Pahsimeroi River Subbasin
Total Maximum Daily Load
Agricultural Implementation Plan

Developed for the
Idaho Department of Environmental Quality

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Idaho Soil Conservation Commission
In Cooperation With
Custer Soil and Water Conservation District

September 2005

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Introduction

Purpose

The purpose of this plan is to recommend Best Management Practices (BMPs) that would improve or restore physical, chemical and biological functions of the Pahsimeroi River. The plan will build upon past conservation accomplishments made through the Upper Salmon Basin Watershed Project (USBWP) and the Custer Soil and Water Conservation District (SWCD). Future projects will assist or 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 and nutrient loading to the Pahsimeroi River.

Beneficial Use Status

Idaho Department of Environmental Quality (IDEQ) designated beneficial uses on rivers, creeks, lakes, and reservoirs to meet the requirements of the Clean Water Act. The Pahsimeroi River is on the State of Idaho's §303(d) list of water quality impaired water bodies (IDEQ, 1998). The Pahsimeroi River is listed for sediment and nutrients from Mahogany Creek to the Salmon River, a distance of 53 miles. Beneficial uses designated on the river include domestic water supply, cold water biota, salmonid spawning, primary contact recreation, and special resource water. These uses are not fully supported (IDEQ, 2001).

Background

Custer SWCD was activated in June 1953 with the organization of the board of supervisors. The total acreage within the District is about 2.5 million acres. The Pahsimeroi River subbasin constitutes 537,210 of these acres. The private land in the District is about 150,000 acres with 47,035 acres of private land in the Pahsimeroi subbasin.

The Custer SWCD’s main priorities in their Five-Year Plan are SWCD Operations; Water Quality and Water Resources; Pasture/Hayland and Rangeland Management; and Recreation. The Custer SWCD has placed a high priority on several aspects of each priority. For example the Water Quality and Water Resources priority addresses Fish and Wildlife, Endangered Species Act (ESA), and the Bull Trout Conservation Plan (BTCP), riparian and wetland management, and water resources (Custer SWCD, 2003)

Since 1992, the Custer SWCD has been a partner in the USBWP. By teaming up with the USBWP, Lemhi SWCD, Bonneville Power Administration (BPA), and multiple natural resource agencies, the Custer SWCD has been very instrumental in assisting local landowners with on the ground conservation efforts. USBWP, in addition to providing BPA funding, cooperates with the Custer SWCD to deal with fish habitat and fish passage issues, which include water quality, water resources, riparian management, and wetlands. Future USBWP projects under BPA funding will require an additional planning effort to address all these priorities with a basin wide watershed approach.

In the Custer SWCD, 90% of the fish rearing habitat is found on private property. Efforts such as riparian fencing and streambank restoration projects have improved fish habitat. Installations of fish friendly structures and sprinkler irrigation systems have improved fish passage. The Custer SWCD has contracted with over 40 landowners over the past eight years to tackle resource problems on their land.

Project Setting

The Pahsimeroi River subbasin (Hydrologic Unit Code [HUC] #17060202) is located in east-central Idaho between the Lost River Range and the Lemhi Range (Figure 1). The Pahsimeroi River subbasin is in a transition zone between the Northern Rocky Mountain Geomorphic Province and the Basin and Range Province (Stevenson, 1994). The Pahsimeroi River originates near Borah Peak, the highest peak in

Idaho, located within the Lost River Range. The river flows northward and joins the Salmon River near the town-site of Ellis. The subbasin is somewhat unique in Idaho in that streams from the mountains disappear into the gravel-filled valley and feed the base flow of the Pahsimeroi River from primarily subsurface flow (Young and Harenberg, 1973).

The drainage area of the Pahsimeroi River encompasses 845 square miles (ISCC, 1995). Elevations of the valley floor vary from 7,800 feet near the divide with the Little Lost River drainage to 4,600 feet at the confluence with the Salmon River. The highest elevations in the subbasin are 10,971 feet in the Lemhi Range, 12,662 feet (Borah Peak) in the Lost River Range, and 9,550 feet in the Donkey Hills, which separate the drainage from the Little Lost River.

