of numerous studies and monitoring projects (IDEQ, 1999). USEPA rates the water quality of the subbasin as a five, on a scale of one to six; with six being the poorest (IDEQ, 1999). Numerous studies have found fish, algae and macroinvertebrates that are tolerant of degraded water quality (IDEQ, 1999). Water quality monitoring sites are shown in Figure 8.

The Idaho Department of Health and Welfare (IDHW) collected water samples in 1975 and 1976 on the Portneuf River and concluded that Marsh Creek was degrading the Portneuf River by increasing turbidity and fecal coliform bacteria concentrations (McSorley, 1977 and Perry et al., 1977). Additionally, the Union Pacific Railroad effluent discharge and the Pocatello Waste Water Treatment Plant did not have a discernible effect on the river, however Simplot and FMC phosphate plant effluents increase TP concentrations above the recommended levels (Perry et al., 1977). These reports were followed with an inventory of nonpoint pollution sources in Bannock and Caribou counties and identified the impacts of agricultural lands on water quality in the subbasin (Roberts, 1977).

In 1985 and 1986, IDHW collected water samples and found that several tributaries, to the lower Portneuf River, exceeded water quality standards or recommended criteria. The primary contaminants were TSS, TP, TIN and fecal coliform bacteria (Drewes, 1987). Additional water quality samples were collected on Marsh Creek in 1988 to determine BMP effectiveness in the Lone Pine SAWQP project (Drewes, 1991).

In 1985, IDHW found that stream channel erosion on the Downey Canal and Twentyfourmile Creek contributed the largest amount of sediment to the upper Portneuf River. It also showed that Twentyfourmile Creek contributes the largest amount of TP and Eighteenmile Creek contributes the largest amount of total nitrogen to the Portneuf River (Hoover, 1985).

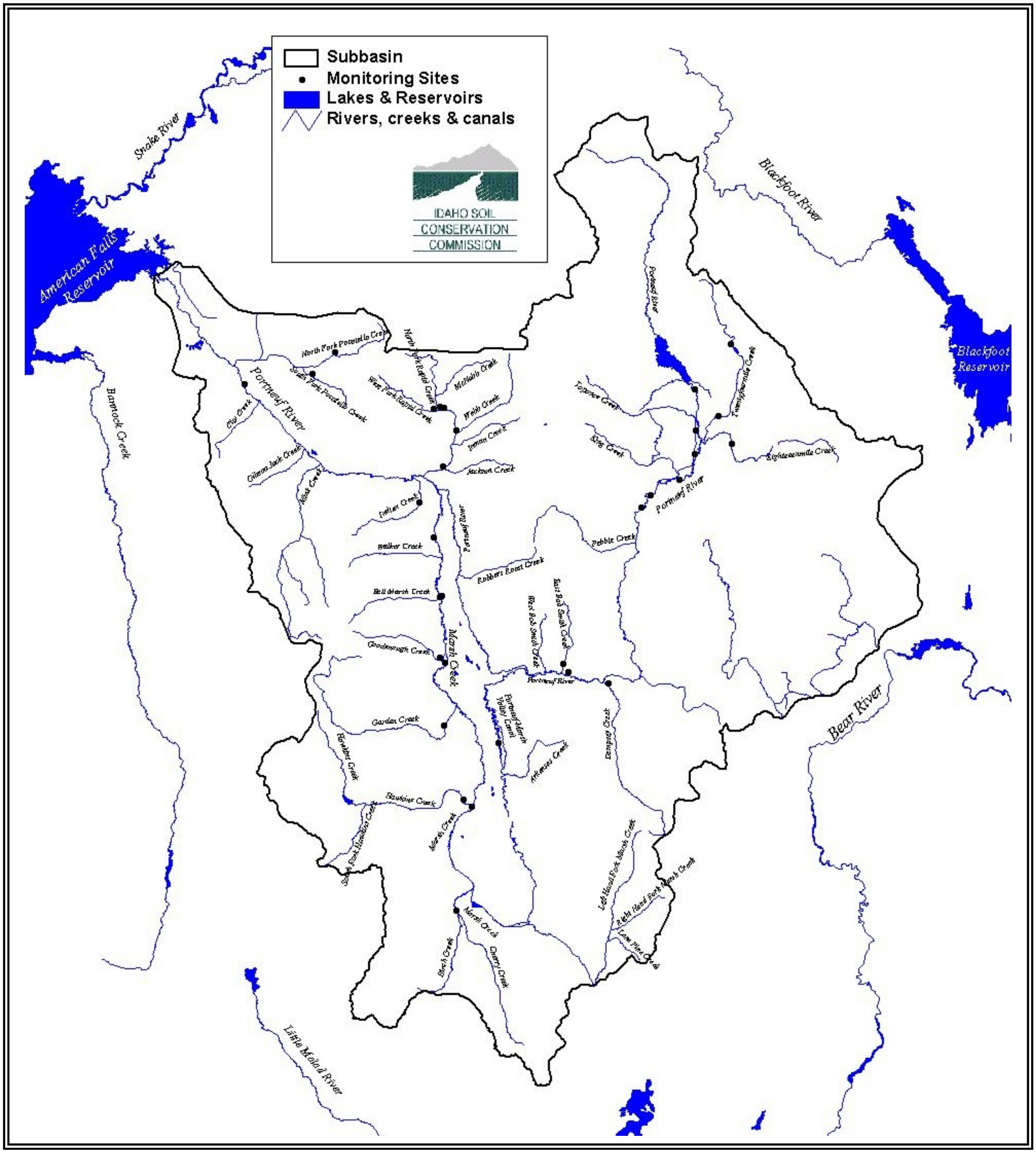
IDEQ in cooperation with the CSCD sampled the river below Chesterfield Reservoir from 1995 to 1997. High concentrations of sediment, phosphorus, nitrogen and fecal bacteria were found during the monitoring period. This study concluded that the physical, chemical and biological data demonstrates less than full support for the beneficial uses of cold water biota, salmonid spawning and primary or secondary contact recreation, resulting in an impaired and dysfunctional riverine system in poor health and in need of repair (Rudel, 1999).

The Upper Snake River Basin National Water Quality Assessment (NAWQA), which included sampling in the subbasin, found that nitrates in surface water are highest downstream from agricultural areas, however they do not exceed the drinking water standards. Pesticides in surface water were generally found in the spring and early summer following early season applications and do not exceed established water quality criteria. Concentrations of organochlorine compounds in tissue of fish from the Portneuf River at Pocatello, Rock Creek near Twin Falls, and Snake River near Twin Falls equaled or exceeded national guidelines for the protection of fish-eating wildlife (Maret and Ott, 1998).

IASCD conducted water quality sampling from 1999 to 2002 on selected tributaries to the Portneuf River. Results indicate that sediment and nutrients are the primary pollutants in the subbasin. TSS, TP and TIN concentrations were above the TMDL targets at numerous monitoring sites (Fischer, 2002).

The Portneuf Monitoring Group, comprised of the City of Pocatello, IDEQ, Simplot, FMC, Three Rivers Resources Conservation and Development (RC&D) and PSWCD in conjunction with Rapid Creek Research, Inc. installed continuous monitoring stations at six sites along the lower Portneuf River. Real time results are available online at www.portneufriver.org but no data has been published yet.

Figure 8. IASCD and USGS Monitoring Sites in the Portneuf River Subbasin



Irrigation Diversions

There are 10 irrigation companies in the subbasin that manage about 140 miles of canals or ditches which supply irrigation water to approximately 150 irrigators who irrigate an estimated 20,000 acres. The largest of these is the Portneuf Marsh Valley Canal Company (PMVCC), which was formed in 1908 by the Carey Act to supply water to Marsh Valley, Downey, Virginia, and a portion of the Arimo area. They depend upon Chesterfield Reservoir for their water supply. Water is brought to the reservoir from the upper reaches of the Portneuf River, Toponce and Cabin creeks. The irrigation water is brought downstream by the Portneuf River and diverted into a canal, about five miles west of Lava Hot Springs, that meanders along the east foothills of Marsh Valley for 22 miles to Downey (IWUA, 2002).

Ground Water

The subbasin contains aquifers that occur in a variety of volcanic rocks, sedimentary deposits and alluvium as shown in Figure 9. Alluvium, sedimentary rocks and occasional basalt units are common aquifers south of Bonneville County (Neely and Crockett, 1999). In Bannock and Caribou counties, ground water is used for public-supply, domestic and commercial, agricultural, and industrial purposes. The industrial use is related to mining activities and food processing. Depth to ground water ranges from 0 to 200 feet with wells yielding from 20 to 3,500 gallons per minute in Caribou County and 5,000 gallons per minute in Bannock County (Sharpley et al., 1994).

Water Quality

IDEQ, ISDA and USGS collected 1,540 ground water samples from 1991 to 1994 and then 1,289 monitoring sites were sampled again from 1995 to 1998. In southeast Idaho, nitrate samples were collected at 246 sites initially and then 208 sites were sampled subsequently. Subsequent sampling sites with increases occurred in clusters in Bingham, Bannock and Caribou counties (Neely and Crockett, 1999). In Bannock and Caribou counties, these clusters occurred in northern Gem Valley, southern Marsh Valley and lower Portneuf Valley. Idaho has identified 33 nitrate priority areas shown in Figure 10 with Pocatello and Soda Springs/Bear River ranked 17th and 18th, respectively (IDEQ, 2002).

Lower Portneuf River Valley Aquifer

The Lower Portneuf River Valley (LPRV) aquifer supplies the cities of Pocatello and Chubbuck with their drinking water. The aquifer is transmissive, shallow and vulnerable to several contamination sources, including trichloroethylene (TCE) which closed two of the city of Pocatello's wells (Welhan and Meehan, 1993). Most of the recharge is thought to come from tributary watersheds with negligible recharge coming from the Portneuf River (Welhan, 2000). The overall quality of the LPRV aquifer is good, although very hard with a relatively high total dissolved solids (TDS) content. However, recent monitoring indicate several areas of the LPRV aquifer have degraded water quality due to TCE, and perchloroethylene (PCE), nitrate, sulfate, chloride and TDS (BBC Research & Consulting, 2001). Recent efforts have focused on reclassifying the aquifer as a "sensitive resource" under Idaho law. This reclassification enables strict water quality standards to be established.

Figure 9. Aquifers in the Portneuf River Subbasin

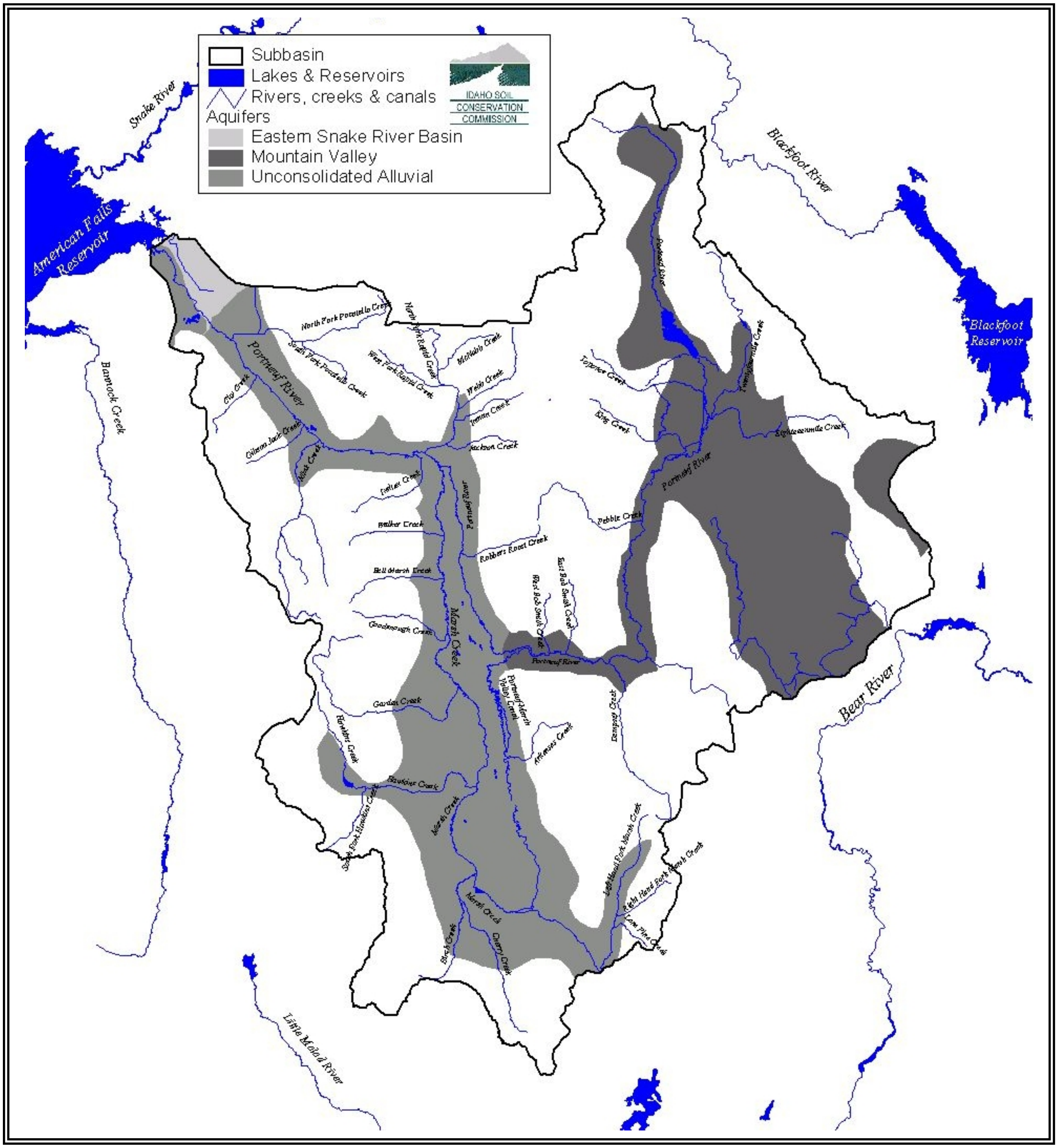
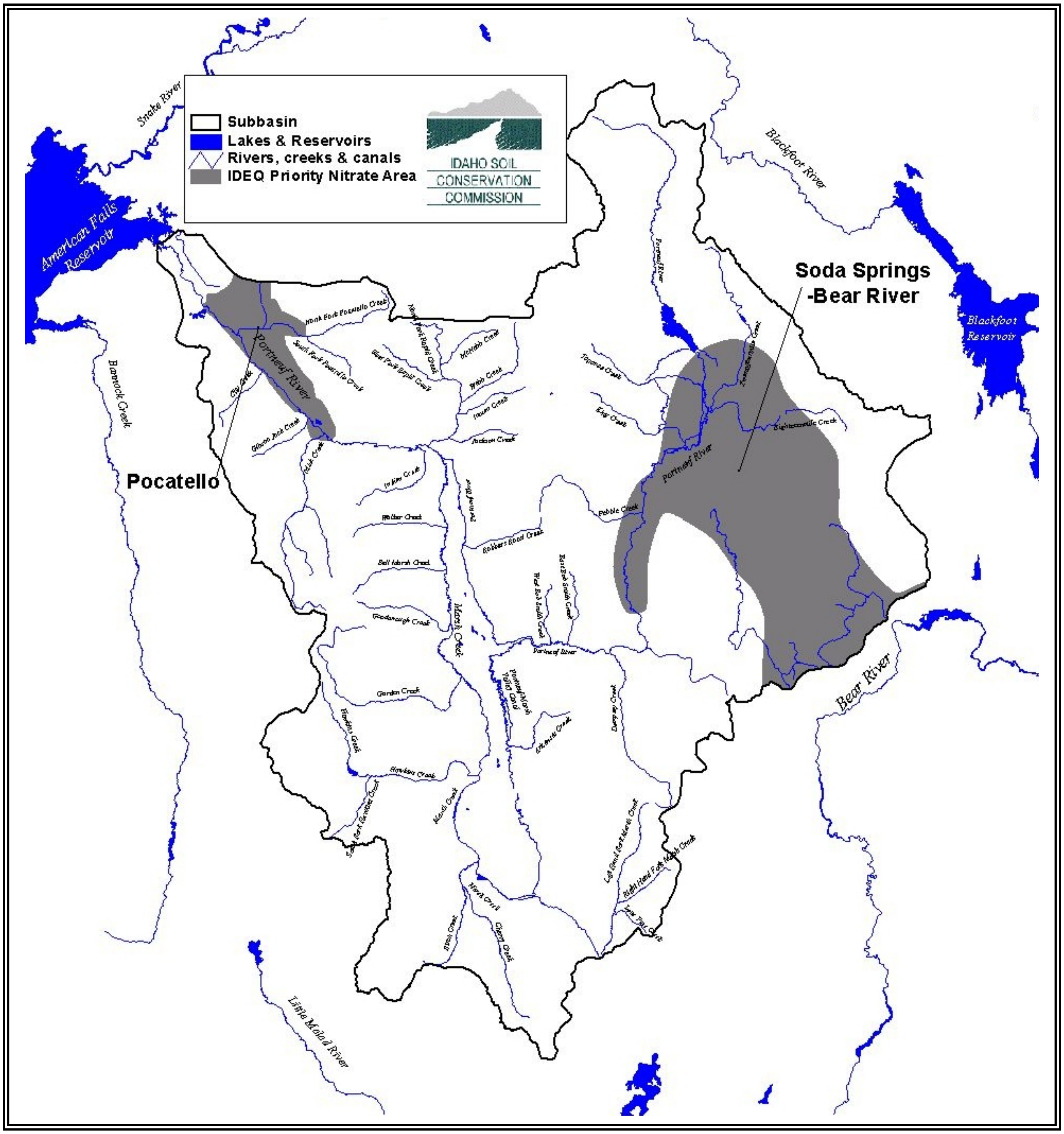


Figure 10. IDEQ Nitrate Priority Areas in the Portneuf River Subbasin



Topography

The subbasin is part of the Northern Basin and Range and has a varied topography of mountains, mountain valleys, basalt and lava flows, foothills, terraces, alluvial fans and valley plains. The Chesterfield, Fish Creek and Portneuf ranges comprise the mountainous, eastern edge of the subbasin, with tributaries flowing west into the lower elevations in Gem and Marsh valleys. The Bannock Range comprises the mountainous, western edge, with tributaries flowing east into the lower elevations in Marsh Valley. The Pocatello Range and the Snake River Plain comprise the northern boundary, with tributaries flowing into the lower elevations of the Portneuf Valley. The Bannock and Malad ranges bound the subbasin on the south, with tributaries flowing north into the lower elevations of Marsh Valley. The subbasin is diamond shaped and about 60 miles wide and 50 miles long. The subbasin drains 848,755 acres or 1,326 square miles. Elevations range from 9,260 feet at Bonneville Peak in the Portneuf Range to 4,350 feet at American Falls Reservoir. Almost 47% of the subbasin's elevation occur between 5,000 and 6,000 feet. About six percent of the subbasin is quite flat, with slopes less than one percent. Almost 73% of the subbasin have slopes greater than 10% as shown in Figure 11.

Land Ownership

Private lands make up the majority of the subbasin with about 488,124 acres or 58%. In comparison the subbasin also consists of 323,683 acres or 38% of federal lands managed by the US Department of Interior (USDI) Bureau of Land Management (BLM) and the US Department of Agriculture (USDA) Forest Service (FS). State lands are managed by the Idaho Department of Lands (IDL) and comprise only 35,254 acres or 4% of the subbasin. Land ownership for the subbasin is shown in Table 4 and Figure 12.

Table 4. Land Ownership in the Portneuf River Subbasin

Land Owners	Acres	Percent of Total
Private	488,124	57.5%
BLM	103,084	12.1%
BIA	63,649	7.5%
IDL	35,254	4.2%
FS	156,950	18.5%
Water	1,694	0.2%
Total	**848,755**	**100.0%**

Land Use

Range land is the major land use with approximately 393,303 acres or 46% of the subbasin. In comparison, the subbasin also consists of 282,879 acres or 33% of crop land, which includes both non-irrigated and irrigated lands. Forest lands comprise about 112,087 acres or 13% of the subbasin. All land uses for the subbasin are displayed in Table 5 and Figure 13.

Table 5. Public and Private Land Use in the Portneuf River Subbasin

Land Use	Acres	Percent of Total
Range Land	393,303	46.3%
Crop Land	282,879	33.3%
Forest Land	112,087	13.2%
Urban	25,637	3.0%
Wetlands	20,107	2.4%
Roads	8,924	1.1%
Unknown	2,827	0.3%
Reservoirs	1,694	0.2%
Streams	1,297	0.2%
Total	**848,755**	**100.0%**

Figure 11. Slope Classes in the Portneuf River Subbasin

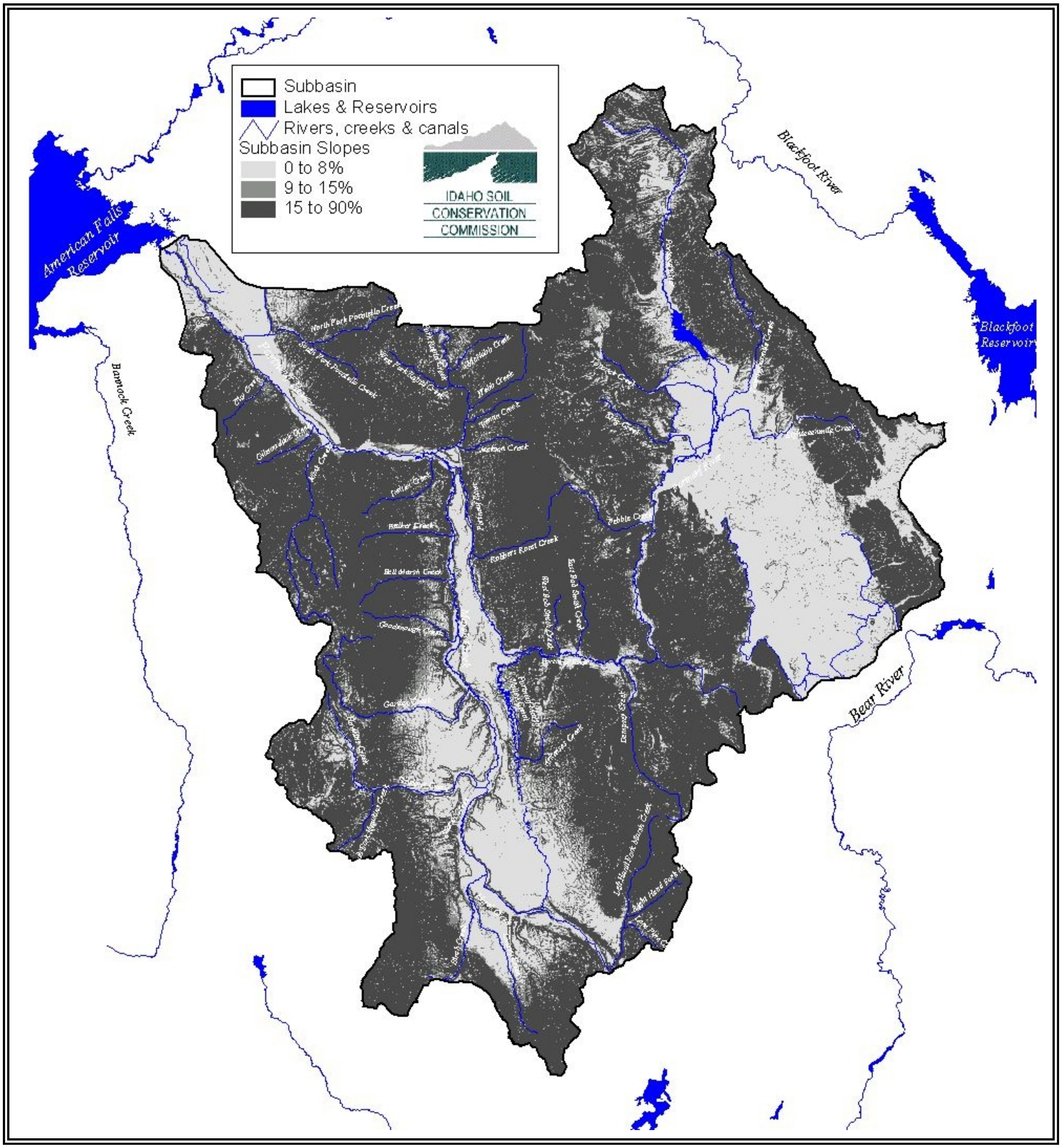


Figure 12. Land Ownership in the Portneuf River Subbasin

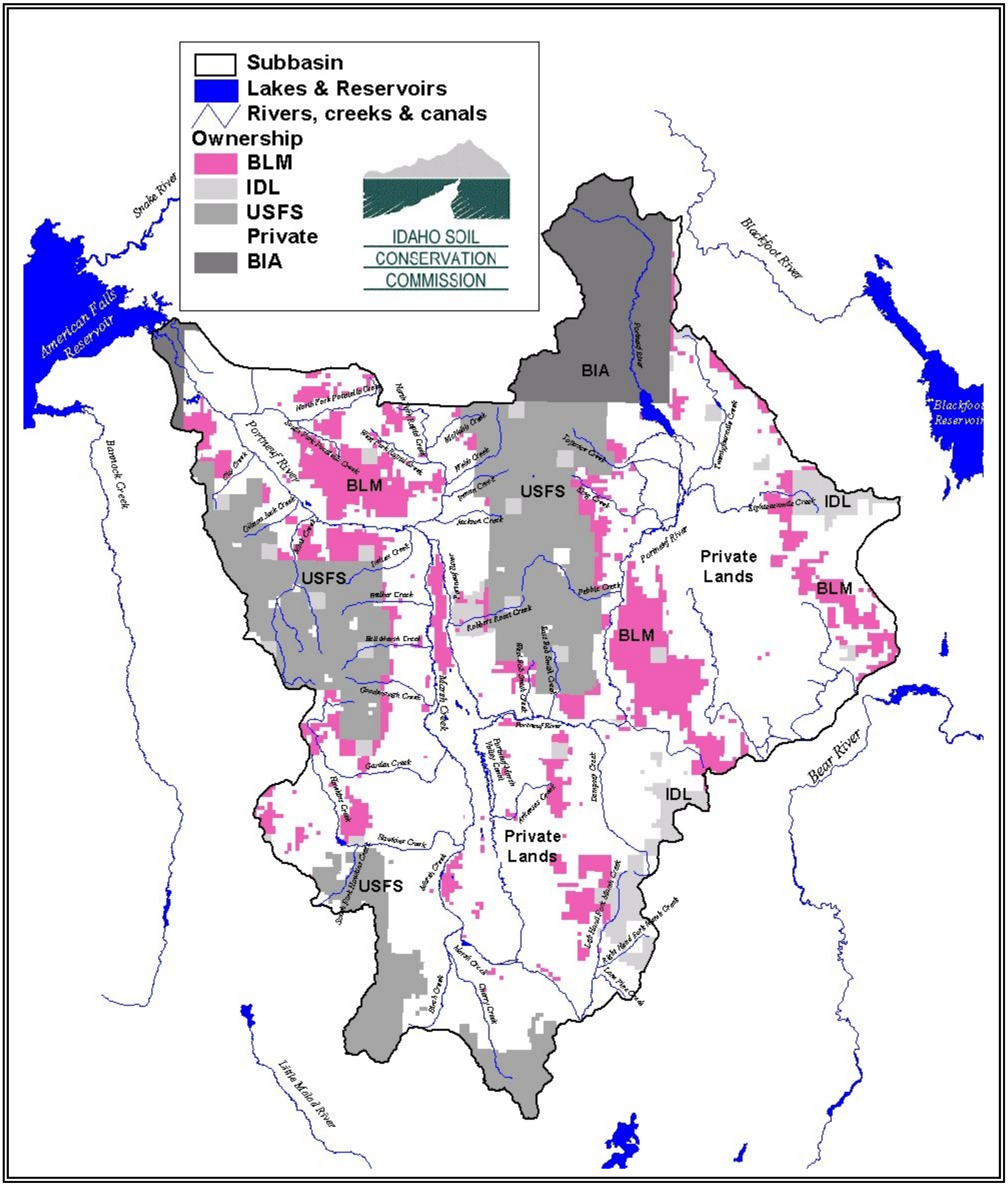
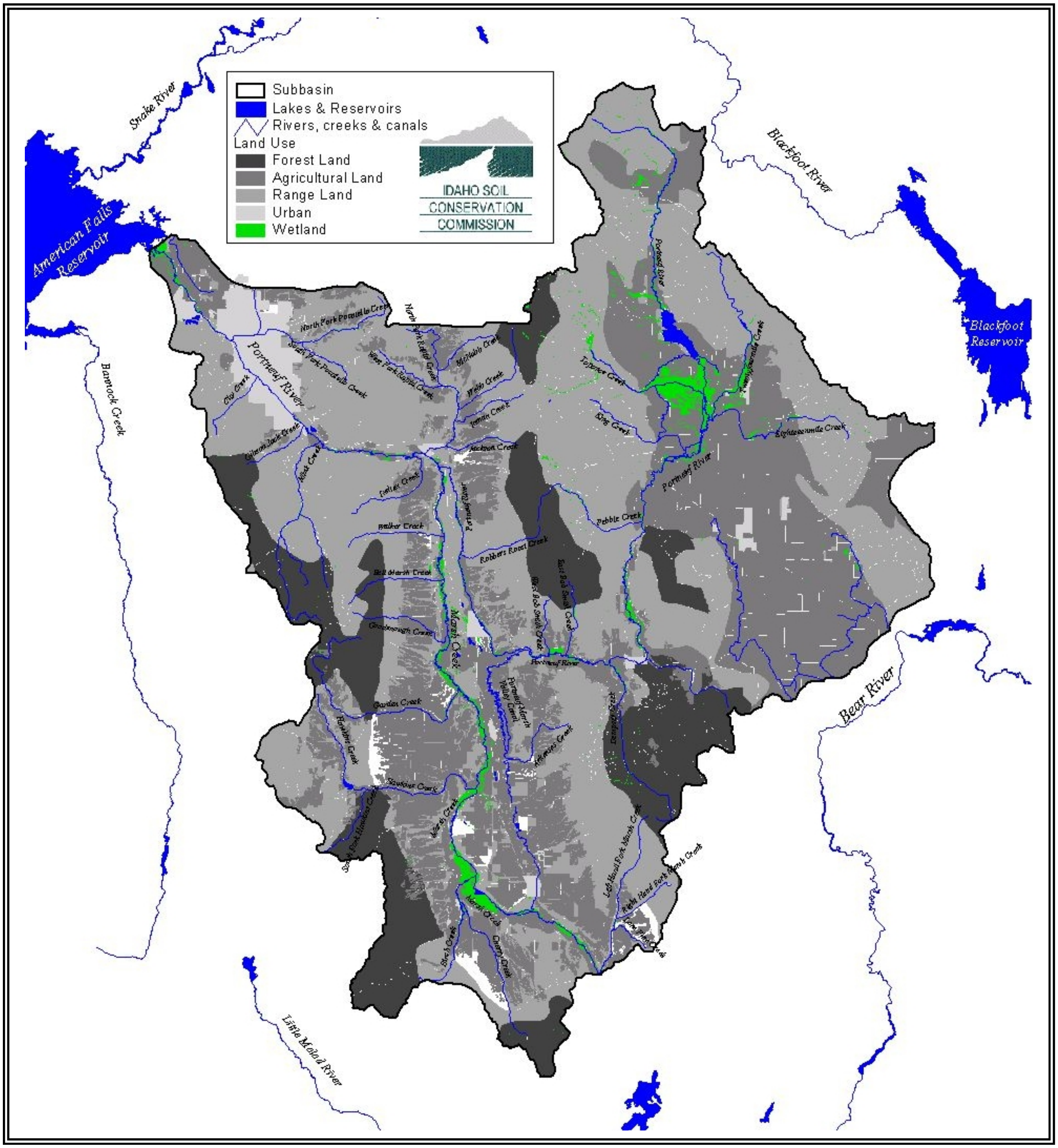


Figure 13. Land Use in the Portneuf River Subbasin



Private Land Use

There is approximately 489,000 acres of private land in the subbasin. Of these lands, crop land is the predominant private land use within the subbasin with 256,100 acres or 52%. Crop land includes non-irrigated and irrigated grain, hay and pasture lands. In comparison, private land also consists of 33% of range land. Forest land comprises about six percent and urban areas account for five percent of the private land. Private land uses for the subbasin are displayed in Table 6 and Figure 14.

Table 6. Private Land Uses in the Portneuf River Subbasin

Land Use	Acres	Percent of Total
Crop Land	256,100	51.6%
Range Land	163,395	32.9%
Forest Land	27,286	5.5%
Urban	24,350	4.9%
Wetlands	16,984	3.4%
Roads	6,720	1.4%
Streams	1,013	0.2%
Reservoirs	147	0.1%
Total	**495,995**	**100.0%**

Population

From 1980 to 2000, the estimated population in Bannock and Caribou counties increased by 14% and 5% compared to 29% for the state of Idaho (Forstall, 1995 and MapStats, 2002). Annual estimates were not available specifically for the subbasin, given its irregular geography but populations are shown in Table 7.

Table 7. Census Populations for the State of Idaho, Bannock and Caribou Counties

Census Year	Idaho	Bannock County	Percent of Idaho Population	Caribou County	Percent of Idaho Population
2000	1,296,593	75,565	5.8%	7,304	0.6%
1990	1,006,749	66,026	6.6%	6,963	0.7%
1980	943,935	65,421	6.9%	8,695	0.9%
1970	712,567	52,200	7.3%	6,534	0.9%
1960	667,191	49,342	7.4%	5,976	0.9%
1950	588,637	41,745	7.1%	5,576	0.9%
1940	524,873	34,759	6.6%	2,284	0.4%
1930	445,032	31,266	7.0%	2,121	0.5%
1920	431,866	27,532	6.4%	2,191	0.5%
1910	325,594	19,242	5.9%	---	---
1900	161,772	11,702	7.2%	---	---

Demographics and Economics

The subbasin is changing every year as agricultural lands are subdivided for housing and urban areas. For the purposes of this plan, a farm or ranch is defined as any place which produced and sold or normally would have produced or sold $1,000 worth of agricultural products during the year (IASS, 1998 and NASS, 2002). The subbasin demographics and economics contain statistics for both Bannock and Caribou counties. Portions of both counties extend beyond the subbasin, therefore the statistics are less than those listed. Figure 15 shows the rural residential and rural subdivision zoning in Bannock County.

Figure 14. Private Land Use in the Portneuf River Subbasin

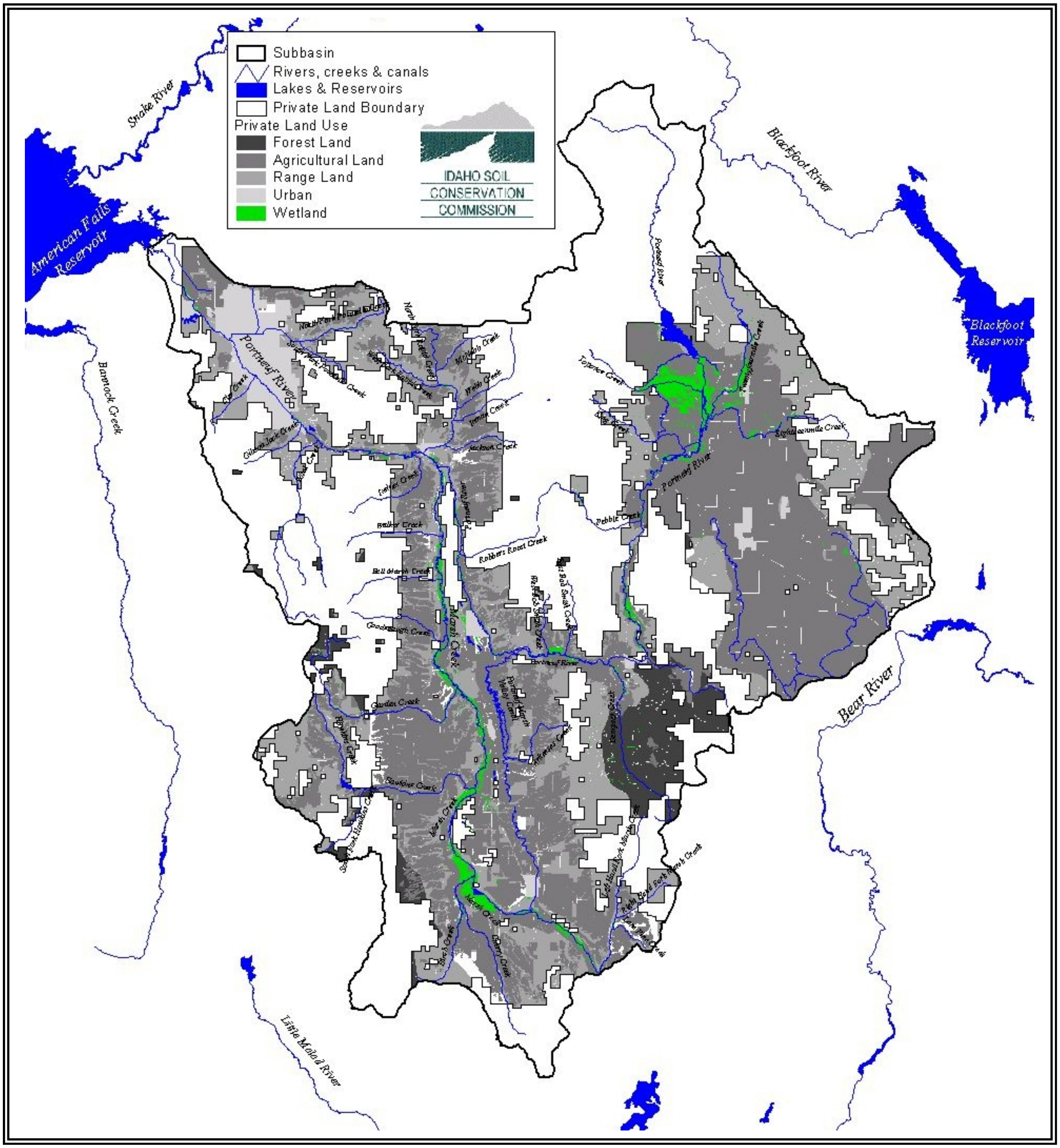


Figure 15. Rural Land Use Zoning in Bannock County

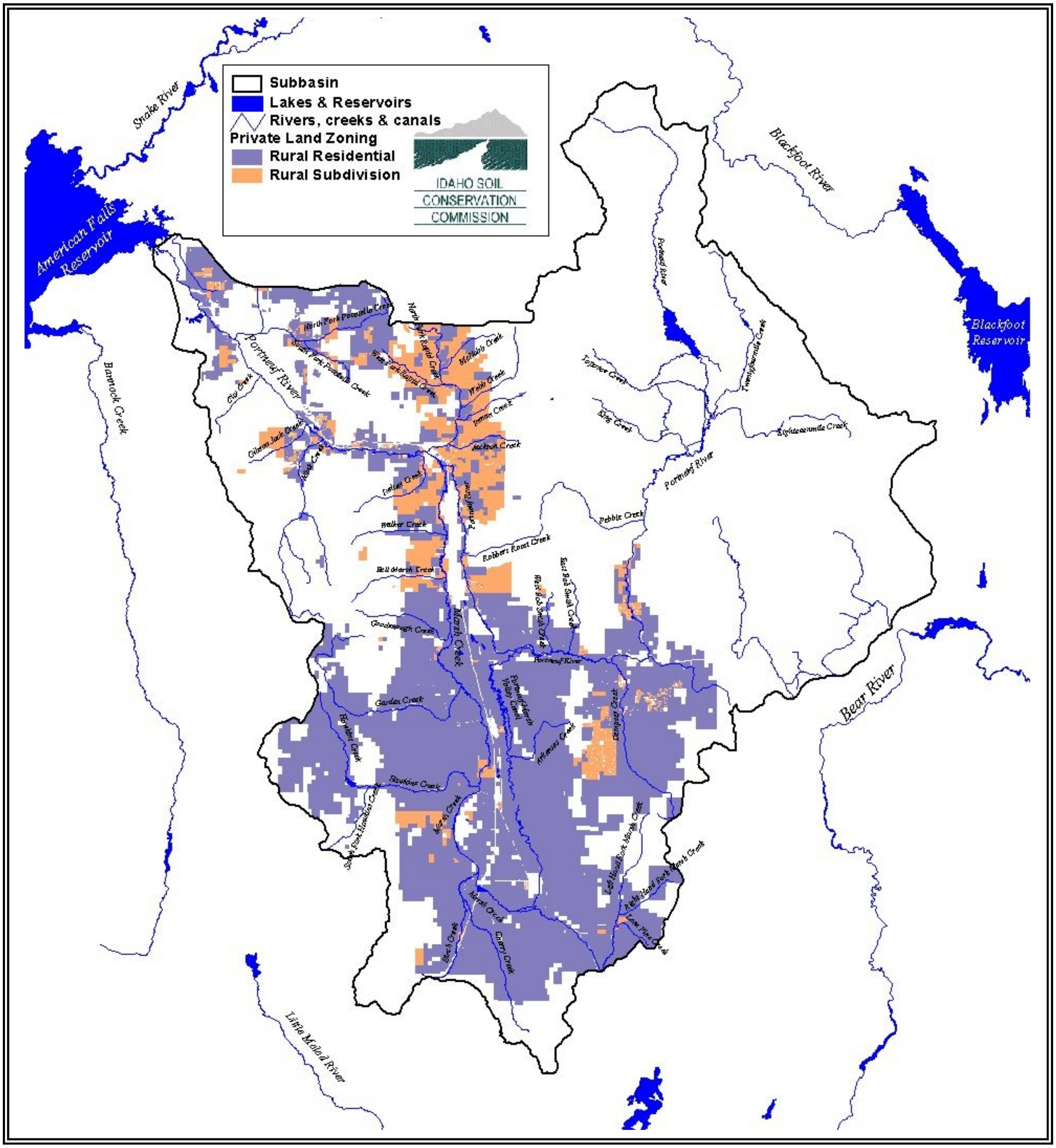


Table 8. Agricultural Inventory Data for Bannock County

Agricultural Category	1987	1992	1997
Total Number of Farms	655	588	664
Land in Farms (total acres)	358,189	325,338	309,281
Land in Farms (average size)	547	553	466
Land in Irrigated Farms (acres)	160,096	151,398	162,613
Commercial Fertilizer (acres applied on)	79,977	49,123	34,250
Herbicides (acres applied on)	76,274	42,215	36,971
Number of Farms with Grazing Permits	65	58	69
Number of Farms (1 to 9 acres)	112	98	118
Number of Farms (10 to 49 acres)	183	157	174
Number of Farms (50 to 179 acres)	115	107	120
Number of Farms (180 to 499 acres)	107	97	115
Number of Farms (500 to 999 acres)	57	50	55
Number of Farms (1,000 acres or more)	81	79	82

Crop or Commodity	1987	1992	1997	2000
Wheat (acres)	53,429	54,812	35,110	35,400
Barley (acres)	19,801	9,804	10,282	9,600
Alfalfa Hay (acres)	30,940	24,667	24,303	17,400
Potatoes (acres)	2,305	3,328	3,449	5,200
Beef Cows (head)	10,578	10,465	12,467	10,900
Dairy Cows (head)	2,230	1,666	1,037	1,000
Sheep and Lambs (head)	4,024	4,378	3,774	3,800
Horses and Ponies (head)	2,109	1,794	2,983	--

Table 9. Agricultural Inventory Data for Caribou County

Agricultural Category	1987	1992	1997
Total Number of Farms	428	384	427
Land in Farms (total acres)	587,384	587,693	469,381
Land in Farms (average size)	1,372	1,530	1,099
Land in Irrigated Farms (acres)	273,910	258,384	280,596
Commercial Fertilizer (acres applied on)	102,072	104,763	107,446
Herbicides (acres applied on)	82,649	83,336	86,891
Number of Farms (1 to 9 acres)	25	22	17
Number of Farms (10 to 49 acres)	39	33	48
Number of Farms (50 to 179 acres)	50	54	78
Number of Farms (180 to 499 acres)	100	83	85
Number of Farms (500 to 999 acres)	89	72	60
Number of Farms (1,000 acres or more)	125	120	139

Crop or Commodity	1987	1992	1997	2000
Wheat (acres)	35,580	34,800	40,897	29,800
Barley (acres)	75,482	73,692	74,912	75,400
Alfalfa Hay (acres)	29,322	29,289	32,073	27,400
Potatoes (acres)	4,353	4,313	5,823	7,700
Beef Cows (head)	13,791	15,284	14,254	12,400
Dairy Cows (head)	2,311	2,011	1,346	1,200
Sheep and Lambs (head)	13,254	16,359	10,144	10,500
Horses and Ponies (head)	1,065	844	1,025	--

Accomplishments

Several conservation practices have been implemented on thousands of acres in the PSWCD and CSCD as shown in Table 10. Most of the projects have focused on sprinkler irrigation, residue management, conservation cover, terraces, water and sediment control basins and prescribed grazing. From 1967 to 2001, the estimated installation cost of these conservation practices was approximately $14 million. The Farm Service Agency (FSA) pays an annual rental rate of $36 per acre in Bannock County (Williams, 2002) and $39 per acre in Caribou County (Christensen, 2002) for approximately 85,000 acres enrolled in the Conservation Reserve Program (CRP). FSA pays an estimated $3 million annually for crop lands enrolled in CRP in the subbasin. CRP had the largest impact in the subbasin with soil erosion savings of about 900,000 tons per year.