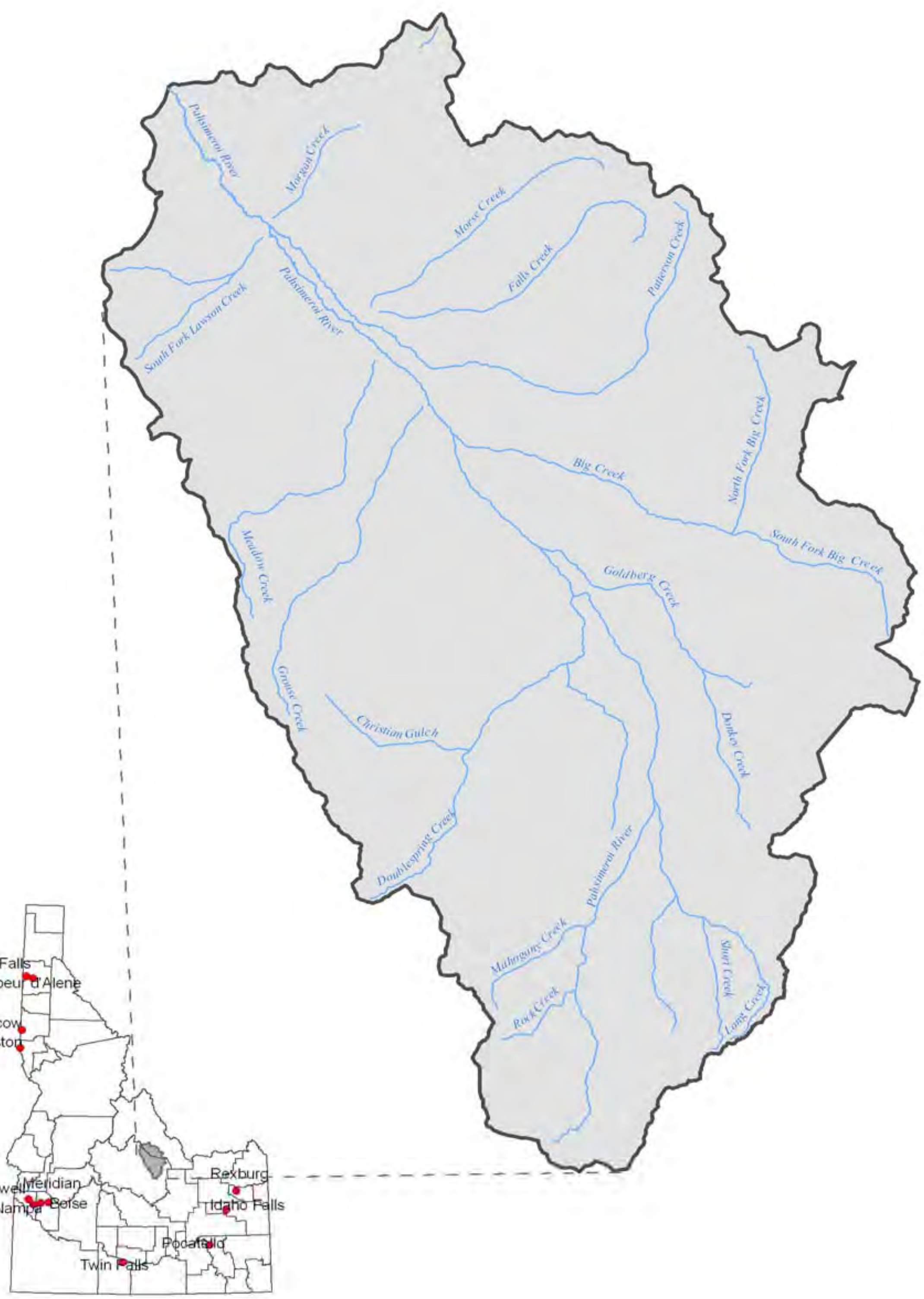
The climate of the subbasin is typical of central Idaho mountainous areas with cold winters and hot, dry summers affected by Pacific maritime air masses. Elevation, topography, and aspect influence climatic conditions throughout the subbasin (IDEQ, 2001).

Mean annual precipitation ranges from less than 8 inches on the valley floor to more than 30 inches in the higher elevations of the Lemhi and Lost River Ranges (Young and Harenberg, 1973). Most of the precipitation in the mountains occurs as snow during the winter months. A National Weather Service station at May, Idaho, (1961-1989) on the valley floor showed mean monthly precipitation levels varying from 0.28 inches in January and February to 1.43 inches in June (Abramovich et al., 1998). Average annual precipitation was 8.23 inches. Average monthly temperatures at the same station ranged from 19.5^{o} F (-6.9^{o} C) in January to 66.3^{o} F (19^{o} C) in July. Extreme temperatures for the same time period (1961-1989) are 101^{o} F (38.3^{o} C) set on August 3, 1961 and -40^{o} F (-40^{o} C) on December 23, 1983.

The Pahsimeroi River subbasin is split between Custer and Lemhi Counties. The Pahsimeroi River and Big Creek form the boundary between the two counties. Custer County has a population of about 4,200 people and Lemhi County has over 8,000 people (Idaho Department of Commerce, 1999). The population base in the subbasin is very small and associated with private agricultural lands in the valley bottom.

There are several place names or small towns including Patterson, May, Goldburg, and Ellis. The Pahsimeroi Valley was settled during the late 1800s and early 1900s (Meinzer, 1924). By 1920, the valley's population had swelled to 569 people and 8,277 acres of irrigated crop and pasture land (Meinzer, 1924). The population has probably decreased from those early levels. In 1990, the U.S. Bureau of Census reported 60 people living in May and 4 people in Patterson. Most of the roads in the valley are associated with agricultural lands. There are two main roads that travel the length of the valley on either side of the Pahsimeroi River. There are numerous primitive roads that travel perpendicular to the valley up through the BLM land to the Salmon Challis National Forest (SCNF) boundaries.

Figure 1. Pahsimeroi River Subbasin Area Map



Land Ownership

Most of the subbasin is in public ownership (Figure 3). Both mountain ranges are in the SCNF, and lower slopes to the valley floor are BLM lands. Throughout the BLM land are sections of Idaho Department of Lands (IDL), including one large block in the upper Goldburg Creek drainage. Private lands are found on both sides of the Pahsimeroi River throughout the valley. There are two large pieces of private land in the Big Creek and Patterson Creek drainages near the interface of BLM and SCNF land.

Table 1. Pahsimeroi River Subbasin Ownership

Ownership	Acres	Percent of Total
BLM	224,278	41.8%
Private	47,035	8.8%
IDL	19,159	3.5%
SCNF	246,717	45.9%
Total	**537,189**	**100.0%**

Land Use

The principal land use of the subbasin is agriculture. Irrigated agricultural activities occur on the valley floor and grazing throughout much of the rangeland areas (Figure 3). In terms of land area, 30,000 acres or approximately 5% of the subbasin are in irrigated agriculture (hay, pasture, or crop); 263,430 acres, 49% are rangelands; and the remaining 244,970 acres, 46% are primarily forest lands (ISCC, 1995).

Irrigation water rights amount to approximately 900 cubic feet per second (cfs) (ISCC, 1995). Most irrigation is in the form of sprinkler irrigation from wells in the valley floor. Gravity flow irrigation for about 7,400 acres also exists in the Big Creek and Patterson Creek drainages and the upper end of Goldburg Creek. There is one area of dryland agriculture just south of Patterson. Idaho Power has water rights to 50 cfs for its fish hatchery (ISCC, 1995).

Mining in the subbasin is limited and mostly historical; the tungsten mine in Patterson Creek is most notable (ISCC, 1995). Patterson Creek flows through this mine area, but is diverted or subsides below ground before reaching the Pahsimeroi River. Logging has been very limited in the subbasin due to lack of timber resources (ISCC, 1995).

Table 2. Private Land Uses in the Pahsimeroi River Subbasin

Land Use	Acres	Percent of Total
Cropland and Pasture	35,550	76.0%
Other Agricultural Land	34	0.1%
Mixed Rangeland	4,724	10.1%
Herbaceous Rangeland	5,047	10.8%
Evergreen Forest Land	313	0.7%
Non-Forested Wetland	214	0.5%
Residential	34	0.1%
Shrub and Brush Rangeland	788	1.7%
Total	**46,704**	**100.0%**

Figure 2. Pahsimeroi River Subbasin Area Map

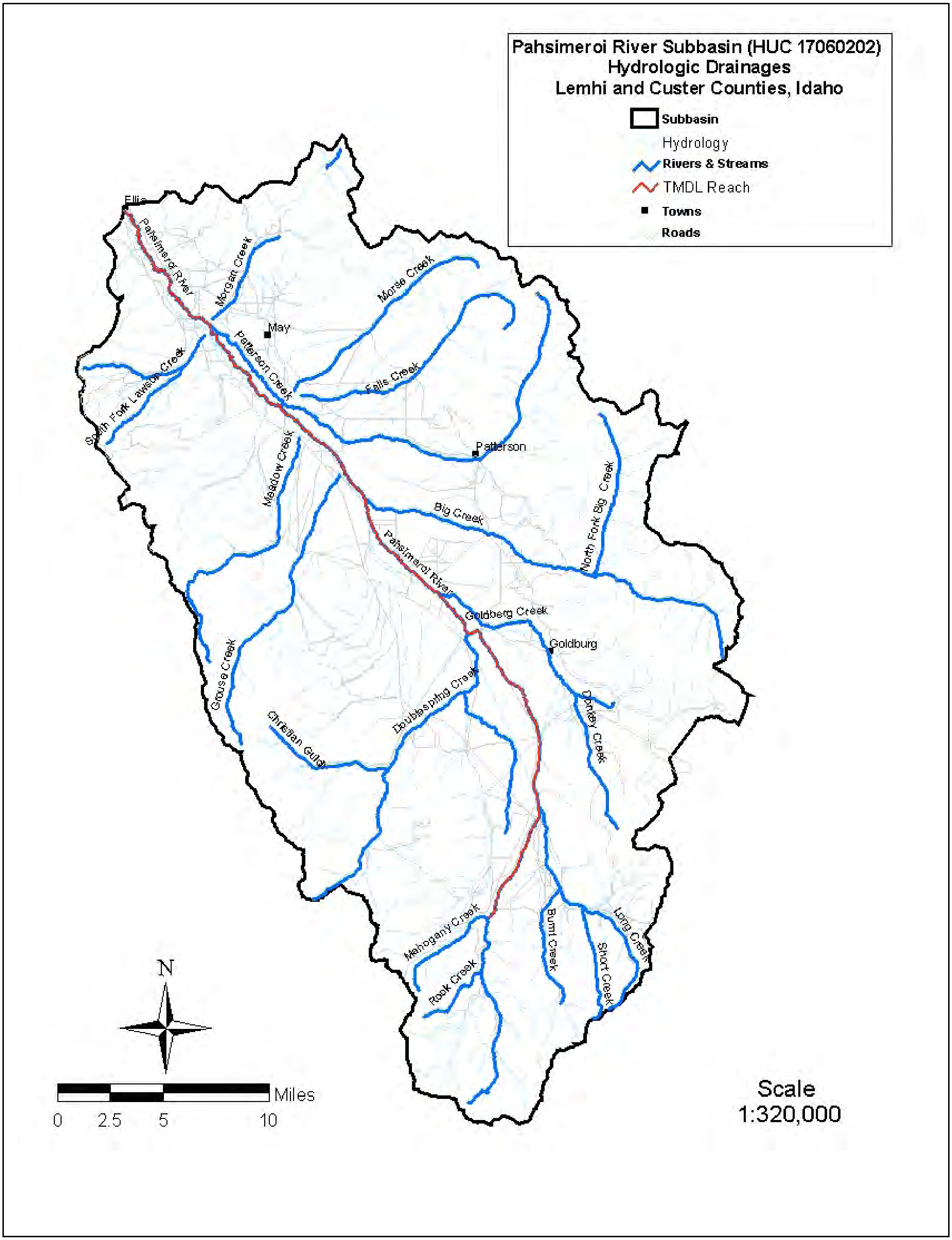
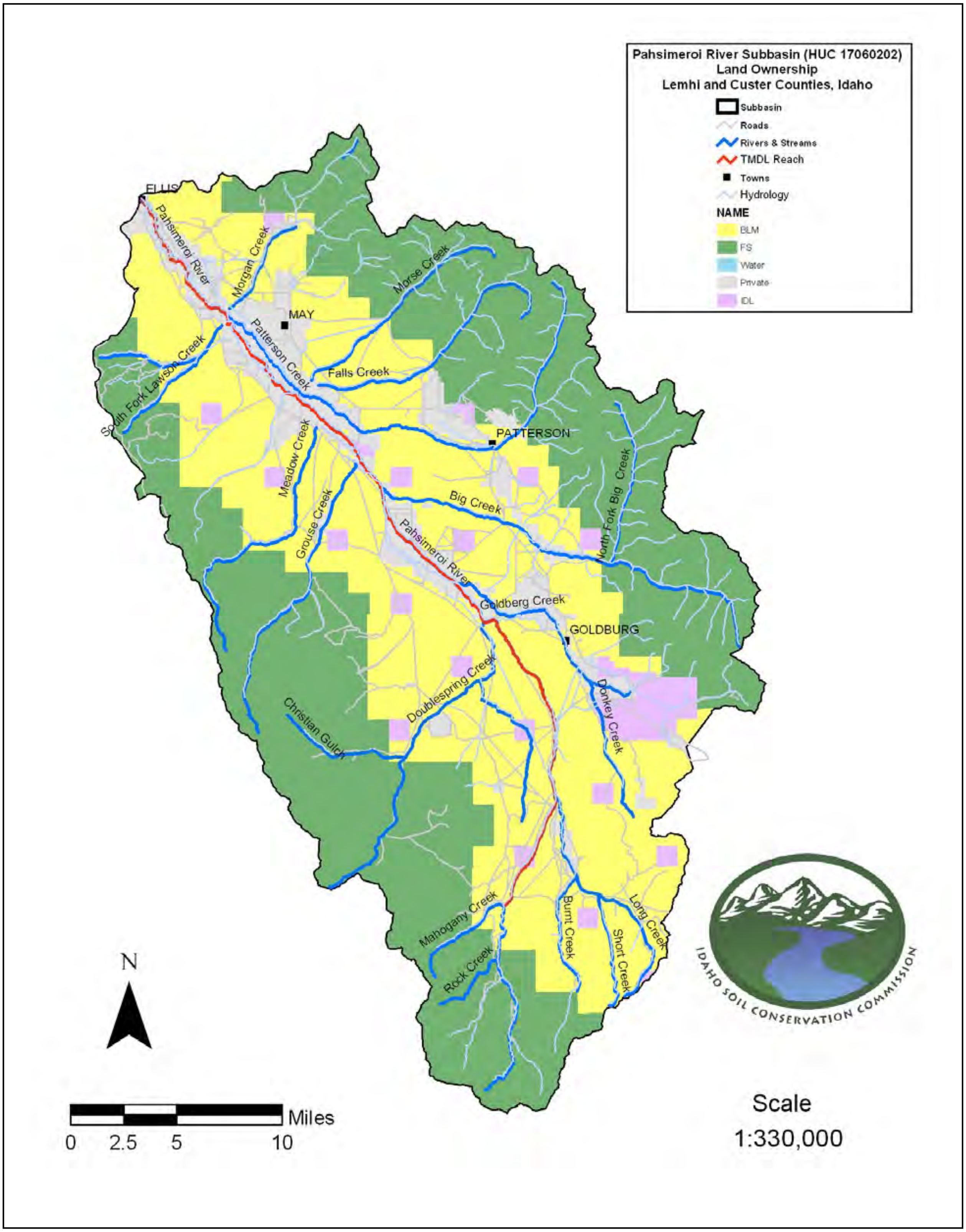