Table 10. Conservation Practices Completed in Bannock and Caribou Counties

Conservation Practice	NRCS Practice Standard	Bannock Amount	Caribou Amount	Total Amount	Units
Brush Management	314	7,743	12,158	19,901	acres
Conservation Cover (CRP)	327	83,099	67,528	150,627	acres
Contour Farming	330	13,906	146,621	160,527	acres
Forage Harvest Management	511	39,075	90,817	129,892	acres
Irrigation Water Management	449	50,448	15,735	66,183	acres
Irrigation System-Sprinkler	442	32,072	8,198	40,270	acres
Nutrient Management	590	1,400	--	1,400	acres
Pasture & Hayland Planting	512	44,546	61,107	105,653	acres
Pest Management	595	1,350	--	1,350	acres
Prescribed Grazing	528A	101,493	139,834	241,327	acres
Residue Management	329	74,708	200,159	274,867	acres
Riparian Forest Buffer	391A	597	--	597	acres
Tree/Shrub Establishment	612	150	--	150	acres
Upland Wildlife Habitat Management	645	16,789	12,053	28,842	acres
Spring Development	574	40	34	74	each
Waste Storage Facility	313	9	6	15	each
Water & Sediment Control Basin	638	961	34	995	each
Watering Facility	614	43	58	101	each
Fence	382	87,950	51,272	139,222	feet
Pipeline	430&516	656,287	402,206	1,058,493	feet
Terrace	600	537,773	121,736	659,509	feet
Windbreak/Shelterbelt	380	9,920	--	9,920	feet

State Agricultural Water Quality Projects

There have been five State Agricultural Water Quality Program (SAWQP) projects completed in the subbasin. The Upper Portneuf River Channel and Bancroft SAWQP projects were completed in the Upper Portneuf watershed by the CSCD and landowners. The Arkansas Basin and Lone Pine SAWQP projects were completed in the Marsh Creek watershed and the Upper Rapid Creek SAWQP project was completed in the Rapid Creek watershed by the PSWCD and landowners. These projects enabled approximately 100 participants to install BMPs on about 35,000 acres shown in Table 11. Most of the projects have focused on conservation tillage, residue management, pasture and hay land planting, terraces, water and sediment control basins and chiseling or subsoiling (CSCD, 1993; CSCD, 1999; CSCD, 2001; PSWCD, 1994; PSWCD 1996 and PSWCD 1999). Since 1982, the estimated installation cost of these water quality practices was approximately $1,752,401.

Table 11. State Agricultural Water Quality Projects in the Portneuf River Subbasin

Project Name	Acres Treated	Project Duration	SAWQP Cost	BMPs Installed
Upper Portneuf River	9,952	1992-2000	$608,329	Chiseling/Subsoiling, Conservation Tillage, Water & Sediment Control Basins, Fence, Pasture & Hay land Planting, Water Gaps
Bancroft Subwatershed	11,605	1987-1998	$284,161	Chiseling/Subsoiling, Conservation Tillage, Water & Sediment Control Basins, Pasture & Hay land Planting, Permanent Vegetative Cover, Field Strip Cropping
Arkansas Basin	4,085	1982-1992	$226,232	Chiseling/Subsoiling, Pasture Seeding, Residue Management, Cross Slope Farming, Spring Development, Terraces, Water & Sediment Control Basins, Waste System, Sprinkler System
Upper Rapid Creek	4,425	1989-1999	$306,404	Chiseling, Fence, Residue Management, Cross Slope Farming, Conservation Tillage, Pasture Planting, Subsoiling, Waste Management System, Water & Sediment Control Basin
Lone Pine	5,196	1985-1995	$327,275	Chiseling/Subsoiling, Pasture Seeding, Residue Management, Cross Slope Farming, Spring Development, Terraces, Fence, Water & Sediment Control Basins, Critical Seeding
TOTAL	**35,263**	**1982-2000**	**$1,752,401**	

Problem Identification

Beneficial Use Status

IDEQ designated beneficial uses, shown in Table 12, on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. The Portneuf River is listed from its headwaters to the American Falls Reservoir. Twenty water quality limited segments were on the state of Idaho's 1998 §303(d) list (IDEQ, 1998), shown in Figure 16. These segments contain approximately 244 miles of perennial streams.

The Portneuf River and 16 of its tributaries were on the state of Idaho's 1996 §303(d) list, Table 13. However in 1998, IDEQ completely removed eight tributaries and partially removed four others while two tributaries were added to the 1998 list. Eventually, the Portneuf River and ten of its tributaries were on the state of Idaho's 1998 §303(d) list and are shown in Table 14 (IDEQ, 1998).

The Portneuf River's designated beneficial uses include cold water biota, salmonid spawning, primary contact recreation, secondary contact recreation, domestic water supply, agricultural water supply, industrial water supply, wildlife habitat and aesthetics. The Portneuf River's beneficial uses are not fully supported due to sediment, nutrients, bacteria, flow alteration and oil/grease (IDEQ, 1999). Beneficial uses on the tributaries are not fully supported due to sediment and nutrients. Hawkins Reservoir's beneficial uses are not fully supported due to nutrients and dissolved oxygen. The status of beneficial uses on other segments will be discussed further in the appendices.

Disturbances and Impacts in the Portneuf River Subbasin

Impacts to the Portneuf River and its tributaries have been numerous. Rivers are a reflection of the disturbances that have occurred in their history. Disturbances affecting the Portneuf River include natural and human-induced activities that occurred separately or simultaneously. Natural disturbances affecting river corridors include floods, hurricanes, tornadoes, fire, lightning, volcanic eruptions, earthquakes, insects and disease, landslides, temperature extremes and drought (FISRWG, 1998). Human-induced disturbances include dams, channelization, diversions, land use change and exotic species introduction. Indirect impacts to mountain rivers include timber harvest, road building, grazing, crops, urbanization, lode mining and climate change. Direct impacts to mountain rivers include beaver trapping, large woody debris removal, railroad tie drives, dams, flow regulation and placer or sand/gravel mining (Wohl, 2000). Several of these activities have occurred and continue to occur in the subbasin.

Land use changes have occurred mostly because of conversion from agriculture to urban. The greatest land use change probably occurred from the time that early European settlers arrived in the area to present. There was an estimated 94,000 acres of crop land in Bannock County in 1900 compared to 251,000 acres in 2002. There was also about 11,702 people living in Bannock County in 1900 compared to 75,565 people by 2000. Currently there are 4,462 private parcel landowners, outside of the urban areas, with an average parcel size of 34 acres and a median parcel size of 5 acres. Several watersheds are transitioning from agricultural land uses to urban, residential or recreational land uses. Approximately 45,000 acres or 25% of the private parcels outside of the urban areas are zoned as rural subdivisions. As agricultural lands are converted to urban areas, the impact from flooding worsens because precipitation doesn't infiltrate into the ground and development encroaches into the floodplain. Severe floods occurred on the Portneuf River during the month of February in 1911, 1962 and 1963. These floods were caused by substantial rain on frozen ground events with rapid melting of the snow pack (FEMA, 1996). Urbanization eventually causes an increase in water yield as impervious surface areas expand which results in higher intensity and frequency of flooding thus damaging low-lying structures and causing river channel instability (Wohl, 2000).

Table 12. Beneficial Uses for Waterbodies in the Portneuf River Subbasin

Segment	Designated & Existing Uses
Portneuf River, Headwaters to American Falls Reservoir	Domestic Water Supply, Agricultural Water Supply, Cold Water Biota, Salmonid Spawning, Primary Contact Recreation, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Pocatello Creek, Headwaters to Portneuf River	Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Gibson Jack Creek, Headwaters to Portneuf River	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Mink Creek, Headwaters to Portneuf River	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Rapid Creek, Headwaters to Portneuf River	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Marsh Creek, Headwaters to Portneuf River	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Primary Contact Recreation, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Walker Creek, Headwaters to Marsh Creek	Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Bell Marsh Creek, Headwaters to Marsh Creek	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Goodenough Creek, Headwaters to Marsh Creek	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Hawkins Creek, Headwaters to Marsh Creek	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Hawkins Reservoir	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Birch Creek, Headwaters to Marsh Creek	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Cherry Creek, Headwaters to Birch Creek	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Dempsey Creek, Headwaters to Portneuf River	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Pebble Creek, Headwaters to Portneuf River	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Twentyfourmile Creek, Headwaters to Portneuf River	Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat
Toponce Creek, Headwaters to Portneuf River	Salmonid Spawning, Agricultural Water Supply, Cold Water Biota, Secondary Contact Recreation, Industrial Water Supply, Aesthetics and Wildlife Habitat

Figure 16. 1998 303(d) Listed Waterbodies in the Portneuf River Subbasin

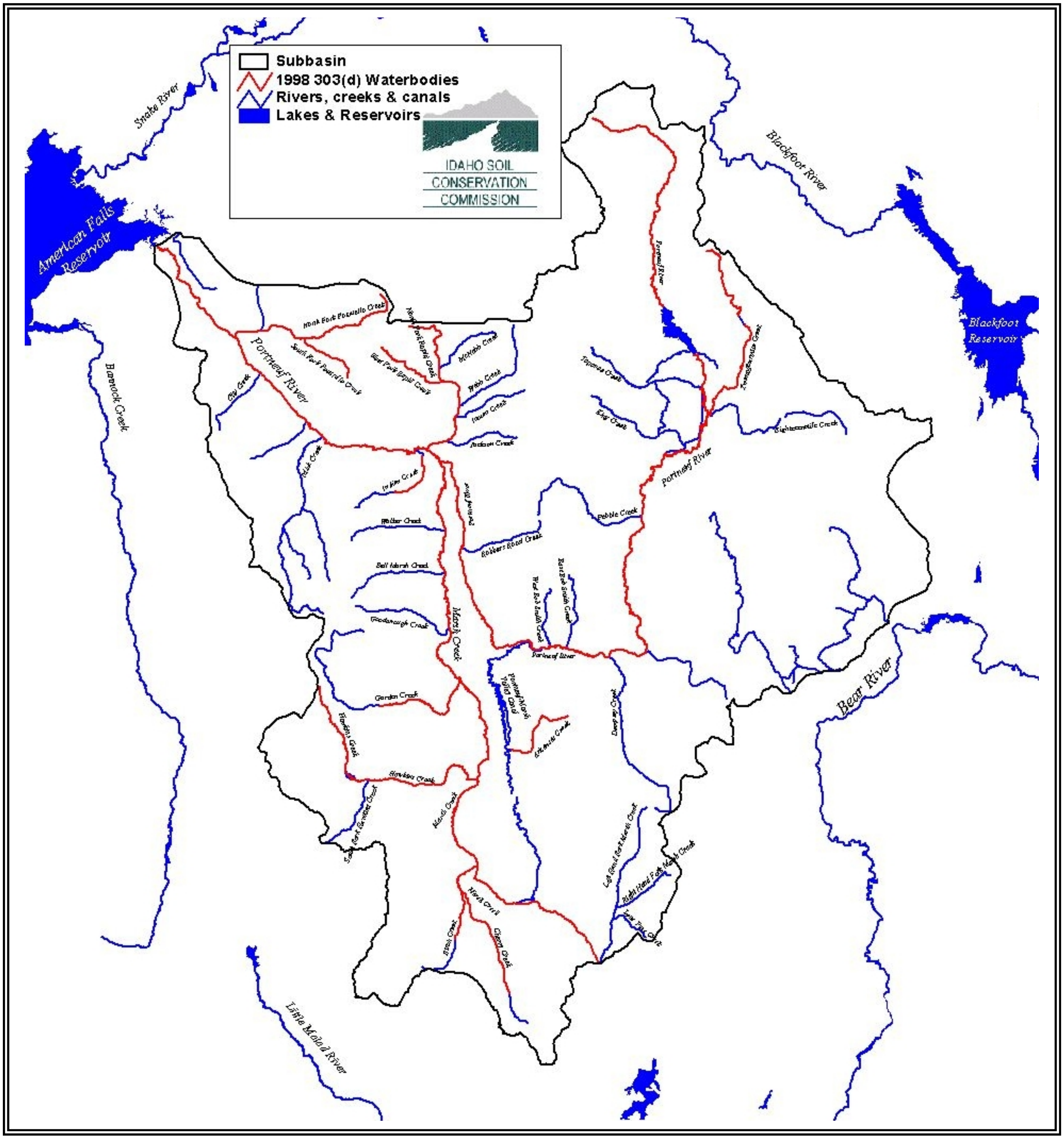


Table 13. 1996 State of Idaho's §303(d) Listed Segments in the Portneuf River Subbasin

Waterbody	Segment Boundaries	Pollutants
Portneuf River	Chesterfield Reservoir to American Falls Reservoir	Sediment, nutrients & bacteria
Portneuf River	Fort Hall reservation to Interstate 86	Nutrients and sediment
Portneuf River	Interstate 86 to Johnny Creek	Sediment, oil and grease
Portneuf River	Johnny Creek to Marsh Creek	Sediment
Portneuf River	Marsh Creek to PMVCC Diversion	Sediment
Portneuf River	PMVCC Diversion to Lava Hot Springs	Sediment and nutrients
Portneuf River	Lava Hot Springs to Downey Canal	Sediment, nutrients & flow alteration
Portneuf River	Downey Canal to Chesterfield Reservoir	Sediment and nutrients
Portneuf River	Chesterfield Reservoir to Headwaters	Sediment
Pocatello Creek	Headwaters to Portneuf River	Sediment
Gibson Jack Creek	Headwaters to Portneuf River	Sediment
Mink Creek	Headwaters to Portneuf River	Sediment and nutrients
Rapid Creek	Headwaters to Portneuf River	Sediment
Marsh Creek	Headwaters to Portneuf River	Sediment and nutrients
Walker Creek	Headwaters to Marsh Creek	Sediment
Bell Marsh Creek	Headwaters to Marsh Creek	Sediment
Goodenough Creek	Headwaters to Marsh Creek	Sediment
Garden Creek	Headwaters to Marsh Creek	Sediment and nutrients
Hawkins Creek	Headwaters to Marsh Creek	Sediment and nutrients
Hawkins Reservoir	Entire Reservoir	Nutrients and dissolved oxygen
Birch Creek	Headwaters to Marsh Creek	Sediment and nutrients
Cherry Creek	Headwaters to Birch Creek	Sediment and nutrients
Dempsey Creek	Headwaters to Portneuf River	Sediment
Pebble Creek	Headwaters to Portneuf River	Sediment
Twentyfourmile Creek	Headwaters to Portneuf River	Sediment
Toponce Creek	Headwaters to Portneuf River	Sediment

Table 14. 1998 State of Idaho's §303(d) Listed Segments in the Portneuf River Subbasin

Waterbody	Segment Boundaries	Pollutants
Portneuf River	Fort Hall Reservation Boundary to Interstate 86	Sediment, nutrients & bacteria
Portneuf River	Marsh Creek to PMVCC Diversion	Sediment, nutrients & bacteria
Portneuf River	PMVCC Diversion to Lava Hot Springs	Sediment, nutrients & bacteria
Portneuf River	Lava Hot Springs to Downey Canal	Sediment, nutrients, bacteria & flow
Portneuf River	Downey Canal to Chesterfield Reservoir	Sediment, nutrients, bacteria & flow
Portneuf River	Chesterfield Reservoir to Headwaters	Sediment
Portneuf River	American Falls Reservoir to Fort Hall Reservation	Sediment, nutrients & bacteria
Portneuf River	Interstate 86 to Johnny Creek	Sediment, nutrients, bacteria, oil/grease
Portneuf River	Johnny Creek to Marsh Creek	Sediment, nutrients & bacteria
Pocatello Creek	Headwaters to Portneuf River	Sediment
Rapid Creek	Headwaters to Portneuf River	Sediment
Marsh Creek	Calvin Road to Portneuf River	Sediment and nutrients
Garden Creek	Garden Creek Gap to Marsh Creek	Sediment and nutrients
Hawkins Creek	Headwaters to Marsh Creek	Sediment and nutrients
Birch Creek	Birch Creek Road to Marsh Creek	Sediment and nutrients
Cherry Creek	Forest Service Boundary to Marsh Creek	Sediment and nutrients
Twentyfourmile Creek	Headwaters to Portneuf River	Sediment
Indian Creek	Forest Service Boundary to Portneuf River	Unknown
Arkansas Creek	Headwaters to Marsh Creek	Unknown
Hawkins Reservoir	Entire reservoir	Nutrients and dissolved oxygen

Causes of Agricultural Pollution

Agricultural nonpoint source pollution is being caused by:

- sheet and rill, gully, irrigation-induced and stream channel erosion on agricultural land
- nutrient runoff or leaching from fertilizer and animal waste applications on agricultural land
- animal waste from facility runoff and waste applications on agricultural land
- aquatic habitat degradation from human and animal activities on agricultural land

Effects of Agricultural Pollutants

Sediment can:

- affect a stream channel's sediment transport function
- severely alter aquatic communities
- clog and abrade fish gills
- suffocate eggs and aquatic insect larvae on the stream bottom
- fill in the pore space between substrates where fish lay eggs
- become suspended and interfere with recreation and aesthetics
- reduce water clarity and fill in water bodies
- carry other pollutants such as nutrients and toxic substances
- increases mechanical wear of water supply pumps and distribution systems
- increases treatment costs for water supplies

Nutrients (Phosphorus and/or Nitrogen) can:

- increase the amount of aquatic (macrophytes, algae and phytoplankton) vegetation
- change the color, appearance, odor and taste of water
- diminish sensitive species by reducing oxygen when dead plants decompose
- decrease sensitive species by releasing toxic gases during anaerobic conditions
- reduce sensitive species due to toxins secreted from algal blooms and die off
- accelerate the eutrophication or aging process of lakes, reservoirs or streams
- increase treatment and distribution costs by clogging pipes, intakes or control structures
- decrease recreational use due to abundant aquatic vegetation
- contaminate drinking water above the drinking water standard

Animal Waste can:

- potentially transmit waterborne disease to humans through ingestion or bodily contact
- limit primary or secondary recreation, such as swimming or wading
- contaminate receiving waters with oxygen-demanding organic matter
- contribute nutrients (nitrogen and phosphorus) to receiving waters

Aquatic Habitat Degradation can:

- change the flow regime (peak and low flows) due to dams or diversions
- reduce or alter space and channel structure (including large woody debris)
- shift substrate quality and size due to surface, stream bank or mass wasting erosion
- damage riparian condition due to channelization, vegetative removal or exotic species
- worsen water quality by temperature, sediment, nutrient or toxin loading
- decrease habitat access due to physical barriers limiting migration
- deteriorate watershed condition, aquatic habitat and floodplain connectivity

Sediment

Three primary geomorphic processes involved with flowing water are erosion, transport and deposition. Soil particles are detached, moved and deposited either gradually or rapidly and can be caused by human activities or natural processes (FISWRG, 1998). This plan focuses on those agricultural activities that accelerate these natural processes. Agricultural sources of sediment include; sheet and rill, gully, stream channel and irrigation-induced erosion. The recommended BMPs in this plan can reduce the acceleration of these processes. Because of limited financial and technical resources, an approach must be developed to address those areas where BMPs will be most effective. Below is the priority strategy for implementing BMPs to reduce agricultural sediment.

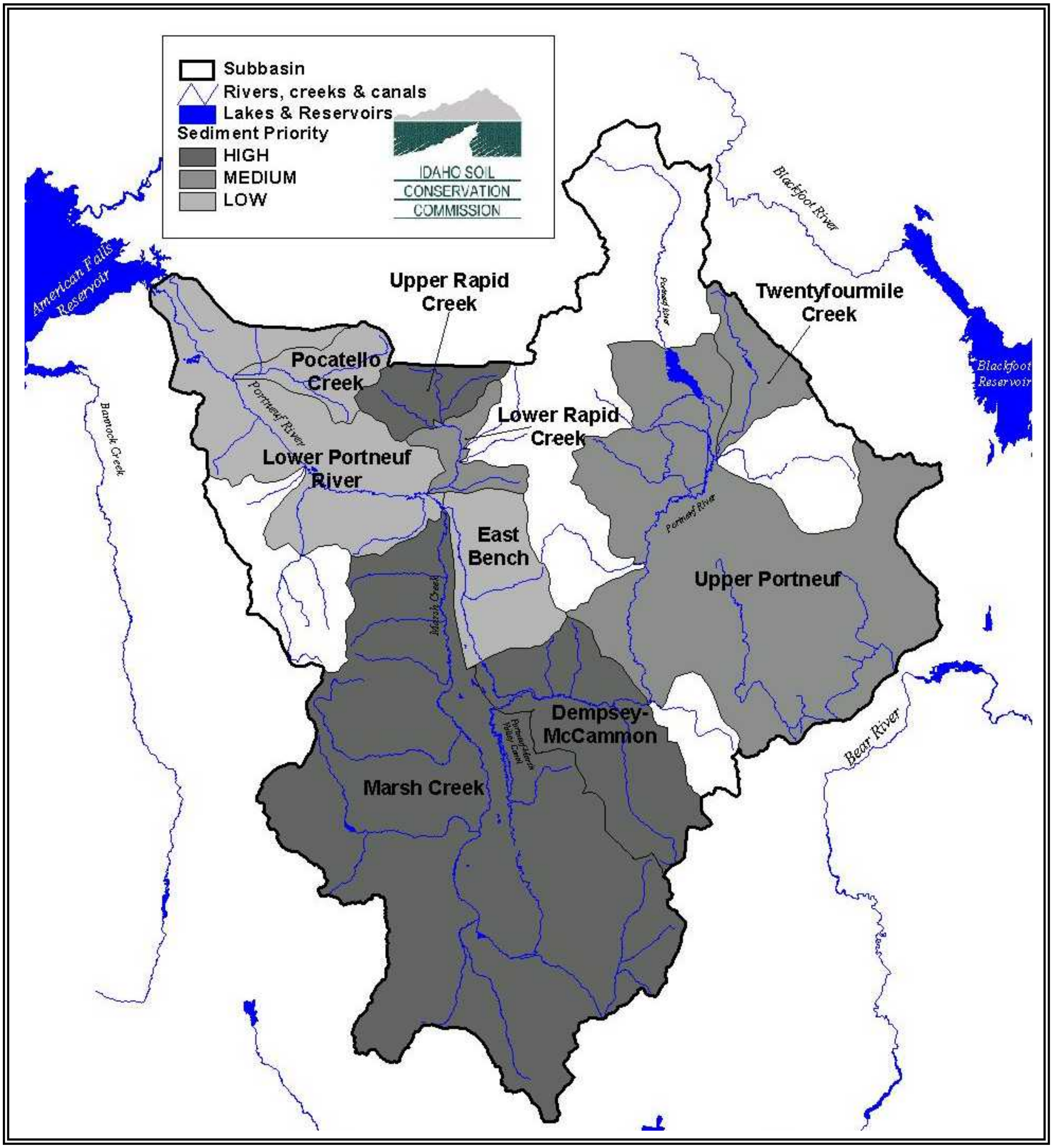
Sediment Priority Ranking Criteria

Portneuf River watersheds or subwatersheds were ranked based upon their TSS loads, percent contribution to the Portneuf River and TMDL target exceedance. Large contributors such as Marsh, Rapid and Dempsey creeks are considered high priority for BMP application. Sediment BMP priorities for the subbasin are presented in Table 15 and Figure 17.

Table 15. Sediment Priorities for Agricultural BMP Implementation

Priority Category	Watershed or Subwatershed	Priority Ranking	Segment
HIGH	Marsh Creek	1	Calvin Road to Portneuf River
	Upper Rapid Creek	2	Headwaters to Rapid Creek
	Dempsey-McCammon	3	Lava Hot Springs to McCammon
MEDIUM	Lower Rapid Creek	4	North and West forks to Portneuf River
	Twentyfourmile Creek	5	Headwaters to Portneuf River
	Upper Portneuf River	6	Chesterfield Reservoir to Lava Hot Springs
LOW	Lower Portneuf River	8	Marsh Creek to American Falls Reservoir
	East Bench	7	McCammon to Marsh Creek
	Pocatello Creek	9	Headwaters to Portneuf River

Figure 17. Sediment Priority Map for Agricultural BMP Implementation



Sediment Load Reductions

Sediment load reductions were estimated using only TSS. There are no load reductions currently set for tributaries, although the TSS targets are expected to be met (Rowe, 2002). These estimates reflect the low flow (June to January) criteria of 50 mg/L TSS for no more than 28 days, and the high flow (February to May) criteria of 80 mg/L TSS for no more than 14 days. TMDL load analysis for river flows from 1955 to 1996 yielded TSS load reductions for three USGS gages (Pocatello, Marsh Creek and Topaz) are 65%, 67% and 53%, respectively (IDEQ, 1999).

The TMDL targets were applied to water quality data and used to predict what TSS load reductions may be needed. These reduction estimates don't include bedload estimates. Water quality monitoring data collected by IASCD from 1999 to 2001 was compared to data collected at three USGS gages from 1995 to 2001. The data is summarized in Table 16. The IASCD and USGS April 2000 data, shown in Table 17, was the only period that TSS was monitored throughout the subbasin.

Agricultural Sediment Sources

For the purpose of this plan, sediment sources are divided into four primary categories: sediment generated from sheet and rill erosion; gully (ephemeral and classic) erosion; stream channel (bed and bank) erosion and irrigation-induced (surface and sprinkler) erosion.

Sheet and Rill Erosion

Sheet and rill erosion is the detachment and transport of soil particles by raindrop impact, surface runoff from rainfall and snowmelt on frozen and thawing soil that results in a negative impact on soil productivity. NRCS has designated criteria for sheet and rill erosion that is termed the tolerable level or "T" for each soil unit. On range and wood lands, when the quality criteria for plants is met, the soil loss is assumed less than "T" (NRCS, 2002). NRCS uses the Revised Universal Soil Loss Equation (RUSLE) for predicting average annual sheet and rill erosion on crop lands.

NRCS describes two cropping systems on non-irrigated crop land in Bannock County (NRCS, 2002). The first system is for dry crop land with zero to eight percent slopes and silt loam soils. This dry crop land is planted to winter wheat and fallow. Yields are generally 30 bushels per acre with conventional tillage leaving five to ten percent crop residues after planting. Precipitation is usually 10 to 14 inches per year with an average growing season length of 150 days. Tillage practices include fall or spring disking, chiseling and rod weeding. The average-annual soil loss is 7.6 tons per acre per year. The second system is for non-irrigated crop land with 9 to 15% slopes and silt loam soils. These crop lands are often characterized by significant ephemeral gully erosion. This crop land is planted to winter wheat and fallow. Yields are generally 30 bushels per acre with conventional tillage leaving five to ten percent crop residues after planting. Precipitation is 10 to 14 inches per year with an average growing season length of 150 days. Tillage practices include fall or spring disking, chiseling and rod weeding. The average-annual soil loss is 8.9 tons per acre per year.

Gully Erosion (ephemeral and classic)

There are two categories of gully erosion. The first is ephemeral gully erosion, which is the detachment and transport of soil particles from surface runoff that has concentrated in channels. Ephemeral gullies on crop land are typically removed with normal tillage operations. The second is classic gully erosion that is the movement of soil by concentrated flow of water in channels that are too deep to be obscured by normal tillage operations. These channels are lengthened and enlarged by runoff events that cause water to erode and deepen the channel and to widen the channel by stream bank failure (NRCS, 2002).

Stream Channel Erosion

Stream channel erosion is defined as the movements of soil caused from sloughing of stream banks caused by overbank flow, unstable soils, and bank scour at obstructions or unstable channel bottoms (NRCS, 2002). There are several stream channel types in the subbasin. However, there are two types of stream channels associated with riparian areas on private agricultural lands. They include streams with the slope of the water surface zero to two percent and two to four percent. Channel substrates are usually silt, sand, gravel or cobbles. The stream channels are usually vertically stable and slightly to moderately entrenched. Woody and herbaceous vegetative buffers are generally less than one channel width on each side of the stream and are usually degraded and inadequate to withstand high flows. Often the stream channels have been altered with some recovery from the disturbance. Management of these areas are associated with adjacent crop, pasture or range lands. Generally no conservation practices are in place or attempts have been made by the landowner and failed. Irrigation diversion structures are present. Generally, these stream channels are in areas that receive 12 to 24 inches of annual precipitation with seasonal flooding during spring runoff or occasional summer thunderstorms. Elevations range between 5,000 and 7,000 feet. Soils range from silt loams to gravel loams. These streams often have slight to moderate erosion with a lateral recession rate of 0.01 to 0.2 feet per year. NRCS uses the Stream Visual Assessment Protocol (SVAP) and the Stream Erosion Condition Inventory (SECI) for assessing aquatic habitat suitability and predicting average annual stream bank erosion along streams.

Irrigation-Induced Erosion (surface and sprinkler)

There are two types of irrigation-induced erosion. Surface and sprinkler irrigation-induced erosion, which is the movement of soil caused by irrigation water. Surface irrigation-induced erosion also includes irrigation supply and drainage ditches that are eroding. NRCS has designated criteria for surface irrigation-induced erosion, as sediment loss off the end of the field is less than the tolerable level "T" for each soil unit or water conveyances and ditches, which are stable. Sprinkler irrigation-induced erosion is stable when sheet and rill erosion is less than "T" and ephemeral gullies do not occur annually. NRCS uses Surface Irrigated Soil Loss (SISL) for predicting erosion on irrigated lands (NRCS, 2002). NRCS describes a cropping system in Bannock County for irrigated crop lands with zero to eight percent slopes and silt loam soils (NRCS, 2002). This crop land is planted to winter wheat and fallow. Yields are generally 30 bushels per acre with conventional tillage leaving five to ten percent crop residues after planting. Precipitation is 10 to 14 inches per year with an average growing season length of 150 days. Tillage practices include fall or spring disking, chiseling and rod weeding. The average-annual soil loss is 7.6 tons per acre per year.

Sediment BMPs for Agriculture

Agricultural sediment sources can be reduced or eliminated by applying these BMPs. The following sediment BMPs shown in Table 18 are available for use by landowners. The most effective BMPs for reducing these agricultural sediment sources are Channel Vegetation (NRCS PS 322), Conservation Cover (NRCS PS 327), Critical Area Planting (NRCS PS 342), Prescribed Grazing (NRCS PS 528A), Residue Management, No-Till (NRCS PS 329A), Riparian Forest Buffer (NRCS PS 391A), Streambank & Shoreline Protection (NRCS PS 580), Terrace (NRCS PS 600), Tree/Shrub Establishment (NRCS PS 612) and Use Exclusion (NRCS PS 472). In general, these BMPs significantly reduce agricultural sediment sources although site-specific situations may occur that other BMPs would also significantly reduce sediment sources.

Table 16. 1995-2001 TSS Loads and Exceedance for the Portneuf River and Tributaries

Monitoring Site	Average TSS Load (tons/day)	Average TSS Load @ TSS Target (tons/day)	Average TSS Load Reduction	TSS Target Exceedance
Portneuf River @ Pocatello*	164.3	58.0	65%	56%
Marsh Creek @ above Portneuf River	4.6	4.4	4%	10%
Twentyfourmile Creek (lower site)***	0.42	0.37	12%	19%
Twentyfourmile Creek above reservoir***	0.02	0.01	50%	56%
Indian Creek***	0.07	0.05	29%	12%
Rapid Creek below Jackson Creek***	2.3	1.9	17%	7%
Portneuf River @ Topaz*	204.3	38.6	81%	61%
Marsh Creek @ McCammon*	30.0	10.1	66%	22%
Rapid Creek below West & North forks***	4.5	2.7	40%	25%
East Bob Smith Creek***	0.5	0.4	20%	24%
South Fork Pocatello Creek***	0.07	0.07	0%	37%
Marsh Creek below Bell Marsh Creek***	8.9	6.5	27%	27%
Dempsey Creek***	3.4	2.3	32%	28%
North Fork Rapid Creek***	0.4	0.4	0%	0%
West Fork Rapid Creek***	0.06	0.06	0%	5%
Bell Marsh Creek***	0.6	0.5	17%	14%
Goodenough Creek***	0.6	0.4	33%	22%
North Fork Pocatello Creek***	0.7	0.4	43%	35%
Birch Creek***	1.4	0.7	50%	22%
Garden Creek (lower site)***	1.9	0.5	74%	35%
Garden Creek (upper site)***	0.38	0.37	3%	24%
Hawkins Creek (above reservoir)***	0.09	0.06	33%	75%
Hawkins Creek (lower site)***	0.4	0.1	75%	79%
Webb Creek (lower site)***	0.3	0.3	0%	0%
Webb Creek (upper site)***	0.2	0.2	0%	0%
Eighteenmile Creek***	0.04	0.04	0%	0%
Marsh Creek below Hawkins Creek***	1.7	1.4	18%	31%
Portneuf River @ Chesterfield Dam**	0.7	0.7	0%	0%
Portneuf River @ Stalker Rd**	7.1	6.5	8%	14%
Portneuf River @ Nipper Rd**	8.6	6.2	28%	24%
Portneuf River @ Kelly-Toponce Rd**	7.3	6.0	18%	17%

* 1996-2000 water quality data from USGS gage stations #13074000, #13075000 and #13075500
** 1995-97 water quality data from IDEQ sites on the Portneuf River (P1, P4, P5 and P6)
*** 1999-2001 water quality data from IASCD on tributaries to the Portneuf River

Table 17. April 2000 TSS loads for the Portneuf River and tributaries

Monitoring Site	TSS (mg/L)	TSS Load (tons/day)	Discharge (cfs)	Portion of river load	Portion of river discharge
Portneuf River @ Pocatello*	96	113.3	437.0	100.0%	100.0%
Marsh Creek below Bell Marsh Creek***	144	39.1	100.5	34.5%	23.0%
Portneuf River @ Topaz*	52	31.0	221.0	27.4%	50.6%
Marsh Creek @ McCammon*	115	25.2	81.0	22.2%	18.5%
Dempsey Creek***	96	8.2	31.7	7.2%	7.3%
Rapid Creek***	46	6.1	49.2	5.4%	11.3%
Marsh Creek below Hawkins Creek***	26	4.5	64.0	4.0%	14.6%
Garden Creek***	189	3.6	7.1	3.2%	1.6%
East Bob Smith Creek***	118	2.9	9.2	2.6%	2.1%
Twentyfourmile Creek***	85	2.7	11.7	2.4%	2.7%
Goodenough Creek***	143	1.2	3.1	1.1%	0.7%
Birch Creek***	49	0.9	6.5	0.8%	1.5%
Bell Marsh Creek***	16	0.4	9.3	0.4%	2.1%
Indian Creek***	102	0.2	0.8	0.2%	0.2%
North Fork Pocatello Creek***	28	0.2	2.8	0.2%	0.6%
South Fork Pocatello Creek***	110	0.2	0.6	0.2%	0.1%
Hawkins Creek***	265	0.1	0.1	0.1%	0.02%
Webb Creek***	16	1.4	31.6	1.2%	7.2%
Eighteenmile Creek***	21	0.2	3.2	0.2%	0.7%

* 2000 water quality data from USGS gage stations #13074000, #13075000 and #13075500
** 1995-97 water quality data from IDEQ sites on the Portneuf River (P1, P4, P5 and P6)
*** 1999-2001 water quality data from IASCD on tributaries to the Portneuf River

Table 18. Sediment BMPs for Agriculture and Effects on Resource Problems

Conservation Practices	NRCS Practice Standard	Soil Erosion; Sheet & Rill	Soil Erosion; Ephemeral Gully	Soil Erosion; Classic Gully	Soil Erosion; Stream bank	Soil Erosion; Irrigation Induced (Surface)	Soil Erosion; Irrigation Induced (Sprinkler)
Channel Vegetation	322	N/A	N/A	N/A	Sig Decrease	N/A	N/A
Conservation Cover	327	Sig Decrease	Sig Decrease	Sl to Sig Decrease	N/A	Sig Decrease	Sig Decrease
Conservation Crop Rotation	328	Sl to Sig Decrease	Sl to Mod Decrease	Sl to Mod Decrease	N/A	Sl to Mod Decrease	Sl to Mod Decrease
Contour Farming	330	Sl to Sig Decrease	Sl to Mod Decrease	Sl Decrease	N/A	N/A	N/A
Cover Crop	340	Sl to Sig Decrease	Sl Decrease	Insignificant	N/A	Sl Decrease	Sl Decrease
Critical Area Planting	342	Sig Decrease	Sig Decrease	Sl to Mod Decrease	Sl Decrease	N/A	N/A
Deep Tillage	324	Sl to Mod Decrease	Sl Decrease	Sl Decrease	N/A	Sl to Mod Decrease	Sl to Mod Decrease
Diversion	362	Insignificant	Sl to Mod Decrease	Sl to Mod Decrease	N/A	N/A	N/A
Filter Strip	393A	N/A	N/A	N/A	Sl to Mod Decrease	N/A	N/A
Stream Habitat Improvement	395	N/A	N/A	N/A	Sl to Mod Decrease	N/A	N/A
Forage Harvest Management	511	Mod to Sig Decrease	Mod to Sig Decrease	Sl Decrease	Sl to Mod Decrease	Mod to Sig Decrease	Mod to Sig Decrease
Grade Stabilization Structure	410	N/A	Mod to Sig Decrease	Mod to Sig Decrease	N/A	N/A	N/A
Grassed Waterway	412	N/A	Sig Decrease	Sl to Mod Decrease	N/A	N/A	N/A
Heavy Use Area Protection	561	N/A	N/A	N/A	Sl to Sig Decrease	N/A	N/A
Irrigation System-Micro-Irrigation	441	N/A	N/A	N/A	N/A	Sig Decrease	Sig Decrease
Irrigation System-Sprinkler	442	N/A	N/A	N/A	N/A	Sig Decrease	Situational
Irrigation Water Management	449	N/A	N/A	N/A	N/A	Mod to Sig Decrease	Mod to Sig Decrease
Open Channel	582	N/A	N/A	Mod Decrease	Sl to Mod Decrease	N/A	N/A
Pasture & Hayland Planting	512	Mod to Sig Decrease	Mod to Sig Decrease	Sl to Mod Decrease	N/A	Sl to Mod Decrease	Sl to Mod Decrease
Prescribed Grazing	528A	Sig Decrease	Mod Decrease	Mod Decrease	Sig Decrease	N/A	N/A
Range Planting	550	Sl to Sig Decrease	Sl to Sig Decrease	Sl to Mod Decrease	N/A	N/A	N/A
Residue Management, Direct Seeding	777	Sig Decrease	Sig Decrease	Sl Decrease	N/A	Sig Decrease	Sig Decrease
Residue Management, No-Till & Strip Till	329A	Sig Decrease	Sig Decrease	Sl Decrease	N/A	Sig Decrease	Sig Decrease
Riparian Forest Buffer	391A	N/A	N/A	N/A	Sl to Mod Decrease	N/A	N/A
Riparian Herbaceous Cover	390	N/A	N/A	N/A	Sl to Mod Decrease	N/A	N/A
Stream Channel Stabilization	584	N/A	N/A	N/A	Sig Decrease	N/A	N/A
Streambank & Shoreline Protection	580	N/A	N/A	Sl to Sig Decrease	Sig Decrease	N/A	N/A
Stripcropping-Field	586	Sl to Mod Decrease	Sl to Mod Decrease	Sl Decrease	N/A	N/A	N/A
Terrace	600	Sl to Mod Decrease	Sig Decrease	Mod to Sig Decrease	N/A	N/A	N/A
Tree/Shrub Establishment	612	Sig Decrease	Sig Decrease	Sl to Mod Decrease	Sl to Mod Decrease	N/A	N/A
Use Exclusion	472	Sig Decrease	Mod to Sig Decrease	Sl to Mod Decrease	Sl to Sig Decrease	N/A	N/A
Water & Sediment Control Basin	638	N/A	Sig Decrease	Sl to Sig Decrease	N/A	N/A	N/A
Watering Facility	614	N/A	N/A	N/A	Sl Decrease	N/A	N/A
Wetland Creation	658	N/A	Sl to Mod Decrease	Sl to Mod Decrease	N/A	N/A	N/A

Sl = Slight, Mod = Moderate, Sig = Significant, N/A = Not Applicable

Bacteria

Fecal coliform bacteria include numerous species of bacteria. Following the completion of the TMDL, IDEQ recommended that *E.coli* be monitored in the subbasin and addressed by designated management agencies in their TMDL implementation plans (Rowe, 2002). For this reason, IASCD sampled both fecal coliform bacteria and *E.coli* to aid in the development of the TMDL agricultural implementation plan.

Bacteria Priority Ranking Criteria

Bacteria treatment priorities for segments and tributaries of the Portneuf River are presented in Table 19 and Figure 18. The prioritization for bacteria implementation is based on monitoring data from (Fischer, 2001; USGS, 2002 and IDEQ, 1999). The water quality standard of instantaneous samples for *E.coli* in PCR and SCR is 406 cfu/100 ml and 576 cfu/100 ml, respectively. Those monitoring sites that exceeded the *E.coli* standards 33% or more were in the high category. Sites that exceeded the *E.coli* standards between 5% and 33% of the samples are ranked as medium priority. Finally, those sites with less than five percent of the samples exceeding the *E.coli* standards are in the low category. The sites were ranked by discharge in each of the categories.

Bacteria Load Reductions

The TMDL bacteria load reductions are based on a one-time grab sample (Fischer, 2001). The TMDL recommends a 63% reduction in bacteria loads in the Portneuf River from Lava Hot Springs to Rainey Park in Pocatello and a 7% reduction in bacteria loads in the Portneuf River from Chesterfield Reservoir to Pebble Creek. No loads were calculated for *E.coli* in the TMDL. No bacteria or *E.coli* load allocations have been calculated for the tributaries because instantaneous fixed interval sampling was done and no geomeans were established (Fischer, 2002). The tributary bacteria results were evaluated by comparing the percent of samples that exceeded the fecal coliform targets or the *E.coli* standards for primary and secondary contact recreation and summarized in Table 20.

Table 19. Bacteria Priorities for Agricultural BMP Implementation

Priority Category	Watershed or Subwatershed	Priority Ranking	Segment
HIGH	Upper Rapid Creek	1	Headwaters to Rapid Creek
	Twentyfourmile Creek	2	Headwaters to Portneuf River
	Marsh Creek	3	Calvin Road to Portneuf River
MEDIUM	Lower Rapid Creek	4	North and West forks to Portneuf River
	Lower Portneuf River	5	Marsh Creek to American Falls Reservoir
	Dempsey-McCammon	6	Lava Hot Springs to McCammon
LOW	East Bench	7	McCammon to Marsh Creek
	Upper Portneuf River	8	Chesterfield Reservoir to Lava Hot Springs
	Pocatello Creek	9	Headwaters to Portneuf River

Figure 18. Bacteria Priority Map for Agricultural BMP Implementation

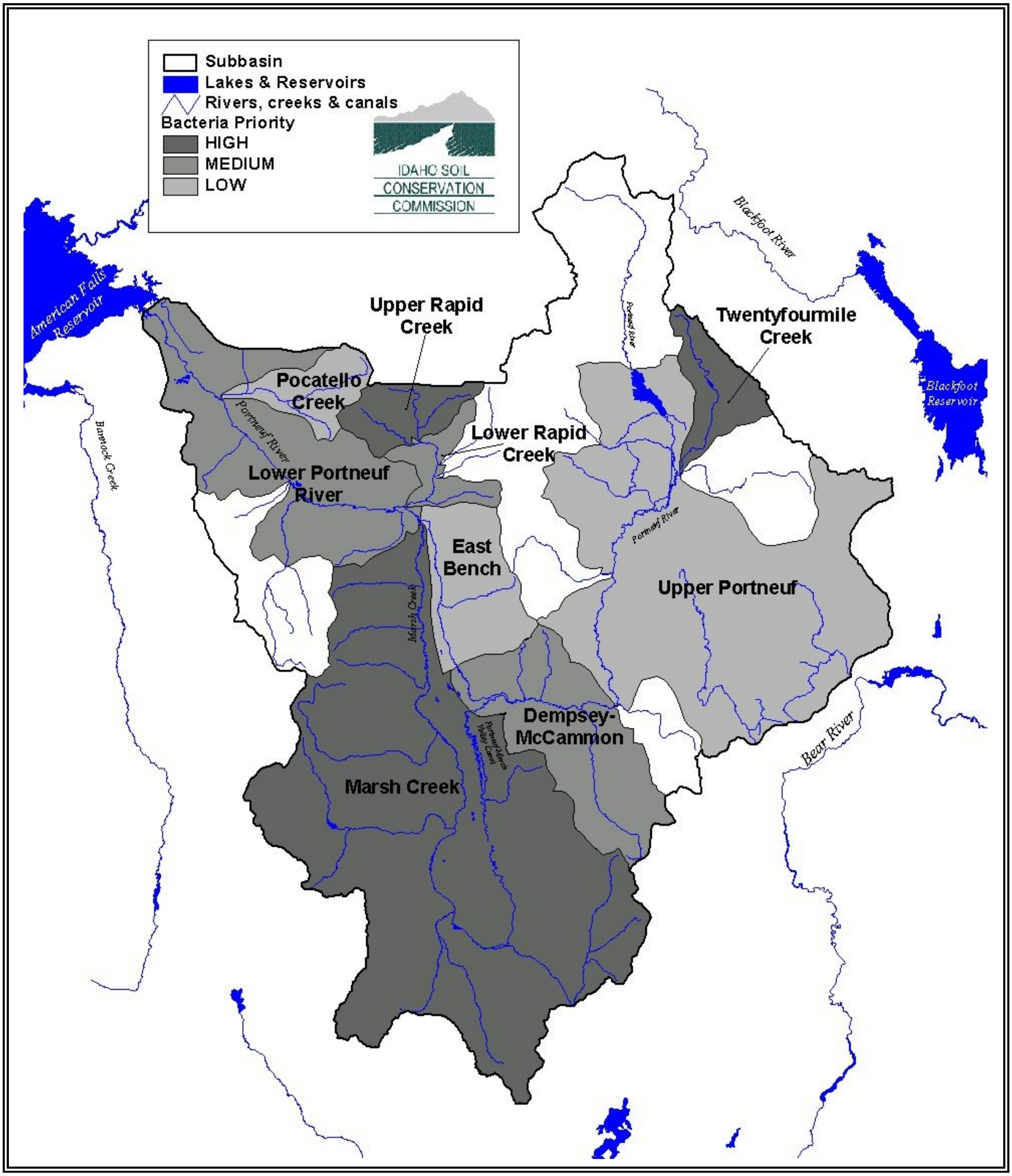


Table 20. Percent of Samples Exceeding the TMDL Targets & *E. coli* Standards

Monitoring Site	Fecal Coliform PCR Target Exceedance	Fecal Coliform SCR Target Exceedance	*E.coli* PCR Standard Exceedance	*E.coli* SCR Standard Exceedance
Hawkins Creek (lower site)***	61%	32%	50%	39%
Twentyfourmile Creek above reservoir***	56%	56%	56%	56%
Garden Creek (lower site)***	54%	49%	43%	41%
North Fork Rapid Creek***	45%	40%	40%	35%
Birch Creek***	33%	11%	6%	6%
West Fork Rapid Creek***	32%	21%	32%	16%
Indian Creek***	29%	24%	29%	29%
East Bob Smith Creek***	29%	18%	18%	12%
Rapid Creek below West & North forks***	25%	25%	13%	13%
Garden Creek (upper site)***	24%	18%	18%	12%
Bell Marsh Creek***	21%	14%	21%	21%
Hawkins Creek (above reservoir)***	20%	20%	20%	20%
Portneuf River @ Pocatello*	17%	17%	NS	NS
Rapid Creek below Jackson Creek***	13%	13%	13%	7%
Twentyfourmile Creek (lower site)***	13%	6%	6%	6%
Portneuf River @ Nipper Rd**	11%	4%	NS	NS
Marsh Creek below Hawkins Creek***	11%	3%	3%	3%
Marsh Creek @ above Portneuf River	10%	0%	0%	0%
Portneuf River @ Kelly-Toponce Rd**	7%	0%	NS	NS
Dempsey Creek***	6%	6%	0%	0%
Portneuf River @ Chesterfield Dam**	4%	0%	NS	NS
Portneuf River @ Stalker Rd**	4%	0%	NS	NS
Marsh Creek below Bell Marsh Creek***	3%	0%	3%	3%
Webb Creek (lower site)***	3%	0%	0%	0%
Portneuf River @ Topaz*	0%	0%	NS	NS
Marsh Creek @ McCammon*	0%	0%	NS	NS
North Fork Pocatello Creek***	0%	0%	5%	0%
South Fork Pocatello Creek***	0%	0%	0%	0%
Goodenough Creek***	0%	0%	0%	0%
Webb Creek (upper site)***	0%	0%	0%	0%
Eighteenmile Creek***	0%	0%	0%	0%

* 2000 water quality data from USGS gage stations #13074000, #13075000 and #13075500
** 1995-97 water quality data from IDEQ sites on the Portneuf River (P1, P4, P5 and P6)
*** 1999-2001 water quality data from IASCD on tributaries to the Portneuf River
NS = Not Sampled

Table 21. April 2000 Bacteria Results for the Portneuf River and Tributaries

Monitoring Site	Fecal Coliform (cfu/100ml)	Discharge (cfs)	Portion of river discharge
Portneuf River @ Pocatello*	82	437.0	100.0%
Marsh Creek below Bell Marsh Creek***	404	100.5	23.0%
Portneuf River @ Topaz*	8	221.0	50.6%
Marsh Creek @ McCammon*	190	81.0	18.5%
Dempsey Creek***	12	31.7	7.3%
Rapid Creek***	624	49.2	11.3%
Garden Creek***	TNTC	7.1	1.6%
East Bob Smith Creek***	296	9.2	2.1%
Twentyfourmile Creek***	484	11.7	2.7%
Goodenough Creek***	0	3.1	0.7%
Birch Creek***	188	6.5	1.5%
Bell Marsh Creek***	0	9.3	2.1%
Indian Creek***	56	0.8	0.2%
North Fork Pocatello Creek***	20	2.8	0.6%
South Fork Pocatello Creek***	156	0.6	0.1%
Hawkins Creek***	84	0.1	0.02%
Marsh Creek below Hawkins Creek***	28	64.0	14.6%
Webb Creek***	8	31.6	7.2%
Eighteenmile Creek***	312	3.2	0.7%

* 2000 water quality data from USGS gage stations #13074000, #13075000 and #13075500
*** 1999-2001 water quality data from IASCD on tributaries to the Portneuf River
TNTC = Too Numerous To Count

Agricultural Bacteria Sources

Surface runoff of animal wastes contaminates a receiving water body with four types of pollutants; pathogenic and non-pathogenic microorganisms, biodegradable organic matter, nutrients and salts (SCS, 1989). Bacterial sources from agricultural land include animal waste storage in animal feed operations and corrals, applications of accumulated animal waste on crop and pasture lands and livestock droppings on range lands or near water bodies. Animal feed operations for dairy or beef cattle are under regulation (IDAPA 02.04.14.001 and IDAPA 02.04.15.001) to eliminate runoff or discharges. These regulations require waste systems to be designed for a 25-year, 24-hour storm event as well as average 5-year runoff events from the feeding areas or milking facilities. On lands where animal wastes are applied, phosphorus and nitrogen thresholds are used to ensure applications are based on crop nutrient needs.

Animal Related Bacterial Sources

Animal feeding, grazing and watering occurs along the Portneuf River and several of its tributaries. Manure applications from either runoff of corral stockpiles or animal droppings during grazing or watering are potential sources of bacteria. The potential is even greater when these waste applications or waste storage sites occur near surface or ground waters. The NRCS Confined Animal Feeding Operation/Animal Feeding Operation (CAFO/AFO) Worksheet and the Idaho Animal Waste Management (IDAWM) computer program is used to determine problems for bacteria runoff from livestock waste storage and application areas (NRCS, 2002).

Animal Feed Operations

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. Any new dairy farms are required to have an approved nutrient management plan before issuance of a milk permit. ISDA promulgated rules (IDAPA 02.04.14.000 et seq.) for dairy waste and they were adopted in 1997. Currently, ISDA is conducting inspections and soil sampling on all dairies to ensure compliance with the nutrient management plans. There are currently eight dairies in the subbasin of which seven are milking less than 200 cows and one is milking over 250 cows (ISDA, 1999). All eight of these dairies have submitted their nutrient management plans to ISDA.

The Idaho Legislature passed Idaho law, *I.C. §22-4906*, *Title 22, Chapter 49, Beef Cattle Environmental Control Ac*, in 2000. ISDA promulgated rules (IDAPA 02.04.15.000 et seq.) which became effective in September 2000. Beef cattle animal feed operations are required to submit a nutrient management plan to ISDA for approval no later than January 1, 2005. In 2002, ISDA and ISCC conducted a preliminary inventory and identified approximately 250 potential sites with animal feed operations, corrals or pens within the subbasin.

Bacteria BMPs for Agriculture

Agricultural bacteria sources can be reduced or eliminated by applying BMPs. The following bacteria BMPs shown in Table 22 are available for use by landowners. The most effective BMPs for reducing these agricultural bacterial sources are Waste Storage Facility (NRCS PS 313), Watering Facility (NRCS PS 614), Riparian Forest Buffer (NRCS PS 391A) and Use Exclusion (NRCS PS 472). BMPs that would reduce agricultural phosphorus sources would also reduce animal related bacteria sources. In general, these BMPs significantly reduce agricultural bacteria sources although site-specific situations may occur that other BMPs would also significantly reduce bacteria sources.

Table 22. Bacteria BMPs for Agriculture and Effects on Resource Problems

Conservation Practices	NRCS Practice Standard	Water Quality, Surface Water; Pathogens	Soil Contamination; From Animal Wastes & Other Organics	Animal Habitat, Domestic; Quantity & Quality of Drinking Water
Animal Trails and Walkways	575	Sl to Mod Increase	N/A	Sl to Mod Decrease
Brush Management	314	Sl Decrease	N/A	Sl Decrease
Channel Vegetation	322	Sl Decrease	Sl Decrease	N/A
Composting Facility	317	Sl to Sig Decrease	Facilitating	N/A
Conservation Cover	327	Sl Decrease	Mod Decrease	Sl to Sig Decrease
Conservation Crop Rotation	328	Sl Decrease	Sl Decrease	N/A
Constructed Wetland	656	Sl to Sig Decrease	Sl to Mod Decrease	Situational
Contour Buffer Strips	332	Sl Decrease	Insignificant	Situational
Contour Farming	330	Sl Decrease	N/A	Situational
Cover Crop	340	Sl Decrease	Insignificant	Sl to Mod Decrease
Critical Area Planting	342	Sl Decrease	Sl Decrease	Sl Decrease
Deep Tillage	324	Sl Decrease	Sl Decrease	N/A
Diversion	362	Sl to Mod Decrease	N/A	Sl to Mod Decrease
Filter Strip	393A	Sl Decrease	Sl Increase	Sl to Sig Decrease
Forage Harvest Management	511	Sl Decrease	Mod to Sig Decrease	N/A
Heavy Use Area Protection	561	Situational	N/A	Sl to Mod Decrease
Irrigation System, Tailwater Recovery	447	Sl to Sig Decrease	N/A	Situational
Irrigation System-Sprinkler	442	Sl to Mod Decrease	N/A	Sl to Mod Decrease
Irrigation Water Management	449	Sl Decrease	N/A	Sl to Sig Decrease
Nutrient Management	590	Sl to Sig Decrease	Sl to Sig Decrease	Sl to Sig Decrease
Pasture & Hayland Planting	512	Sl Decrease	N/A	Sl Decrease
Pipeline	516	Facilitating	Facilitating	Facilitating
Prescribed Grazing	528A	Sl Decrease	Sl to Mod Decrease	Sl to Mod Decrease
Range Planting	550	Sl to Mod Decrease	Sl to Mod Decrease	Sl to Mod Decrease
Residue Management, Direct Seeding	777	Sl Decrease	Insignificant	Sl Decrease
Residue Management, No-Till	329A	Sl Decrease	Insignificant	Sl Decrease
Riparian Forest Buffer	391A	Mod to Sig Decrease	Sl Increase	Sl to Sig Decrease
Riparian Herbaceous Cover	390	Mod to Sig Decrease	Sl Increase	Sl to Sig Decrease
Roof Runoff Management	558	Sl to Sig Decrease	N/A	N/A
Sediment Basin	350	Sl Decrease	N/A	Sl to Mod Decrease
Spring Development	574	Sl to Sig Decrease	N/A	Sig Decrease
Surface Drainage-Field Ditch	607	Sl to Mod Increase	N/A	Situational
Surface Drainage-Main or Lateral	608	Sl to Mod Increase	Sl Decrease	Situational
Tree/Shrub Establishment	612	Sl Decrease	Sl to Sig Decrease	Sl Decrease
Use Exclusion	472	Sl to Sig Decrease	Sl to Mod Decrease	Sl to Sig Decrease
Waste Storage Facility	313	Sl to Sig Decrease	N/A	N/A
Waste Treatment Lagoon	359	Sl to Sig Decrease	N/A	N/A
Water & Sediment Control Basin	638	Sl Decrease	N/A	Sl to Mod Decrease
Watering Facility	614	Sl to Mod Decrease	Sl to Mod Increase	Sig Decrease
Wetland Enhancement	659	Sl Decrease	Sl Increase	Sl to Mod Decrease
Wetland Restoration	657	Sl Decrease	Sl Increase	Sl to Mod Decrease

Sl = Slight, Mod = Moderate, Sig = Significant, N/A = Not Applicable

Phosphorus

Phosphorus runoff includes two processes, surface runoff and subsurface flow. The loss of phosphorus in agricultural runoff occurs in sediment bound and dissolved forms (Sharpley et al., 1999). According to the TMDL, a reduction in sediment will yield reductions in nutrients, especially TP (IDEQ, 1999). The Portneuf River, Marsh and Rapid creeks have significant loads of TP and are more than sufficient to support algae growth. Elevated dissolved phosphorus or orthophosphorus occur during high flows at most sample sites. However, Rapid, Garden and Pocatello creeks show elevated orthophosphorus concentrations during the growing season. Generally, orthophosphorus concentrations are 30% to 60% of TP amounts. The exception to this is Marsh Creek and its tributaries where orthophosphorus is absent.

Phosphorus Priority Ranking Criteria

Segments and tributaries of the Portneuf River were ranked based upon their TP loads, percent contribution to the Portneuf River and TMDL target exceedance. Large contributors such as the Portneuf River, Marsh and Rapid creeks are considered high priority for BMP application. Phosphorus BMP priorities for the subbasin are presented in Table 23 and Figure 19.

Table 23. Phosphorus Priorities for Agricultural BMP Implementation

Priority Category	Watershed or Subwatershed	Priority Ranking	Segment
HIGH	Lower Rapid Creek	1	North and West forks to Portneuf River
	Upper Rapid Creek	2	Headwaters to Rapid Creek
	Marsh Creek	3	Calvin Road to Portneuf River
MEDIUM	Upper Portneuf River	4	Chesterfield Reservoir to Lava Hot Springs
	Lower Portneuf River	5	Marsh Creek to American Falls Reservoir
	Dempsey-McCammon	6	Lava Hot Springs to McCammon
LOW	Twentyfourmile Creek	7	Headwaters to Portneuf River
	Pocatello Creek	8	Headwaters to Portneuf River
	East Bench	9	McCammon to Marsh Creek

Phosphorus Load Reductions

Phosphorus load reductions were estimated using only TP. There are no load reductions currently set for tributaries, although the TP targets are expected to be met (Rowe, 2002). These estimates reflect the TMDL target criteria of 0.075 mg/L of TP. Additionally the TMDL also recommends a target of 0.025 mg/L of TP for Hawkins Reservoir. Estimated TP load reductions for the Pocatello, Marsh Creek and Topaz USGS gages are 39%, 33% and 15%, respectively (IDEQ, 1999).

Water quality monitoring data collected by IASCD, IDEQ and USGS were compared to estimate these load reductions which are shown in Table 24. The IASCD and USGS April 2000 data is shown in Table 25 and was the only period that TP was monitored throughout the subbasin.

Figure 19. Phosphorus Priority Map for Agricultural BMP Implementation

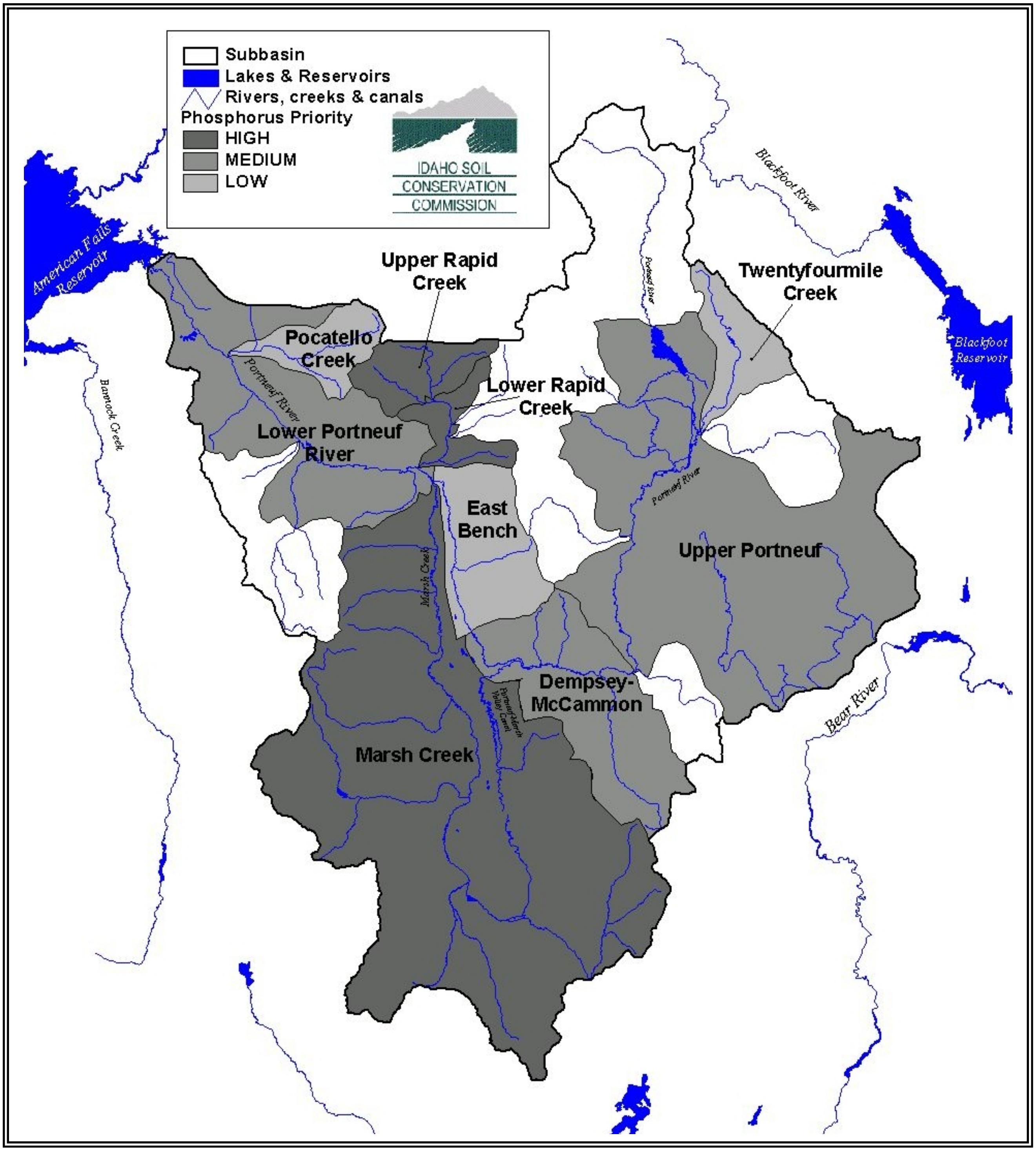


Table 24. 1995-2002 TP Loads and Exceedance for the Portneuf River and Tributaries

Monitoring Site	Average TP Load (lbs/day)	Average TP Load @ TP Target (lbs/day)	Average TP Load Reduction	TP Target Exceedance
Portneuf River @ Pocatello*	244.0	117.4	52%	44%
Marsh Creek @ above Portneuf River	19.4	16.2	16%	10%
Twentyfourmile Creek (lower site)***	2.2	1.0	55%	31%
Twentyfourmile Creek above reservoir***	0.2	0.1	50%	89%
Indian Creek***	0.6	0.2	67%	71%
Rapid Creek below Jackson Creek***	15.3	7.6	50%	67%
Portneuf River @ Topaz*	138.9	74.1	47%	17%
Marsh Creek @ McCammon*	37.1	24.5	34%	22%
Rapid Creek below West & North forks***	31.1	7.0	77%	100%
East Bob Smith Creek***	2.1	1.1	48%	41%
South Fork Pocatello Creek***	0.6	0.2	67%	100%
Marsh Creek below Bell Marsh Creek***	20.5	14.2	31%	49%
Dempsey Creek***	13.7	4.9	64%	39%
North Fork Rapid Creek***	2.4	1.3	46%	100%
West Fork Rapid Creek***	0.6	0.4	33%	100%
Bell Marsh Creek***	3.7	1.5	59%	21%
Goodenough Creek***	2.2	1.0	55%	22%
North Fork Pocatello Creek***	4.6	1.2	74%	100%
Birch Creek***	4.7	1.5	68%	44%
Garden Creek (lower site)***	5.4	1.0	81%	73%
Garden Creek (upper site)***	1.5	1.0	33%	82%
Hawkins Creek (above reservoir)***	0.3	0.1	67%	100%
Hawkins Creek (lower site)***	1.7	0.3	82%	79%
Webb Creek (lower site)***	3.6	2.8	22%	20%
Webb Creek (upper site)***	0.9	0.9	0%	0%
Eighteenmile Creek***	0.7	0.5	29%	21%
Marsh Creek below Hawkins Creek***	9.6	6.0	38%	72%
Portneuf River @ Chesterfield Dam**	16.7	13.5	19%	33%
Portneuf River @ Stalker Rd**	32.9	21.4	35%	70%
Portneuf River @ Nipper Rd**	29.1	18.6	36%	53%
Portneuf River @ Kelly-Toponce Rd**	33.9	22.2	35%	53%

* 1996-2000 water quality data from USGS gage stations #13074000, #13075000 and #13075500
** 1995-97 water quality data from IDEQ sites on the Portneuf River (P1, P4, P5 and P6)
*** 1999-2001 water quality data from IASCD on tributaries to the Portneuf River
NS = Not Sampled

Table 25. April 2000 TP loads for the Portneuf River and Selected Tributaries

Monitoring Site	TP (mg/L)	TP Load (lbs/day)	Discharge (cfs)	Portion of river load	Portion of river discharge
Portneuf River @ Pocatello*	0.12	292.1	437.0	100.0%	100.0%
Marsh Creek below Bell Marsh Creek**	0.36	195.0	100.5	66.8%	23.0%
Portneuf River @ Topaz*	0.04	51.2	221.0	17.5%	50.6%
Marsh Creek @ McCammon*	0.06	26.2	81.0	9.0%	18.5%
Dempsey Creek**	0.13	22.2	31.7	7.6%	7.3%
Rapid Creek**	0.12	31.8	49.2	10.9%	11.3%
Garden Creek**	0.26	9.9	7.1	3.4%	1.6%
East Bob Smith Creek**	0.17	8.4	9.2	2.9%	2.1%
Twentyfourmile Creek**	0.45	28.5	11.7	9.8%	2.7%
Goodenough Creek**	0.13	2.2	3.1	0.8%	0.7%
Birch Creek**	0.12	4.2	6.5	1.4%	1.5%
Bell Marsh Creek**	0.18	9.0	9.3	3.1%	2.1%
Indian Creek**	0.19	0.9	0.8	0.3%	0.2%
North Fork Pocatello Creek**	0.11	1.7	2.8	0.6%	0.6%
South Fork Pocatello Creek**	0.23	0.7	0.6	0.2%	0.1%
Hawkins Creek**	0.37	0.3	0.1	0.1%	0.02%
Marsh Creek below Hawkins Creek**	0.22	75.8	64.0	26.0%	14.6%
Webb Creek**	0.09	15.3	31.6	5.2%	7.2%
Eighteenmile Creek**	0.23	4.0	3.2	1.4%	0.7%

* 1996-2000 water quality data from USGS gage stations #13074000, #13075000 and #13075500
** 1999-2001 water quality data from IASCD on tributaries to the Portneuf River

Agricultural Phosphorus Sources

For the purpose of this implementation plan, agricultural phosphorus sources are divided into three categories: phosphorus generated from non-irrigated crop or pasture land; irrigated crop or pasture land and animal related phosphorus sources.

Phosphorus can be released from soil and plant material to surface and subsurface flow or lost by erosion. Irrigation can significantly increase the potential for phosphorus loss through surface and subsurface flow. Sediment bound phosphorus is referred to as particulate phosphorus and is not readily available for biological uptake. Phosphorus that is most readily available for biological uptake is known as dissolved phosphorus. Erosion is the most prevalent process for phosphorus loss in the subbasin. This relationship between sediment and phosphorus was found to be significant according to the TMDL (IDEQ, 1999). Any BMP that is installed to decrease erosion will also decrease the potential for particulate phosphorus to be transported to receiving water bodies. With dissolved phosphorus, the transport mechanism is either surface runoff or subsurface flow. Additionally the amount of phosphorus in the soil profile influences the amount of phosphorus loss (Sharpley et al., 1999).

Non-Irrigated Crop and Pasture Land

Application of fertilizer and animal waste to non-irrigated crop or pasture land creates the potential for phosphorus loss by erosion and leaching. The most effective BMP for reducing the potential phosphorus losses from non-irrigated crop and pasture lands is Nutrient Management (NRCS PS 590). This BMP requires soil testing and adjusted fertilizer and animal waste applications based on plant needs.

Irrigated Crop and Pasture Land

Application of fertilizer and animal waste to irrigated crop or pasture land creates the potential for phosphorus loss by erosion and leaching. The most effective BMPs for reducing the potential phosphorus losses from irrigated crop and pasture lands are Nutrient Management (NRCS PS 590) and Irrigation Water Management (NRCS PS 449). These BMPs require soil testing and adjusted fertilizer, animal waste and irrigation water applications based on crop or pasture plant needs.

Animal Related Phosphorus Sources

Manure applications from corral runoff or animal droppings during grazing or watering are potential sources of phosphorus. The potential is even greater when these applications occur near surface or ground waters. Animal grazing or watering increases stream bank erosion and the amount of sediment delivered to surface waters, which consequently can be a source of particulate phosphorus. The most effective BMPs for reducing the potential phosphorus losses from animal sources are Nutrient Management (NRCS PS 590), Riparian Forest Buffer (NRCS PS 391A) and Use Exclusion (NRCS PS 472). These BMPs require soil testing, adjusted fertilizer or waste applications and grazing management.

Animal Feed Operations

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. Any new dairy farms are required to have an approved nutrient management plan before issuance of a milk permit. ISDA promulgated rules (IDAPA 02.04.14.000 et seq.) for dairy waste and they were adopted in 1997. Currently, ISDA is conducting inspections and soil sampling on all dairies to ensure compliance with the nutrient management plans. There are currently eight dairies in the subbasin of which seven are milking less than 200 cows and one is milking over 250 cows (ISDA, 1999). All eight of these dairies have submitted their nutrient plans to ISDA.

The Idaho Legislature passed Idaho law, *I.C. §22-4906, Title 22, Chapter 49, Beef Cattle Environmental Control Ac,* in 2000. ISDA promulgated rules (IDAPA 02.04.15.000 et seq.) which became effective in September 2000. Beef cattle animal feed operations are required to submit a nutrient management plan to ISDA for approval no later than January 1, 2005. In 2002, ISDA and ISCC conducted a preliminary inventory and identified approximately 250 potential sites with animal feed operations, corrals or pens within the subbasin.

Nutrient Management Standard

Idaho NRCS worked with the ISDA and the University of Idaho (UI) to revise the Idaho NRCS Nutrient Management Practice Standard (NRCS PS 590) and adopted the new standard in June 1999. ISDA is using the standard as a guideline for developing nutrient management plans on all dairies and beef animal feed operations in Idaho. NRCS, IASCD and ISCC are also using the standard on all non-irrigated and irrigated crop and pasture lands. The purpose of the standard is to manage the amount, source, placement, form and timing of the application of nutrients (NRCS, 2002). ISDA is using the standard's phosphorus threshold to conduct regulatory soil sampling to ensure compliance and to monitor the long-term environmental effects of the nutrient management program (Mitchell and Beddoes, 1999).

Nitrogen

Nitrogen runoff includes two processes, surface runoff and subsurface flow. Nitrogen, because it does not readily bind to sediment, moves easily between the substrate and the water column and cycles continuously (FISRWG, 1998). The Portneuf River, Marsh and Rapid creeks have significant loads of TIN. TIN amounts in these areas are more than sufficient to support algae growth. Elevated TIN concentrations occur during high flows at most sample sites. However, Rapid, Garden and Pocatello creeks show elevated levels during the growing season. Generally, TIN concentrations are 50 to 70% of total nitrogen concentrations in the Portneuf River and its tributaries.

Monitoring of water quality in Idaho by both state and federal agencies indicates nitrate to be the most widespread contaminant in Idaho's ground water. In most areas, agricultural sources are believed to be the primary cause of the problem. IDEQ estimates that 93% of nitrate loads originate from cattle manure, fertilizer and legume crops combined. Domestic septic systems account for less than two percent of total nitrogen input in most rural agricultural areas. In 1999, IDEQ began to prioritize areas based on their monitoring data. Consequently, 33 areas in Idaho were identified as having degraded ground water quality due to excessive nitrates. Two areas in the subbasin, Pocatello and Soda Springs/Bear River, were identified as Nitrate Priority Areas shown in Figure 10. These areas were ranked 17^{th} and 18^{th}, respectively (IDEQ, 2002).

Nitrogen Priority Ranking Criteria

The Portneuf River and its tributaries were ranked based upon their TIN loads, percent contribution to the Portneuf River and TMDL target exceedance. Large contributors such as the Portneuf River, Marsh and Rapid creeks are considered high priority for BMP application. Nitrogen BMP priorities for the subbasin are presented in Table 26 and Figure 20.