Figure 3. Pahsimeroi River Subbasin General Ownership



Threatened and Endangered Species

The threatened and endangered species that occur in Pahsimeroi River Subbasin include; Chinook salmon *(Oncorhynchus tshawytscha),* Steelhead rainbow trout *(Oncorhynchus mykiss),* Westslope cutthroat trout *(Oncorhynchus clarki),* and Bull trout *(Salvelinus confluentus).* These threatened and endangered species will be addressed in site specific conservation planning, during implementation of BMPs, with individual landowners and operators in ways that will benefit any listed species in a project area. This work will be in conjunction with ongoing efforts of the USBWP, using BPA funds, Pacific Coast Salmon Recovery Fund (PCSRF), and Fisheries Restoration Irrigation Mitigation Act (FRIMA) funds. Natural Resources Conservation Service (NRCS), Idaho Soil Conservation Commission (ISCC), and the Idaho State Department of Agriculture (ISDA) utilizing Farm Bill and state cost share programs.

The USBWP process for the National Environmental Policy Act (NEPA) depends on the funding source. BPA funded fence projects use the BPA NEPA checklist. Diversion projects require a Biological Assessment (BA) which the Bureau of Reclamation (BoR) is responsible for writing to gain concurrence on the finding of effect with United State Fish and Wildlife Service (USFWS). The National Oceanic and Atmospheric Administration (NOAA) fisheries provides concurrence based upon the Habitat Improvement Programmatic Biological Opinion (HIP BiOp), which was written as a collaborative effort between NOAA and BPA. The Army Corps of Engineers (COE) writes the BA for streambank protection projects as part of the permitting process (personal communication Russell Knight, 2005).

Projects funded through PCSRF and FRIMA utilize NRCS's Environmental Evaluation Worksheet (CPA-52). If a BA is required for a project utilizing these funds, a cooperating agency will write it. Cooperating agencies could be, but are not limited to the following; BLM, Sawtooth National Recreation Area (SNRA), SCNF, and IDFG (personal communication Russell Knight, 2005).

Accomplishments

The Custer SWCD in conjunction with the USBWP, NRCS, IDFG, and area landowners have implemented many projects in the subbasin. There were five projects in the form of diversion consolidation, elimination and improvement. These projects resulted in the elimination of two diversions and the modification of five diversions. There were nine riparian fencing projects that resulted in 15 miles of fence being installed. These fence projects treated 11 miles of riparian area. The accomplishments of these projects in the subbasin are outlined below in Table 3. More detailed information on these projects is outlined in Table 4. NRCS is working with six landowners to improve their Animal Feeding Operations (AFOs) to remove impacts to water quality in the subbasin. The Custer SWCD received a Water Quality Program for Agriculture (WQPA) from the ISCC to fund four AFO projects in the subbasin.