Table 26. Nitrogen Priorities for Agricultural BMP Implementation

Priority Category	Watershed or Subwatershed	Priority Ranking	Segment
HIGH	Upper Portneuf River	1	Chesterfield Reservoir to Lava Hot Springs
	Lower Portneuf River	2	Marsh Creek to American Falls Reservoir
	Marsh Creek	3	Calvin Road to Portneuf River
MEDIUM	Lower Rapid Creek	4	North and West forks to Portneuf River
	Upper Rapid Creek	5	Headwaters to Rapid Creek
	Dempsey-McCammon	6	Lava Hot Springs to McCammon
LOW	Twentyfourmile Creek	7	Headwaters to Portneuf River
	Pocatello Creek	8	Headwaters to Portneuf River
	East Bench	9	McCammon to Marsh Creek

Figure 20. Nitrogen Priority Map for Agricultural BMP Implementation

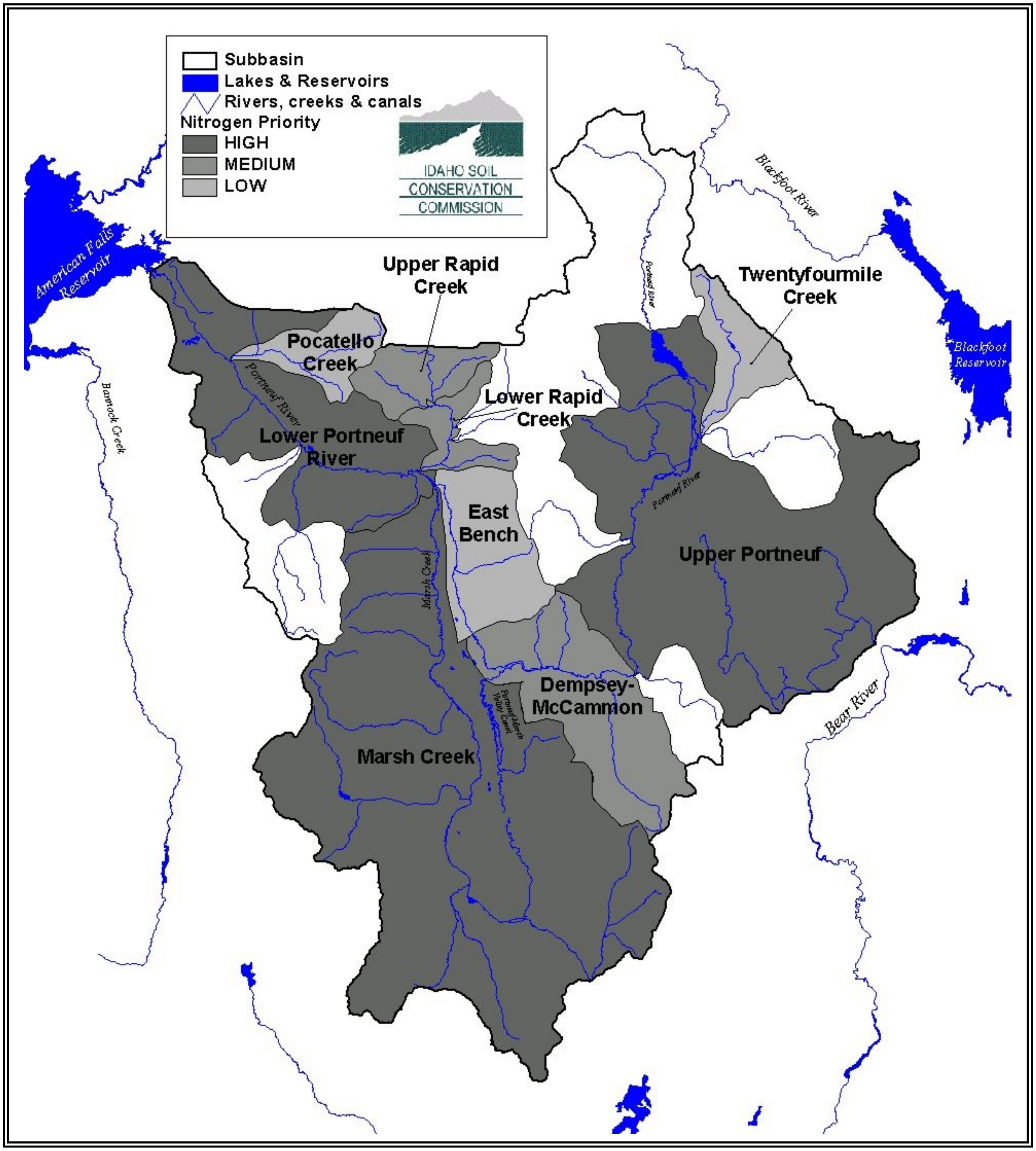


Table 27. 1995-2001 TIN Loads and Exceedance for the Portneuf River and Tributaries

Monitoring Site	Average TIN Load (lbs/day)	Average TIN Load @ TIN Target (lbs/day)	Average TIN Load Reduction	TIN Target Exceedance
Portneuf River @ Pocatello*	911.8	484.6	47%	56%
Marsh Creek @ above Portneuf River	420.0	108.0	74%	100%
Twentyfourmile Creek (lower site)***	5.7	3.5	39%	31%
Twentyfourmile Creek above reservoir***	0.1	0.1	0%	33%
Indian Creek***	3.4	1.0	71%	100%
Rapid Creek below Jackson Creek***	163.5	33.0	80%	100%
Portneuf River @ Topaz*	771.8	411.4	47%	100%
Marsh Creek @ McCammon*	234.2	123.2	47%	83%
Rapid Creek below West & North forks***	139.6	28.0	80%	100%
East Bob Smith Creek***	17.7	5.2	71%	100%
South Fork Pocatello Creek***	3.4	0.6	82%	100%
Marsh Creek below Bell Marsh Creek***	336.3	74.0	78%	97%
Dempsey Creek***	76.2	22.4	71%	100%
North Fork Rapid Creek***	27.4	5.0	82%	95%
West Fork Rapid Creek***	5.6	1.4	75%	100%
Bell Marsh Creek***	25.9	9.0	65%	93%
Goodenough Creek***	15.1	5.3	65%	67%
North Fork Pocatello Creek***	43.5	4.8	89%	100%
Birch Creek***	25.3	7.2	72%	100%
Garden Creek (lower site)***	14.9	3.9	74%	95%
Garden Creek (upper site)***	12.7	3.8	70%	53%
Hawkins Creek (above reservoir)***	2.9	0.6	79%	100%
Hawkins Creek (lower site)***	4.6	1.0	78%	89%
Webb Creek (lower site)***	49.5	15.4	69%	75%
Webb Creek (upper site)***	63.8	10.9	83%	100%
Eighteenmile Creek***	4.6	1.6	65%	43%
Marsh Creek below Hawkins Creek***	75.9	20.6	73%	69%
Portneuf River @ Chesterfield Dam**	22.5	21.0	7%	7%
Portneuf River @ Stalker Rd**	20.5	20.5	0%	0%
Portneuf River @ Nipper Rd**	17.5	15.7	10%	3%
+Portneuf River @ Kelly-Toponce Rd**	68.4	52.9	23%	40%

* 1996-2000 water quality data from USGS gage stations #13074000, #13075000 and #13075500
** 1995-97 water quality data from IDEQ sites on the Portneuf River (P1, P4, P5 and P6)
*** 1999-2001 water quality data from IASCD on tributaries to the Portneuf River
NS = Not Sampled

Table 28. April 2000 TIN loads for the Portneuf River and Tributaries

Monitoring Site	TIN (mg/L)	TIN Load (lbs/day)	Discharge (cfs)	Portion of river load	Portion of river discharge
Portneuf River @ Pocatello*	0.48	1,128.3	437.0	100%	100.0%
Marsh Creek below Bell Marsh Creek**	1.19	641.9	100.5	56.9%	23.0%
Portneuf River @ Topaz*	0.75	888.6	221.0	78.8%	50.6%
Marsh Creek @ McCammon*	0.53	229.2	81.0	20.3%	18.5%
Dempsey Creek**	1.05	178.3	31.7	15.8%	7.3%
Rapid Creek**	1.27	335.2	49.2	29.7%	11.3%
Garden Creek**	1.22	46.4	7.1	4.1%	1.6%
East Bob Smith Creek**	1.08	53.2	9.2	4.7%	2.1%
Twentyfourmile Creek**	0.96	60.4	11.7	5.4%	2.7%
Goodenough Creek**	1.0	16.8	3.1	1.5%	0.7%
Birch Creek**	1.1	38.5	6.5	3.4%	1.5%
Bell Marsh Creek**	1.0	51.0	9.3	4.5%	2.1%
Indian Creek**	1.14	5.1	0.8	0.5%	0.2%
North Fork Pocatello Creek**	2.22	33.2	2.8	2.9%	0.6%
South Fork Pocatello Creek**	1.58	5.0	0.6	0.4%	0.1%
Hawkins Creek**	1.7	1.1	0.1	0.1%	0.02%
Marsh Creek below Hawkins Creek**	1.0	336.1	64.0	29.8%	14.6%
Webb Creek**	1.13	191.5	31.6	17.0%	7.2%
Eighteenmile Creek**	1.0	17.1	3.2	1.5%	0.7%

* 2000 water quality data from USGS gage stations #13074000, #13075000 and #13075500
** 2000 water quality data from IASCD on tributaries to the Portneuf River

Nitrogen Load Reductions

Nitrogen load reductions were estimated using only TIN. There are no load reductions currently set for tributaries, although the TIN targets are expected to be met (Rowe, 2002). These estimates reflect the TMDL target criteria of 0.3 mg/L of TIN. The TMDL load analysis recommends TIN load reductions for the Pocatello, Marsh Creek and Topaz USGS gages are 66%, 66% and 50%, respectively (IDEQ, 1999).

The TMDL targets were applied to water quality data and used to predict what TIN load reductions may be needed. Water quality monitoring data collected by IASCD, IDEQ and USGS were compared to estimate these reductions shown in Table 26. The IASCD and USGS April 2000 data is shown in Table 27 and was the only time period that TIN was monitored throughout the subbasin.

Agricultural Nitrogen Sources

Non-Irrigated Crop and Pasture Land

Application of fertilizer and animal waste to non-irrigated crop or pasture land creates the potential for nitrogen loss by runoff and leaching. The most effective BMP for reducing nitrogen losses from non-irrigated crop and pasture lands is Nutrient Management (NRCS PS 590). This BMP requires soil testing and adjusted fertilizer and animal waste applications based on crop or pasture plant needs.

Irrigated Crop and Pasture Land

Application of fertilizer and animal waste to irrigated crop or pasture land creates the potential for nitrogen loss by runoff and leaching. The most effective BMPs for reducing potential nitrogen losses from irrigated crop and pasture lands are Nutrient Management (NRCS PS 590) and Irrigation Water Management (NRCS PS 449). These BMPs require soil testing and adjusted fertilizer, animal waste and irrigation water applications based on crop or pasture plant needs.

Animal Related Nitrogen Sources

Manure applications from corral runoff or animal droppings during grazing or watering are sources of nitrogen. The potential is even greater when these applications occur near surface or ground waters. Animal waste applications near water bodies, while generally associated with bacteria, can also increase the amount of nitrogen delivered to the Portneuf River. The most effective BMPs for reducing the potential nitrogen losses from animal sources are Nutrient Management (NRCS PS 590), Riparian Forest Buffer (NRCS PS 391A) and Use Exclusion (NRCS PS 472). These BMPs require soil testing, adjusted fertilizer or waste applications and grazing management.

Animal Feed Operations

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. Any new dairy farms are required to have an approved nutrient management plan before issuance of a milk permit. ISDA promulgated rules (IDAPA 02.04.14.000 et seq.) for dairy waste and they were adopted in 1997. There are currently eight dairies in the subbasin of which seven are milking less than 200 cows and one is milking over 250 cows (ISDA, 1999). All eight of these dairies have submitted their nutrient management plans to ISDA.

The Idaho Legislature passed Idaho law, *I.C. §22-4906, Title 22, Chapter 49, Beef Cattle Environmental Control Ac*, in 2000. ISDA promulgated rules (IDAPA 02.04.15.000 et seq.) which became effective in September 2000. Beef cattle animal feed operations are required to submit a plan to ISDA for approval no later than January 1, 2005. In 2002, ISDA and ISCC conducted a preliminary inventory and identified approximately 250 potential sites with animal feed operations, corrals or pens within the subbasin.

Nutrient Management Standard

Idaho NRCS worked with the ISDA and UI to revise the Idaho NRCS Nutrient Management Practice Standard (NRCS PS 590) and adopted the new standard in June 1999. ISDA is using the standard as a guideline for developing nutrient management plans on all dairies and beef animal feed operations in Idaho. NRCS, IASCD and ISCC are using the standard on all non-irrigated and irrigated crop and pasture lands. The purpose of the standard is to manage the amount, source, placement, form and timing of the application of nutrients (NRCS, 2002). ISDA is using the standard's phosphorus threshold to conduct regulatory soil sampling to ensure compliance and to monitor the long-term environmental effects of the nutrient management program (Mitchell and Beddoes, 1999).

Nitrogen and Phosphorus BMPs for Agriculture

Agricultural nutrient sources can be reduced or eliminated by applying BMPs. The most effective BMPs for reducing agricultural nitrogen and phosphorus sources are Nutrient Management (NRCS PS 590), Irrigation Water Management (NRCS PS 449), Waste Storage Facility (NRCS PS 313), Watering Facility (NRCS PS 614), Riparian Forest Buffer (NRCS PS 391A) and Use Exclusion (NRCS PS 472). BMPs that would reduce agricultural nutrients would also reduce sediment and bacteria sources. These BMPs significantly reduce agricultural nutrients although site-specific situations may occur that other BMPs would also significantly reduce nutrients. The following nutrient BMPs shown in Table 29 are available for use by landowners.

Table 29. Nitrogen/Phosphorus BMPs for Agriculture and Effects on Resource Problems

Conservation Practices	NRCS Practice Standard	Water Quality, Surface Water; Nutrients & Organics	Water Quality, Groundwater; Nutrients & Organics	Plant Management; Nutrients
Animal Trails and Walkways	575	Sl Increase	Insignificant	N/A
Channel Vegetation	322	Sl Decrease	N/A	N/A
Conservation Cover	327	Mod to Sig Decrease	Sl to Sig Decrease	Mod to Sig Decrease
Conservation Crop Rotation	328	Sl to Mod Decrease	Insignificant	Sl to Mod Decrease
Constructed Wetland	656	Sl to Sig Decrease	Insignificant	N/A
Contour Buffer Strips	332	Sl to Sig Decrease	Insignificant	Insignificant
Contour Farming	330	Sl to Sig Decrease	Sl Increase	Insignificant
Cover Crop	340	Sl Decrease	Insignificant	Sl to Mod Decrease
Critical Area Planting	342	Mod Decrease	Sl Decrease	Sl Decrease
Deep Tillage	324	Sl to Mod Decrease	Sl to Mod Increase	N/A
Dike	356	Sl to Mod Decrease	Insignificant	N/A
Diversion	362	Sl Decrease	Insignificant	N/A
Filter Strip	393A	Mod Decrease	Sl Increase	N/A
Forage Harvest Management	511	Sl to Sig Decrease	Insignificant	Mod to Sig Decrease
Heavy Use Area Protection	561	Sl Decrease	Insignificant	N/A
Irrigation System, Tailwater Recovery	447	Sl to Mod Decrease	Insignificant	Sl Decrease
Irrigation System-Sprinkler	442	Sl to Mod Decrease	Situational	Sl to Mod Decrease
Irrigation Water Management	449	Sl to Sig Decrease	Sig Decrease	Sl to Sig Decrease
Nutrient Management	590	Mod to Sig Decrease	Sig Decrease	Mod to Sig Decrease
Pasture & Hayland Planting	512	Mod Decrease	Sl to Mod Decrease	N/A
Prescribed Grazing	328A	Sl to Sig Decrease	Sl to Mod Decrease	Sl to Mod Decrease
Range Planting	550	Sl to Mod Decrease	Sl to Mod Decrease	N/A
Residue Management, Direct Seeding	777	Mod Decrease	Sl Increase	Sl Decrease
Residue Management, No-Till	329A	Mod Decrease	Sl Increase	Sl Decrease
Riparian Forest Buffer	391A	Sl to Mod Decrease	Sl to Sig Decrease	N/A
Riparian Herbaceous Cover	390	Sl to Mod Decrease	Sl to Sig Decrease	N/A
Roof Runoff Management	558	Sl to Mod Decrease	N/A	N/A
Sediment Basin	350	Sl to Sig Decrease	Sl Increase	N/A
Streambank & Shoreline Protection	580	Sl Decrease	N/A	N/A
Stripcropping-Field	586	Sl to Mod Decrease	Sl Increase	Insignificant
Terrace	600	Sl to Mod Decrease	Sl to Mod Increase	N/A
Tree/Shrub Establishment	612	Sl to Mod Decrease	Insignificant	N/A
Use Exclusion	472	Mod to Sig Decrease	Insignificant	N/A
Waste Storage Facility	313	Sl to Sig Decrease	N/A	Sl to Sig Decrease
Water & Sediment Control Basin	638	Sl to Sig Decrease	Sl Increase	N/A
Watering Facility	614	Sl to Mod Decrease	N/A	N/A
Wetland Restoration	657	Sl to Mod Decrease	Situational	N/A

Sl = Slight, Mod = Moderate, Sig = Significant, N/A = Not Applicable

Critical Acres

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. Private agricultural land accounts for 446,781 acres in the subbasin while the major private land use is crop land with 256,100 acres.

Because the TMDL reductions are so substantial, it is estimated that 92% or 412,934 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, within these areas, BMP implementation efforts should be focused toward the tiered approach as shown in Table 30.

Implementation Tiers

Critical areas adjacent to the Portneuf River and its tributaries in Tier 1 are considered high priority for implementation due to the increased potential to directly impact surface water quality. Accordingly, the following is a general rule that applies to the priority of critical acres:

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

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table 30. Critical Areas by Watershed or Subwatershed in the Portneuf River Subbasin

Implementation Tiers		Tier 1		Tier 2		Tier 3
Priority	**Watershed or Subwatershed**	**Riparian Acres**	**Animal Facilities**	**Crop and Pasture Acres**	**Animal Facilities**	**Range Acres**
HIGH	Marsh Creek	1,128	35	102,944	77	64,274
	Upper Rapid Creek	44	6	2,951	3	8,637
	Dempsey-McCammon	76	20	12,898	12	12,514
MEDIUM	Twentyfourmile Creek	72	3	4,233	2	10,073
	Lower Rapid Creek	91	4	3,578	10	4,602
	Upper Portneuf River	395	4	93,238	16	36,270
	Lower Portneuf River	227	8	11,540	18	15,801
LOW	Pocatello Creek	77	6	2,374	2	10,871
	East Bench	221	17	7,617	12	6,188
	Total	**2,331**	**103**	**241,373**	**152**	**169,230**

Proposed Treatment

Each agricultural critical area is divided into one or more treatment units. These units describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 80,000 acres of CRP and 38,000 acres of crop, pasture and range land, 74 acres of riparian areas and 10 animal facilities, shown in Table 31, were removed from the critical area amounts in Table 30 because they meet NRCS resource quality criteria. The remaining proposed treatment unit amounts, shown in Table 32, because they do not meet NRCS resource quality criteria and should be treated in order to meet the TMDL targets and pollutant reductions.

Table 31. Treated Acres by Watershed or Subwatershed in the Portneuf River Subbasin

Watershed or Subwatershed	Riparian Acres	CRP Acres	Crop, Pasture and Range Acres	Animal Facilities
Marsh Creek	38	37,234	11,945	8
Upper Rapid Creek	0	1,519	683	1
Dempsey-McCammon	14	2,318	2,154	0
Twentyfourmile Creek	18	1,349	2,278	0
Lower Rapid Creek	0	729	0	0
Upper Portneuf River	4	32,400	20,709	1
Lower Portneuf River	0	1,698	0	0
Pocatello Creek	0	729	0	0
East Bench	0	1,521	0	0
Total	**74**	**79,497**	**37,769**	**10**

Table 32. Proposed Treatment Amounts in the Portneuf River Subbasin

Watershed or Subwatershed	TU 1 Riparian Acres	TU 2 Crop and Pasture Acres	TU 3 Range Acres	TU 4 Animal Facilities
Marsh Creek	1,090	63,210	54,829	112
Upper Rapid Creek	44	970	8,416	8
Dempsey-McCammon	62	10,235	10,705	32
Twentyfourmile Creek	54	606	10,073	5
Lower Rapid Creek	91	2,849	4,602	14
Upper Portneuf River	391	40,129	36,270	19
Lower Portneuf River	227	9,842	15,841	18
Pocatello Creek	77	923	10,871	8
East Bench	221	6,096	6,188	29
Total	**2,257**	**134,860**	**157,795**	**245**

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
2,257	**Downata-Bear Lake-Tendoy:** very deep, very poorly drained and poorly drained soils that formed in silty alluvium and organic material and are subject to flooding with slopes ranging from 0 to 1 percent **Bear Lake-Lago-Merkley or Downata-Bear Lake-Tendoy:** deep, moderately well to poorly drained soils that formed in silty alluvium on floodplains and low terraces with slopes ranging from 0 to 2 percent	Unstable & erosive stream channels Lack of riparian vegetation Barriers to fish migration

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
134,860	**Arimo-Downey-Bahem:** very deep, well drained soils that formed in loess and silty alluvium overlying sand, gravel, cobbles and stones with slopes from 0 to 8 percent **Ririe-Rexburg-Lanoak:** very deep, well drained soils that formed in loess and in silty alluvium derived from loess with slopes from 1 to 50 percent **Rexburg-Ririe-Iphil or Bancroft-Paulson-Lanark or Dranyon-Nielson or Cedarhill-Ireland:** deep and very deep, well drained, soils formed in loess and silty alluvium, mixed alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 0 to 20 percent	Accelerated sheet & rill, gully, or irrigation-induced erosion, nutrient leaching & runoff

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
157,795	**Camelback-Hades-Valmar:** very deep to moderately deep, well drained, noncalcareous soils that formed in alluvium, colluvium and residuum derived from quartzite and related rock with slopes from 5 to 65 percent **Cedarhill-Ireland:** very deep and moderately deep, well drained, calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 12 to 60 percent **Rexburg-Ririe-Iphil or Bancroft-Paulson-Lanark or Dranyon-Nielson or Cedarhill-Ireland:** deep and very deep, well drained, soils formed in loess and silty alluvium, mixed alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 0 to 60 percent	Accelerated gully erosion Lack of drinking water sources

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
245	**Downata-Bear Lake-Tendoy:** very deep, very poorly drained and poorly drained soils that formed in silty alluvium and organic material and are subject to flooding with slopes ranging from 0 to 1 percent **Arimo-Downey-Bahem:** very deep, well drained soils that formed in loess and silty alluvium overlying sand, gravel, cobbles and stones with slopes from 0 to 8 percent **Bear Lake-Lago-Merkley or Downata-Bear Lake-Tendoy:** deep, moderately well to poorly drained soils that formed in silty alluvium on floodplains and low terraces with slopes ranging from 0 to 2 percent **Rexburg-Ririe-Iphil or Bancroft-Paulson-Lanark or Dranyon-Nielson or Cedarhill-Ireland:** deep and very deep, well drained, soils formed in loess and silty alluvium, mixed alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 0 to 20 percent	Lack of drinking water sources Inadequate waste storage Bacteria & nutrient runoff from corrals or pens

Estimated Costs for TMDL Agricultural Implementation

The IASCD, in 1997, sent a letter to Governor Batt which estimated that the cost to implement the agricultural component of the Portneuf River TMDL would be approximately $33 million (Koester, 1997). Currently, the estimated cost for the agricultural portion of the TMDL is approximately $51 million. This estimate is based on the proposed treatment unit amounts in Table 31 and then applied to PSWCD or CSCD BMP cost-share lists (NRCS, 2002). This figure was derived by summing the implementation, administrative and technical costs for each watershed or subwatershed shown in Table 33. Please refer to the appendices for the detailed estimated costs of each watershed or subwatershed.

Table 33. Estimated Cost for TMDL Agricultural BMPs in the Portneuf River Subbasin

Watershed or Subwatershed	Cost Share Funds (75%)	Participant Funds (25%)	Total Funds (100%)
Marsh Creek	$13,255,500	$4,418,500	$17,674,000
Upper Rapid Creek	$822,750	$274,250	$1,097,000
Dempsey-McCammon	$2,106,000	$702,000	$2,808,000
Twentyfourmile Creek	$925,500	$308,500	$1,234,000
Lower Rapid Creek	$849,750	$283,250	$1,133,000
Upper Portneuf River	$6,191,250	$2,063,750	$8,255,000
Lower Portneuf River	$2,758,500	$919,500	$3,678,000
Pocatello Creek	$771,750	$257,250	$1,029,000
East Bench	$1,666,500	$555,500	$2,222,000
BMP Subtotal	**$29,347,500**	**$9,782,500**	**$39,130,000**
Administration (15% of BMPs)	$4,402,125	$1,467,375	$5,869,500
Technical (15% of BMPs)	$4,402,125	$1,467,375	$5,869,500
Subbasin Total	**$38,151,750**	**$12,717,250**	**$50,869,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the subbasin and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative would reduce accelerated stream bank and bed erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The PSWCD and CSCD selected alternatives that combined Alternatives 2, 3 and 4 for the subbasin. These alternatives meet the objectives set forth in their resource conservation plans by improving water quality in the Portneuf River. The estimated timeline for implementation, shown in Table 34, can only occur if all watersheds or subwatersheds are fully funded and all of the landowners participate.

Table 34. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project areas	Assessment reports	2005
Develop conservation plans and contracts	Completed plans and contracts	2010
Finalize BMP designs	Completed BMP plans and designs	2015
Design and install approved BMPs	Certify BMP installations	2020
Track BMP installations	Implementation progress reports	2025
Evaluate BMP & project effectiveness	Complete project effectiveness reports	2030

Nonpoint Source Pollution Control Efforts

Several local, state and federal programs address nonpoint pollution. Most of those programs are voluntary. However, several rules and regulations have been adopted to deal with nonpoint source pollution and those authorities and responsible agencies are shown in Table 35.

Table 35. State of Idaho's Rules and Regulations affecting Nonpoint Source Pollution.

Authority	IDAPA	Agency
Solid Waste Management Rules and Standards	58.01.06	IDEQ
Individual/Subsurface Sewage Disposal Rules	58.01.03	IDEQ
Rules Governing the Cleaning of Septic Tanks	58.01.15	IDEQ
Ground Water Quality Rule	58.01.11	IDEQ
Rules Pertaining to the Idaho Forest Practices Act	20.02.01	IDL
Rules for the Regulation of Beds, Waters, and Airspace Over Navigable Lakes in the State of Idaho	20.03.04	IDL
Rules Governing Grazing Leases and Cropland Leases	20.03.14	IDL
Rules Governing Exploration and Surface Mining in Idaho	20.03.02	IDL
Rules Governing Placer and Dredge Mining in Idaho	20.03.01	IDL
Stream Channel Alteration Rules	37.03.07	IDWR
Rules and Minimum Standards for the Construction and Use of Injection Wells in the State of Idaho	37.03.03	IDWR
Well Construction Standards Rules	37.03.09	IDWR
Rules for the Antidegradation Plan for Agriculture for the Idaho Soil Conservation and Soil Conservation Districts	02.05.02	ISCC
Rules of the Department of Agriculture Governing Dairy Waste	02.04.14	ISDA
Rules of the Department of Agriculture Governing Beef Cattle Animal Feeding Operations	02.04.15	ISDA

Reasonable Assurance

The Portneuf River TMDL will rely substantially on nonpoint source reductions to meet the sediment, bacteria, phosphorus and nitrogen targets necessary to restore beneficial uses. If appropriate load reductions are not achieved from nonpoint sources through existing regulatory and voluntary programs, then reductions must come from point sources (IDEQ, 1999). Regulatory authority can be found in the water quality standards (IDAPA 58.01.02.350). If a voluntary approach does not succeed in abating the pollutant problem, the state may seek injunctive relief for those situations that may be determined to be an imminent and substantial danger to public health or environment (IDAPA 16.01.02.350.02(a)).

Agencies and Organizations

Many different agencies and organizations exist that can assist with conservation plan development and implementation in the subbasin are shown in Table 36 but only represent a partial list of groups and agencies available for assistance.

Table 36. Agencies and Organizations in the Portneuf River Subbasin

Agency or Organization	Acronym	Private/Local/State/Federal
Portneuf Watershed Council	PWC	Private
South East Idaho Fly Fishers	SEIFF	Private
Idaho Farm Bureau	FB	Private
Ground Water Guardians	GWG	Private
Idaho Association of Soil Conservation Districts	IASCD	Private
Idaho Cattle Association	ICA	Private
Idaho Dairymen Association	IDA	Private
Idaho Water Users Association	IWUA	Private
Portneuf Soil and Water Conservation District	PSWCD	Local
Caribou Soil Conservation District	CSCD	Local
Idaho Soil Conservation Commission	ISCC	State
Idaho Department of Environment Quality	IDEQ	State
Idaho State Department of Agriculture	ISDA	State
Idaho Department of Water Resources	IDWR	State
University of Idaho Cooperative Extension Service	UI-CES	State
Idaho Department of Lands	IDL	State
Idaho Department of Fish and Game	IDFG	State
Natural Resources Conservation Service	NRCS	Federal
Farm Services Agency	FSA	Federal
Resource Conservation and Development	RC&D	Federal
Rural Development	RD	Federal
Bureau of Reclamation	BOR	Federal
Bureau of Land Management	BLM	Federal
Forest Service	FS	Federal
Environmental Protection Agency	USEPA	Federal
Army Corps of Engineers	USACE	Federal

Public Participation

The Portneuf Watershed Council acts as the watershed advisory group and holds ten monthly meetings during the year. Anyone can attend the meetings as a stakeholder in the subbasin. In the past, the Portneuf Watershed Council received $1,400 from USEPA for the Portneuf Watershed Water Quality Education Project. This project improved public awareness of the importance of the quality of both surface water and ground water in the subbasin. Presentations were made for students, teachers, civic groups, community and tribal leaders and the public. Currently the Portneuf Watershed Council receives up to $1,000 annually from the ISCC to conduct watershed outreach activities. Additionally, the Caribou and Portneuf conservation districts hold monthly meetings that are open to the public as well. Both districts have held outreach meetings and tours for stakeholders to learn more about TMDLs and conservation assistance. A more detailed description of outreach activities is included in each of the appendices.

Conservation Planning

Past implementation efforts and a long history of conservation in the subbasin has demonstrated that landowners are more likely to install BMPs when technical and financial assistance is available. Conservation districts, IASCD, ISCC and NRCS contact landowners and operators to solicit participation in the implementation project. Landowners that want to participate are then contacted to discuss the resource concerns on their property. After an initial on farm meeting with the participant, the technical agency inventories and evaluates all of the resource concerns on the property. Subsequent meetings with the participant are held to discuss problems that can be addressed by developing a conservation plan. Conservation plan alternatives are created to select the most effective BMPs for the resources and the participant. These alternatives are evaluated by the participant for cost, difficulty, maintenance and durability. Once the plan is finalized, then contracts are created to schedule BMP installation. One conservation plan can produce several contracts with the numerous programs that are available.

BMP Operation and Maintenance

After contracted BMPs have been installed, maintenance and operation is checked by the IASCD, ISCC or NRCS during annual status reviews conducted throughout the life of the contract. When conservation plans are not under contract agreements, such as when participants install BMPs without financial assistance, they are not obligated by contract to maintain BMPs.

Sources of Funding for Agricultural BMP Implementation

Historically, state and federal sources comprised the majority of funds used in the subbasin to install BMPs. CRP has been the best-received program in the subbasin with 85,000 acres enrolled. The Farm Security and Rural Investment Act of 2002 or the new Farm Bill was enacted by Congress and increased conservation programs and program funding to assist farmers and ranchers in addressing resource concerns on their property. Because state-funded conservation programs have decreased due to declining revenues and budgets, it is likely that these federal funds will comprise the bulk of BMP installation in the future. Through USDA, IDEQ, USEPA and ISCC programs, there are funding sources available for installation of BMPs throughout priority subbasins to meet water quality objectives. Programs currently available to assist landowners and local organizations with technical and financial assistance when installing BMPs are shown in Table 37.

TMDL Implementation Monitoring

Plan for Agricultural BMP Effectiveness Monitoring

BMP effectiveness monitoring is part of the conservation planning process. The monitoring is conducted to determine how the BMP is installed, operated and maintained. Conservation planning establishes a benchmark for the resource concerns using several methods. The resources are inventoried and their condition is assessed with tools including but not limited to the following. RUSLE and SISL are models 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 indexes that are used to assess aquatic habitat and stream bank erosion. Stream channel cross sections and stream bank profile measurements are done to determine stream bank erosion and lateral recession rates. CAFO/AFO assessment and IDAWM are used to document problems with livestock waste feeding and storage areas. The Phosphorus Threshold and the Water Quality Indicators Guide are used to assess nitrogen, phosphorus, sediment and bacteria contamination from agricultural land. Once BMPs are installed, these same methods are applied to determine the effectiveness of the practice and the associated pollutant reduction. BMP effectiveness monitoring and field evaluations of progress within the subbasin will be conducted by IASCD, ISCC and ISDA personnel. BMP effectiveness monitoring typically consists of a visual inspection and participant record keeping.

Plan for Water Quality Monitoring

IASCD and ISDA are currently collecting water quality samples in the subbasin. Most samples have been taken bimonthly through the growing season (April to October) and monthly through the rest of the year (November to March). The USGS has monitored the Portneuf River and Marsh Creek at their gages.

Table 37. Sources of Technical and Financial Assistance in the Portneuf River Subbasin

Funding Program	Acronym	Agency
Water Quality Program for Agriculture	WQPA	ISCC
Resource Conservation & Development	RC&D	NRCS
Emergency Watershed Protection Program	EWP	NRCS
Small Watershed and Flood Prevention Program	PL-566	NRCS
Cooperative River Basin Studies Program	CRBS	NRCS
Rural Clean Water Program	RCWP	NRCS
Food Security Act of 1985	FSA	NRCS
Food, Agricultural, Conservation and Trade Act of 1990	FACTA	NRCS
Section 319 Nonpoint Source Management Program Grants	319	IDEQ
Resource Conservation and Rangeland Development Program	RCRDP	ISCC
Grazing Lands Conservation Initiative	GLCI	NRCS
Natural Resource Conservation Credit	--	ISCC
Environmental Quality Incentives Program	EQIP	NRCS
Soil and Water Conservation Assistance Program	SWCA	NRCS
FWS Partners Program	--	USFWS
Columbia Basin Fish and Wildlife Program	CBFWP	CBFWA
Conservation Reserve Program	CRP	FSA
Continuous Sign-Up Conservation Reserve Program	CCRP	FSA
Wetland Reserve Program	WRP	NRCS
Wildlife Habitat Incentives Program	WHIP	NRCS
Habitat Improvement Program	HIP	IDFG
State Revolving Fund	SRF	IDEQ &ISCC
Conservation Security Program	CSP	NRCS
Grasslands Reserve Program	GRP	FSA
Conservation Reserve Enhancement Program	CREP	FSA
Emergency Conservation Program	ECP	FSA
National Fish and Wildlife Foundation Grants Program	NFWFGP	NFWF
Fisheries Restoration and Irrigation Mitigation Program	FRIMA	USFWS
Water Conservation Field Services Program	WCFSP	BOR
Conservation of Private Grazing Land	CPGL	NRCS
Conservation Technical Assistance	CTA	NRCS
Farmland Protection Program	FPP	NRCS
Forestry Incentives Program	FIP	NRCS & FS
Aberdeen, Idaho Plant Materials Center	PMC	NRCS
National Cooperative Soil Survey Program	NCSS	NRCS
Stewardship Incentive Program	SIP	FS
Nutrient Management Program	NMP	ISDA
Floodplain Management Services Program	FPMS	USACE
Continuing Authorities Program, Sections 206 & 1135	CAP	USACE
Idaho Water Resource Board Financial Program	--	IDWR
Idaho Fish Screening & Passage Program	--	IDFG

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APPENDIX A

Upper Portneuf River Watershed

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of the Portneuf River. This plan addresses the Portneuf River and its tributaries from Chesterfield Reservoir to Lava Hot Springs. The plan builds upon past accomplishments made through the Bancroft, Upper Portneuf River SAWQP and Twentyfourmile Creek TMDL projects and will assist other efforts in restoring beneficial uses.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, nutrient and bacteria loading to the Portneuf River.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. The Portneuf River is on the state of Idaho's §303(d) list of water quality impaired water bodies (IDEQ, 1998). The river is listed for sediment, nutrients and bacteria from Chesterfield Reservoir to Lava Hot Springs. This section of the river is approximately 32 miles in length. The Portneuf River's designated beneficial uses include cold water biota, salmonid spawning, primary contact recreation, secondary contact recreation, domestic water supply, agricultural water supply, industrial water supply, wildlife habitat and aesthetics. The Portneuf River's beneficial uses are not fully supported due to sediment, nutrients, bacteria, flow alteration, and oil/grease (IDEQ, 1999).

Background

The upper Portneuf River has been the subject of much interest and research ranging from water quality, sedimentation, channel stability and agricultural practices to spawning habitat, fish populations and angler use (CSCD and PSWCD, 1988). In 1986, the CSCD in cooperation with the SCS investigated water quality problems in the watershed and completed the Upper Portneuf River Agricultural Pollution Abatement Plan (CSCD, 1986). This culminated in the startup of the Bancroft and the Upper Portneuf River Dry Cropland SAWQP projects (CSCD, 1993). The 1986 Upper Portneuf River Agricultural Pollution Abatement Plan didn't address the effects of the Downey Canal and stream channels, including tributaries, so the CSCD completed the Upper Portneuf River Channel SAWQP Planning Project (CSCD, 1993). The Upper Portneuf River Channel SAWQP project was implemented and ended in 2000. In 1997, CSCD and IDEQ finished a report that showed pollutant reductions in the Portneuf River (Rudel, 1999).

IDEQ found that stream channel erosion on the Downey Canal and Twentyfourmile Creek contributed the largest amount of sediment to the Portneuf River. It also showed that Twentyfourmile Creek contributes the largest amount of phosphorus and Eighteenmile Creek contributes the largest amount of nitrogen to the Portneuf River (Hoover, 1985). The study also concluded that bacterial contamination in the study area comes from a non-human source.

Project Setting

The upper Portneuf River watershed encompasses 183,524 acres or 287 square miles in Bannock and Caribou counties. The watershed is in the northeastern portion of the subbasin as shown in Figure 6 on page 17. The Portneuf Range bounds the watershed on the north and west. On the east, the Chesterfield Range bounds the area. The southern boundary is the Fish Creek Range. The watershed consists of six subwatersheds listed in Table A-1. Elevations range from 5,270 feet near Lava Hot Springs to 9,260 feet at Bonneville Peak in the Portneuf Range (CSCD, 1991). Sixty-nine percent of the watershed's elevation occurs between 5,000 and 6,000 feet. The watershed is relatively flat with 15% of the slopes less than 1%.

There are 46 miles of perennial streams in the watershed, 176 miles of intermittent streams and 67 miles of canals and ditches. The Portneuf River, from Chesterfield Reservoir to Lava Hot Springs, is 30 miles in length with several tributaries, including portions of King, Pebble and Toponce creeks. The Downey Canal carries nearly all the water that formerly was carried by the Portneuf River's natural channel and extends south from Chesterfield Reservoir for eight miles to its confluence with the river channel just northeast of the bridge on Kelly-Toponce Road (CSCD, 1991).

Table A-1. Subwatersheds in the Upper Portneuf River Watershed

Subwatershed	Acres	Percent of Total
Bancroft	81,006	44.1%
Chesterfield	16,384	8.9%
King	7,719	4.2%
Pebble	24,935	13.6%
Tenmile	10,805	5.9%
Toponce	42,674	23.3%
Total	183,524	100.0%

Land Ownership and Land Use

Seventy percent of the watershed is privately owned and about 30% is managed by the BLM, IDL and FS. Crop land is the primary private land use in the watershed at 75% as shown in Table A-2. The city of Bancroft and the historic townsite of Chesterfield are located in the watershed. The portion of the watershed in Bannock County is transitioning from agricultural to residential developments. There are 118 private parcel owners with an average parcel size of 22 acres and a median size of 5 acres. About 25% of the private parcels are zoned as rural subdivisions (Bannock County, 1999).

Table A-2. Private Land Uses in the Upper Portneuf River Watershed

Land Use	Acres	Percent of Total
Crop Land	93,271	74.9%
Forest Land	332	0.3%
Range Land	24,631	19.8%
Riparian/Wetland	6,217	5.0%
Total	124,451	100.0%

Threatened and Endangered Species

Threatened or endangered species in Caribou County include the Gray wolf *(Canis lupus)*, which is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)*, which are listed as threatened. Canada lynx *(Lynx canadensis)* is proposed to be listed while no candidate species exist in the county (NRCS, 2002).

Accomplishments

The CSCD and watershed residents successfully implemented the Bancroft and the Upper Portneuf River SAWQP projects. Those projects enabled 58 participants to implement BMPs on 20,709 acres and improved about ten miles of the Portneuf River. BMPs utilized by participants included: fencing, watering facilities, channel vegetation, conservation tillage, cross slope farming, pipelines, rock weirs, water and sediment control basins, stream bank protection, nutrient management and pasture planting (CSCD, 1999 and CSCD, 2001).

Additionally, several landowners enrolled about 32,400 acres of crop land into CRP. The CRP acres and the acres converted from crop land to pasture had an estimated pre-treatment erosion rate of eight tons per acre per year or a soil loss of 310,448 tons per year. Currently these acres have an estimated erosion rate of one ton per acre per year. The annual soil savings are 271,642 tons per year or 88% reduction in annual erosion shown in Table A-5. Exclusion fencing and stream bank protection reduced about 1,800 tons per year or 70% of the stream bank erosion along the Portneuf River and Downey Canal.

Table A-4. Completed BMP Amounts and Costs in the Upper Portneuf River Watershed

Best Management Practice	Units	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Conservation Cover (CRP)	32,400 acres	$17,398,800	$972,000	$18,370,800	CRP
Fence	26,800 feet	$15,075	$5,025	$20,100	SAWQP
Irrigation Water Management	2,898 acres	$5,434	$1,811	$7,245	SAWQP
Pasture & Hayland Planting	6,624 acres	$161,460	$53,820	$215,280	SAWQP
Pasture & Hayland Management	3,870 acres	$8,708	$2,902	$11,610	SAWQP
Prescribed Grazing	2,038 acres	$1,147	$382	$1,529	SAWQP
Residue Management	12,300 acres	$92,250	$30,750	$123,000	CRP
Riparian Forest Buffer	5 acres	$3,150	$350	$3,500	SAWQP
Upland Wildlife Habitat Management	6,266 acres	$17,624	$5,874	$23,498	SAWQP
Water & Sediment Control Basin	34 each	$15,300	$5,100	$20,400	SAWQP
Watering Facility	10 each	$3,000	$1,000	$4,000	SAWQP
	Total Cost	**$17,721,948**	**$1,079,014**	**$18,800,962**	

Table A-5. Soil Erosion Reductions from BMPs in the Upper Portneuf River Watershed

Land Treatment	Average Annual Soil Loss (tons/acre/year)	Treated Acres	Annual Soil Loss (tons/year)
Before	8.0	38,806	310,448
After	1.0	38,806	38,806
Soil Savings in the Upper Portneuf River Watershed = 271,642 tons/year			

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E. coli.* The recommended reduction for TSS is 53%, TP is 15% and TIN is 50% at the USGS gage near Topaz. The TMDL also recommends a 73% reduction of fecal coliform bacteria in the river from Lava Hot Springs to Rainey Park in Pocatello (IDEQ, 1999). No load reductions were recommended for the tributaries.

Identified Problems

The upper Portneuf River watershed in Caribou and Bannock counties has been identified as a major source of sediment and associated agricultural pollutants to the Portneuf River (CSCD, 1991). IDHW monitored water quality in the upper Portneuf River and concluded that stream bank, sheet and rill and gully erosion contributed to past and present problems in the watershed (Hoover, 1985). The upper Portneuf River is noted for its high level of nutrients near Pebble Creek and Chesterfield Reservoir caused by agricultural practices (McSorley, 1977). The water quality of the Portneuf River is severely impacted by crop land erosion and sedimentation, stream bank erosion and livestock waste (CSCD, 1986). Heimer and Ratzlaff (1987) evaluated the channel stability of the Portneuf River and estimated that approximately seven miles were in poor condition. Accelerated erosion occurs on tributary stream banks and along the Downey Canal because of grazing and farming impacts and past maintenance of the canal which has increased channel erosion, widening and deepening (Stevenson, 1992).

Many of the pollutants contributing to the water quality problems originate from agricultural sources, primarily non-irrigated crop land, animal holding or feeding operations, stream banks and pastures that drain directly into surface waters (CSCD, 1993). In addition, dewatering prevents the upper Portneuf River from reaching its full potential as a fishery (CSCD, 1993). There are three active dairies in the watershed, which currently are complying with animal waste storage and application requirements. Sixteen animal feed areas were identified in the watershed in 1991 (CSCD, 1991). Rudel (1999) concluded that the physical, chemical and biological data demonstrates less than full support for the beneficial uses of cold water biota, salmonid spawning and primary or secondary contact recreation, resulting in an impaired and dysfunctional riverine system in poor health and in need of repair. In 2002, the ISDA and ISCC identified as many as 20 active operations, corrals or pens in the watershed.

Water Quality Monitoring Results

IDHW sampled the Portneuf River above Pebble Creek and near Lava Hot Springs in 1975-1976 and found that the river carried about 60,000 and 164,000 tons per year of sediment, respectively (McSorley, 1977). The Portneuf River, above Pebble Creek, carried 378 tons per day during the peak runoff in April 1985 (Hoover, 1985). IDEQ sampled the Portneuf River below Chesterfield Reservoir from 1995 to 1997 and found high concentrations of sediment, phosphorus, nitrogen and fecal bacteria (Rudel, 1999). Three stations along the river exceeded the TMDL target for TSS and TIN while four stations exceeded the TMDL targets for TP and fecal coliform bacteria. These results were used in Tables A-6 and A-7 to estimate reductions needed to meet the TMDL targets.

Table A-6. TSS, TP & TIN Loads for the Upper Portneuf River

Monitoring Site	Average TSS Load (tons/day)	Average TSS Load @ TSS Target (tons/day)	Average TSS Load Reduction	TSS Target Exceedance
Portneuf River @ Chesterfield Dam	0.7	0.7	0%	0%
Portneuf River @ Stalker Rd	7.1	6.5	8%	14%
Portneuf River @ Nipper Rd	8.6	6.2	28%	24%
Portneuf River @ Kelly-Toponce Rd	7.3	6.0	18%	17%
Monitoring Site	**Average TP Load (lbs/day)**	**Average TP Load @ TP Target (lbs/day)**	**Average TP Load Reduction**	**TP Target Exceedance**
Portneuf River @ Chesterfield Dam	16.7	13.5	19%	33%
Portneuf River @ Stalker Rd	32.9	21.4	35%	70%
Portneuf River @ Nipper Rd	29.1	18.6	36%	53%
Portneuf River @ Kelly-Toponce Rd	33.9	22.2	35%	53%
Monitoring Site	**Average TIN Load (lbs/day)**	**Average TIN Load @ TIN Target (lbs/day)**	**Average TIN Load Reduction**	**TIN Target Exceedance**
Portneuf River @ Chesterfield Dam	22.5	21.0	7%	7%
Portneuf River @ Stalker Rd	20.5	20.5	0%	0%
Portneuf River @ Nipper Rd	17.5	15.7	10%	3%
Portneuf River @ Kelly-Toponce Rd	68.4	52.9	23%	40%

Table A-7. Percent of Samples Exceeding the TMDL Bacteria Targets

Monitoring Site	Fecal Coliform PCR Target Exceedance	Fecal Coliform SCR Target Exceedance
Portneuf River @ Chesterfield Dam	4%	0%
Portneuf River @ Stalker Rd	4%	0%
Portneuf River @ Nipper Rd	11%	4%
Portneuf River @ Kelly-Toponce Rd	7%	0%

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The watershed consists of approximately 183,524 acres. Private agricultural land accounts for 124,059 acres of the watershed. The predominant private land use is crop land with 93,271 acres.

Because the TMDL reductions are so substantial, it is estimated that 95% or 117,297 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, within these areas, BMP implementation efforts should be focused toward the tiered approach as shown in Table A-8.

Implementation Tiers

Critical areas adjacent to the Portneuf River and its tributaries in Tier 1 are considered highest priority for implementation due to the increased potential to directly impact surface water quality. There are three tiers delineated within the watershed. 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 influence on the stream**

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table A-8. Critical Areas by Subwatershed in the Upper Portneuf River Watershed

Subwatershed	Tier 1		Tier 2		Tier 3	
	Riparian Acres	Animal Facilities	Crop and Pasture Acres	Animal Facilities	Range Acres	Animal Facilities
Bancroft	0	0	49,201	1	11,627	0
Chesterfield	0	0	13,175	2	0	0
King	30	0	0	0	2,187	0
Pebble	133	0	3,604	6	3,917	0
Tenmile	20	0	4,981	0	1,446	0
Toponce	212	4	22,277	7	4,849	0
Total	**395**	**4**	**93,238**	**16**	**24,026**	**0**

Animal Feed Operations

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. There is one dairy in the watershed. 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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the subwatershed and found as many as 20 possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. The TUs describe critical areas with similar land uses, soils, productivity, resource concerns and implementation needs. Approximately 32,400 acres of CRP and 20,709 acres crop, pasture and range lands and 4 acres of riparian areas were removed from the TUs because those acres meet NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
391	**Bear Lake-Lago-Merkley or Downata-Bear Lake-Tendoy:** deep, moderately well to poorly drained soils that formed in silty alluvium on floodplains and low terraces with slopes ranging from 0 to 2 percent	Unstable and erosive stream channel Lack of riparian vegetation Barriers to fish migration

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
40,129	**Rexburg-Ririe-Iphil or Bancroft-Paulson-Lanark or Dranyon-Nielson or Cedarhill-Ireland:** deep and very deep, well drained, soils formed in loess and silty alluvium, mixed alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 0 to 20 percent	Accelerated sheet and rill or gully erosion on crop and pasture lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
36,270	**Rexburg-Ririe-Iphil or Bancroft-Paulson-Lanark or Dranyon-Nielson or Cedarhill-Ireland:** deep and very deep, well drained, soils formed in loess and silty alluvium, mixed alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 0 to 60 percent	Accelerated gully erosion on range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
19	**Bear Lake-Lago-Merkley or Downata-Bear Lake-Tendoy:** deep, moderately well to poorly drained soils that formed in silty alluvium on floodplains and low terraces with slopes ranging from 0 to 2 percent **Rexburg-Ririe-Iphil or Bancroft-Paulson-Lanark or Dranyon-Nielson or Cedarhill-Ireland:** deep and very deep, well drained, soils formed in loess and silty alluvium, mixed alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 0 to 20 percent	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens

Estimated BMP Implementation Costs

Conservation efforts in the watershed have demonstrated that landowners will install BMPs if technical and financial assistance is available. Below is Table A-9, which lists the BMP amounts and costs.

Table A-9. Estimated BMP Installation Costs for the Upper Portneuf River Watershed

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percent	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6.00	75%	250,000	$1,125,000	$375,000	$1,500,000
	Conservation Cover	acre	$100.00	75%	100	$7,500	$2,500	$10,000
	Critical Area Planting	acre	$150.00	75%	20	$2,250	$750	$3,000
	Fence, 4-wire	feet	$1.50	75%	300,000	$337,500	$112,500	$450,000
	Fence, Corral Panel	each	$175.00	75%	120	$15,750	$5,250	$21,000
	Heavy Use Area Protection	cuyd	$30.00	75%	1,000	$22,500	$7,500	$30,000
	Structure for Water Control	each	$3,000.00	75%	20	$45,000	$15,000	$60,000
	Prescribed Grazing	acre	$3.00	75%	500	$1,125	$375	$1,500
	Riparian Forest Buffer	feet	$6.00	75%	250,000	$1,125,000	$375,000	$1,500,000
	Stream Bank Protection	cuyd	$40.00	75%	8,000	$240,000	$80,000	$320,000
	Stream Channel Stabilization	cuyd	$35.00	75%	4,000	$105,000	$35,000	$140,000
	Stream Habitat Improvement	feet	$250.00	75%	2,000	$375,000	$125,000	$500,000
	Tree/Shrub Establishment	each	$6.00	75%	100,000	$450,000	$150,000	$600,000
	Pumping Plant for Water Control	each	$2,500.00	75%	30	$56,250	$18,750	$75,000
	Water Well	feet	$25.00	75%	4,000	$75,000	$25,000	$100,000
	Watering Facility	each	$800.00	75%	100	$60,000	$20,000	$80,000
	Use Exclusion	acre	$14.00	75%	500	$5,250	$1,750	$7,000
	Wildlife Wetland Habitat Management	acre	$7.50	75%	200	$1,125	$375	$1,500
					Subtotal	**$4,049,250**	**$1,349,750**	**$5,399,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6.00	75%	20,000	$90,000	$30,000	$120,000
	Critical Area Planting	acre	$150.00	75%	200	$22,500	$7,500	$30,000
	Fence, 4-wire	feet	$1.50	75%	150,000	$168,750	$56,250	$225,000
	Irrigation Water Conveyance, 10" pvc	feet	$9.50	75%	20,000	$142,500	$47,500	$190,000
	Irrigation Water Management	acre	$5.00	75%	20,000	$75,000	$25,000	$100,000
	Nutrient Management	acre	$5.00	75%	35,000	$131,250	$43,750	$175,000
	Pasture & Hayland Planting	acre	$65.00	75%	4,000	$195,000	$65,000	$260,000
	Pipeline, 2" PVC	feet	$2.25	75%	140,000	$236,250	$78,750	$315,000
	Pond	cuyd	$3.00	75%	20,000	$45,000	$15,000	$60,000
	Prescribed Grazing	acre	$3.00	75%	20,000	$45,000	$15,000	$60,000
	Pump Plant for Water Control	hp	$2,500.00	75%	10	$18,750	$6,250	$25,000
	Residue Management	acre	$20.00	75%	20,000	$300,000	$100,000	$400,000
	Spring Development	each	$2,500.00	75%	10	$18,750	$6,250	$25,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	6,000	$33,750	$11,250	$45,000
	Water & Sediment Control Basin	cuyd	$3.00	75%	10,000	$22,500	$7,500	$30,000
	Watering Facility	each	$800.00	75%	50	$30,000	$10,000	$40,000
	Water Well	feet	$25.00	75%	2,000	$37,500	$12,500	$50,000
					Subtotal	**$1,612,500**	**$537,500**	**$2,150,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	100,000	$112,500	$37,500	$150,000
	Pipeline, 2" PVC	feet	$2.25	75%	140,000	$236,250	$78,750	$315,000
	Pond	cuyd	$3.00	75%	5,000	$11,250	$3,750	$15,000
	Prescribed Grazing	acre	$3.00	75%	12,000	$27,000	$9,000	$36,000
	Pump Plant for Water Control	hp	$2,500.00	75%	10	$18,750	$6,250	$25,000
	Range Planting	acre	$55.00	75%	1,000	$41,250	$13,750	$55,000
	Spring Development	each	$2,500.00	75%	10	$18,750	$6,250	$25,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	4,000	$22,500	$7,500	$30,000
	Watering Facility	each	$800.00	75%	60	$36,000	$12,000	$48,000
	Water Well	feet	$25.00	75%	2,000	$37,500	$12,500	$50,000
					Subtotal	**$561,750**	**$187,250**	**$749,000**
TU4 AF	Nutrient Management	acre	$5.00	75%	5,000	$18,750	$6,250	$25,000
	Waste Storage Facility	cuyd	$3.00	75%	20,000	$45,000	$15,000	$60,000
	Windbreak/Shelterbelt	feet	$2.20	75%	10,000	$16,500	$5,500	$22,000
					Subtotal	$80,250	$26,750	$107,000
					Total	**$6,303,750**	**$2,101,250**	**$8,405,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the watershed and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and bed erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The CSCD selected an alternative that combined Alternatives 2, 3 and 4 for this watershed. Their alternative meets the objectives set forth in their resource conservation plan by improving water quality in the Portneuf River (CSCD, 2002).

Table A-10. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Assessment report	2005
Develop conservation plans and contracts	Completed plans and contracts	2010
Finalize BMP designs	Completed BMP plans and designs	2015
Design and install approved BMPs	Certify BMP installations	2020
Track BMP installation	Implementation progress report	2025
Evaluate BMP & project effectiveness	Complete project effectiveness report	2030

APPENDIX B

Upper Rapid Creek Subwatersheds

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of the North and West forks of Rapid Creek. The plan will build upon past conservation accomplishments made through the Upper Rapid Creek SAWQP Project and will assist and compliment other subbasin efforts in restoring beneficial uses.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, nutrient and bacteria loading to Rapid Creek.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. Rapid Creek is on the state of Idaho §303(d) list of water quality impaired water bodies from its headwaters to the Portneuf River (IDEQ, 1998). Rapid Creek's designated beneficial uses include cold water biota, salmonid spawning, secondary contact recreation, agricultural water supply, industrial water supply, wildlife habitat and aesthetics. Cold water biota is not supported due to sediment.

Background

The subwatersheds were inventoried and planned by the PSWCD, ISCC, IDEQ and NRCS as part of the Lower Portneuf River Agricultural Water Pollution Abatement Plan (PSWCD, 1987). The PSWCD obtained the Upper Rapid Creek Subwatershed SAWQP grant which ended in 1999. Thirteen landowners placed BMPs on 4,425 acres of crop, pasture and range lands. In 1999, the PSWCD initiated a project that would inventory, plan and implement BMPs in the riparian area along Rapid Creek. The PSWCD received an Idaho Nonpoint Source §319 Grant for the Upper Rapid Creek Subwatersheds Riparian Project in 2001. The assessment teams completed their assessment in July 2001 and their findings are included in the Upper Rapid Creek Subwatersheds Stream Assessment Report.

Project Setting

The upper Rapid Creek subwatershed is located in north central Bannock County and is 13 miles east of Pocatello and 4 miles north of Inkom as shown in Figure 6 on page 17. The project area consists of two subwatersheds, West Rapid and North Rapid, which drain approximately 16,195 acres or 25 square miles. The subwatersheds are located in the Inkom watershed, which is in the Portneuf River subbasin. Seventy-two percent of the subwatersheds are privately owned. Range land is the predominant land use within the subwatersheds at 78% of the acres.

Threatened and Endangered Species

Threatened or endangered species in Bannock County include the Gray wolf *(Canis lupus)*, which is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)*, which are listed as threatened. Canada lynx *(Lynx canadensis)* is proposed to be listed while no candidate species exist in the county (NRCS, 2002).

Accomplishments

In 1995, the PSWCD received the IDEQ Water Quality Award for Outstanding Implementation Project for accomplishments in the Upper Rapid Creek Subwatershed SAWQP Project. Within the first three years of the project, 87% of the critical acres were contracted. Thirteen landowners placed BMPs on 4,425 acres (PSWCD, 1999). The BMPs installed by participants included water and sediment control basins, conservation tillage, cross slope farming, crop residue use, chiseling and subsoiling, pasture and hay land management, nutrient management and waste management systems as shown in Table B-1. Since 1985, several landowners have enrolled about 1,519 acres into CRP.

Table B-1. Completed BMP Amounts and Costs in the Upper Rapid Creek Subwatersheds

Best Management Practice	Units Treated	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Chiseling	346 acres	$1,730	$2,540	$4,270	SAWQP
Conservation Cover (CRP)	1,519 acres	$756,462	$45,570	$802,032	CRP
Crop Residue Use	3,007 acres	$158,536	$90,045	$248,581	SAWQP
Cross-Fencing	10,560 feet	$1,826	$609	$2,435	EQIP
Cross Slope Farming	2,661 acres	$11,799	$2,704	$14,503	SAWQP
Conservation Tillage	462 acres	$2,309	$4,343	$6,652	SAWQP
Diversion	1 structure	$452	$151	$603	SAWQP
Fencing	17,874 feet	$10,177	$12,004	$22,181	SAWQP
Pasture & Hay Land Planting	328 acres	$11,693	$5,765	$17,458	SAWQP
Pasture & Hay Land Management	221 acres	$0	$332	$332	EQIP
Proper Grazing Use	221 acres	$0	$332	$332	EQIP
Subsoiling	316 acres	$2,306	$2,464	$4,770	SAWQP
Waste Management System	1 system	$5,515	$5,515	$11,030	SAWQP
Water & Sediment Basins	247 basins	$101,887	$45,493	$147,380	SAWQP
	Total Cost	**$1,064,692**	**$217,867**	**$1,282,559**	

Soil Erosion Reductions

The Upper Rapid Creek Subwatershed SAWQP project treated 3,495 critical acres with BMPs to an erosion rate not to exceed 5.2 tons per acre per year, which resulted in an average annual soil loss of 18,174 tons per year. In addition, there are 1,519 acres of CRP in the subwatersheds, with an erosion rate of one ton per acre per year. When compared to a pre-project rate of 20.4 tons per acre per year or an annual soil loss of 102,286 tons per year, the soil savings is 82,593 tons per year or an 81% reduction in annual soil erosion shown in Table B-2.

Table B-2. Soil Erosion Reductions from BMPs in the Upper Rapid Creek Subwatersheds

<table>
<tr><th colspan="2">Land Treatment</th><th>Average Annual Soil Loss (tons/acre/year)</th><th>Critical Acres</th><th>Annual Soil Loss (tons/year)</th></tr>
<tr><td colspan="2">Before</td><td>20.4</td><td>5,014</td><td>102,286</td></tr>
<tr><td rowspan="2">After</td><td>CRP</td><td>1.0</td><td>1,519</td><td>1,519</td></tr>
<tr><td>SAWQP</td><td>5.2</td><td>3,495</td><td>18,174</td></tr>
<tr><td colspan="5">Annual Soil Erosion Savings in Upper Rapid Creek Subwatersheds = 82,593</td></tr>
</table>

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E. coli* (IDEQ, 1999). The recommended reduction for TSS is 66%, TP is 39% and TIN is 66% at the USGS gage near Pocatello (IDEQ, 1999). No specific load reductions were suggested for Rapid Creek. Erosion reductions of assessed reaches are estimated and shown in Table B-3.

Table B-3. Erosion Estimates for North & West Forks Rapid, Hagler & McNabb Creeks

Stream	Stream Reach	Inventoried Length (feet)	Existing Erosion (tons/year)	Desired Erosion (tons/year)	Percent Reduction
North Fork Rapid Creek	NFRC3B	2,130	163	37	77%
	NFRC5	1,166	6	2	67%
	NFRC8	1,665	23	8	65%
	NFRC9A	1,726	111	38	66%
	NFRC9B	2,677	3	2	33%
	NFRC10	2,614	128	61	52%
	NFRC11	4,753	435	139	68%
	Subtotal	**16,731**	**869**	**287**	**67%**
West Fork Rapid Creek	WFRC4	1,309	0	0	0%
	WFRC5	1,304	80	23	71%
	WFRC9	1,396	0	0	0%
	WFRC11	3,073	0	0	0%
	WFRC13	2,506	73	35	52%
	WFRC14	1,572	0	0	0%
	WFRC18	1,541	199	27	86%
	Subtotal	**12,701**	**352**	**85**	**76%**
McNabb Creek	MNC4	2,877	1	1	0%
	MNC5A	780	77	32	58%
	MNC5B	637	93	30	68%
	Subtotal	**4,294**	**171**	**63**	**63%**
Hagler Creek	HC2	758	37	18	51%
	Subtotal	**758**	**37**	**18**	**51%**
	Total	**34,484**	**1,429**	**453**	**68%**

Identified Problems

In July 2001, assessment teams identified resource problems on 6.5 miles of assessed stream reaches. Those problems that were identified included sediment from livestock access, stream crossings, road surface and embankment runoff, sheet and rill erosion, stream bank and bed erosion and animal feed operations. Evidence of excessive nutrients from animal feed operations, grazing animals and crop land runoff was observed. Possible temperature problems from lack of riparian vegetation and canopy cover were noted. Fish migration barriers from headcuts and culverts were also recognized (ISCC, 2002).

IASCD Water Quality Monitoring Results

IASCD conducted water quality sampling on West Fork Rapid and North Fork Rapid creeks and on upper and lower sites on Rapid Creek. Data in Table B-4 and B-5 indicates that West and North forks Rapid creeks exceed the TMDL targets for TP, TIN, fecal coliform bacteria and *E.coli*. IASCD's upper monitoring site on Rapid Creek, located just below the confluence of North and West forks, exceeds the TMDL targets for TSS, TP, TIN, fecal coliform bacteria and *E. coli* (Fischer, 2002).

Table B-4. TSS, TP & TIN Loads for the North and West Forks Rapid and Rapid Creeks

Monitoring Site	Average TSS Load (tons/day)	Average TSS Load @ TSS Target (tons/day)	Average TSS Load Reduction	TSS Target Exceedance
Rapid Creek below North & West Forks	4.5	2.7	40%	25%
North Fork Rapid Creek	0.4	0.4	0%	0%
West Fork Rapid Creek	0.06	0.06	0%	5%
Monitoring Site	**Average TP Load (lbs/day)**	**Average TP Load @ TP Target (lbs/day)**	**Average TP Load Reduction**	**TP Target Exceedance**
Rapid Creek below North & West Forks	31.1	7.0	77%	100%
North Fork Rapid Creek	2.4	1.3	46%	100%
West Fork Rapid Creek	0.6	0.4	33%	100%
Monitoring Site	**Average TIN Load (lbs/day)**	**Average TIN Load @ TIN Target (lbs/day)**	**Average TIN Load Reduction**	**TIN Target Exceedance**
Rapid Creek below North & West Forks	139.6	28.0	80%	100%
North Fork Rapid Creek	27.4	5.0	82%	85%
West Fork Rapid Creek	5.6	1.4	75%	100%

Table B-5. Percent of Samples Exceeding the TMDL Bacteria Targets & *E. coli* Standards

Monitoring Site	Fecal Coliform PCR Target Exceedance	Fecal Coliform SCR Target Exceedance	*E.coli* PCR Standard Exceedance	*E.coli* SCR Standard Exceedance
Rapid Creek below North & West Forks	25%	25%	13%	13%
North Fork Rapid Creek	45%	40%	40%	35%
West Fork Rapid Creek	32%	21%	32%	16%

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The subwatersheds consist of approximately 16,395 acres. Private agricultural land accounts for 11,670 acres of the subwatersheds.

Because the TMDL reductions are so substantial, it is estimated that 99% or 11,632 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, within these areas, BMP implementation efforts should be focused toward the tiered approach as shown in Table B-6.

Implementation Tiers

Critical areas adjacent to Rapid Creek and its tributaries in Tier 1 are considered high priority for implementation due to the increased potential to directly impact surface water quality. There are three tiers delineated within the subwatersheds. 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 influence on the stream**

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table B-6. Critical Areas by Subwatershed within the Upper Rapid Creek Subwatersheds

Implementation Tiers	Tier 1		Tier 2		Tier 3	
Subwatershed	Riparian Acres	Animal Facilities	Crop and Pasture Acres	Animal Facilities	Range Acres	Animal Facilities
North Fork Rapid	33	5	2,355	1	3,701	0
West Fork Rapid	11	1	596	2	4,936	0
Total	**44**	**6**	**2,951**	**3**	**8,637**	**0**

Animal Feed Operations

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. There are no dairies in the subwatershed. 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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the subwatershed and found as many as nine possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. These TUs describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 1,519 acres of CRP, 462 acres of crop land, 221 acres of pasture land and 1 waste storage facility were removed from the treatment units because those acres meet NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
44	**Enochville-Enochville Variant:** very deep, poorly drained, soils that formed in alluvium derived from mixed sources with slopes ranging form 0 to 1 percent	Unstable and erosive stream bed and banks Lack of riparian vegetation diversity and density Barriers to fish migration and movement

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
970	**Ririe-Rexburg-Lanoak:** very deep, well drained soils that formed in loess and in silty alluvium derived from loess with slopes from 1 to 50 percent	Accelerated sheet and rill erosion Over utilized pasture and range lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
8,416	**Sedgeway-Pavohroo-Harkness:** very deep and well drained, cold soils that formed in alluvium and colluvium derived from sedimentary and metasedimentary rock and in alluvium derived from loess with slopes from 8 to 60 percent	Accelerated sheet and rill and gully erosion Over utilized pasture and range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
8	Enochville-Enochville Variant: very deep, poorly drained, soils that formed in alluvium derived from mixed sources with slopes ranging form 0 to 1 percent	Lack of drinking waters sources Inadequate waste storage Runoff from corrals

Estimated BMP Implementation Costs

Conservation efforts in the subwatersheds 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. Below is Table B-7, which lists BMP amounts and costs.

Table B-7. Estimated BMP Installation Costs for the Upper Rapid Creek Subwatersheds

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percent	Unit Amount	C/S Funds	Participants Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6	75%	20,000	$90,000	$30,000	$120,000
	Conservation Cover	acre	$100	75%	10	$750	$250	$1,000
	Critical Area Planting	acre	$150	75%	4	$450	$150	$600
	Fence, 4-wire	foot	$1.50	75%	50,000	$56,250	$18,750	$75,000
	Fence, Electric 3 Wire	foot	$0.80	75%	8,000	$4,800	$1,600	$6,400
	Fence, Corral Panel	each	$175	75%	200	$26,250	$8,750	$35,000
	Structure for Water Control	each	$3,000	75%	10	$22,500	$7,500	$30,000
	Irrigation System, Micro-Irrigation	acre	$1,000	75%	10	$7,500	$2,500	$10,000
	Prescribed Grazing	acre	$3	75%	100	$225	$75	$300
	Pumping Plant for Water Control	each	$2,500	75%	6	$11,250	$3,750	$15,000
	Riparian Forest Buffer	each	$6	75%	4,000	$18,000	$6,000	$24,000
	Stream Bank Protection	cuyd	$40	75%	400	$12,000	$4,000	$16,000
	Stream Channel Stabilization	cuyd	$35	75%	200	$5,250	$1,750	$7,000
	Stream Habitat Improvement	feet	$250	75%	100	$18,750	$6,250	$25,000
	Tree/Shrub Establishment	each	$6	75%	2,000	$9,000	$3,000	$12,000
	Water Well	feet	$25	75%	1,000	$18,750	$6,250	$25,000
	Use Exclusion	acre	$14	75%	50	$525	$175	$700
					Subtotal	**$302,250**	**$100,750**	**$403,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6	75%	500	$2,250	$750	$3,000
	Critical Area Planting	acre	$150	75%	10	$1,125	$375	$1,500
	Fence, 4-wire	feet	$1.50	75%	40,000	$45,000	$15,000	$60,000
	Fence, Corral Panel	each	$175	75%	40	$5,250	$1,750	$7,000
	Nutrient Management	acre	$5	75%	800	$3,000	$1,000	$4,000
	Pasture & Hayland Planting	acre	$65	75%	400	$19,500	$6,500	$26,000
	Pipeline, Sch 40, 2" PVC	foot	$2.25	75%	40,000	$67,500	$22,500	$90,000
	Prescribed Grazing	acre	$3	75%	500	$1,125	$375	$1,500
	Pump Plant for Water Control	each	$2,500	75%	6	$11,250	$3,750	$15,000
	Residue Management	acre	$25	75%	600	$11,250	$3,750	$15,000
	Spring Development	each	$2,500	75%	6	$11,250	$3,750	$15,000
	Water & Sediment Control Basin	cuyd	$3	75%	5,000	$11,250	$3,750	$15,000
	Watering Facility	each	$800	75%	30	$18,000	$6,000	$24,000
	Water Well	feet	$25	75%	1,200	$22,500	$7,500	$30,000
					Subtotal	**$230,250**	**$76,750**	**$307,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	60,000	$67,500	$22,500	$90,000
	Range Planting	acre	$55	75%	800	$33,000	$11,000	$44,000
	Pipeline, Sch 40, 2" PVC	foot	$2.25	75%	60,000	$101,250	$33,750	$135,000
	Prescribed Grazing	acre	$3	75%	4,000	$9,000	$3,000	$12,000
	Pump Plant for Water Control	each	$2,500	75%	4	$7,500	$2,500	$10,000
	Spring Development	each	$2,500	75%	4	$7,500	$2,500	$10,000
	Watering Facility	each	$800	75%	40	$24,000	$8,000	$32,000
	Water Well	feet	$25	75%	1,200	$22,500	$7,500	$30,000
					Subtotal	**$272,250**	**$90,750**	**$363,000**
TU4 AF	Nutrient Management	acre	$5	75%	400	$1,500	$500	$2,000
	Waste Storage Facility	cuyd	$3	75%	8,000	$18,000	$6,000	$24,000
	Windbreak Establishment	feet	$2.20	75%	5000	$8,250	$2,750	$11,000
					Subtotal	**$27,750**	**$9,250**	**$37,000**
					Total	**$832,500**	**$277,500**	**$1,110,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the subbasin and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the subwatersheds and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and channel erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the subwatersheds and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the subwatersheds and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The PSWCD selected Alternative 3 and 4 for these subwatersheds. These alternatives meet objectives in their resource conservation plan by improving water quality in the Portneuf River (PSWCD, 2002).

Table B-8. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Stream assessment report	2002
Develop conservation plans and contracts	Completed contract agreements	2004
Finalize BMP designs	Completed BMP plans and designs	2006
Design and install approved BMPs	Certify BMP installations	2008
Track BMP installation	Implementation progress report	2010
Evaluate BMP & project effectiveness	Complete project effectiveness report	2012

APPENDIX C

Twentyfourmile Creek Watershed

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of Twentyfourmile Creek. The plan will build upon past conservation accomplishments made through the Upper Portneuf River and Bancroft SAWQP projects and will assist and compliment other subbasin efforts in restoring beneficial uses.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, nutrient and bacteria loading to Twentyfourmile Creek.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. Twentyfourmile Creek is on the state of Idaho's §303(d) list of water quality impaired water bodies (IDEQ, 1998). Twentyfourmile Creek is listed for sediment from its headwaters to the Portneuf River, which is approximately 14 miles in length. Beneficial uses that are designated on Twentyfourmile Creek include cold water biota, secondary contact recreation and agricultural water supply. These beneficial uses need verification (IDEQ, 1999).

Background

In 1985, IDEQ found that Twentyfourmile Creek contributed the largest amount of sediment, roughly 3 tons of sediment per day, to the Portneuf River. It also showed that Twentyfourmile Creek contributed about 1.3 tons of total phosphorus and 4.3 tons of total kjeldahl nitrogen per year to the Portneuf River (Hoover, 1985). The study also concluded that bacterial contamination in the study area comes from a non-human source. According to NRCS, heavy livestock use on Twentyfourmile Creek and its tributaries has resulted in the removal of overhanging vegetation and a subsequent increase in water temperature. NRCS also estimated that Twentyfourmile Creek yielded 1,190 tons of sediment per year of which 60% or 714 tons of sediment is delivered to the Portneuf River (CSCD, 2001).

Twentyfourmile Creek watershed was inventoried and planned in 1992 by the CSCD, ISCC and NRCS as part of the Upper Portneuf River Channel SAWQP project. An implementation alternative was selected that did not include Twentyfourmile Creek in the critical project area. The Upper Portneuf River SAWQP project was implemented and ended in 2000. That project enabled 23 project applicants to implement BMPs on 9,104 critical acres and treated about 8 miles of the Portneuf River (CSCD, 199). BMPs utilized by participants included: exclusion fencing, watering facilities, channel vegetation, rock weirs, water and sediment control basins, conservation tillage and cross slope farming. In 1997, CSCD and IDEQ completed a report that documented pollutant reductions in the Portneuf River (IDEQ, 1998).

In 1998, CSCD initiated a project that would inventory, plan and implement BMPs along Twentyfourmile Creek. In 2000, CSCD received an Idaho Nonpoint Source §319 Grant and secured funding through WQPA for the Twentyfourmile Creek TMDL Implementation Project. The assessment team completed their assessment in July 2000 and their findings are included in the Twentyfourmile Creek Stream Assessment Report (ISCC, 2001).

Project Setting

The Twentyfourmile Creek watershed encompasses an area of 17,062 acres or 27 square miles, in Caribou County, Idaho. The watershed is located in the most northeastern portion of the subbasin as shown in Figure 6 on page 17. The watershed is bounded on the north by the Caribou/Bingham county line. On the west, the area is bounded by the Fort Hall Indian Reservation. On the south, the boundary is the Portneuf River and the Eighteenmile Creek watershed. The southern boundary continues east by northeast through the Portneuf Valley. The eastern boundary is the Chesterfield Range. The watershed consists of an upper and a lower subwatershed. The divide between the upper and lower subwatersheds occurs at the confluence of Pole Canyon and Twentyfourmile creeks. The upper subwatershed drains 8,953 acres and the lower subwatershed drains 8,109 acres. Twentyfourmile Reservoir is in the upper subwatershed and about 1.4 miles upstream of the Pole Canyon and Twentyfourmile creeks confluence. Elevations range from 7,246 feet at Twentyfourmile Peak in the Chesterfield Range to 5,314 feet at the confluence with the Portneuf River. Eighty-six percent of the watershed is privately owned with 14% managed by BLM and IDL. Range is the major private land use in the watershed at 73% of the acres and shown in Table C-1.

Table C-1. Private Land Uses in the Twentyfourmile Creek Watershed

Land Use	Acres	Percent of Total
Crop Land	4,233	28.7%
Range Land	10,073	68.3%
Urban	99	0.7%
Riparian/Wetland	72	0.5%
Road	224	1.5%
Stream	18	0.1%
Reservoir	34	0.2%
Total	**14,753**	**100.0%**

In the spring of 1985, spring runoff and reservoir releases led to Twentyfourmile Creek downcutting 15 to 20 feet into the valley floor and extended downstream for approximately two miles. The downcut channel begins at the confluence of Pole Canyon and Twentyfourmile creeks. The sediment was moved downstream in approximately one day as bedload through the stream channel (Stevenson, 1992).

Presently this downcut channel seems to be in a similar condition as it appeared in 1992. The head cut, that deflected off the upper terrace and proceeded up Pole Canyon Creek, still exists. The floodplain was abandoned and no longer supports riparian vegetation. However in these incised channels, the riparian vegetation is quite vigorous along the creek perhaps due to the reduced access by livestock, favorable soil or stream bank substrate at the lower elevation. Currently the riparian vegetation consists of alders, dogwoods and willows that are dense and shade more than 75% of the creek in these reaches.

Threatened and Endangered Species

Threatened or endangered species in Caribou County include the Gray wolf *(Canis lupus)*, which is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)*, which are listed as threatened. Canada lynx *(Lynx canadensis)* is proposed to be listed while no candidate species exist in the county (NRCS, 2002).

Accomplishments

The CSCD and area landowners have successfully implemented the Bancroft and Upper Portneuf River SAWQP projects. Since 1985, several landowners have enrolled 1,349 acres of highly erodible land into CRP. Additionally the CSCD is working with landowners to install BMPs along Twentyfourmile Creek. As part of the Twentyfourmile Creek TMDL Implementation Project, the CSCD's first participant has installed approximately 23,000 feet of fence, 30,000 feet of pipeline, 3 troughs and 1 spring development. These BMPs were installed to aid prescribed grazing on Twentyfourmile Creek and the Portneuf River.

Table C-2. Completed BMP Amounts and Costs in the Twentyfourmile Creek Watershed

Best Management Practice	Units Treated	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Fence	22,640 feet	$30,564	$3,396	$33,960	WQPA
Conservation Cover (CRP)	1,349 acres	$724,413	$40,470	$764,883	CRP
Pipeline	29,600 feet	$22,200	$7,400	$29,600	WQPA
Prescribed Grazing	2,278 acres	$0	$13,668	$13,668	WQPA
Spring Development	1 each	$1,875	$625	$2,500	WQPA
Watering Facility	3 troughs	$1,200	$1,200	$2,400	WQPA
	Total Cost	**$780,252**	**$66,759**	**$847,011**	

Soil Erosion Reductions

There are approximately 1,349 acres of highly erodible crop land enrolled in CRP. These acres had an estimated pre-CRP erosion rate of 8 tons per acre per year or a soil loss of 10,792 tons per year. Currently these same acres have an estimated erosion rate of one ton per acre per year. The annual soil savings are 9,443 tons per year or 88% reduction in average annual soil erosion shown in Table C-3. Additionally, the WQPA project has installed fencing and prescribed grazing that reduced about seven tons per year of stream bank erosion on Twentyfourmile Creek.

Table C-3. Soil Erosion Reductions from BMPs in the Twentyfourmile Creek Watershed

Land Treatment	Average Annual Soil Loss (tons/acre/year)	CRP Acres	Annual Soil Loss (tons/year)
Before CRP	8.0	1,349	10,792
After CRP	1.0	1,349	1,349
Annual Soil Erosion Savings in Twentyfourmile Creek = 9,443 tons/year			

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E. coli* (IDEQ, 1999). The recommended reduction for TSS is 66%, TP is 39% and TIN is 66% at the Pocatello USGS gage (IDEQ, 1999). No specific load reductions were suggested for Twentyfourmile Creek, however erosion reductions for assessed reaches were estimated and shown in Table C-4.

Identified Problems

In July 2000, assessment teams identified resource problems on approximately nine miles of assessed stream reaches. Those problems included sediment from livestock access, stream crossings, road surface and embankment runoff, sheet and rill erosion, stream bank and bed erosion and animal feed operations. Evidence of excessive nutrients from animal feed operations, grazing animals and crop land runoff was observed. Possible temperature problems from lack of riparian vegetation and canopy cover were noted. Fish migration barriers from headcuts and culverts were also documented (ISCC, 2001).

Table C-4. Erosion Estimates for Assessed Reaches along Twentyfourmile Creek

Stream	Stream Reach	Inventoried Length (feet)	Existing Erosion (tons/year)	Desired Erosion (tons/year)	Percent Reduction
Twentyfourmile Creek	TFMC8	3,213	65	25	62%
	TFMC9	2,628	38	10	74%
	TFMC10	2,411	48	9	81%
	TFMC13	879	3	3	0%
	TFMC14	904	9	3	62%
	TFMC16	706	51	14	74%
	TFMC17	709	115	11	91%
	TFMC19	3,794	1,245	146	88%
	TFMC20	3,051	605	117	81%
	TFMC21	6,049	2,453	232	91%
	TFMC22	150	10	1	88%
	TFMC22	3,271	67	25	62%
	TFMC23	500	49	6	88%
	TFMC23	6,110	47	47	0%
	TFMC24	1,277	74	20	74%
	TFMC25	5,006	26	19	25%
	TFMC26	3,953	26	15	42%
	TFMC27	1,467	10	6	42%
	TFMC28	872	17	10	42%
	Subtotal	**46,950**	**4,958**	**719**	**86%**
East Fork Corduroy Spring	EF3	1,609	53	6	88%
	EF4	460	0	0	0%
	EF5	615	1	1	0%
	Subtotal	**2,684**	**54**	**7**	**87%**
	Total	**49,632**	**5,012**	**726**	**86%**

Water Quality Monitoring Results

IASCD has been conducting integrated water column sampling at fixed intervals on two sites along Twentyfourmile Creek since 1999. Data indicates that Twentyfourmile Creek exceeds the TMDL target for TIN. Fecal coliform and *E. coli* TMDL targets were exceeded twice during the sampling period. TSS targets were exceeded only during April 2000 and 2001. IASCD's upper monitoring site on

Twentyfourmile Creek, located just above the reservoir exceeds the TMDL targets for TSS and TP. Bacteria and *E. coli* TMDL targets were exceeded five times are shown in Table C-5 (Fischer, 2002).

Table C-5. TSS, TP & TIN Loads for Twentyfourmile Creek

Monitoring Site	Average TSS Load (tons/day)	Average TSS @ TSS Target (tons/day)	Average TSS Reduction	TSS Target Exceedance
Twentyfourmile Creek (upper)	0.02	0.01	50%	56%
Twentyfourmile Creek (lower)	0.42	0.37	12%	19%
Monitoring Site	**Average TP Load (lbs/day)**	**Average TP @ TP Target (lbs/day)**	**Average TP Reduction**	**TP Target Exceedance**
Twentyfourmile Creek (upper)	0.2	0.1	50%	89%
Twentyfourmile Creek (lower)	2.2	1.0	55%	31%
Monitoring Site	**Average TIN Load (lbs/day)**	**Average TIN @ TIN Target (lbs/day)**	**Average TIN Reduction**	**TIN Target Exceedance**
Twentyfourmile Creek (upper)	0.1	0.1	0%	33%
Twentyfourmile Creek (lower)	5.7	3.5	39%	31%

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The watershed consists of approximately 17,062 acres and private agricultural land accounts for 14,378 acres. The predominant private land use within the watershed is range land with 10,073 acres. Because the TMDL reductions are so substantial, it is estimated that 100% or 14,378 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, within these areas, BMP implementation should be focused toward the tiers shown in Table C-6.

Implementation Tiers

Critical areas adjacent to Twentyfourmile Creek and its tributaries in Tier 1 are considered high priority for implementation due to the increased potential to directly impact surface water quality. There are three tiers delineated within the watershed. 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 influence on the stream**

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table C-6. Critical Areas by Subwatershed within the Twentyfourmile Creek Watershed

Implementation Tiers	Tier 1		Tier 2		Tier 3	
Subwatershed	**Riparian Acres**	**Animal Facilities**	**Crop and Pasture Acres**	**Animal Facilities**	**Range Acres**	**Animal Facilities**
Lower Twentyfourmile	21	3	4,233	2	3,161	0
Upper Twentyfourmile	51	0	0	0	6,912	0
Total	**72**	**3**	**4,233**	**2**	**10,073**	**0**

Animal Feed Operations

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. There are no dairies in the subwatershed. 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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the subwatershed and found as many as five possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. These TUs describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 1,349 acres of CRP and 2,278 acres of pasture land and 18 acres of riparian areas were removed from the TUs because they meet NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
54	**Rexburg-Ririe-Iphil:** deep and very deep, well drained, soils formed in loess and silty alluvium derived from loess with slopes from 0 to 4 percent	Unstable and erosive stream bed and banks Lack of riparian vegetation diversity and density Barriers to fish migration and movement

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
606	**Rexburg-Ririe-Iphil:** deep and very deep, well drained, soils formed in loess and silty alluvium derived from loess with slopes from 0 to 20 percent	Accelerated sheet and rill erosion Over utilized pasture lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
10,073	**Lanark-Dranyon-Nielson:** shallow to very deep, well drained, strongly sloping to very steep soils formed in loess and mixed alluvium with slopes from 0 to 60 percent	Accelerated sheet and rill or gully erosion Over utilized range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
5	**Rexburg-Ririe-Iphil:** deep and very deep, well drained, soils formed in loess and silty alluvium derived from loess with slopes from 0 to 20 percent	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens

Estimated BMP Implementation Costs

Conservation efforts 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 C-7 lists the BMP amounts and costs.