Table 3. Completed BMP Amounts and Costs in the Pahsimeroi River Subbasin

Type	Extent	Total Cost
Fence Riparian Exclusion	79,301 feet	$216,319
Diversion Modifications	7 projects	$616,802
Streambank Protection	2 projects	$33,853
Riparian Enhancement	1 project	$11,000
Total		**$877,974**

Table 4. Project and BMP Descriptions in the Pahsimeroi River Subbasin

Descriptive Name	Project Description	Stream Reach	Stream Treated (ft)	Fencing Length (ft)	Water Saved (cfs)
Pahsimeroi River Riparian Enhancement	Fence was constructed to exclude grazing, enhance riparian vegetation, and protect critical spawning and rearing habitat	PR 16	5,280	5,808	0
Pahsimeroi River Riparian Enhancement	Fence was constructed to exclude grazing, enhance riparian vegetation, and protect critical spawning and rearing habitat	PR 16	4,382	4,382	0
Pahsimeroi River Flow Enhancement	Access was to be restored to 2.1 miles of the Pahsimeroi River and 5.7 miles of Patterson/Big Springs Creek for anadromous and resident fish	PR 6	0	0	6
Pahsimeroi River Riparian Enhancement	Fence was built to control grazing, enhance riparian vegetation, and protect critical spawning and rearing habitat on Patterson/Big Springs Creek	Pahsimeroi River and Tributaries	6,600	6,600	0
Pahsimeroi River P9 Diversion Enhancement	Reconstructed head gate for fish passage and water control	PR 6	0	0	0
Pahsimeroi River Riparian Enhancement	Fence was built to exclude grazing, enhance riparian vegetation, and protect critical spawning and rearing habitat on the Pahsimeroi River	PR 17	7,392	14,784	0
Pahsimeroi River Riparian Enhancement	Fence was constructed to exclude grazing, enhance riparian vegetation, and critical spawning and rearing habitat on the Pahsimeroi River	PR 13	4,224	7,709	0
Pahsimeroi River Riparian Enhancement	Established grazing system to improve riparian vegetation along the Pahsimeroi River	Pahsimeroi River and Tributaries	5,000	15,312	0
Pahsimeroi River Riparian Enhancement	Fence was constructed to protect the Pahsimeroi River	PR 6	5,808	5,808	0
Pahsimeroi River Stream Enhancement	Placed stream barbs to stabilize eroding streambanks and protect critical spawning habitat in the Pahsimeroi River	PR 13	2,640	0	0
Pahsimeroi River P8a Diversion Elimination	Eliminated unscreened diversion and maintained flows in Pahsimeroi River, Big Springs, Duck Springs, and Mud Springs creeks	PR 6	0	0	14
Lawson Creek, Pahsimeroi River Riparian Enhancement	Utilized Anderson Spring for livestock watering to eliminate grazing pressure from the Lawson Creek riparian area	Pahsimeroi River and Tributaries	0	0	0
Mahogany Creek, Pahsimeroi River Diversion Enhancement	Installed a livestock water pipeline to conserve water, improve fish passage, and improve livestock distribution	Pahsimeroi River and Tributaries	0	0	0
Pahsimeroi River Diversion Modification	Relocated diversion, eliminated 6 miles of ditch, conserved 6 cfs, and enhanced fish passage	PR 3	0	0	6
Pahsimeroi River Riparian Enhancement	Installed fence to protect the Pahsimeroi River	PR 8	4,382	4,382	0
Pahsimeroi River P12 Diversion Enhancement	Installed pipe to replace 2 miles of open ditch, installed sprinkler irrigation, and removed P11 diversion	PR 6	0	0	4
Pahsimeroi River Diversion Enhancement	Improved diversion for better water control and enhanced fish passage	PR 6	0	0	0
Pahsimeroi River Diversion Enhancement	Consolidated 2 ditches and installed 1 fish screen to eliminate fish barrier and excessive water loss	Pahsimeroi River and Tributaries	0	0	0
Muddy Springs, Pahsimeroi River Riparian Enhancement	Fence built to control grazing, enhance riparian vegetation, and protect critical spawning and rearing habitat on Muddy Springs and Pahsimeroi River	PR 7	10,560	14,516	0
Pahsimeroi River P11 Diversion Enhancement	Eliminate one diversion, consolidate remaining diversions, convert ditches to pipelines, convert flood to sprinkler irrigation, eliminate return flows, and save 7 to 10 cfs	PR 6	0	0	5
Pahsimeroi River Riparian Enhancement	Planted 2,100 willows on outside bends to stabilize streambanks as an Eagle Scout project	PR11	1,684		
		Total	**57,176 FT or 10.8 Miles**	**79,301 FT or 15 miles**	**35 cfs**

Riparian Assessment

Introduction

Riparian conditions on the Pahsimeroi River have improved. This section summarizes an assessment completed by ISCC, IASCD, ISDA, and USBWP in 2003. IDEQ determined the river's water quality was impaired by sediment from streambank erosion and temperature from lack of riparian vegetation (IDEQ, 2001). We assessed conditions, analyzed data, and suggested actions for ten river reaches.

Past Efforts

IDFG currently manages the Pahsimeroi River as a coldwater, anadromous fishery with Rainbow trout, Brook trout, Whitefish, Steelhead, Chinook salmon, Cutthroat trout, and Bull trout present (IDFG, 2001). In 1992, the Lemhi SWCD initiated recovery efforts with their *Irrigators Plan to Improve Passage on the Lemhi River* (Loucks, 2000). Idaho's USBWP assessed conditions and implemented restoration actions in the Lemhi, Pahsimeroi, and East Fork of the Salmon watersheds (ISCC, 1995). Later, the entire Pahsimeroi River drainage was identified as a key watershed, critical to the long term persistence of Bull trout populations (Batt, 1996). The Pahsimeroi subbasin as well as the entire Salmon River Basin has since been designated "proposed but excluded" as final critical habitat for Bull trout (USFWS, 2002).