Table C-7. Estimated BMP Installation Costs for the Twentyfourmile Creek Watershed

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percent	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6	75%	15,000	$67,500	$22,500	$90,000
	Conservation Cover	acre	$100	75%	10	$750	$250	$1,000
	Critical Area Planting	acre	$150	75%	6	$675	$225	$900
	Fence, 4-wire	feet	$1.50	75%	50,000	$56,250	$18,750	$75,000
	Fence, Corral Panel	each	$175	75%	40	$5,250	$1,750	$7,000
	Heavy Use Area Protection	cuyd	$30	75%	200	$4,500	$1,500	$6,000
	Structure for Water Control	each	$3,000	75%	6	$13,500	$4,500	$18,000
	Prescribed Grazing	acre	$3	75%	200	$450	$150	$600
	Riparian Forest Buffer	feet	$6	75%	5,000	$22,500	$7,500	$30,000
	Stream Bank Protection	cuyd	$40	75%	500	$15,000	$5,000	$20,000
	Stream Channel Stabilization	cuyd	$35	75%	200	$5,250	$1,750	$7,000
	Stream Habitat Improvement	feet	$250	75%	1,000	$187,500	$62,500	$250,000
	Tree/Shrub Establishment	each	$6	75%	5,000	$22,500	$7,500	$30,000
	Pumping Plant for Water Control	each	$2,500	75%	5	$9,375	$3,125	$12,500
	Water Well	feet	$25	75%	1,000	$18,750	$6,250	$25,000
	Watering Facility	each	$800	75%	20	$12,000	$4,000	$16,000
	Use Exclusion	acre	$14	75%	100	$1,050	$350	$1,400
	Wildlife Wetland Habitat Management	acre	$7.50	75%	80	$450	$150	$600
					Subtotal	**$443,250**	**$147,750**	**$591,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6	75%	500	$2,250	$750	$3,000
	Critical Area Planting	acre	$150	75%	2	$225	$75	$300
	Fence, 4-wire	feet	$1.50	75%	26,000	$29,250	$9,750	$39,000
	Fence, Corral Panel	each	$175	75%	40	$5,250	$1,750	$7,000
	Irrigation Water Conveyance, 10" PVC	feet	$9.50	75%	2,000	$14,250	$4,750	$19,000
	Irrigation Water Management	acre	$5	75%	500	$1,875	$625	$2,500
	Nutrient Management	acre	$5	75%	400	$1,500	$500	$2,000
	Pasture & Hayland Planting	acre	$65	75%	400	$19,500	$6,500	$26,000
	Pipeline, PVC 100 psi, 2.0" PVC	feet	$2.25	75%	40,000	$67,500	$22,500	$90,000
	Pond	cuyd	$3	75%	1,000	$2,250	$750	$3,000
	Prescribed Grazing	acre	$3	75%	400	$900	$300	$1,200
	Pump Plant for Water Control	hp	$2,500	75%	4	$7,500	$2,500	$10,000
	Residue Management	acre	$20	75%	500	$7,500	$2,500	$10,000
	Spring Development	each	$2,500	75%	4	$7,500	$2,500	$10,000
	Water & Sediment Control Basin	cuyd	$3	75%	2,000	$4,500	$1,500	$6,000
	Watering Facility	each	$800	75%	20	$12,000	$4,000	$16,000
	Water Well	feet	$25	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$202,500**	**$67,500**	**$270,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	80,000	$90,000	$30,000	$120,000
	Pipeline, PVC 100 psi, 2.0" PVC	feet	$2.25	75%	50,000	$84,375	$28,125	$112,500
	Prescribed Grazing	acre	$3	75%	8,000	$18,000	$6,000	$24,000
	Pump Plant for Water Control	hp	$2,500	75%	4	$7,500	$2,500	$10,000
	Range Planting	acre	$55	75%	600	$24,750	$8,250	$33,000
	Spring Development	each	$2,500	75%	30	$56,250	$18,750	$75,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	200	$1,125	$375	$1,500
	Watering Facility	each	$800	75%	80	$48,000	$16,000	$64,000
	Water Well	feet	$25	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$348,750**	**$116,250**	**$465,000**
TU4 AF	Nutrient Management	acre	$5.00	75%	200	$750	$250	$1,000
	Waste Storage Facility	cuyd	$3.00	75%	4,000	$9,000	$3,000	$12,000
	Windbreak/Shelterbelt	feet	$2.20	75%	5,000	$8,250	$2,750	$11,000
					Subtotal	**$18,000**	**$6,000**	**$24,000**
					Total	**$1,012,500**	**$337,500**	**$1,350,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the watershed and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and bed erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The CSCD selected Alternative 3 and 4 for this watershed. These alternatives meet objectives set forth in their resource conservation plan by improving water quality in the Portneuf River (CSCD, 2002).

Table C-8. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Stream assessment report	2001
Develop conservation plans and contracts	Completed contract agreements	2003
Finalize BMP designs	Completed BMP plans and designs	2005
Design and install approved BMPs	Certify BMP installations	2007
Track BMP installation	Implementation progress report	2009
Evaluate BMP & project effectiveness	Complete project effectiveness report	2011

APPENDIX D

Dempsey-McCammon Watershed

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of the Portneuf River. This plan addresses the Portneuf River and its tributaries from Lava Hot Springs to McCammon. The plan builds upon past accomplishments made through the Dempsey-McCammon EQIP Priority Area and will assist other efforts in restoring beneficial uses.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, nutrient and bacteria loading to Portneuf River.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. The Portneuf River is on the state of Idaho's §303(d) list of water quality impaired water bodies (IDEQ, 1998). The river is listed for sediment, nutrients and bacteria from Lava Hot Springs to the PMVCC diversion. This section of the river is approximately 16 miles in length. The Portneuf River's designated beneficial uses include cold water biota, salmonid spawning, primary contact recreation, secondary contact recreation, domestic water supply, agricultural water supply, industrial water supply, wildlife habitat and aesthetics. The Portneuf River's beneficial uses are not fully supported due to sediment, nutrients, bacteria, flow alteration, and oil/grease (IDEQ, 1999).

Background

In 1987, the PSWCD prioritized the subwatersheds along the Portneuf River below Lava Hot Springs in the Lower Portneuf River Agricultural Pollution Abatement Plan (PSWCD, 1987). The Dempsey and McCammon subwatersheds were ranked third and fifth in importance for implementation. The PSWCD applied for a SAWQP grant in 1996, but the application was denied (PSWCD, 1996). In 1997, the PSWCD received NRCS funding and designated the watershed as the Dempsey-McCammon EQIP Priority Area. That project enabled six landowners to implement BMPs on 2,288 acres and improved about two miles of the Portneuf River, Dempsey and Beaverdam creeks. Water quality sampling on the Portneuf River at the Topaz USGS gage indicated that the river transports an average of 204 tons of TSS per day. It also showed that the river carries about 138 lbs of TP and 771 lbs of TIN daily. Additional water quality sampling was conducted on Dempsey and East Bob Smith creeks and Jenkins Canyon (Drewes, 1987 and Fischer, 2002).

Project Setting

The Dempsey-McCammon watershed encompasses 55,167 acres or 86 square miles in Bannock County. The watershed is located in the southeastern portion of the subbasin as shown in Figure 6 on page 17. The Portneuf Range bounds the watershed on the north and south. On the west, Marsh Valley bounds the area. The eastern boundary is the Fish Creek Range. The watershed consists of eight subwatersheds. These subwatersheds are listed in Table D-1. Elevations range from 9,208 feet to 4,753 feet near McCammon. Seventy-eight percent of the terrain occurs between 5,000 and 7,000 feet elevation. The watershed is steep with 82% of the slopes greater than 15% and just over 1% of the slopes less than 1%. Slopes increase in all directions into the Fish Creek and Portneuf ranges. There are 40 miles of perennial streams in the watershed, which include the Portneuf River and several tributaries including Beaverdam, Dempsey, East Bob Smith, Snodgrass and West Bob Smith creeks, and 79 miles of intermittent streams.

Table D-1. Subwatersheds in the Dempsey-McCammon Watershed

Subwatershed	Acres	Percent of Total
East Bob Smith	4,474	8.1%
East Creek	6,475	11.7%
Jenkins Canyon	4,804	8.8%
Lower Dempsey	7,025	12.7%
McCammon	7,462	13.5%
Old Lava	9,523	17.3%
Upper Dempsey	12,378	22.4%
West Bob Smith	3,026	5.5%
Total	55,167	100.0%

Land Ownership and Land Use

Seventy-six percent of the watershed is privately owned and about 24% is managed by the BLM, IDL and FS. Range and forest lands are the primary land uses within the watershed at 36%, each and shown in Table D-2. The cities of Lava Hot Springs and McCammon are located within the watershed. The watershed is transitioning from agricultural to recreational and residential developments. There are 976 private parcel owners in the watershed. The average parcel size is 22 acres with a median size of 5 acres. About eight percent of the private parcels are zoned as rural subdivisions (Bannock County, 1999).

Table D-2. Land Uses in the Dempsey-McCammon Watershed

Land Use	Acres	Percent of Total
Crop Land	12,020	21.8%
Forest Land	20,115	36.5%
Range Land	20,313	36.8%
Riparian/Wetland	1,072	1.9%
Road	684	1.2%
Urban	846	1.5%
Water	117	0.3%
Total	55,167	100.0%

General Soils

The Bannock County Soil Survey covers about 91% of the watershed (SCS, 1987). Soils are predominantly silt loam on 0 to 50% slopes, however a variety of soils are shown in Table D-3.

Table D-3. Soil Surface Textures in the Dempsey-McCammon Watershed

Soil Surface Texture	Acres	Percent of Total
Cobbly silt loam	95	0.2%
Very cobbly silt loam	12,970	25.9%
Gravelly silt loam	8,724	17.4%
Very gravelly silt loam	2,148	4.3%
Silt loam	21,353	42.6%
Extremely stony silt loam	4,827	9.6%
Total	50,136	100.0%

Threatened and Endangered Species

Listed below are the threatened or endangered species in Bannock County: Gray wolf *(Canis lupus)* is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)* are listed as threatened. Canada lynx *(Lynx canadensis)* are proposed listed while no candidate species exist in the county (NRCS, 2002).

Accomplishments

The PSWCD and watershed residents successfully implemented the Dempsey-McCammon EQIP Priority Area. That project enabled six landowners to implement BMPs on 2,288 acres and improved about two miles of the Portneuf River, Dempsey and Beaverdam creeks. BMPs utilized by participants included: fencing, watering facilities, pipelines, rock weirs, water and sediment control basins, stream bank protection, nutrient management, riparian forest buffer and pasture and hayland planting. Additionally, several landowners enrolled 2,318 acres of crop land into CRP. The CRP acres and the acres converted from crop land to pasture had an estimated pre-treatment erosion rate of eight tons per acre per year or a soil loss of 19,560 tons per year. Currently these acres have an estimated erosion rate of one ton per acre per year. The annual soil savings are 17,115 tons per year or 88% reduction in annual erosion shown in Table D-5. Stream bank protection and fencing reduced about 50 tons per year of stream bank erosion.

Table D-4. Completed BMP Amounts and Costs in the Dempsey-McCammon Watershed

Best Management Practice	Units	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Conservation Cover (CRP)	2,318 acres	$1,154,364	$69,540	$1,223,904	CRP
Fence	5,476 feet	$18,163	$6,054	$24,217	EQIP
Irrigation System-Sprinkler	75 acres	$20,796	$6,932	$27,728	EQIP
Nutrient Management	2,154 acres	$0	$10,770	$10,770	EQIP
Pasture & Hayland Planting	127 acres	$6,177	$2,059	$8,236	EQIP
Pasture & Hayland Management	149 acres	$0	$894	$894	EQIP
Pipeline	7,517 feet	$19,558	$6,519	$26,077	EQIP
Prescribed Grazing	1,809 acres	$0	$5,427	$5,427	EQIP
Pumping Plant for Water Control	2 each	$4,546	$1,515	$6,061	EQIP
Riparian Forest Buffer	6 acres	$0	$2,640	$2,640	EQIP
Spring Development	2 each	$4,950	$1,650	$6,600	EQIP
Stream Bank Protection	250 ft	$14,910	$4,970	$19,880	EQIP
Tree/Shrub Establishment	164 ft	$1,838	$612	$2,450	EQIP
Water & Sediment Control Basin	17 each	$7,018	$2,339	$9,357	EQIP
Watering Facility	3 each	$1,125	$375	$1,500	EQIP
Well	2 each	$9,211	$3,070	$12,281	EQIP
	Total Cost	**$1,262,656**	**$125,366**	**$1,388,022**	

Table D-5. Soil Erosion Reductions from BMPs in the Dempsey-McCammon Watershed

Land Treatment	Average Annual Soil Loss (tons/acre/year)	Treated Acres	Annual Soil Loss (tons/year)
Before	8.0	2,445	19,560
After	1.0	2,445	2,445
Soil Savings in the Dempsey-McCammon Watershed = 17,115 tons/year			

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E.coli.* The recommended reduction for TSS is 53%, TP is 15% and TIN is 50% at the Topaz USGS gage. The TMDL also recommends a 73% reduction of fecal coliform bacteria in the river from Lava Hot Springs to Rainey Park in Pocatello (IDEQ, 1999). No reductions were recommended for the tributaries.

Identified Problems

The PSWCD and NRCS stated that the mountain range land is not causing significant sediment problems in the watershed (PSWCD, 1996). In 1996, a NRCS reconnaissance team estimated that about 78,000 feet of riparian area along the Portneuf River and Dempsey Creek were in poor or fair condition. Livestock grazing in small pastures next to the river caused the conditions. Irrigated crop land with slopes greater than 4% were also considered areas with excessive erosion. The team also identified five small animal feed operations within the watershed (PSWCD, 1996). In 2002, ISDA and ISCC identified as many as 32 active feed operations or corrals in the watershed.

Water Quality Monitoring Results

IDEQ sampled Dempsey Creek in 1985 and 1986. They found that Dempsey Creek along with Rapid Creek were the largest contributors of sediment and nutrients to the Portneuf River (Drewes, 1987). Dempsey Creek never exceeded the water quality standards for fecal coliform bacteria. USGS conducted water sampling at the Topaz gage on the Portneuf River from 1995 to 2000. Data indicates that the river exceeds the TMDL targets for TSS, TP and TIN. However, there was no exceedance of the water quality standards for fecal coliform bacteria or *E. coli.*

IASCD has been conducting integrated water column sampling at fixed intervals on Dempsey and East Bob Smith creeks during 1999 and 2000. Dempsey Creek exceeded the TMDL targets for TSS, TP, TIN and fecal coliform bacteria. However, the samples never exceeded the water quality standards for *E. coli*. East Bob Smith Creek exceeded the TMDL targets for TSS, TP, TIN and fecal coliform bacteria. East Bob Smith Creek exceeded the *E. coli* water quality standards twice (Fischer, 2002). These results were used in Tables D-6, D-7 and D-8 to estimate reductions needed to meet the TMDL targets.

Table D-6. TSS, TP & TIN Loads for Portneuf River, Dempsey & East Bob Smith Creeks

Monitoring Site	Average TSS Load (tons/day)	Average TSS Load @ TSS Target (tons/day)	Average TSS Load Reduction	TSS Target Exceedance
Portneuf River @ Topaz*	204.3	38.6	81%	61%
East Bob Smith Creek***	0.5	0.4	20%	24%
Dempsey Creek***	3.4	2.3	32%	28%
Monitoring Site	**Average TP Load (lbs/day)**	**Average TP Load @ TP Target (lbs/day)**	**Average TP Load Reduction**	**TP Target Exceedance**
Portneuf River @ Topaz*	138.9	74.1	47%	17%
East Bob Smith Creek***	2.1	1.1	48%	41%
Dempsey Creek***	13.7	4.9	64%	39%
Monitoring Site	**Average TIN Load (lbs/day)**	**Average TIN Load @ TIN Target (lbs/day)**	**Average TIN Load Reduction**	**TIN Target Exceedance**
Portneuf River @ Topaz*	771.8	411.4	47%	100%
East Bob Smith Creek***	17.7	5.2	71%	100%
Dempsey Creek***	76.2	22.4	71%	100%

Table D-7. April 2000 Pollutants for Portneuf River, Dempsey & East Bob Smith Creeks

Monitoring Site	TSS (mg/L)	TSS Load (tons/day)	Discharge (cfs)	Portion of river TSS load	Portion of discharge
Portneuf River @ Topaz*	52	31.0	221.0	27.4%	50.6%
Dempsey Creek***	96	8.2	31.7	7.2%	7.3%
East Bob Smith Creek***	118	2.9	9.2	2.6%	2.1%
Monitoring Site	**TP (mg/L)**	**TP Load (lbs/day)**	**Discharge (cfs)**	**Portion of river TP load**	**Portion of discharge**
Portneuf River @ Topaz*	0.04	51.2	221.0	17.5%	50.6%
Dempsey Creek**	0.13	22.2	31.7	7.6%	7.3%
East Bob Smith Creek**	0.17	8.4	9.2	2.9%	2.1%
Monitoring Site	**TIN (mg/L)**	**TIN Load (lbs/day)**	**Discharge (cfs)**	**Portion of river TIN load**	**Portion of discharge**
Portneuf River @ Topaz*	0.75	888.6	221.0	78.8%	50.6%
Dempsey Creek**	1.05	178.3	31.7	15.8%	7.3%
East Bob Smith Creek**	1.08	53.2	9.2	4.7%	2.1%

Table D-8. Percent of Samples Exceeding the TMDL Bacteria Targets & *E. coli* Standards

Monitoring Site	Fecal Coliform PCR Target Exceedance	Fecal Coliform SCR Target Exceedance	*E.coli* PCR Standard Exceedance	*E.coli* SCR Standard Exceedance
East Bob Smith Creek***	29%	18%	18%	12%
Dempsey Creek***	6%	6%	0%	0%
Portneuf River @ Topaz*	0%	0%	---	---

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The watershed consists of approximately 55,167 acres. Private agricultural land accounts for 41,927 acres of the watershed. The predominant private land use within the watershed is crop land with 12,898 acres. Because the TMDL reductions are so substantial, it is estimated that 61% or 25,488 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, BMP implementation should be focused toward the tiers shown in Table D-9.

Implementation Tiers

Critical areas adjacent to the Portneuf River and its tributaries in Tier 1 are considered high priority for implementation due to the increased potential to directly impact surface water quality. There are three tiers delineated within the watershed. 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 influence on the stream**

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table D-9. Critical Areas by Subwatershed within the Dempsey-McCammon Watershed

Implementation Tiers	Tier 1		Tier 2		Tier 3	
Subwatershed	Riparian Acres	Animal Facilities	Crop and Pasture Acres	Animal Facilities	Range Acres	Animal Facilities
East Bob Smith	4	1	336	0	181	0
East	2	0	262	0	40	0
Jenkins Canyon	0	0	2,104	0	1,969	0
Lower Dempsey	2	3	1,409	1	3,360	0
McCammon	28	4	3,472	1	3,048	0
Old Lava	17	7	4,064	10	2,186	0
Upper Dempsey	15	2	150	0	1,095	0
West Bob Smith	8	3	1,118	0	634	0
Total	**76**	**20**	**12,898**	**12**	**12,514**	**0**

Animal Feed Operations

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. There are no dairies in the subwatershed. 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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the watershed and found as many as 32 possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. These TUs describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 2,318 acres of CRP and 2,154 acres crop, pasture and range lands and 14 acres of riparian areas were removed from the treatment units because those acres exceed NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
76	**Inkom-Joevar:** very deep, moderately well drained and well drained soils that formed in silty alluvium with slopes ranging from 0 to 2 percent	Unstable and erosive stream channel Lack of riparian vegetation Barriers to fish migration

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
10,235	**Cedarhill-Ireland or Camelback-Hades-Valmar or Sedgeway-Pavohroo-Harkness:** very deep and moderately deep, well drained non calcareous and calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite, quartzite and sedimentary rock with slopes from 0 to 20 percent	Accelerated sheet and rill or gully erosion on crop and pasture lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
10,705	**Cedarhill-Ireland or Camelback-Hades-Valmar or Sedgeway-Pavohroo-Harkness:** very deep and moderately deep, well drained non calcareous and calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite, quartzite and sedimentary rock with slopes from 0 to 60 percent	Accelerated gully erosion on range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
32	**Inkom-Joevar:** very deep, moderately well drained and well drained soils that formed in silty alluvium with slopes ranging from 0 to 2 percent **Cedarhill-Ireland or Camelback-Hades-Valmar or Sedgeway-Pavohroo-Harkness:** very deep and moderately deep, well drained non calcareous and calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite, quartzite and sedimentary rock with slopes from 0 to 60 percent	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens

Estimated BMP Implementation Costs

Conservation efforts in the watershed and the EQIP Priority Area have demonstrated that landowners will install BMPs if technical and financial assistance is available. The proposed treatment will be to implement BMPs through conservation plans. Table D-10 lists the BMP amounts and costs.

Table D-10. Estimated BMP Installation Costs for the Dempsey-McCammon Watershed

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percent	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6.00	75%	30,000	$135,000	$45,000	$180,000
	Conservation Cover	acre	$100.00	75%	10	$750	$250	$1,000
	Critical Area Planting	acre	$150.00	75%	4	$450	$150	$600
	Fence, 4-wire	feet	$1.50	75%	150,000	$168,750	$56,250	$225,000
	Fence, Corral Panel	each	$175.00	75%	400	$52,500	$17,500	$70,000
	Heavy Use Area Protection	cuyd	$30.00	75%	100	$2,250	$750	$3,000
	Structure for Water Control	each	$3,000.00	75%	10	$22,500	$7,500	$30,000
	Prescribed Grazing	acre	$3.00	75%	11,000	$24,750	$8,250	$33,000
	Riparian Forest Buffer	feet	$6.00	75%	70,000	$315,000	$105,000	$420,000
	Stream Bank Protection	cuyd	$40.00	75%	1,000	$30,000	$10,000	$40,000
	Stream Channel Stabilization	cuyd	$35.00	75%	1,000	$26,250	$8,750	$35,000
	Stream Habitat Improvement	feet	$250.00	75%	1,000	$187,500	$62,500	$250,000
	Tree/Shrub Establishment	each	$6.00	75%	60,000	$270,000	$90,000	$360,000
	Pumping Plant for Water Control	each	$2,500.00	75%	20	$37,500	$12,500	$50,000
	Water Well	feet	$25.00	75%	5,000	$93,750	$31,250	$125,000
	Watering Facility	each	$800.00	75%	60	$36,000	$12,000	$48,000
	Use Exclusion	acre	$14.00	75%	100	$1,050	$350	$1,400
	Wildlife Wetland Habitat Management	acre	$7.50	75%	800	$4,500	$1,500	$6,000
					Subtotal	**$1,408,500**	**$469,500**	**$1,878,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6.00	75%	2,500	$11,250	$3,750	$15,000
	Critical Area Planting	acre	$150.00	75%	10	$1,125	$375	$1,500
	Fence, 4-wire	feet	$1.50	75%	40,000	$45,000	$15,000	$60,000
	Fence, Corral Panel	Each	$175.00	75%	400	$52,500	$17,500	$70,000
	Irrigation Water Conveyance, 10" pvc	feet	$9.50	75%	10,000	$71,250	$23,750	$95,000
	Irrigation Water Management	acre	$5.00	75%	6,000	$22,500	$7,500	$30,000
	Nutrient Management	acre	$5.00	75%	10,000	$37,500	$12,500	$50,000
	Pasture & Hayland Planting	acre	$65.00	75%	2,000	$97,500	$32,500	$130,000
	Pipeline, 2" PVC	feet	$2.25	75%	28,000	$47,250	$15,750	$63,000
	Pond	cuyd	$3.00	75%	3,000	$6,750	$2,250	$9,000
	Prescribed Grazing	acre	$3.00	75%	6,000	$13,500	$4,500	$18,000
	Pump Plant for Water Control	hp	$2,500.00	75%	10	$18,750	$6,250	$25,000
	Residue Management	acre	$20.00	75%	2,500	$37,500	$12,500	$50,000
	Spring Development	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Upland Wildlife Habitat Management	acre	$7.50	75%	400	$2,250	$750	$3,000
	Water & Sediment Control Basin	cuyd	$3.00	75%	5,000	$11,250	$3,750	$15,000
	Watering Facility	each	$800.00	75%	40	$24,000	$8,000	$32,000
	Water Well	feet	$25.00	75%	2,000	$37,500	$12,500	$50,000
					Subtotal	**$546,750**	**$182,250**	**$729,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	60,000	$67,500	$22,500	$90,000
	Pipeline, 2" PVC	feet	$2.25	75%	52,000	$87,750	$29,250	$117,000
	Prescribed Grazing	acre	$3.00	75%	9,000	$20,250	$6,750	$27,000
	Pump Plant for Water Control	hp	$2,500.00	75%	6	$11,250	$3,750	$15,000
	Range Planting	acre	$55.00	75%	600	$24,750	$8,250	$33,000
	Spring Development	each	$2,500.00	75%	6	$11,250	$3,750	$15,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	400	$2,250	$750	$3,000
	Watering Facility	each	$800.00	75%	40	$24,000	$8,000	$32,000
	Water Well	feet	$25.00	75%	1,200	$22,500	$7,500	$30,000
					Subtotal	**$271,500**	**$90,500**	**$362,000**
TU4 AF	Nutrient Management	acre	$5.00	75%	2,000	$7,500	$2,500	$10,000
	Waste Storage Facility	cuyd	$3.00	75%	8,000	$18,000	$6,000	$24,000
	Windbreak/Shelterbelt	feet	$2.20	75%	5,000	$8,250	$2,750	$11,000
					Subtotal	**$33,750**	**$11,250**	**$45,000**
					Total	**$2,260,500**	**$753,500**	**$3,014,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the watershed and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and bed erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The PSWCD selected an alternative that combined Alternatives 2, 3 and 4 for this watershed. Their alternative meets the objectives set forth in their resource conservation plan by improving water quality in the Portneuf River (PSWCD, 2002).

Table D-11. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Assessment report	2002
Develop conservation plans and contracts	Completed plans and contracts	2004
Finalize BMP designs	Completed BMP plans and designs	2010
Design and install approved BMPs	Certify BMP installations	2014
Track BMP installation	Implementation progress report	2018
Evaluate BMP & project effectiveness	Complete project effectiveness report	2022

APPENDIX E

Marsh Creek Watershed

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of Marsh Creek and its tributaries. The plan will build upon past conservation accomplishments made through the Marsh Creek Corridor EQIP Priority Area, Lone Pine SAWQP, Arkansas SAWQP and Marsh Creek Riparian Restoration projects and will assist and compliment other subbasin efforts in restoring beneficial uses.

Goals and Objectives

The goal of this TMDL implementation plan is to restore cold water biota beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, nutrients and bacteria loading to Marsh Creek.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. Marsh Creek is on the state of Idaho's §303(d) list of water quality impaired water bodies (IDEQ, 1998). Marsh Creek is listed for sediment, nutrients and bacteria from Calvin Road to the Portneuf River. This segment of the creek is approximately 16 miles in length. Marsh Creek's designated beneficial uses include cold water biota, salmonid spawning, primary and secondary contact recreation, domestic water supply, agricultural and industrial water supply, wildlife habitat and aesthetics.

Background

In 1977, IDHW completed water quality status reports (McSorley, 1977 and Perry et al., 1977) for the Portneuf River and submitted their findings to the Southeast Idaho Council of Governments (SICOG). This report was followed with an inventory of nonpoint pollution sources in Bannock and Caribou counties (Roberts, 1977). This study identified the impacts of agricultural lands on water quality in the Marsh Creek watershed. At about the same time the PSWCD, IDHW and USGS starting monitoring water quality in the watershed as part of the State of Idaho's Section 208 non-point source program (PSWCD, 1984). Marsh Creek was considered to be one of the worst 22 streams in Idaho for soil erosion problems and was listed as the number one priority stream affected by agriculture (PSWCD, 1994).

The PSWCD was awarded funding for the Arkansas Basin SAWQP project in 1982. In 1985, the PSWCD also received funding for the Lone Pine SAWQP project. Both projects were subwatersheds located in the watershed. By 1996, the PSWCD, NRCS and 29 project participants implemented BMPs on 9,281 acres in the Arkansas and Lone Pine subwatersheds.

Water quality sampling on Marsh Creek at the USGS gage near McCammon indicates that the creek transports an average of 30 tons of TSS per day. It also showed that Marsh Creek carries about 37 lbs of TP and 234 lbs of TIN daily (USGS, 2002). Additional water sampling was done on Marsh, Hawkins, Bell Marsh, Garden, Birch, Goodenough, Walker, Dempsey and East Bob Smith creeks and Jenkins Canyon (McSorley, 1977; Frenzel and Jones, 1985; Drewes, 1991; Fischer, 2002).

Project Setting

The Marsh Creek watershed encompasses 259,356 acres or 405 square miles in Bannock County. The watershed is in the southeastern portion of the subbasin as shown in Figure 6 on page 17. The Portneuf River and Pocatello Range bound it on the north. On the west and south, the Bannock Range bounds the area. The eastern boundary is the Portneuf Range. The watershed has 14 subwatersheds (Table E-1).

Table E-1. Subwatersheds in the Marsh Creek Watershed

Subwatershed	Acres	Percent of Total
Arimo	8,427	3.3%
Arkansas	6,589	2.5%
Bell Marsh	4,863	2.0%
Birch	23,348	9.0%
Cherry	13,989	5.4%
Downey	39,772	15.3%
Garden	18,114	7.0%
Goodenough	6,582	2.5%
Hawkins	36,655	14.1%
Lone Pine	15,571	6.0%
Lower Marsh	15,532	6.0%
Middle Marsh	24,079	9.3%
Upper Marsh	39,758	15.3%
Walker	6,077	2.3%
Total	259,356	100.0%

Elevations range from 9,282 feet at Oxford Peak to 4,520 feet at the confluence with the Portneuf River near Inkom. Seventy-two percent of the terrain occurs between 4,000 and 6,000 feet elevation. The watershed is moderately steep with 60% of the slopes greater than 15%. However the watershed is relatively flat in portions with approximately seven percent of the slopes are less than one percent gradient. Slopes increase in the south, east and west into the Bannock and Portneuf ranges. Marsh Creek flows in a valley whose major features were formed during the massive flood of Lake Bonneville waters to the Snake River (Malde, 1968). There are 166 miles of perennial streams in the watershed. Private lands contain about 134 miles or 81% of the perennial streams. They include Arkansas, Bell Marsh, Birch, Brush, Cherry, Cottonwood, Ellis, Garden, Goodenough, Hawkins, Left Hand Fork Marsh, Lost, Mill, Marsh, Peck, Potter, Reese, Rowe, Walker, Yago and Yellowdog creeks. There are also 313 miles of intermittent creeks and 47 miles of canals or ditches in the watershed.

Land Ownership and Land Use

Seventy percent of the watershed is privately owned and BLM, IDL and FS manage about 30% of the watershed. Range land is the major land use in the watershed at 43% as shown in Table E-2. The cities of Arimo and Downey are located within the watershed, however the watershed consists primarily of agricultural or rural properties. There are 985 private parcel owners in the watershed. The average parcel size is 68 acres with a median parcel size of 40 acres. About six percent of the private parcels are zoned as rural subdivisions (Bannock County, 1999).

Table E-2. Land Use in the Marsh Creek Watershed

Land Use	Acres	Percent of Total
Crop Land	94,879	36.6%
Forest Land	41,456	16.0%
Range Land	110,795	42.7%
Riparian/Wetland	7,648	0.2%
Road	2,651	1.0%
Urban	1,301	0.5%
Water	626	0.1%
Total	259,356	100.0%

General Soils

The Bannock County Soil Survey covers 80% of the watershed (SCS, 1987). Soils in the watershed are mainly silt loams on 0 to 20% slopes, however a variety of soils are present as shown in Table E-3.

Table E-3. Soil Surface Textures in the Marsh Creek Watershed

Soil Surface Texture	Acres	Percent of Total
Cobbly loam	464	0.2%
Cobbly silt loam	11,345	5.5%
Very cobbly silt loam	29,366	14.2%
Gravelly loam	1,845	0.9%
Gravelly silt loam	37,148	17.9%
Very gravelly loam	18	0.0%
Very gravelly silt loam	4,008	1.9%
Silt loam	101,742	49.1%
Extremely stony silt loam	12,124	5.9%
Very fine sandy loam	2,987	1.4%
Unclassified	6,037	2.9%
	207,084	100.0%

Threatened and Endangered Species

Threatened or endangered species in Bannock County include the Gray wolf *(Canis lupus)*, which is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)*, which are listed as threatened. Canada lynx *(Lynx canadensis*, is proposed to be listed with no current candidate species in the county (NRCS, 2002).

Accomplishments

The PSWCD, NRCS and watershed residents successfully implemented the Arkansas Basin SAWQP, Lone Pine SAWQP, Marsh Creek Riparian Restoration projects and the Marsh Creek Corridor EQIP Priority Area. Those projects enabled 31 landowners to implement BMPs on 10,335 acres and improved about five miles of Marsh Creek. BMPs utilized by participants included fencing, watering facilities, pipelines, water and sediment control basins, stream bank protection, nutrient management, riparian forest buffer and pasture or hayland planting.

In 1995, the Arimo Ranch Corporation, PSWCD and IDFG initiated the Marsh Creek Riparian Restoration Project and received §319 funds from IDEQ. Arimo Ranch established 22,000 feet of fencing, 500 willow plantings and 1,500 acres of prescribed grazing. This project's stream bank protection and exclusion fencing reduced about 500 tons per year of stream bank erosion.

Since 1987, landowners have enrolled 37,234 acres of crop land into CRP. These CRP acres and the acres converted from crop land to pasture had an estimated pre-treatment erosion rate of eight tons per acre per year or a soil loss of 297,872 tons per year. Currently these acres have an estimated erosion rate of one ton per acre per year. The annual soil savings are 262,318 tons per year or 87% reduction. Since 1997, 11 landowners applied BMPs on 2,945 acres through EQIP. BMPs installed included fencing, livestock wells, watering facilities, pipelines, water and sediment basins, nutrient management, pasture and hayland planting, prescribed grazing, waste storage facility and structures for water control. Three other landowners enrolled 38 acres in CRP, which installed riparian forest buffers along streams. About 9,000 acres of range were improved through SWCA with prescribed grazing, fencing and watering facilities.

Table E-4. Soil Erosion Reductions from BMPs in the Marsh Creek Watershed

Land Treatment	Average Annual Soil Loss (tons/acre/year)	Treated Acres	Annual Soil Loss (tons/year)
Before	8.0	37,474	299,792
After	1.0	37,474	37,474
Soil Erosion Savings in the Marsh Creek Watershed = 262,318 tons/year			

Table E-5. Completed BMP Amounts and Estimated Costs in the Marsh Creek Watershed

Best Management Practice	Units	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Conservation Cover	37,234 acres	$18,542,532	$1,117,020	$19,659,552	CRP
Contour Farming	5,939 acres	$17,817	$17,817	$35,634	SAWQP
Fence	41,518 feet	$46,707	$15,569	$62,276	EQIP, SAWQP, §319, SWCA
Nutrient Management	474 acres	$1,777	$592	$2,369	EQIP
Forage Harvest Management	443 acres	$0	$2,658	$2,658	EQIP
Pasture & Hayland Planting	5,847 acres	$285,041	$95,013	$380,054	EQIP & SAWQP
Pipeline	10,101 feet	$18,939	$6,313	$25,252	EQIP, SAWQP & SWCA
Prescribed Grazing	9,476 acres	$0	$14,214	$14,214	EQIP, SAWQP, §319, SWCA
Residue Management	6,089 acres	$60,890	$60,890	$121,780	SAWQP
Riparian Forest Buffer	38 acres	$1,710	$190	$1,900	CCRP & EQIP
Spring Development	3 springs	$5,625	$1,875	$7,500	EQIP & SAWQP
Irrigation System-Sprinkler	202 acres	$75,750	$25,250	$101,000	EQIP & SAWQP
Terrace	29,226 feet	$29,226	$29,226	$58,452	SAWQP
Tree/Shrub Establishment	38 acres	$15,048	$1,672	$16,720	CCRP & EQIP
Waste Storage Facility	3 structures	$18,000	$6,000	$24,000	EQIP & SAWQP
Water & Sediment Basin	485 structures	$97,000	$97,000	$194,000	SAWQP
Watering Facility	3 troughs	$1,743	$581	$2,324	EQIP, SAWQP & SWCA
	Total Cost	$19,217,805	$1,491,880	$20,709,685	

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E.coli*. The recommended reduction for TSS is 67%, TP is 33% and TIN is 66% at the Marsh Creek USGS gage station (IDEQ, 1999). The TMDL also recommends a 73% reduction of fecal coliform bacteria in the Portneuf River from Lava Hot Springs to Rainey Park in Pocatello (IDEQ, 1999). No specific load reductions were recommended for the tributaries.

Identified Problems

Marsh Creek has been identified with excessive soil erosion for several decades. Merrell and Onstott (1965) stated the effects of gully and sheet erosion on crop production and farming operations are the most pronounced in the Marsh Creek watershed with fine sediment deposited in the channel of Marsh Creek and on adjacent hay meadows. IDHW monitored water quality in the lower Portneuf River and found that Marsh Creek was degrading the Portneuf River because of significant quantities of fecal coliform bacteria and total suspended solids (McSorley, 1977). The highest sediment yield areas in the subbasin were reportedly found in the Rapid Creek area and on the bench areas along Marsh Creek (Roberts, 1977). Runoff from agricultural lands severely degrades water quality in Marsh Creek (PSWCD, 1984). Cattle and erosion from dryland farming on the benches (Frenzel and Jones, 1985) contributed sediment and nutrients. In 1995, IDFG and NRCS estimated that about 10,000 feet of riparian area along Marsh Creek in the project area was in poor condition. There are five active dairies within the watershed, which currently are all complying with animal waste storage and application requirements. Additionally, ISDA and ISCC have identified 112 potential sites with feed operations, corrals or pens.

Water Quality Monitoring Results

IDHW sampled Marsh Creek biweekly in 1977 and found that it was contributing solids and fecal coliform bacteria that were increasing turbidity in the Portneuf River (McSorley, 1977). They also sampled Marsh Creek, near Red Rock Pass, in 1980 and 1981. This data showed that Marsh Creek carried 199 tons of TSS in April 1980 and 13 tons of TSS in April 1981 (PSWCD, 1984).

Water quality sampling at the Marsh Creek USGS gage from 1995 to 2000 indicates that Marsh Creek exceeds the TMDL target for TSS and TIN. However, there was no exceedance of the water quality standards for fecal coliform bacteria or *E. coli*. The sampling also shows that the creek transports 30 tons of TSS, 37 lbs of TP and 234 lbs of TIN daily (USGS, 2002).

IASCD has been conducting integrated water column sampling at fixed intervals for three sites on Marsh Creek from 1999 to 2001. The upper site on Marsh Creek, which is located just below where Hawkins Creek enters, exceeded the TMDL targets for TSS, TP, TIN and fecal coliform bacteria and *E. coli*. The middle site on Marsh Creek, which is located just below where Bell Marsh Creek enters, exceeded the TMDL targets for TSS, TP and TIN. These samples never exceeded the TMDL target for fecal coliform bacteria. However, the samples exceeded the PCR water quality standard for *E. coli* once during the sample period. The lower site on Marsh Creek, which is located above where Marsh Creek enters the Portneuf River, exceeded the TMDL targets for TSS, TP and TIN. These samples never exceeded the TMDL target for fecal coliform bacteria or the PCR water quality standard for *E. coli* (Fischer, 2002). These results were used in Tables E-6, E-7 and E-8 to estimate reductions needed to meet the TMDL targets.

Table E-6. TSS, TP & TIN Loads for Monitoring Sites in the Marsh Creek Watershed

Monitoring Site	Average TSS Load (tons/day)	Average TSS Load @ TSS Target (tons/day)	Average TSS Load Reduction	TSS Target Exceedance
Marsh Creek @ above Portneuf River	4.6	4.4	4%	10%
Marsh Creek @ USGS gage	30.0	10.1	66%	22%
Marsh Creek below Bell Marsh Creek***	8.9	6.5	27%	27%
Bell Marsh Creek***	0.6	0.5	17%	14%
Goodenough Creek***	0.6	0.4	33%	22%
Birch Creek***	1.4	0.7	50%	22%
Garden Creek (lower site)***	1.9	0.5	74%	35%
Garden Creek (upper site)***	0.38	0.37	3%	24%
Hawkins Creek (above Hawkins Res)***	0.09	0.06	33%	75%
Hawkins Creek (lower site)***	0.4	0.1	75%	79%
Marsh Creek below Hawkins Creek***	1.7	1.4	18%	31%
Monitoring Site	**Average TP Load (lbs/day)**	**Average TP Load @ TP Target (lbs/day)**	**Average TP Load Reduction**	**TP Target Exceedance**
Marsh Creek @ above Portneuf River	19.4	16.2	16%	10%
Marsh Creek @ USGS gage	37.1	24.5	34%	22%
Marsh Creek below Bell Marsh Creek	20.5	14.2	31%	49%
Bell Marsh Creek	3.7	1.5	59%	21%
Goodenough Creek	2.2	1.0	55%	22%
Birch Creek	4.7	1.5	68%	44%
Garden Creek (lower site)	5.4	1.0	81%	73%
Garden Creek (upper site)	1.5	1.0	33%	82%
Hawkins Creek (above Hawkins Reservoir)	0.3	0.1	67%	100%
Hawkins Creek (lower site)	1.7	0.3	82%	79%
Marsh Creek below Hawkins Creek	9.6	6.0	38%	72%
Monitoring Site	**Average TIN Load (lbs/day)**	**Average TIN Load @ TIN Target (lbs/day)**	**Average TIN Load Reduction**	**TIN Target Exceedance**
Marsh Creek @ above Portneuf River	420.0	108.0	74%	100%
Marsh Creek @ USGS gage	234.2	123.2	47%	83%
Marsh Creek below Bell Marsh Creek	336.3	74.0	78%	97%
Bell Marsh Creek	25.9	9.0	65%	93%
Goodenough Creek	15.1	5.3	65%	67%
Birch Creek	25.3	7.2	72%	100%
Garden Creek (lower site)	14.9	3.9	74%	95%
Garden Creek (upper site)	12.7	3.8	70%	53%
Hawkins Creek (above Hawkins Reservoir)	2.9	0.6	79%	100%
Hawkins Creek (lower site)	4.6	1.0	78%	89%
Marsh Creek below Hawkins Creek	75.9	20.6	73%	69%

Table E-7. April 2000 Pollutants for Monitoring Sites in the Marsh Creek Watershed

Monitoring Site	TSS (mg/L)	TSS Load (tons/day)	Discharge (cfs)	Portion of TSS load	Portion of discharge
Marsh Creek below Bell Marsh Creek	144	39.1	100.5	34.5%	23.0%
Marsh Creek @ USGS gage	115	25.2	81.0	22.2%	18.5%
Garden Creek	189	3.6	7.1	3.2%	1.6%
Goodenough Creek	143	1.2	3.1	1.1%	0.7%
Birch Creek	49	0.9	6.5	0.8%	1.5%
Bell Marsh Creek	16	0.4	9.3	0.4%	2.1%
Hawkins Creek (lower site)	265	0.1	0.1	0.1%	0.02%
Marsh Creek below Hawkins Creek	26	4.5	64.0	4.0%	14.6%
Monitoring Site	**TP (mg/L)**	**TP Load (lbs/day)**	**Discharge (cfs)**	**Portion of TP load**	**Portion of discharge**
Marsh Creek below Bell Marsh Creek	0.36	195.0	100.5	66.8%	23.0%
Marsh Creek @ USGS gage	0.06	26.2	81.0	9.0%	18.5%
Garden Creek	0.26	9.9	7.1	3.4%	1.6%
Goodenough Creek	0.13	2.2	3.1	0.8%	0.7%
Birch Creek	0.12	4.2	6.5	1.4%	1.5%
Bell Marsh Creek	0.18	9.0	9.3	3.1%	2.1%
Hawkins Creek (lower site)	0.37	0.3	0.1	0.1%	0.02%
Marsh Creek below Hawkins Creek	0.22	75.8	64.0	26.0%	14.6%
Monitoring Site	**TIN (mg/L)**	**TIN Load (lbs/day)**	**Discharge (cfs)**	**Portion of TIN load**	**Portion of discharge**
Marsh Creek below Bell Marsh Creek	1.19	641.9	100.5	56.9%	23.0%
Marsh Creek @ USGS gage	0.53	229.2	81.0	20.3%	18.5%
Garden Creek	1.22	46.4	7.1	4.1%	1.6%
Goodenough Creek	1.0	16.8	3.1	1.5%	0.7%
Birch Creek	1.1	38.5	6.5	3.4%	1.5%
Bell Marsh Creek	1.0	51.0	9.3	4.5%	2.1%
Hawkins Creek (lower site)	1.7	1.1	0.1	0.1%	0.02%
Marsh Creek below Hawkins Creek	1.0	336.1	64.0	29.8%	14.6%

Table E-8. Bacteria TMDL & *E. coli* Standards Exceedance in Marsh Creek Watershed

Monitoring Site	Fecal Coliform PCR Target Exceedance	Fecal Coliform SCR Target Exceedance	*E.coli* PCR Standard Exceedance	*E.coli* SCR Standard Exceedance
Hawkins Creek (lower site)	61%	32%	50%	39%
Garden Creek (lower site	54%	49%	43%	41%
Birch Creek	33%	11%	6%	6%
Garden Creek (upper site)	24%	18%	18%	12%
Bell Marsh Creek	21%	14%	21%	21%
Hawkins Creek (above Hawkins Reservoir)	20%	20%	20%	20%
Marsh Creek below Hawkins Creek	11%	3%	3%	3%
Marsh Creek @ above Portneuf River	10%	0%	0%	0%
Marsh Creek below Bell Marsh Creek	3%	0%	3%	3%
Marsh Creek @ USGS gage	0%	0%	NS	NS
Goodenough Creek	0%	0%	0%	0%

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The watershed consists of approximately 259,356 acres. Private agricultural land accounts for 180,550 acres of the watershed. The predominant private land use within the watershed is crop land with 102,944 acres. Because the TMDL reductions are so substantial, it is estimated that 65% or 168,346 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, BMP implementation should be focused toward the tiered approach as shown in Table E-9.

Implementation Tiers

Critical areas adjacent to Marsh Creek and its tributaries in Tier 1 are considered high priority for implementation due to the increased potential to directly impact surface water quality. There are three tiers delineated within the watershed. 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 influence on the stream**

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table E-9. Critical Areas by Subwatershed within the Marsh Creek Watershed

Implementation Tiers	Tier 1		Tier 2		Tier 3	
Subwatershed	**Riparian Acres**	**Animal Facilities**	**Crop and Pasture Acres**	**Animal Facilities**	**Range Acres**	**Animal Facilities**
Arimo	0	1	2,428	2	6,230	0
Arkansas	1	0	2,874	0	2,449	0
Bell Marsh	14	2	461	0	391	0
Birch	86	3	4,672	5	4,332	0
Cherry	62	0	4,976	4	1,141	0
Downey	78	0	21,301	0	12,022	0
Garden	116	3	7,432	10	2,363	0
Goodenough	51	1	1,866	0	849	0
Hawkins	121	0	13,189	3	11,510	0
Lone Pine	71	0	3,247	0	4,015	0
Lower Marsh	140	18	6,338	16	4,464	0
Middle Marsh	163	3	13,728	17	6,103	0
Upper Marsh	202	2	16,553	16	11,731	0
Walker	23	2	261	4	1,045	0
Total	**1,128**	**35**	**102,944**	**77**	**64,274**	**0**

Animal Feed Operations

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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the watershed and found as many as 112 possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. These TUs describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 37,234 acres of CRP and 2,945 acres of crop and pasture land and 9,000 acres of range land and 38 acres of riparian areas were removed from the TUs because those acres meet NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
1,090	**Downata-Bear Lake-Tendoy:** very deep, very poorly drained and poorly drained soils that formed in silty alluvium and organic material and are subject to flooding with slopes ranging from 0 to 1 percent	Unstable & erosive stream channel Lack of riparian vegetation Barriers to fish migration

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
63,210	**Arimo-Downey-Bahem:** very deep, well drained soils that formed in loess and silty alluvium overlying sand, gravel, cobbles and stones with slopes from 0 to 8 percent **Ririe-Rexburg-Lanoak:** very deep, well drained soils that formed in loess and in silty alluvium derived from loess with slopes from 1 to 50 percent	Accelerated sheet and rill, irrigation-induced or gully erosion on crop and pasture lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
54,829	**Camelback-Hades-Valmar:** very deep to moderately deep, well drained, noncalcareous soils that formed in alluvium, colluvium and residuum derived from quartzite and related rock with slopes from 5 to 65 percent **Cedarhill-Ireland:** very deep and moderately deep, well drained, calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 12 to 60 percent	Accelerated gully erosion on range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
112	**Downata-Bear Lake-Tendoy:** very deep, very poorly drained and poorly drained soils that formed in silty alluvium and organic material and are subject to flooding with slopes ranging from 0 to 1 percent **Arimo-Downey-Bahem:** very deep, well drained soils that formed in loess and silty alluvium overlying sand, gravel, cobbles and stones with slopes from 0 to 8 percent	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens

Estimated BMP Implementation Costs

Conservation efforts 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 E-10 lists BMP amounts and costs.

Table E-10. Estimated BMP Installation Costs for the Marsh Creek Watershed

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percent	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6.00	75%	300,000	$1,350,000	$450,000	$1,800,000
	Conservation Cover	acre	$100.00	75%	2,000	$150,000	$50,000	$200,000
	Critical Area Planting	acre	$150.00	75%	500	$56,250	$18,750	$75,000
	Fence, 4-wire	feet	$1.50	75%	1,000,000	$1,125,000	$375,000	$1,500,000
	Fence, Corral Panel	each	$175.00	75%	120	$15,750	$5,250	$21,000
	Heavy Use Area Protection	cuyd	$30.00	75%	1,000	$22,500	$7,500	$30,000
	Structure for Water Control	each	$3,000.00	75%	50	$112,500	$37,500	$150,000
	Prescribed Grazing	acre	$3.00	75%	1,000	$2,250	$750	$3,000
	Riparian Forest Buffer	feet	$6.00	75%	500,000	$2,250,000	$750,000	$3,000,000
	Stream Bank Protection	cuyd	$40.00	75%	10,000	$300,000	$100,000	$400,000
	Stream Channel Stabilization	cuyd	$35.00	75%	5,000	$131,250	$43,750	$175,000
	Stream Habitat Improvement	feet	$250.00	75%	2,000	$375,000	$125,000	$500,000
	Tree/Shrub Establishment	each	$6.00	75%	300,000	$1,350,000	$450,000	$1,800,000
	Pumping Plant for Water Control	each	$2,500.00	75%	150	$281,250	$93,750	$375,000
	Water Well	feet	$25.00	75%	20,000	$375,000	$125,000	$500,000
	Watering Facility	each	$800.00	75%	500	$300,000	$100,000	$400,000
	Use Exclusion	acre	$14.00	75%	1,000	$10,500	$3,500	$14,000
	Wildlife Wetland Habitat Management	acre	$7.50	75%	800	$4,500	$1,500	$6,000
					Subtotal	**$8,211,750**	**$2,737,250**	**$10,949,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6.00	75%	10,000	$45,000	$15,000	$60,000
	Critical Area Planting	acre	$150.00	75%	100	$11,250	$3,750	$15,000
	Fence, 4-wire	feet	$1.50	75%	300,000	$337,500	$112,500	$450,000
	Fence, Corral Panel	Each	$175.00	75%	120	$15,750	$5,250	$21,000
	Irrigation Water Conveyance, 10" pvc	feet	$9.50	75%	80,000	$570,000	$190,000	$760,000
	Irrigation Water Management	acre	$5.00	75%	30,000	$112,500	$37,500	$150,000
	Nutrient Management	acre	$5.00	75%	50,000	$187,500	$62,500	$250,000
	Pasture & Hayland Planting	acre	$65.00	75%	15,000	$731,250	$243,750	$975,000
	Pipeline, 2" PVC	feet	$2.25	75%	200,000	$337,500	$112,500	$450,000
	Pond	cuyd	$3.00	75%	30,000	$67,500	$22,500	$90,000
	Prescribed Grazing	acre	$3.00	75%	40,000	$90,000	$30,000	$120,000
	Pumping Plant for Water Control	each	$2,500.00	75%	50	$93,750	$31,250	$125,000
	Residue Management	acre	$20.00	75%	30,000	$450,000	$150,000	$600,000
	Spring Development	each	$2,500.00	75%	20	$37,500	$12,500	$50,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	4,000	$22,500	$7,500	$30,000
	Water & Sediment Control Basin	cuyd	$3.00	75%	35,000	$78,750	$26,250	$105,000
	Watering Facility	each	$800.00	75%	200	$120,000	$40,000	$160,000
	Water Well	feet	$25.00	75%	6,000	$112,500	$37,500	$150,000
					Subtotal	**$3,420,750**	**$1,140,250**	**$4,561,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	400,000	$450,000	$150,000	$600,000
	Pipeline, 2" PVC	feet	$2.25	75%	200,000	$337,500	$112,500	$450,000
	Prescribed Grazing	acre	$3.00	75%	30,000	$67,500	$22,500	$90,000
	Pumping Plant for Water Control	each	$2,500.00	75%	50	$93,750	$31,250	$125,000
	Range Planting	acre	$55.00	75%	4,000	$165,000	$55,000	$220,000
	Spring Development	each	$2,500.00	75%	20	$37,500	$12,500	$50,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	6,000	$33,750	$11,250	$45,000
	Watering Facility	each	$800.00	75%	300	$180,000	$60,000	$240,000
	Water Well	feet	$25.00	75%	4,000	$75,000	$25,000	$100,000
					Subtotal	**$1,440,000**	**$480,000**	**$1,920,000**
TU4 AF	Nutrient Management	acre	$5.00	75%	10,000	$37,500	$12,500	$50,000
	Waste Storage Facility	cuyd	$3.00	75%	50,000	$112,500	$37,500	$150,000
	Windbreak/Shelterbelt	feet	$2.20	75%	20,000	$33,000	$11,000	$44,000
					Subtotal	**$183,000**	**$61,000**	**$244,000**
					Total	**$13,255,500**	**$4,418,500**	**$17,674,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the watershed and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and channel erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The PSWCD selected an alternative that combined Alternatives 2, 3 and 4 for this watershed. Their alternative meets the objectives set forth in their resource conservation plan by improving water quality in the Portneuf River (PSWCD, 2002).

Table E-11. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Assessment report	2005
Develop conservation plans and contracts	Completed plans and contracts	2010
Finalize BMP designs	Completed BMP plans and designs	2015
Design and install approved BMPs	Certify BMP installations	2020
Track BMP installation	Implementation progress report	2025
Evaluate BMP & project effectiveness	Complete project effectiveness report	2030

APPENDIX F

Lower Rapid Creek Subwatershed

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of Rapid Creek. The plan will build upon past conservation accomplishments made through the Upper Rapid Creek Subwatershed SAWQP and the §319 Upper Rapid Subwatersheds Riparian projects and will assist other subbasin efforts in restoring beneficial uses.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, bacteria, temperature and nutrient loading to lower Rapid Creek.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. Rapid Creek is on the state of Idaho's §303(d) list and is listed from its headwaters to the Portneuf River (IDEQ, 1998). Rapid Creek's designated beneficial uses include cold water biota, salmonid spawning, secondary contact recreation, agricultural and industrial water supply, wildlife habitat and aesthetics. Cold water biota is not fully supported due to sediment.

Background

The subwatershed was inventoried and planned by the PSWCD, ISCC, IDEQ and NRCS as part of the Lower Portneuf River Agricultural Water Pollution Abatement Plan (PSWCD, 1987). However, the area was prioritized as the second choice after the Upper Rapid Creek subwatersheds for implementation efforts. In 1991, NRCS investigated flooding problems in Inkom and recommended BMP installation in the subwatershed above the city, however no project funding was acquired (SCS, 1992).

Water quality sampling on Rapid Creek indicates that the creek transports an average of 2.7 tons of TSS per day. It also showed that Rapid Creek carries about 15 lbs of TP and 163 lbs of TIN daily (Fischer 2002). Additional water quality sampling was conducted on Webb Creek, which is used as a reference for comparing other subbasin monitoring data (Fischer, 2001).

Project Setting

The subwatershed is located in north central Bannock County, 13 miles east of Pocatello and encompasses the city of Inkom. The project area consists of one subwatershed, Lower Rapid, which drains approximately 11,378 acres or 18 square miles. The subwatershed is in the Inkom watershed located in the Portneuf River subbasin as shown in Figure 6 on page 17.

Land Ownership and Land Use

Seventy-six percent of the subwatershed is privately owned and the BLM, IDL and FS manage 24% of the subwatershed. Range land is the predominant land use in the subwatershed at 62% as shown in Table F-1. The city of Inkom is located within the subwatershed, however the subwatershed consists primarily of rural residential or rural subdivision properties. There are 145 private parcel owners in the subwatershed. The average parcel size is 29 acres with a median parcel size of 6 acres. About 66% of the private parcels are zoned as rural subdivisions (Bannock County, 1999).

Table F-1. Land Use in the Lower Rapid Creek Subwatershed

Land Use	Acres	Percent of Total
Crop Land	3,611	31.1%
Forest Land	369	3.2%
Range Land	7,223	62.1%
Riparian/Wetland	46	0.4%
Road	113	1.0%
Urban	231	2.0%
Water	28	0.2%
Total	11,621	100.0%

General Soils

The Bannock County Soil Survey covers 84% of the subwatershed (SCS, 1987). Soils in the subwatershed are predominantly silt loams on 0 to 60% slopes, shown in Table F-2.

Table F-2. Soil Surface Textures in the Lower Rapid Creek Subwatershed

Soil Surface Texture	Acres	Percent of Total
Cobbly silt loam	95	1.0%
Very cobbly silt loam	2,133	22.7%
Gravelly silt loam	855	9.1%
Silt loam	6,219	66.3%
Extremely stony silt loam	83	0.9%
Total	9,385	100.0%

Threatened and Endangered Species

Threatened or endangered species in Bannock County include the Gray wolf *(Canis lupus)*, which is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)*, which are listed as threatened. Canada lynx *(Lynx canadensis)* is proposed to be listed while no candidate species exist in the county (NRCS, 2002).

Accomplishments

Several landowners enrolled 729 acres of crop land into CRP. The CRP acres had an estimated pre-treatment erosion rate of eight tons per acre per year or a soil loss of 5,832 tons per year. Currently these acres have an estimated erosion rate of one ton per acre per year. The annual soil savings are 5,103 tons per year or 88% reduction in annual erosion shown in Table F-3.

Table F-3. Soil Erosion Reductions from BMPs in the Lower Rapid Creek Subwatershed

Land Treatment	Average Annual Soil Loss (tons/acre/year)	Treated Acres	Annual Soil Loss (tons/year)
Before	8.0	729	5,832
After	1.0	729	729
Soil Erosion Savings in the Lower Rapid Creek Subwatershed = 5,103 tons/year			

Table F-4. Completed BMP Amounts and Costs in the Lower Rapid Creek Subwatershed.

Best Management Practice	Units Treated	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Conservation Cover (CRP)	729 acres	$363,042	$21,870	$384,912	CRP
	Total Cost	$363,042	$21,870	$384,912	

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E. coli* (IDEQ, 1999). The recommended reduction for TSS is 66%, TP is 39% and TIN is 66% at the Pocatello USGS gage (IDEQ, 1999). No specific load reductions were suggested for Rapid Creek.

Identified Problems

IDHW monitored water quality and found the Rapid Creek, along with Dempsey Creek, contributed the most suspended sediment to the Portneuf River (Drewes, 1987). The highest sediment yield areas in the subbasin were reportedly found in the Rapid Creek area and on the bench areas along Marsh Creek (Roberts, 1977). In 1991, NRCS found that the stream channels of Rapid, Webb and Inman creeks were in good condition, however they also found that riparian vegetation was in poor condition along Sawmill and Jackson creeks (SCS, 1992). There are no active dairies in the subwatershed. Additionally, ISDA and ISCC have identified 16 potential sites with feed operations, corrals or pens within the subwatershed.

Water Quality Monitoring Results

IASCD has been conducting integrated water column sampling at fixed intervals on sites on upper and lower sites on Rapid and Webb creeks. Data indicates that the lower monitoring site on Rapid Creek, which is below where Jackson Creek enters, exceeds the TMDL targets for TSS, TP, TIN, fecal coliform and *E. coli*. IASCD's upper monitoring site on Rapid Creek, located just below the confluence of North and West forks, exceeds the TMDL targets for TSS, TP, TIN, fecal coliform and *E. coli* (Fischer, 2002).

Table F-5. TSS, TP & TIN Loads for Sites in the Lower Rapid Creek Subwatershed

Monitoring Site	Average TSS Load (tons/day)	Average TSS Load @ TSS Target (tons/day)	Average TSS Load Reduction	TSS Target Exceedance
Rapid Creek (below Jackson Creek)	2.3	1.9	17%	7%
Rapid Creek (below North & West forks)	4.5	2.7	40%	25%
Webb Creek (lower site)	0.3	0.3	0%	0%
Webb Creek (upper site)	0.2	0.2	0%	0%
Monitoring Site	**Average TP Load (lbs/day)**	**Average TP Load @ TP Target (lbs/day)**	**Average TP Load Reduction**	**TP Target Exceedance**
Rapid Creek (below Jackson Creek)	15.3	7.6	50%	67%
Rapid Creek (below North & West forks)	31.1	7.0	77%	100%
Webb Creek (lower site)	3.6	2.8	22%	20%
Webb Creek (upper site)	0.9	0.9	0%	0%
Monitoring Site	**Average TIN Load (lbs/day)**	**Average TIN Load @ TIN Target (lbs/day)**	**Average TIN Load Reduction**	**TIN Target Exceedance**
Rapid Creek (below Jackson Creek)	163.5	33.0	80%	100%
Rapid Creek (below North & West forks)	139.6	28.0	80%	100%
Webb Creek (lower site)	49.5	15.4	69%	75%
Webb Creek (upper site)	63.8	10.9	83%	100%

Table F-6. April 2000 Pollutants for Sites in the Lower Rapid Creek Subwatershed

Monitoring Site	TSS (mg/L)	TSS Load (tons/day)	Discharge (cfs)	Portion of TSS load	Portion of discharge
Rapid Creek (below Jackson Creek)	46	6.1	49.2	5.4%	11.3%
Webb Creek (lower site)	16	1.4	31.6	1.2%	7.2%
Monitoring Site	**TP (mg/L)**	**TP Load (lbs/day)**	**Discharge (cfs)**	**Portion of TP load**	**Portion of discharge**
Rapid Creek (below Jackson Creek)	0.12	31.8	49.2	10.9%	11.3%
Webb Creek (lower site)	0.09	15.3	31.6	5.2%	7.2%
Monitoring Site	**TIN (mg/L)**	**TIN Load (lbs/day)**	**Discharge (cfs)**	**Portion of TIN load**	**Portion of discharge**
Rapid Creek (below Jackson Creek)	1.27	335.2	49.2	29.7%	11.3%
Webb Creek (lower site)	1.13	191.5	31.6	17.0%	7.2%

Table F-7. Bacteria TMDL & *E. coli* Exceedance in the Lower Rapid Creek Subwatershed

Monitoring Site	Fecal Coliform PCR Target Exceedance	Fecal Coliform SCR Target Exceedance	*E.coli* PCR Standard Exceedance	*E.coli* SCR Standard Exceedance
Rapid Creek (below Jackson Creek)	13%	13%	13%	7%
Rapid Creek (below North & West forks)	25%	25%	13%	13%
Webb Creek (lower site)	3%	0%	0%	0%
Webb Creek (upper site)	0%	0%	0%	0%

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The subwatershed consists of approximately 11,378 acres. Private agricultural land accounts for 8,647 acres of the subwatershed. The predominant private land use within the subwatershed is range land with 4,602 acres. Because the TMDL reductions are so substantial, it is estimated that 96% or 8,271 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, BMP implementation should focus on the tiers shown in Table F-8.

Implementation Tiers

Critical areas adjacent to Rapid Creek and its tributaries in Tier 1 are considered high priority for implementation due to the 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 influence on the stream**

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table F-8. Critical Areas within the Lower Rapid Creek Subwatershed

Implementation Tiers	Tier 1		Tier 2		Tier 3	
Subwatershed	**Riparian Acres**	**Animal Facilities**	**Crop and Pasture Acres**	**Animal Facilities**	**Range Acres**	**Animal Facilities**
Lower Rapid	91	4	3,578	10	4,602	0
Total	**91**	**4**	**3,578**	**10**	**4,602**	**0**

Animal Feed Operations

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. There are no dairies in the subwatershed. 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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the subwatershed and found as many as 14 possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. These TUs describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 729 acres of CRP were removed from the TUs because those acres meet NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
91	**Inkom-Joevar:** very deep, moderately well drained and well drained soils that formed in silty alluvium with slopes ranging from 0 to 3 percent	Unstable & erosive stream channel Lack of riparian vegetation Barriers to fish migration

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
2,849	**Ririe-Rexburg-Lanoak:** very deep, well drained soils that formed in loess and in silty alluvium derived from loess with slopes from 1 to 50 percent	Accelerated sheet and rill or gully erosion on crop and pasture lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
4,602	**Camelback-Hades-Valmar:** very deep to moderately deep, well drained, noncalcareous soils that formed in alluvium, colluvium and residuum derived from quartzite and related rock with slopes from 5 to 65 percent	Accelerated gully erosion on range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
14	Inkom-Joevar: very deep, moderately well drained and well drained soils that formed in silty alluvium with slopes ranging from 0 to 3 percent	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens

Estimated BMP Implementation Costs

Conservation efforts in the subwatershed 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 F-9 lists BMP amounts and costs.

Table F-9. Estimated BMP Installation Costs for the Lower Rapid Creek Subwatershed

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percent	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6.00	75%	15,000	$67,500	$22,500	$90,000
	Conservation Cover	acre	$100.00	75%	30	$2,250	$750	$3,000
	Critical Area Planting	acre	$150.00	75%	40	$4,500	$1,500	$6,000
	Fence, 4-wire	feet	$1.50	75%	100,000	$112,500	$37,500	$150,000
	Fence, Corral Panel	each	$175.00	75%	40	$5,250	$1,750	$7,000
	Heavy Use Area Protection	cuyd	$30.00	75%	100	$2,250	$750	$3,000
	Structure for Water Control	each	$3,000.00	75%	10	$22,500	$7,500	$30,000
	Prescribed Grazing	acre	$3.00	75%	500	$1,125	$375	$1,500
	Riparian Forest Buffer	feet	$6.00	75%	10,000	$45,000	$15,000	$60,000
	Stream Bank Protection	cuyd	$40.00	75%	1,000	$30,000	$10,000	$40,000
	Stream Channel Stabilization	cuyd	$35.00	75%	500	$13,125	$4,375	$17,500
	Stream Habitat Improvement	feet	$250.00	75%	100	$18,750	$6,250	$25,000
	Tree/Shrub Establishment	each	$6.00	75%	2,000	$9,000	$3,000	$12,000
	Pumping Plant for Water Control	each	$2,500.00	75%	10	$18,750	$6,250	$25,000
	Water Well	feet	$25.00	75%	2,000	$37,500	$12,500	$50,000
	Watering Facility	each	$800.00	75%	40	$24,000	$8,000	$32,000
	Use Exclusion	acre	$14.00	75%	100	$1,050	$350	$1,400
	Wildlife Wetland Habitat Management	acre	$7.50	75%	80	$450	$150	$600
					Subtotal	**$415,500**	**$138,500**	**$554,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6.00	75%	2,000	$9,000	$3,000	$12,000
	Critical Area Planting	acre	$150.00	75%	2	$225	$75	$300
	Fence, 4-wire	feet	$1.50	75%	30,000	$33,750	$11,250	$45,000
	Fence, Corral Panel	Each	$175.00	75%	20	$2,625	$875	$3,500
	Irrigation Water Conveyance, 10" pvc	feet	$9.50	75%	4,000	$28,500	$9,500	$38,000
	Irrigation Water Management	acre	$5.00	75%	1,000	$3,750	$1,250	$5,000
	Nutrient Management	acre	$5.00	75%	2,000	$7,500	$2,500	$10,000
	Pasture & Hayland Planting	acre	$65.00	75%	1,000	$48,750	$16,250	$65,000
	Pipeline, 2" PVC	feet	$2.25	75%	20,000	$33,750	$11,250	$45,000
	Pond	cuyd	$3.00	75%	1,000	$2,250	$750	$3,000
	Prescribed Grazing	acre	$3.00	75%	1,000	$2,250	$750	$3,000
	Pumping Plant for Water Control	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Residue Management	acre	$20.00	75%	2,000	$30,000	$10,000	$40,000
	Spring Development	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Upland Wildlife Habitat Management	acre	$7.50	75%	160	$900	$300	$1,200
	Water & Sediment Control Basin	cuyd	$3.00	75%	3,000	$6,750	$2,250	$9,000
	Watering Facility	each	$800.00	75%	20	$12,000	$4,000	$16,000
	Water Well	feet	$25.00	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$259,500**	**$86,500**	**$346,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	40,000	$45,000	$15,000	$60,000
	Pipeline, 2" PVC	feet	$2.25	75%	20,000	$33,750	$11,250	$45,000
	Prescribed Grazing	acre	$3.00	75%	2,000	$4,500	$1,500	$6,000
	Pumping Plant for Water Control	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Range Planting	acre	$55.00	75%	400	$16,500	$5,500	$22,000
	Spring Development	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Upland Wildlife Habitat Management	acre	$7.50	75%	400	$2,250	$750	$3,000
	Watering Facility	each	$800.00	75%	20	$12,000	$4,000	$16,000
	Water Well	feet	$25.00	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$151,500**	**$50,500**	**$202,000**
TU4 AF	Nutrient Management	acre	$5.00	75%	1,500	$5,625	$1,875	$7,500
	Waste Storage Facility	cuyd	$3.00	75%	6,000	$13,500	$4,500	$18,000
	Windbreak/Shelterbelt	feet	$2.20	75%	2,500	$4,125	$1,375	$5,500
					Subtotal	**$23,250**	**$7,750**	**$31,000**
					Total	**$849,750**	**$283,250**	**$1,133,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the subwatershed and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the subwatershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and bed erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the subwatershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the subwatershed and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The PSWCD hasn't selected an alternative for this subwatershed to date. However, Alternatives 2, 3 and 4 meet objectives in their resource conservation plan by improving water quality in the Portneuf River (PSWCD, 2002).

Table F-10. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Subwatershed assessment report	2005
Develop conservation plans and contracts	Completed plans and contracts	2010
Finalize BMP designs	Completed BMP plans and designs	2013
Design and install approved BMPs	Certify BMP installations	2015
Track BMP installation	Implementation progress report	2020
Evaluate BMP & project effectiveness	Complete project effectiveness report	2025

APPENDIX G

East Bench Watershed

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of the Portneuf River. This plan addresses the Portneuf River and its tributaries from McCammon to Marsh Creek. The plan builds upon past accomplishments and will assist other efforts in restoring beneficial uses.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, nutrient and bacteria loading to Portneuf River.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. The Portneuf River is on the state of Idaho's §303(d) list of water quality impaired water bodies (IDEQ, 1998). The Portneuf River is listed for sediment, nutrients and bacteria from the PMVCC diversion to the confluence with Marsh Creek. This section of the river is approximately 12 miles in length. The Portneuf River's designated beneficial uses include cold water biota, salmonid spawning, primary and secondary contact recreation, domestic water supply, agricultural and industrial water supply, wildlife habitat and aesthetics. The river's beneficial uses are not fully supported due to sediment, nutrients, bacteria, flow alteration, and oil/grease (IDEQ, 1999).

Background

In 1987, the PSWCD prioritized the subwatersheds along the Portneuf River below Lava Hot Springs in the Lower Portneuf River Agricultural Pollution Abatement Plan (PSWCD, 1987). The East Bench watershed was ranked fourth in importance for implementation. The PSWCD applied for a SAWQP grant in 1996, but the application was denied (PSWCD, 1996).

Project Setting

The East Bench watershed encompasses 31,142 acres or 49 square miles in Bannock County. The watershed is located in the central portion of the subbasin as shown in Figure 6 on page 17. The Portneuf Range bounds the watershed on the east and south. On the west, lava flows bound the area. The northern boundary is the Inkom watershed. The are two subwatersheds which are listed in Table G-1. Elevations range from 9,255 feet to 4,520 feet near Inkom. Sixty-three percent of the terrain occurs between 4,000 and 6,000 feet. The watershed is steep with 82% of the slopes greater than 15% and just over 10% of the slopes less than 1%. Slopes increase to the east and south into the Portneuf Range. There are 33 miles of perennial streams in the watershed, which include the Portneuf River and several tributaries including Green Canyon, Harkness, Lower Rock, Robbers Roost, Spider and Twomile creeks, and 27 miles of intermittent streams.

Table G-1. Subwatersheds in the East Bench Watershed

Subwatershed	Acres	Percent of Total
North Roberts Roost	13,057	41.9%
South Roberts Roost	18,085	58.1%
Total	31,142	100.0%

Land Ownership and Land Use

Forty-seven percent of the watershed is privately owned and about 53% is managed by BLM, IDFG, IDL and FS. Range land is the primary land use in the watershed at 54% and shown in Table G-2. A portion of the city of McCammon is located in the watershed. The watershed is transitioning from agricultural or rural properties to recreational and residential developments. There are 316 private parcel owners in the watershed. The average parcel size is 24 acres with a median size of 5 acres. About 26% of the private parcels are zoned as rural subdivisions (Bannock County, 1999).

Table G-2. Land Uses in the East Bench Watershed

Land Use	Acres	Percent of Total
Crop Land	7,685	24.7%
Forest Land	5,718	18.4%
Range Land	16,770	53.8%
Riparian/Wetland	403	1.3%
Road	311	1.0%
Urban	255	0.8%
Total	31,142	100.0%

General Soils

The Bannock County Soil Survey covers about 66% of the watershed (SCS, 1987). Soils are predominantly silt loams on 0 to 20% slopes, however a variety of soils are shown in Table G-3.

Table G-3. Soil Surface Textures in the East Bench Watershed

Soil Surface Texture	Acres	Percent of Total
Cobbly silt loam	884	4.3%
Very cobbly silt loam	3,768	18.5%
Gravelly silt loam	1,744	8.6%
Very gravelly silt loam	671	3.3%
Silt loam	9,797	48.2%
Extremely stony silt loam	839	4.1%
Lava Flows	2,373	11.7%
Rubble Lands	268	1.3%
Total	20,344	100.0%

Threatened and Endangered Species

Listed below are the threatened or endangered species in Bannock County: Gray wolf *(Canis lupus)* is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)* are listed as threatened. Canada lynx *(Lynx canadensis)* are proposed listed while no candidate species exist in the county (NRCS, 2002).

Accomplishments

Several landowners enrolled 1,521 acres of crop land into CRP. The CRP acres had an estimated pre-treatment erosion rate of eight tons per acre per year or a soil loss of 12,168 tons per year. Currently these acres have an estimated erosion rate of one ton per acre per year. The annual soil savings are 10,647 tons per year or 88% reduction in annual erosion shown in Table G-4.

Table G-4. Soil Erosion Reductions from BMPs in the Lower Rapid Creek Subwatershed

Land Treatment	Average Annual Soil Loss (tons/acre/year)	Treated Acres	Annual Soil Loss (tons/year)
Before	8.0	1,521	12,168
After	1.0	1,521	1,521
Soil Erosion Savings in the East Bench Watershed = 10,647 tons/year			

Table G-5. Completed BMP Amounts and Costs in the East Bench Watershed.

Best Management Practice	Units Treated	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Conservation Cover (CRP)	1,521 acres	$757,458	$45,630	$803,088	CRP
	Total Cost	$757,458	$45,630	$803,088	

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E.coli*. The recommended reduction for TSS is 65%, TP is 39% and TIN is 66% at the Pocatello USGS gage. The TMDL also recommends a 73% reduction of fecal coliform bacteria in the Portneuf River from Lava Hot Springs to Rainey Park in Pocatello (IDEQ, 1999). No reductions were recommended for tributaries.

Identified Problems

In 1987, 5,168 critical acres and one animal feed operation were identified in the watershed (PSWCD, 1987). During the irrigation season, 65 to 93 percent of river flows are diverted through the PMVCC diversion thereby stressing the aquatic organisms due to increased temperature and reduced habitat (Perry et al., 1977). The river also had stream bank erosion problem areas that were determined to be non-agricultural sediment sources therefore no treatment alternatives were developed for the riparian areas (PSWCD, 1987). In 2002, ISDA and ISCC identified 29 active operations or corrals in the watershed.

Water Quality Monitoring Results

IDHW sampled the Portneuf River from 1975 to 1976, downstream of McCammon and at Onyx Station downstream of Robbers Roost Creek (Perry et al., 1977). The Portneuf River, at these sites, exceeded the TMDL targets for TSS, TP and TIN shown in Table G-6. No tributaries were sampled in the watershed.

Table G-6. TSS, TP & TIN Results for the Portneuf River in the East Bench Watershed

Monitoring Site	Average TSS (mg/L)	Average TP (mg/L)	Average TIN (mg/L)
Portneuf River below McCammon*	114	0.15	3.2
Portneuf River @ Onyx Station*	97	0.12	2.9

* - IDHW sampled in 1975 and 1976

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The watershed consists of approximately 31,142 acres. Private agricultural land accounts for 14,637 acres of the watershed. The predominant private land use in the watershed is crop land with 7,617 acres. Because the TMDL reductions are so substantial, it is estimated that 96% or 14,026 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, BMP implementation should be focused toward the tiers shown in Table G-7.

Implementation Tiers

Critical areas adjacent to the Portneuf River and its tributaries in Tier 1 are considered high priority for implementation due to the increased potential to directly impact surface water quality. There are three tiers delineated within the watershed. 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 influence on the stream**

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table G-7. Critical Areas by Subwatershed within the East Bench Watershed

Implementation Tiers	Tier 1		Tier 2		Tier 3	
Subwatershed	**Riparian Acres**	**Animal Facilities**	**Crop and Pasture Acres**	**Animal Facilities**	**Range Acres**	**Animal Facilities**
North Roberts Roost	108	10	5,091	4	3,128	0
South Roberts Roost	113	7	2,526	8	3,060	0
Total	**221**	**17**	**7,617**	**12**	**6,188**	**0**

Animal Feed Operations

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. There are no dairies in the subwatershed. 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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the subwatershed and found as many as 29 possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. These TUs describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 1,521 acres of CRP were removed from the TUs because the acres meet NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
221	**Inkom-Joevar:** very deep, moderately well drained and well drained soils that formed in silty alluvium with slopes ranging from 0 to 2 percent.	Unstable and erosive stream channel Lack of riparian vegetation Barriers to fish migration

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
6,096	**Ririe-Rexburg-Lanoak:** very deep, well drained soils that formed in loess and in silty alluvium derived from loess with slopes from 0 to 20 percent.	Accelerated sheet and rill or gully erosion on crop and pasture lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
6,188	**Camelback-Hades-Valmar:** very deep to moderately deep, well drained, noncalcareous soils that formed in alluvium, colluvium and residuum derived from quartzite and related rock with slopes from 5 to 65 percent. **Cedarhill-Ireland:** very deep and moderately deep, well drained, calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 12 to 60 percent.	Accelerated gully erosion on range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
29	**Inkom-Joevar:** very deep, moderately well drained and well drained soils that formed in silty alluvium with slopes ranging from 0 to 2 percent.	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens

Estimated BMP Implementation Costs

Conservation efforts in the subbasin have demonstrated that landowners will install BMPs if technical and financial assistance is available. The proposed treatment for pollutant reduction will be to implement BMPs through conservation plans. Table G-8 lists the BMP amounts and costs.