There have been several assessments and inventories conducted in the subbasin (Young and Harenberg, 1973; Stevenson, 1994; ISCC, 1995; BLM, 1999; IDEQ, 2001; Ferguson, 2001; and Trapani, 2002). Young and Harenberg (1973) performed a reconnaissance survey of water resources in the subbasin. SCS (Stevenson, 1994) conducted an erosion study which estimated amounts from various sources, including streambanks. Then in 1994, interdisciplinary teams from BLM, NRCS, ISCC, IDEQ, BPA, Shoshone Bannock Tribes (SBT), IDFG, SCNF, and USWBP assessed stream habitat on the Pahsimeroi River and Patterson-Big Spring Creek (Trapani, 2002). This assessment was the basis for developing the Model Watershed Plan (ISCC, 1995) that outlined restoration goals and objectives in the Upper Salmon basin.

From 1994 to 1998, IDEQ conducted Beneficial Use Reconnaissance Program (BURP) assessments on the river and several of its tributaries (IDEQ, 2001). BLM finished their *Pahsimeroi Watershed Biological Assessment* in 1999. In 2001, IDEQ completed an erosion inventory and developed the instream TMDL targets for the river (IDEQ, 2001). Ferguson (2001) also provided a visual, baseline assessment of the physical characteristics of the Pahsimeroi River and Patterson Creek channels and riparian areas. In 2002, ten miles of the river were assessed by ISCC, IASCD, ISDA, and USBWP staff to determine critical areas and priority segments for the TMDL agricultural implementation plan.

Assessment Methods

Reaches were delineated using soils, geology, slope, sinuosity, vegetation, hydrology, roads, drainage area, valley type, land ownership, and land use. There are 17 reaches covering 30 river miles. Elevations, slopes, and sinuosity were determined from USGS 7.5' maps and digital orthophotos. The teams completed field sheets while at each reach. Photos were taken at each reach to record conditions.

Assessing Aquatic Habitat Suitability

The Stream Visual Assessment Protocol (SVAP) is a simple procedure used to evaluate the condition of a stream based on visual characteristics. The protocol is used to assess the condition of stream and riparian ecosystems; identify opportunities to enhance biological value; convey information on stream function; and stress the need to protect or to restore riparian areas (NRCS, 1998). SVAP includes 15 qualitative factors and corresponding numeric values, which are then averaged to rate the reach's condition. Currently, NRCS requires the use of SVAP when assessing aquatic habitat and recommends that a "fair" condition be achieved as a minimum goal for conservation planning (NRCS, 2004).

Estimating Streambank Erosion

Streambank Erosion Condition Inventory (SECI) is used to estimate long-term erosion rates. This method produces an index by ranking six factors; bank stability, bank condition, bank cover, channel shape, channel bottom, and deposition. SECI is based on the direct volume method outlined in the Channel Evaluation Workshop (SCS, 1983). The teams used SECI to estimate erosion on the entire reach. Stream erosion rates are estimated by applying lateral recession rates to bank heights and lengths in Table 5. SECI should be used for comparison rather than absolute rates in a sediment budget (NRCS, 2000).

Assessment Summary

In 2003, ISCC, IASCD, ISDA, and USBWP staff used SVAP and SECI to assess 11 reaches on about 10 miles of the Pahsimeroi River. Landowners granted permission to conduct the assessment on these reaches. The other reaches weren't assessed because the reaches were dry or permission wasn't granted.

Table 5. Pahsimeroi River Subbasin Riparian Assessment Summary

Reach	Length (feet)	Length (miles)	SVAP Condition	SECI Condition	Tons / Year	Tons / Mile / Year
PR1	14,664	2.8	NA	NA	NA	NA
PR2	18,862	3.6	NA	NA	NA	NA
PR3	15,076	2.9	NA	NA	NA	NA
PR4	5,366	1.0	NA	NA	NA	NA
PR5	14,362	2.7	NA	NA	NA	NA
PR6	**6,194**	**1.1**	**Good**	**Slight**	**4**	**3**
PR7	**6,007**	**1.1**	**Good**	**Slight**	**6**	**5**
PR8	**9,562**	**1.8**	**Good**	**Slight**	**27**	**15**
PR9	**5,635**	**1.1**	**Good**	**Slight**	**5**	**5**
PR10	**12,919**	**2.4**	**Good**	**Slight**	**64**	**26**
PR11	**2,025**	**0.4**	**Good**	**Moderate**	**17**	**44**
PR12	8,975	1.7	NA	NA	NA	NA
PR13	**3,543**	**0.7**	**Good**	**Slight**	**20**	**30**
PR14	**3,177**	**0.6**	**Good**	**Slight**	**2**	**3**
PR15	**4,362**	**0.8**	**Good**	**Slight**	**13**	**16**
PR16	**2,492**	**0.5**	**Good**	**Slight**	**4**	**8**
PR17	**5,485**	**1.0**	**Good**	**Slight**	**3**	**3**
Total Assessed	**61,401**	**11.6 Miles**				

NA - Not Assessed due to no stream flow or no landowner permission granted

SVAP

One hundred percent of the 11 assessed reaches or about 12 miles of the Pahsimeroi River were in good condition. No reaches were found to be in poor or fair condition. Six reaches, or about 18 miles, were not assessed due to dry stream channels or permission wasn't granted. Eleven of the fifteen SVAP scoring descriptions were rated. Two reaches rated excellent when the optional invertebrate scores were used. Macro invertebrates were not included in the final scores because all reaches were in group one. When these were not used, those two reaches dropped down to good condition. Teams didn't assess riffle embeddedness because the lack of precision amongst teams (NRCS, 2000).

PR11 and PR13 were the lowest scored reaches. Reaches PR8, PR9, PR10, PR6, and PR7 had the next highest scoring group. PR15, PR16, PR14, and PR17 were the reaches with the highest scores. These results are shown in Figure 6.

All reaches had some evidence of livestock access. Only one, PR9 had an animal waste impact on the river or its floodplain. PR10, PR11, PR13, PR14, and PR17 has evidence of past channel alteration with some recovery of the channel and banks. PR11 and PR13 had bank stability problems. PR6, PR7, PR8, PR13, PR14, PR15, and PR17 had water withdrawals impairing habitat. PR8 and PR9 were the reaches scored for canopy cover, and these had 50% shading. These problems are summarized below in Table 6.