Table G-8. Estimated BMP Installation Costs for the East Bench Watershed

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percent	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6.00	75%	50,000	$225,000	$75,000	$300,000
	Conservation Cover	acre	$100.00	75%	40	$3,000	$1,000	$4,000
	Critical Area Planting	acre	$150.00	75%	20	$2,250	$750	$3,000
	Fence, 4-wire	feet	$1.50	75%	80,000	$90,000	$30,000	$120,000
	Fence, Corral Panel	each	$175.00	75%	40	$5,250	$1,750	$7,000
	Heavy Use Area Protection	cuyd	$30.00	75%	200	$4,500	$1,500	$6,000
	Structure for Water Control	each	$3,000.00	75%	20	$45,000	$15,000	$60,000
	Prescribed Grazing	acre	$3.00	75%	500	$1,125	$375	$1,500
	Riparian Forest Buffer	feet	$6.00	75%	40,000	$180,000	$60,000	$240,000
	Stream Bank Protection	cuyd	$40.00	75%	3,000	$90,000	$30,000	$120,000
	Stream Channel Stabilization	cuyd	$35.00	75%	1500	$39,375	$13,125	$52,500
	Stream Habitat Improvement	feet	$250.00	75%	800	$150,000	$50,000	$200,000
	Tree/Shrub Establishment	each	$6.00	75%	25,000	$112,500	$37,500	$150,000
	Pumping Plant for Water Control	each	$2,500.00	75%	30	$56,250	$18,750	$75,000
	Water Well	feet	$25.00	75%	2,000	$37,500	$12,500	$50,000
	Watering Facility	each	$800.00	75%	60	$36,000	$12,000	$48,000
	Use Exclusion	acre	$14.00	75%	250	$2,625	$875	$3,500
	Wildlife Wetland Habitat Management	acre	$7.50	75%	200	$1,125	$375	$1,500
					Subtotal	**$1,081,500**	**$360,500**	**$1,442,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6.00	75%	3,000	$13,500	$4,500	$18,000
	Critical Area Planting	acre	$150.00	75%	10	$1,125	$375	$1,500
	Fence, 4-wire	feet	$1.50	75%	50,000	$56,250	$18,750	$75,000
	Fence, Corral Panel	Each	$175.00	75%	20	$2,625	$875	$3,500
	Irrigation Water Conveyance, 10" pvc	feet	$9.50	75%	2,000	$14,250	$4,750	$19,000
	Irrigation Water Management	acre	$5.00	75%	3,000	$11,250	$3,750	$15,000
	Nutrient Management	acre	$5.00	75%	4,000	$15,000	$5,000	$20,000
	Pasture & Hayland Planting	acre	$65.00	75%	2,000	$97,500	$32,500	$130,000
	Pipeline, 2" PVC	feet	$2.25	75%	20,000	$33,750	$11,250	$45,000
	Pond	cuyd	$3.00	75%	4,000	$9,000	$3,000	$12,000
	Prescribed Grazing	acre	$3.00	75%	2,000	$4,500	$1,500	$6,000
	Pumping Plant for Water Control	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Residue Management	acre	$20.00	75%	3,000	$45,000	$15,000	$60,000
	Spring Development	each	$2,500.00	75%	4	$7,500	$2,500	$10,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	1000	$5,625	$1,875	$7,500
	Water & Sediment Control Basin	cuyd	$3.00	75%	6,000	$13,500	$4,500	$18,000
	Watering Facility	each	$800.00	75%	30	$18,000	$6,000	$24,000
	Water Well	feet	$25.00	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$376,500**	**$125,500**	**$502,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	50,000	$56,250	$18,750	$75,000
	Pipeline, 2" PVC	feet	$2.25	75%	20,000	$33,750	$11,250	$45,000
	Prescribed Grazing	acre	$3.00	75%	4,000	$9,000	$3,000	$12,000
	Pumping Plant for Water Control	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Range Planting	acre	$55.00	75%	600	$24,750	$8,250	$33,000
	Spring Development	each	$2,500.00	75%	4	$7,500	$2,500	$10,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	600	$3,375	$1,125	$4,500
	Watering Facility	each	$800.00	75%	30	$18,000	$6,000	$24,000
	Water Well	feet	$25.00	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$185,250**	**$61,750**	**$247,000**
TU4 AF	Nutrient Management	acre	$5.00	75%	1,000	$3,750	$1,250	$5,000
	Waste Storage Facility	cuyd	$3.00	75%	7,000	$15,750	$5,250	$21,000
	Windbreak/Shelterbelt	feet	$2.20	75%	5,000	$8,250	$2,750	$11,000
					Subtotal	**$27,750**	**$9,250**	**$37,000**
					Total	**$1,671,000**	**$557,000**	**$2,228,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the watershed and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and bed erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The PSWCD hasn't selected an alternative for this watershed to date. However, Alternatives 2, 3 and 4 meet objectives in their resource conservation plan by improving water quality in the Portneuf River (PSWCD, 2002).

Table G-9. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Subwatershed assessment report	2005
Develop conservation plans and contracts	Completed plans and contracts	2010
Finalize BMP designs	Completed BMP plans and designs	2013
Design and install approved BMPs	Certify BMP installations	2015
Track BMP installation	Implementation progress report	2020
Evaluate BMP & project effectiveness	Complete project effectiveness report	2025

APPENDIX H

Lower Portneuf River Watershed

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of the Portneuf River. This plan addresses the Portneuf River and its tributaries from Inkom to the Fort Hall Indian Reservation boundary. The plan builds upon past accomplishments and will assist other efforts in restoring beneficial uses.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, nutrient and bacteria loading to Portneuf River.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. The Portneuf River is on the state of Idaho's §303(d) list of water quality impaired water bodies (IDEQ, 1998). The Portneuf River is listed for sediment, nutrients and bacteria from Interstate 86 to the Fort Hall Reservation boundary. The Portneuf River is listed for sediment, nutrients, bacteria and oil/gas from Johnny Creek to Interstate 86. The Portneuf River is listed for sediment, nutrients and bacteria from Marsh Creek to Johnny Creek. This section of the river is approximately 29 miles in length. The Portneuf River's designated beneficial uses include cold water biota, salmonid spawning, primary and secondary contact recreation, domestic water supply, agricultural and industrial water supply, wildlife habitat and aesthetics. The river's beneficial uses are not supported due to sediment, nutrients, bacteria, flow alteration, and oil/grease (IDEQ, 1999).

Background

In 1987, the PSWCD prioritized the subwatersheds along the Portneuf River below Lava Hot Springs in the Lower Portneuf River Agricultural Pollution Abatement Plan (PSWCD, 1987). The Pocatello and Mink Creek watersheds ranked sixth and seventh in importance for implementation.

Water quality sampling on the Portneuf River at the Pocatello USGS gage indicated the river transports an average of 164 tons of TSS per day. It also showed that the river carries about 244 lbs of TP and 912 lbs of TIN daily. Additional water quality sampling was conducted on Indian Creek and Sorrell Canyon (Drewes, 1987 and Fischer, 2002).

Project Setting

The lower Portneuf River watershed encompasses 79,842 acres or 125 square miles in Bannock County. The watershed is located in the northern portion of the subbasin as shown in Figure 6 on page 17. The Portneuf Range bounds the watershed on the east. On the south and west, the Bannock Range bounds the area. The northern boundary is the Snake River Plain. The are six subwatersheds which are listed in Table H-1. Elevations range from 7,298 feet at Indian Mountain to 4,350 feet at American Fall Reservoir. Fifty percent of the terrain occurs between 4,000 and 5,000 feet. The watershed is steep with 66% of the slopes greater than 15% and only 7% of the slopes less than 1%. Slopes increase to the east, west and south into the Bannock and Pocatello ranges. There are 51 miles of perennial streams in the watershed, which include the Portneuf River and several tributaries including City, Cusick, Indian and Mink creeks, and 33 miles of intermittent streams.

Table H-1. Subwatersheds in the Lower Portneuf River Watershed

Subwatershed	Acres	Percent of Total
Blackrock Canyon	5,963	7.5%
City Creek	16,287	20.4%
Indian	16,095	20.1%
Lower Mink	13,764	17.2%
North Pocatello	20,174	25.3%
Trail Creek	7,559	9.5%
Total	79,842	100.0%

Land Ownership and Land Use

Fifty-two percent of the watershed is privately owned and about 48% is managed by BLM, IDL, Shoshone-Bannock Tribes and FS. Range land is the primary land use within the watershed at 60% and shown in Table H-2. The cities of Pocatello and Chubbuck are located in the watershed. There are 1,503 private parcel owners in the watershed outside the cities. The average parcel is 10 acres with a median size of 2 acres. About 23% of the private parcels are zoned as rural subdivisions (Bannock County, 1999).

Table H-2. Land Uses in the Lower Portneuf River Watershed

Land Use	Acres	Percent of Total
Crop Land	13,967	17.5%
Range Land	48,255	60.4%
Riparian/Wetland	1,390	1.7%
Road	782	1.0%
Urban	15,448	19.4%
Total	79,842	100.0%

General Soils

The Bannock County Soil Survey covers about 83% of the watershed (SCS, 1987). Soils are predominantly silt loams on 0 to 60% slopes, however a variety of soils are shown in Table H-3.

Table H-3. Soil Surface Textures in the Lower Portneuf River Watershed

Soil Surface Texture	Acres	Percent of Total
Cobbly loam	243	0.4%
Cobbly silt loam	203	0.3%
Very cobbly silt loam	25,509	38.3%
Gravelly silt loam	2,613	3.9%
Very gravelly loam	1,822	2.7%
Very gravelly silt loam	184	0.3%
Silt loam	28,216	42.4%
Extremely stony loam	1,291	1.9%
Extremely stony silt loam	246	0.4%
Lava Flows	414	0.6%
Other	5,821	8.8%
Total	66,652	100.0%

Threatened and Endangered Species

Listed below are the threatened or endangered species in Bannock County: Gray wolf *(Canis lupus)* is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)* are listed as threatened. Canada lynx *(Lynx canadensis)* are proposed listed while no candidate species exist in the county (NRCS, 2002).

Accomplishments

Several landowners enrolled 1,698 acres of crop land into CRP. The CRP acres had an estimated pre-treatment erosion rate of eight tons per acre per year or a soil loss of 13,584 tons per year. Currently these acres have an estimated erosion rate of one ton per acre per year. The annual soil savings are 11,886 tons per year or 88% reduction in annual erosion shown in Table H-4.

Table H-4. Soil Erosion Reductions from BMPs in the Lower Rapid Creek Subwatershed

Land Treatment	Average Annual Soil Loss (tons/acre/year)	Treated Acres	Annual Soil Loss (tons/year)
Before	8.0	1,698	13,584
After	1.0	1,698	1,698
Soil Erosion Savings in the Lower Portneuf River Watershed = 11,886 tons/year			

Table H-5. Completed BMP Amounts and Costs in the Lower Portneuf River Watershed.

Best Management Practice	Units Treated	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Conservation Cover (CRP)	1,698 acres	$757,308	$50,940	$808,248	CRP
	Total Cost	$757,308	$50,940	$808,248	

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E.coli*. The recommended reduction for TSS is 65%, TP is 39% and TIN is 66% at the Pocatello USGS gage. The TMDL also recommends a 73% reduction of fecal coliform bacteria in the Portneuf River from Lava Hot Springs to Rainey Park in Pocatello (IDEQ 1999). No reductions were recommended for tributaries.

Identified Problems

During the late 1960s, the Portneuf River flood control project was constructed on an 8.7-mile stretch of the river through the city of Pocatello. This project installed a 1.5-mile concrete channel and 4.7 miles of levied channel and subsequently eliminated over two miles of original channel (CH^2MHILL, 1996). Marsh Creek is also degrading the Portneuf River by increasing turbidity and fecal coliform bacteria concentrations (McSorley, 1977). A study in 1977 documented sediment, nitrogen, phosphorus and bacteria as major pollutants in the lower Portneuf River (Perry et al., 1977). In 1987, 2,124 critical acres and one animal feed operation were identified in the watershed (PSWCD, 1987). The USACE associated poor water quality upstream of Pocatello with point source pollution and low flows (USACE, 1992). The City of Pocatello conducted sampling on the lower Portneuf River and found that dissolved oxygen fell below water quality standards (Brock, 2002). In 2002, ISDA and ISCC conducted a partial inventory of the upper watershed and identified 18 active operations or corrals.

Water Quality Monitoring Results

IDHW sampled Marsh Creek biweekly in 1977 and found that it was contributing solids and fecal coliform bacteria that were increasing turbidity in the lower Portneuf River (McSorley, 1977). They also sampled Indian Creek and Sorrell Canyon in 1986 and found that the lack of flows in the creeks made it unlikely that these tributaries had a significant impact on the Portneuf River (Perry et al., 1977). Water quality sampling at the Pocatello USGS gage from 1995 to 2000 indicates that the river exceeded the TMDL target for TSS, TP, TIN and fecal coliform. The sampling also shows that the river transports 164 tons of TSS, 244 lbs of TP and 912 lbs of TIN daily (USGS, 2002). IASCD conducted integrated water column sampling at fixed intervals for one site on Indian Creek from 1999 to 2001. This monitoring site exceeded the TMDL targets for TSS, TP, TIN, fecal coliform bacteria and *E. coli* during the sample period (Fischer, 2002). These results are shown in Tables H-6, H-7 and H-8.

Table H-6. TSS, TP & TIN Loads for Sites in the Lower Portneuf River Watershed

Monitoring Site	Average TSS Load (tons/day)	Average TSS Load @ TSS Target (tons/day)	Average TSS Load Reduction	TSS Target Exceedance
Portneuf River @ Pocatello	164.3	58.0	65%	56%
Indian Creek	0.07	0.05	29	12
Monitoring Site	**Average TP Load (lbs/day)**	**Average TP Load @ TP Target (lbs/day)**	**Average TP Load Reduction**	**TP Target Exceedance**
Portneuf River @ Pocatello	244.0	117.4	52%	44%
Indian Creek	0.6	0.2	67%	71%
Monitoring Site	**Average TIN Load (lbs/day)**	**Average TIN Load @ TIN Target (lbs/day)**	**Average TIN Load Reduction**	**TIN Target Exceedance**
Portneuf River @ Pocatello	911.8	484.6	47%	56%
Indian Creek	3.4	1.0	71%	100%

Table H-7. April 2000 Pollutants for Sites in the Lower Portneuf River Watershed

Monitoring Site	TSS (mg/L)	TSS Load (tons/day)	Discharge (cfs)	Portion of TSS load	Portion of discharge
Portneuf River @ Pocatello	96	113.3	437.0	100.0%	100.0%
Indian Creek	102	0.2	0.8	0.2%	0.2%
Monitoring Site	**TP (mg/L)**	**TP Load (lbs/day)**	**Discharge (cfs)**	**Portion of TP load**	**Portion of discharge**
Portneuf River @ Pocatello	0.12	292.1	437.0	100.0%	100.0%
Indian Creek	0.19	0.9	0.8	0.3%	0.2%
Monitoring Site	**TIN (mg/L)**	**TIN Load (lbs/day)**	**Discharge (cfs)**	**Portion of TIN load**	**Portion of discharge**
Portneuf River @ Pocatello	0.48	1,128.3	437.0	100.0%	100.0%
Indian Creek	1.14	5.1	0.8	0.5%	0.2%

Table H-8. Bacteria & *E. coli* Exceedance in the Lower Portneuf River Creek Watershed

Monitoring Site	Fecal Coliform PCR Target Exceedance	Fecal Coliform SCR Target Exceedance	*E.coli* PCR Standard Exceedance	*E.coli* SCR Standard Exceedance
Portneuf River @ Pocatello	17%	17%	NS	NS
Indian Creek	29%	24%	29%	29%

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The watershed consists of approximately 79,842 acres. Private agricultural land accounts for 41,518 acres of the watershed. The predominant private land use within the watershed is range land with 15,801 acres. Because the TMDL reductions are so substantial, it is estimated that 66% or 27,568 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority watersheds or subwatersheds. Furthermore, BMP implementation should be focused toward the tiers shown in Table H-9.

Implementation Tiers

Critical areas adjacent to the Portneuf River and its tributaries in Tier 1 are considered high priority for implementation due to the increased potential to directly impact surface water quality. There are three tiers delineated within the watershed. 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 influence on the stream**

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

Tier 3 **Upland areas or facilities that indirectly influence the stream**

Table H-9. Critical Areas by Subwatershed within the Lower Portneuf River Watershed

Implementation Tiers	Tier 1		Tier 2		Tier 3	
Subwatershed	**Riparian Acres**	**Animal Facilities**	**Crop and Pasture Acres**	**Animal Facilities**	**Range Acres**	**Animal Facilities**
Blackrock Canyon	0	0	0	0	323	0
City Creek	31	?	693	?	3,572	?
Indian Creek	108	7	3,110	4	3,733	0
Lower Mink	69	1	866	6	4,218	0
North Pocatello	18	?	6,473	?	2,592	?
Trail Creek	1	?	398	?	1,363	?
Total	**227**	**8**	**11,540**	**18**	**15,801**	**0**

Animal Feed Operations

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. There are no dairies in the subwatershed. 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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the subwatershed and found as many as 18 possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. These TUs describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 1,698 acres of CRP were removed from the TUs because the acres meet NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
227	**Inkom-Joevar:** very deep, moderately well drained and well drained soils that formed in silty alluvium with slopes ranging from 0 to 2 percent	Unstable and erosive stream channel Lack of riparian vegetation Barriers to fish migration

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
9,842	**Arimo-Downey-Bahem:** very deep, well drained soils that formed in loess and silty alluvium overlying sand, gravel, cobbles and stones with slopes from 0 to 8 percent **Ririe-Rexburg-Lanoak:** very deep, well drained soils that formed in loess and in silty alluvium derived from loess with slopes from 1 to 50 percent	Accelerated sheet and rill or gully erosion on crop and pasture lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
15,801	**Camelback-Hades-Valmar:** very deep to moderately deep, well drained, noncalcareous soils that formed in alluvium, colluvium and residuum derived from quartzite and related rock with slopes from 5 to 65 percent **Cedarhill-Ireland:** very deep and moderately deep, well drained, calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 12 to 60 percent	Accelerated gully erosion on range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
18	**Inkom-Joevar:** very deep, moderately well drained and well drained soils that formed in silty alluvium with slopes ranging from 0 to 2 percent	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens

Estimated BMP Implementation Costs

Conservation efforts in the subbasin have demonstrated that landowners will install BMPs if technical and financial assistance is available. The proposed treatment for pollutant reduction will be to implement BMPs through conservation plans. Table H-10 lists the BMP amounts and costs.

Table H-10. Estimated BMP Installation Costs for the Lower Portneuf River Watershed

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percen	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6.00	75%	150,000	$675,000	$225,000	$900,000
	Conservation Cover	acre	$100.00	75%	20	$1,500	$500	$2,000
	Critical Area Planting	acre	$150.00	75%	20	$2,250	$750	$3,000
	Fence, 4-wire	feet	$1.50	75%	50,000	$56,250	$18,750	$75,000
	Fence, Corral Panel	each	$175.00	75%	40	$5,250	$1,750	$7,000
	Heavy Use Area Protection	cuyd	$30.00	75%	200	$4,500	$1,500	$6,000
	Structure for Water Control	each	$3,000.00	75%	10	$22,500	$7,500	$30,000
	Prescribed Grazing	acre	$3.00	75%	500	$1,125	$375	$1,500
	Riparian Forest Buffer	feet	$6.00	75%	50,000	$225,000	$75,000	$300,000
	Stream Bank Protection	cuyd	$40.00	75%	6,000	$180,000	$60,000	$240,000
	Stream Channel Stabilization	cuyd	$35.00	75%	3,000	$78,750	$26,250	$105,000
	Stream Habitat Improvement	feet	$250.00	75%	2,000	$375,000	$125,000	$500,000
	Tree/Shrub Establishment	each	$6.00	75%	50,000	$225,000	$75,000	$300,000
	Pumping Plant for Water Control	each	$2,500.00	75%	15	$28,125	$9,375	$37,500
	Water Well	feet	$25.00	75%	2,000	$37,500	$12,500	$50,000
	Watering Facility	each	$800.00	75%	50	$30,000	$10,000	$40,000
	Use Exclusion	acre	$14.00	75%	250	$2,625	$875	$3,500
	Wildlife Wetland Habitat Management	acre	$7.50	75%	200	$1,125	$375	$1,500
					Subtotal	**$1,951,500**	**$650,500**	**$2,602,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6.00	75%	2,000	$9,000	$3,000	$12,000
	Critical Area Planting	acre	$150.00	75%	10	$1,125	$375	$1,500
	Fence, 4-wire	feet	$1.50	75%	40,000	$45,000	$15,000	$60,000
	Fence, Corral Panel	Each	$175.00	75%	20	$2,625	$875	$3,500
	Irrigation Water Conveyance, 10" pvc	feet	$9.50	75%	8,000	$57,000	$19,000	$76,000
	Irrigation Water Management	acre	$5.00	75%	7,000	$26,250	$8,750	$35,000
	Nutrient Management	acre	$5.00	75%	7,000	$26,250	$8,750	$35,000
	Pasture & Hayland Planting	acre	$65.00	75%	3,000	$146,250	$48,750	$195,000
	Pipeline, 2" PVC	feet	$2.25	75%	40,000	$67,500	$22,500	$90,000
	Pond	cuyd	$3.00	75%	8,000	$18,000	$6,000	$24,000
	Prescribed Grazing	acre	$3.00	75%	4,000	$9,000	$3,000	$12,000
	Pumping Plant for Water Control	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Residue Management	acre	$20.00	75%	2,000	$30,000	$10,000	$40,000
	Spring Development	each	$2,500.00	75%	4	$7,500	$2,500	$10,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	1,000	$5,625	$1,875	$7,500
	Water & Sediment Control Basin	cuyd	$3.00	75%	6,000	$13,500	$4,500	$18,000
	Watering Facility	each	$800.00	75%	40	$24,000	$8,000	$32,000
	Water Well	feet	$25.00	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$516,750**	**$172,250**	**$689,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	60,000	$67,500	$22,500	$90,000
	Pipeline, 2" PVC	feet	$2.25	75%	30,000	$50,625	$16,875	$67,500
	Prescribed Grazing	acre	$3.00	75%	8,000	$18,000	$6,000	$24,000
	Pumping Plant for Water Control	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Range Planting	acre	$55.00	75%	1,200	$49,500	$16,500	$66,000
	Spring Development	each	$2,500.00	75%	4	$7,500	$2,500	$10,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	2,000	$11,250	$3,750	$15,000
	Watering Facility	each	$800.00	75%	40	$24,000	$8,000	$32,000
	Water Well	feet	$25.00	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$258,750**	**$86,250**	**$345,000**
TU4 AF	Nutrient Management	acre	$5.00	75%	1,000	$3,750	$1,250	$5,000
	Waste Storage Facility	cuyd	$3.00	75%	6,000	$13,500	$4,500	$18,000
	Windbreak/Shelterbelt	feet	$2.20	75%	10,000	$16,500	$5,500	$22,000
					Subtotal	**$33,750**	**$11,250**	**$45,000**
					Total	**$2,760,750**	**$920,250**	**$3,681,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the watershed and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and bed erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the watershed and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The PSWCD hasn't selected an alternative for this watershed to date. However, Alternatives 2, 3 and 4 meet objectives in their resource conservation plan by improving water quality in the Portneuf River (PSWCD, 2002).

Table H-11. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Subwatershed assessment report	2005
Develop conservation plans and contracts	Completed plans and contracts	2010
Finalize BMP designs	Completed BMP plans and designs	2013
Design and install approved BMPs	Certify BMP installations	2015
Track BMP installation	Implementation progress report	2020
Evaluate BMP & project effectiveness	Complete project effectiveness report	2025

APPENDIX I

Pocatello Creek Subwatershed

Agricultural TMDL Implementation Plan

Introduction

Purpose

The purpose of this plan is to recommend BMPs that would improve or restore physical, chemical and biological functions of Pocatello Creek. The plan will build upon past conservation accomplishments and will assist other subbasin efforts in restoring beneficial uses.

Goals and Objectives

The goal of this implementation plan is to restore beneficial uses on §303(d) listed stream segments. The objectives of this plan are to identify critical areas and to recommend BMPs for reducing sediment, bacteria, temperature and nutrient loading to Pocatello Creek.

Beneficial Use Status

IDEQ designated beneficial uses on rivers, creeks, lakes and reservoirs to meet the requirements of the federal Clean Water Act. Pocatello Creek is on the state of Idaho's §303(d) list (IDEQ, 1998) of water quality impaired water bodies. Pocatello Creek is listed from its headwaters to the Portneuf River. Pocatello Creek's beneficial uses include cold water biota, secondary contact recreation, agricultural water supply, wildlife habitat and aesthetics. Cold water biota is not fully supported due to sediment.

Background

The subwatershed was inventoried and planned by the PSWCD, ISCC, IDEQ and NRCS as part of the Lower Portneuf River Agricultural Water Pollution Abatement Plan (PSWCD, 1987). However, the area was ranked sixth in priority for implementation efforts. Water quality sampling on North Fork Pocatello Creek indicates that the creek transports an average of 0.4 tons of TSS, 2.4 lbs of TP and 43.5 lbs of TIN daily (Fischer, 2002). Additional water quality sampling was conducted on South Fork Pocatello Creek, which transports an average of 0.1 tons of TSS, 0.6 lbs of TP and 3.4 lbs of TIN daily (Fischer, 2002).

Project Setting

The subwatershed is located in northern Bannock County on the east side of Pocatello. The subwatershed, Pocatello Creek drains approximately 15,577 acres or 24 square miles. The subwatershed is in the Pocatello watershed located in the Portneuf River subbasin as shown in Figure 6 on page 17.

Land Ownership and Land Use

Seventy-seven percent of the subwatershed is privately owned and 23% is managed by the BLM. Range land is the predominant land use within the subwatershed at 68% as shown in Table I-1. A portion of the city of Pocatello is located within the subwatershed There are 367 private parcel owners in the subwatershed with an average parcel size of 16 acres and a median parcel size of 4 acres. About 17% of the private parcels are zoned as rural subdivisions (Bannock County, 1999).

Table I-1. Land Use in the Pocatello Creek Subwatershed

Land Use	Acres	Percent of Total
Crop Land	2,374	15.2%
Range Land	10,574	67.9%
Riparian/Wetland	92	0.6%
Road	151	1.0%
Urban	2,386	15.3%
Total	15,577	100.0%

General Soils

The Bannock County Soil Survey covers 94% of the subwatershed (SCS, 1987). Soils in the subwatershed are silt loams on 0 to 60% slopes, although a variety of soils are present, Table I-2.

Table I-2. Soil Surface Textures in the Pocatello Creek Subwatershed

Soil Surface Texture	Acres	Percent of Total
Cobbly loam	152	1.0%
Cobbly silt loam	29	0.2%
Very cobbly silt loam	5,470	37.2%
Gravelly silt loam	312	2.1%
Very gravelly loam	412	2.8%
Very gravelly silt loam	1,852	12.6%
Silt loam	6,082	41.3%
Extremely stony loam	13	0.1%
Extremely stony silt loam	394	2.7%
Total	14,716	100.0%

Threatened and Endangered Species

Threatened or endangered species in Bannock County include the Gray wolf *(Canis lupus)*, which is listed as endangered and the Bald eagle *(Haliaeetus leucocephalus)*, Bliss Rapids snails *(Taylorconcha serpenticola)* and Ute Ladies'-tresses *(Spiranthes diluvialis)*, which are listed as threatened. Canada lynx *(Lynx canadensis)* is proposed to be listed while no candidate species exist in the county (NRCS, 2002).

Accomplishments

Several landowners enrolled 1,451 acres of crop land into CRP. The CRP acres had an estimated pre-treatment erosion rate of eight tons per acre per year or a soil loss of 11,608 tons per year. Currently these acres have an estimated erosion rate of one ton per acre per year. The annual soil savings are 10,157 tons per year or 88% reduction in annual erosion shown in Table I-3.

Table I-3. Soil Erosion Reductions from BMPs in the Pocatello Creek Subwatershed

Land Treatment	Average Annual Soil Loss (tons/acre/year)	Treated Acres	Annual Soil Loss (tons/year)
Before	8.0	1,451	11,608
After	1.0	1,451	1,451
Soil Erosion Savings in the Pocatello Creek Subwatershed = 10,157 tons/year			

Table I-4. Completed BMP Amounts and Costs in the Pocatello Creek Subwatershed

Best Management Practice	Units Treated	Cost-Share Funds	Participant Funds	Total Funds	Funding Program
Conservation Cover (CRP)	1,451 acres	$722,598	$43,530	$766,128	CRP
	Total Cost	$722,598	$43,530	$766,128	

Problem Statement

Pollutants of Concern

The Portneuf River TMDL established targets for TSS, TP, TIN, fecal coliform bacteria and *E.coli*. The recommended reduction for TSS is 65%, TP is 39% and TIN is 66% at the Pocatello USGS gage. The TMDL also recommends an 89% reduction of fecal coliform bacteria in the river from Pocatello Creek to Pocatello USGS gage (IDEQ, 1999). No pollutant reductions were recommended for Pocatello Creek.

Identified Problems

IDHW sampled water quality in the North Fork and South Fork Pocatello creeks and concluded that these subwatersheds have a high potential for sediment, nutrient and bacterial pollution loading to the Portneuf River (Drewes, 1987). The creek also had stream bank erosion problem areas that were determined to be non-agricultural sediment sources therefore no treatment alternatives were developed for the riparian areas (PSWCD, 1987). Because of high bacterial counts, Drewes (1987) recommended that a livestock waste control program be implemented on the South Fork Pocatello Creek. In 2002, ISDA and ISCC identified eight potential sites with feed operations, corrals or pens in the subwatershed.

Water Quality Monitoring Results

IASCD has sampled North Fork and South Fork Pocatello creeks and found that North Fork Pocatello Creek exceeds the TMDL targets for TSS, TP, TIN, fecal coliform bacteria and *E. coli* and South Fork Pocatello Creek exceeds the TMDL targets for TSS, TP and TIN (Fischer, 2002).

Table I-5. TSS, TP & TIN Loads for Sites in the Pocatello Creek Subwatershed

Monitoring Site	Average TSS Load (tons/day)	Average TSS Load @ TSS Target (tons/day)	Average TSS Load Reduction	TSS Target Exceedance
North Fork Pocatello Creek	0.7	0.4	43%	35%
South Fork Pocatello Creek	0.07	0.07	0%	37%
Monitoring Site	**Average TP Load (lbs/day)**	**Average TP Load @ TP Target (lbs/day)**	**Average TP Load Reduction**	**TP Target Exceedance**
North Fork Pocatello Creek	4.6	1.2	74%	100%
South Fork Pocatello Creek	0.6	0.2	67%	100%
Monitoring Site	**Average TIN Load (lbs/day)**	**Average TIN Load @ TIN Target (lbs/day)**	**Average TIN Load Reduction**	**TIN Target Exceedance**
North Fork Pocatello Creek	43.5	4.8	89%	100%
South Fork Pocatello Creek	3.4	0.6	82%	100%

Table I-6. April 2000 Pollutants for Sites in the Pocatello Creek Subwatershed

Monitoring Site	TSS (mg/L)	TSS Load (tons/day)	Discharge (cfs)	Portion of TSS load	Portion of discharge
North Fork Pocatello Creek	28	0.2	2.8	0.2%	0.6%
South Fork Pocatello Creek	110	0.2	0.6	0.2%	0.1%
Monitoring Site	**TP (mg/L)**	**TP Load (lbs/day)**	**Discharge (cfs)**	**Portion of TP load**	**Portion of discharge**
North Fork Pocatello Creek	0.11	1.7	2.8	0.6%	0.6%
South Fork Pocatello Creek	0.23	0.7	0.6	0.2%	0.1%
Monitoring Site	**TIN (mg/L)**	**TIN Load (lbs/day)**	**Discharge (cfs)**	**Portion of TIN load**	**Portion of discharge**
North Fork Pocatello Creek	2.22	33.2	2.8	2.9%	0.6%
South Fork Pocatello Creek	1.58	5.0	0.6	0.4%	0.1%

Table I-7. Bacteria TMDL & *E. coli* Exceedance in the Pocatello Creek Subwatershed

Monitoring Site	Fecal Coliform PCR Target Exceedance	Fecal Coliform SCR Target Exceedance	*E.coli* PCR Standard Exceedance	*E.coli* SCR Standard Exceedance
North Fork Pocatello Creek	0%	0%	5%	0%
South Fork Pocatello Creek	0%	0%	0%	0%

Critical Areas

Critical acres are those areas having the most significant impact on the quality of the receiving waters. These critical acres include pollutant source and transport areas. The subwatershed consists of approximately 15,577 acres. Private agricultural land accounts for 9,704 acres of the subwatershed. The predominant private land use within the subwatershed is range land with 7,253 acres. Because the TMDL reductions are so substantial, it is estimated that 100% or 9,704 acres of private agricultural land would need BMPs implemented for sediment, bacteria, phosphorus and nitrogen. In order to allocate available resources most effectively, implementation should be focused in the highest priority areas. Furthermore, BMP implementation should be focused toward the tiers shown in Table I-8.

Implementation Tiers

Critical areas adjacent to Pocatello Creek and its tributaries in Tier 1 are considered high priority for implementation due to the 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.

<u>Tier 1</u> **Unstable and erosive stream channels and riparian areas or adjacent fields and facilities that have a direct and substantial influence on the stream**

<u>Tier 2</u> **Fields or facilities with an indirect, yet substantial influence on the stream**

<u>Tier 3</u> **Upland areas or facilities that indirectly influence the stream**

Table I-8. Critical Areas within the Pocatello Creek Subwatershed

Implementation Tiers	Tier 1		Tier 2		Tier 3	
Subwatershed	Riparian Acres	Animal Facilities	Crop and Pasture Acres	Animal Facilities	Range Acres	Animal Facilities
Pocatello Creek	77	6	2,374	2	7,253	0
Total	**77**	**6**	**2,374**	**2**	**7,253**	**0**

Animal Feed Operations

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. There are no dairies in the subwatershed. 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. In 2002, ISDA and ISCC conducted a preliminary inventory of feed operations and corral facilities in the subwatershed and found as many as eight possible pens, corrals or operations.

Proposed Treatment

Each agricultural critical area is divided into one or more TUs. These TUs describe critical areas with similar land uses, soils, productivity, resource concerns and treatment needs. Approximately 1,451 acres of CRP were removed from the TUs because the acres meet NRCS resource quality criteria.

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
77	**McDole-McDole Variant complex:** very deep and well drained soil that formed in alluvium derived from loess with slopes ranging from 0 to 2 percent	Unstable & erosive stream channel Lack of riparian vegetation Barriers to fish migration

Treatment Unit (TU2) Crop and Pasture Lands

Acres	Soils	Resource Problems
923	**Ririe-Rexburg-Lanoak:** very deep, well drained soils that formed in loess and in silty alluvium derived from loess with slopes from 1 to 50 percent.	Accelerated sheet and rill or gully erosion on crop and pasture lands

Treatment Unit (TU3) Range Lands

Acres	Soils	Resource Problems
7,253	**Camelback-Hades-Valmar:** very deep to moderately deep, well drained, noncalcareous soils that formed in alluvium, colluvium and residuum derived from quartzite and related rock with slopes from 5 to 65 percent. **Cedarhill-Ireland:** very deep and moderately deep, well drained, calcareous soils that formed in alluvium, colluvium and residuum derived from limestone, dolomite and related rock with slopes from 12 to 60 percent.	Accelerated gully erosion on range lands

Treatment Unit (TU4) Animal Facilities

Units	Soils	Resource Problems
8	**McDole-McDole Variant complex:** very deep and well drained soil that formed in alluvium derived from loess with slopes ranging from 0 to 2 percent	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens

Estimated BMP Implementation Costs

Conservation efforts in the subwatershed 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 I-9 lists BMP amounts and costs.

Table I-9. Estimated BMP Installation Costs for the Pocatello Creek Subwatershed

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	C/S Percent	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Riparian	Channel Vegetation	feet	$6.00	75%	30,000	$135,000	$45,000	$180,000
	Conservation Cover	acre	$100.00	75%	20	$1,500	$500	$2,000
	Critical Area Planting	acre	$150.00	75%	10	$1,125	$375	$1,500
	Fence, 4-wire	feet	$1.50	75%	50,000	$56,250	$18,750	$75,000
	Fence, Corral Panel	each	$175.00	75%	20	$2,625	$875	$3,500
	Heavy Use Area Protection	cuyd	$30.00	75%	100	$2,250	$750	$3,000
	Structure for Water Control	each	$3,000.00	75%	5	$11,250	$3,750	$15,000
	Prescribed Grazing	acre	$3.00	75%	200	$450	$150	$600
	Riparian Forest Buffer	feet	$6.00	75%	10,000	$45,000	$15,000	$60,000
	Stream Bank Protection	cuyd	$40.00	75%	800	$24,000	$8,000	$32,000
	Stream Channel Stabilization	cuyd	$35.00	75%	400	$10,500	$3,500	$14,000
	Stream Habitat Improvement	feet	$250.00	75%	200	$37,500	$12,500	$50,000
	Tree/Shrub Establishment	each	$6.00	75%	2,000	$9,000	$3,000	$12,000
	Pumping Plant for Water Control	each	$2,500.00	75%	9	$16,875	$5,625	$22,500
	Water Well	feet	$25.00	75%	2,000	$37,500	$12,500	$50,000
	Watering Facility	each	$800.00	75%	30	$18,000	$6,000	$24,000
	Use Exclusion	acre	$14.00	75%	100	$1,050	$350	$1,400
	Wildlife Wetland Habitat Management	acre	$7.50	75%	200	$1,125	$375	$1,500
					Subtotal	**$411,000**	**$137,000**	**$548,000**
TU2 Crop and Pasture Lands	Contour Farming	acre	$6.00	75%	1,000	$4,500	$1,500	$6,000
	Critical Area Planting	acre	$150.00	75%	10	$1,125	$375	$1,500
	Fence, 4-wire	feet	$1.50	75%	20,000	$22,500	$7,500	$30,000
	Fence, Corral Panel	Each	$175.00	75%	20	$2,625	$875	$3,500
	Irrigation Water Conveyance, 10" pvc	feet	$9.50	75%	1,000	$7,125	$2,375	$9,500
	Irrigation Water Management	acre	$5.00	75%	200	$750	$250	$1,000
	Nutrient Management	acre	$5.00	75%	1,000	$3,750	$1,250	$5,000
	Pasture & Hayland Planting	acre	$65.00	75%	400	$19,500	$6,500	$26,000
	Pipeline, 2" PVC	feet	$2.25	75%	10,000	$16,875	$5,625	$22,500
	Pond	cuyd	$3.00	75%	1,000	$2,250	$750	$3,000
	Prescribed Grazing	acre	$3.00	75%	500	$1,125	$375	$1,500
	Pumping Plant for Water Control	each	$2,500.00	75%	5	$9,375	$3,125	$12,500
	Residue Management	acre	$20.00	75%	1,000	$15,000	$5,000	$20,000
	Spring Development	each	$2,500.00	75%	4	$7,500	$2,500	$10,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	400	$2,250	$750	$3,000
	Water & Sediment Control Basin	cuyd	$3.00	75%	6,000	$13,500	$4,500	$18,000
	Watering Facility	each	$800.00	75%	20	$12,000	$4,000	$16,000
	Water Well	feet	$25.00	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$160,500**	**$53,500**	**$214,000**
TU3 Range Lands	Fence, 4-wire	feet	$1.50	75%	80,000	$90,000	$30,000	$120,000
	Pipeline, 2" PVC	feet	$2.25	75%	12,000	$20,250	$6,750	$27,000
	Prescribed Grazing	acre	$3.00	75%	4,000	$9,000	$3,000	$12,000
	Pumping Plant for Water Control	each	$2,500.00	75%	4	$7,500	$2,500	$10,000
	Range Planting	acre	$55.00	75%	400	$16,500	$5,500	$22,000
	Spring Development	each	$2,500.00	75%	4	$7,500	$2,500	$10,000
	Upland Wildlife Habitat Management	acre	$7.50	75%	400	$2,250	$750	$3,000
	Watering Facility	each	$800.00	75%	20	$12,000	$4,000	$16,000
	Water Well	feet	$25.00	75%	1,000	$18,750	$6,250	$25,000
					Subtotal	**$183,750**	**$61,250**	**$245,000**
TU4 AF	Nutrient Management	acre	$5.00	75%	1,000	$3,750	$1,250	$5,000
	Waste Storage Facility	cuyd	$3.00	75%	2,000	$4,500	$1,500	$6,000
	Windbreak/Shelterbelt	feet	$2.20	75%	5,000	$8,250	$2,750	$11,000
					Subtotal	**$16,500**	**$5,500**	**$22,000**
					Total	**$771,750**	**$257,250**	**$1,029,000**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration:

1. No action
2. Land treatment with structural and management BMPs
3. Riparian and stream channel restoration
4. Animal facility waste management

Description of Alternatives

Alternative 1 - No action

This alternative continues the existing conservation programs without additional project activities or voluntary landowner participation. The identified problems would continue to negatively impact beneficial uses in the subwatershed and the Portneuf River.

Alternative 2 - Land treatment with BMPs on crop, pasture & range lands

This alternative would reduce accelerated sheet and rill, gully and irrigation-induced erosion. It would also reduce nutrient and bacteria runoff from animal waste and fertilizer applications. This will improve water quality in the subwatershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be sustained or improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 3 - Riparian and stream channel restoration

This alternative with voluntary landowner participation would reduce accelerated stream bank and bed erosion. It would also reduce nutrient and bacteria runoff from entering the river and creeks. This alternative would improve water quality, riparian vegetation, aquatic habitat and fish passage in the subwatershed and reduce pollutant loading to the Portneuf River. Beneficial uses would be improved with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative 4 - Animal facility waste management

This alternative would reduce sediment, nutrient and bacteria runoff from animal waste storage and application areas. This will improve water quality in the subwatershed and reduce pollutant loading to the Portneuf River. Beneficial uses will be sustained or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative Selection

The PSWCD hasn't selected an alternative for this subwatershed to date. However, Alternatives 2, 3 and 4 meet objectives in their resource conservation plan by improving water quality in the Portneuf River (PSWCD, 2002).

Table I-10. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Evaluate the project area	Subwatershed assessment report	2005
Develop conservation plans and contracts	Completed plans and contracts	2010
Finalize BMP designs	Completed BMP plans and designs	2013
Design and install approved BMPs	Certify BMP installations	2015
Track BMP installation	Implementation progress report	2020
Evaluate BMP & project effectiveness	Complete project effectiveness report	2025