Table 6. Pahsimeroi River SVAP Identified Problems

	Pahsimeroi River Assessed Reaches										
SVAP Description	PR 11	PR 13	PR 8	PR 9	PR 10	PR 6	PR 7	PR 15	PR 16	PR 14	PR 17
Channel Condition	X	X			X					X	X
Hydrologic Alteration	X					X	X		X		
Riparian Zone	X	X									
Bank Stability	X	X									
Fish Barriers		X	X				X	X		X	X
Manure Presence	X	X	X	X	X	X	X	X	X	X	X

SECI

Approximately 11 miles or 97% of the river had evidence of slight erosion, while 3% or 0.4 miles rated in moderate condition. No severely eroding reaches were found during the assessment. SECI scores are shown in Table 8 and Figure 7. These results are shown in Figure 9. On these lower reaches, the teams found less streambank erosion than previous efforts (Stevenson, 1994; IDEQ, 2001; Trapani, 2002).

PR11 was the only reach with moderate erosion. Reaches PR8, PR10, and PR13 were in the upper end of the slight category. PR6, PR7, PR9, PR15, and PR16 had slight erosion, while PR14 and PR17 were in the very slight group. PR7, PR8, PR10, PR11, PR13, and PR15 had limited, unprotected streambanks. PR8, PR9, PR10, PR11, PR13, PR15, and PR16 had banks with 40% or less bare or erodible. PR7, PR9, PR10, PR11, PR13 and PR15 had bank stability problems. PR8, PR10, PR11, PR13, and PR15 had actively shifting or laterally moving channels. PR8 and PR11 had some minor channel downcuts and recent sediment deposits. These problems are summarized below in Table 7.

Table 7. Pahsimeroi River SECI Identified Problems

	Pahsimeroi River Assessed Reaches										
SECI Factor	**PR 11**	**PR 13**	**PR 8**	**PR 9**	**PR 10**	**PR 6**	**PR 7**	**PR 15**	**PR 16**	**PR 14**	**PR 17**
Bank Erosion	X	X	X	X	X	X	X	X	X	X	X
Bank Stability	X	X	X		X		X	X			
Vegetation Cover	X	X	X	X	X			X	X		
Lateral Stability	X	X	X		X			X			
Channel Bottom	X		X								
Deposition	X		X			X					

Combined SVAP and SECI

When SVAP and SECI scores are combined, three groups of reaches are apparent, shown in Table 8 and Figure 9. The first group contains reaches PR11 and PR13, the lowest ranked reaches. Next, reaches PR6, PR7, PR8, PR10, and PR16 are the middle ranking, second group. Reaches PR9, PR14, PR15, and PR17 are the group with the highest scores.

Table 8. Pahsimeroi River Combined SVAP+SECI^{-1} Scores

Reach	SVAP Total Score	SECI Index Score	Inverse SECI^{-1} (15-SECI Index)	Combined SVAP+SECI^{-1}
PR11	82	5.0	10.0	92
PR13	85	3.5	11.5	96.5
PR8	91	4.0	11.0	102
PR16	90	2.0	13.0	103
PR10	92	3.7	11.3	103.3
PR7	90	1.5	13.5	103.5
PR6	92	1.5	13.5	105.5
PR15	93	2.5	12.5	105.5
PR9	94	2.0	13.0	107
PR14	93	1.0	14.0	107
PR17	93	1.0	14.0	107

Figure 4. Pahsimeroi River SVAP Rating Map

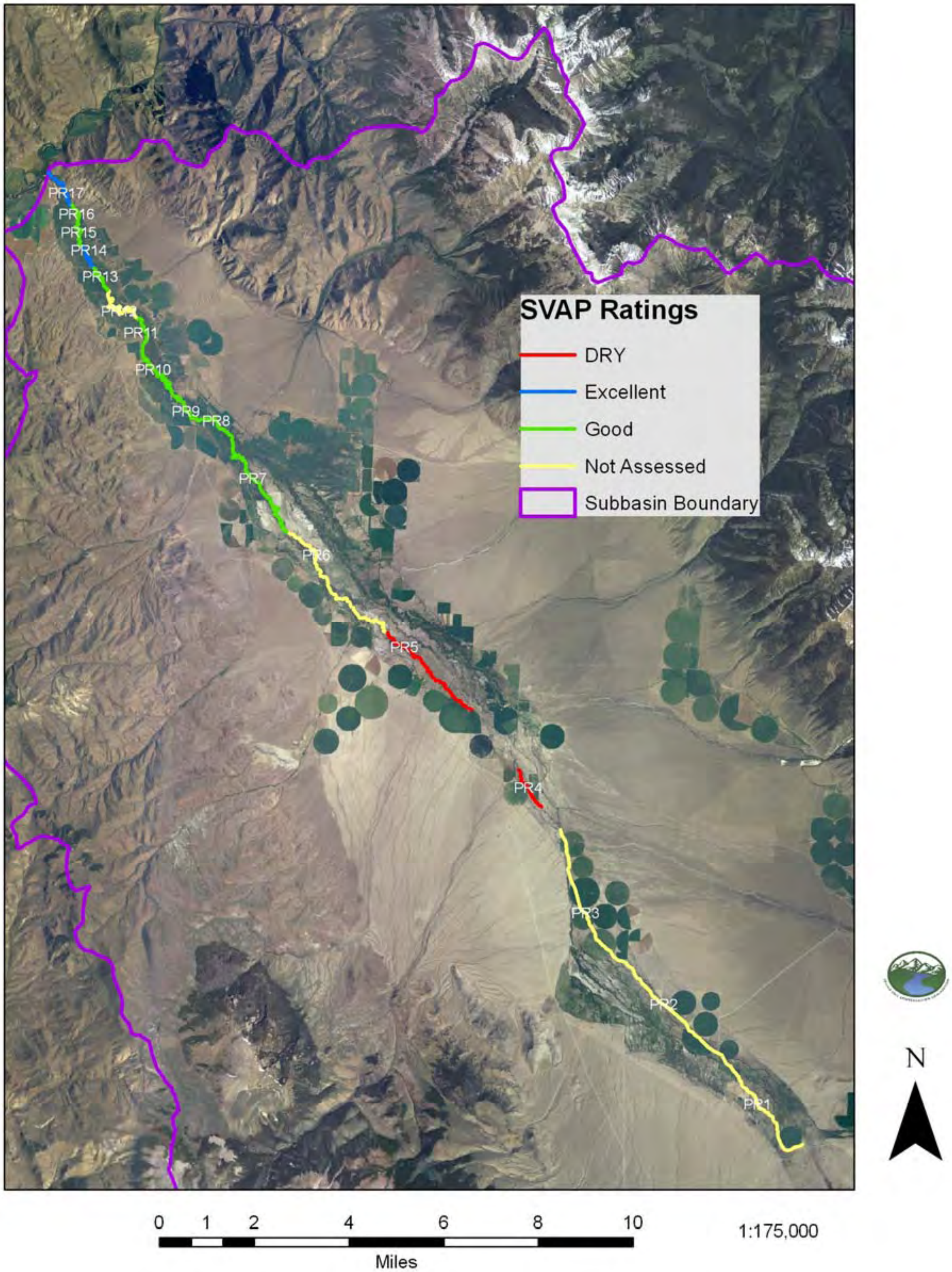
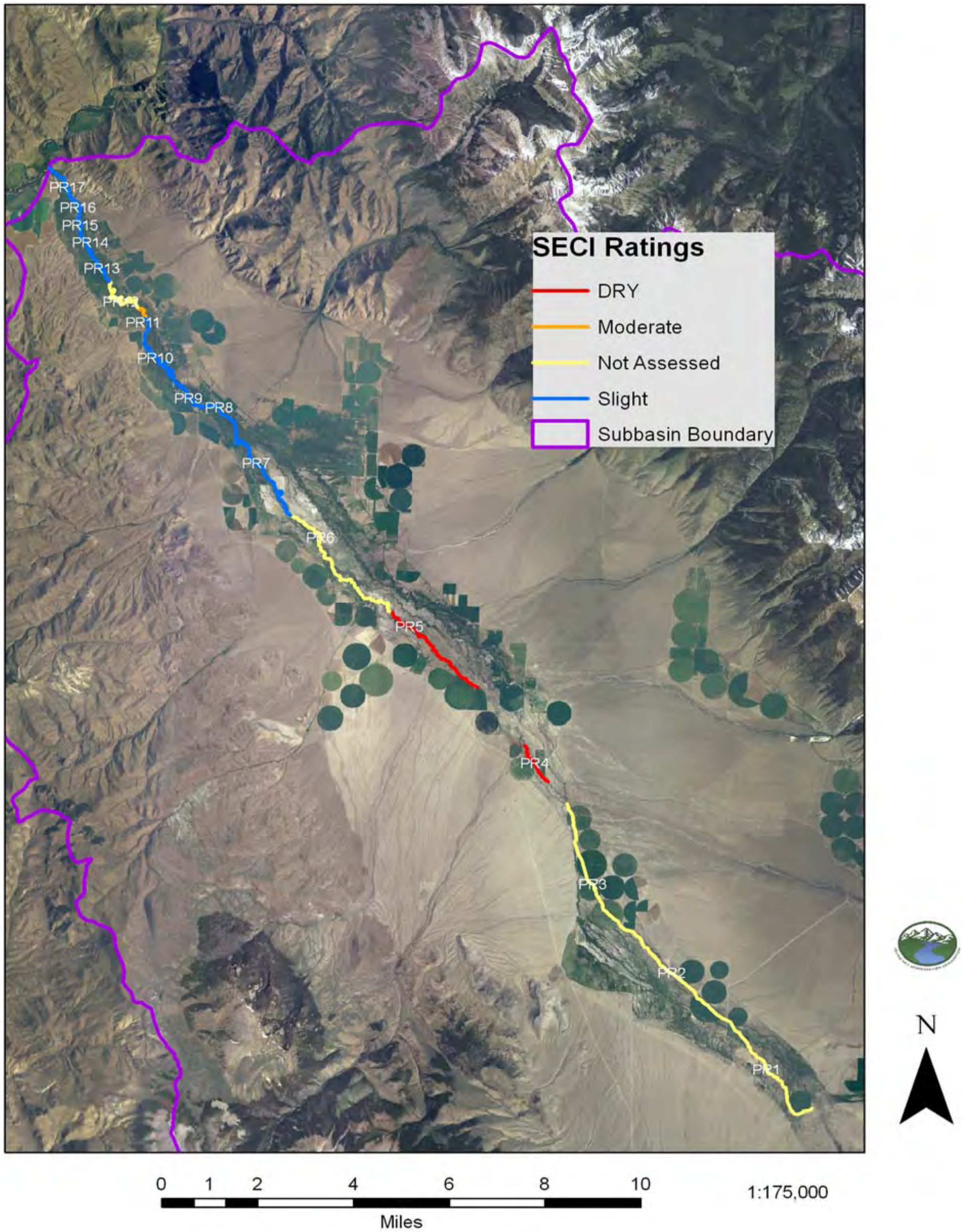


Figure 5. Pahsimeroi River SECI Rating Map



Discussion

Results show recovery has occurred on the lower reaches of the river. Reaches above Hooper Lane were not assessed because there was no water in the channel. Stevenson (1994) found accelerated erosion occurring on streambanks, because grazing impacts, bank trampling, and vegetation removal triggered bank cutting, channel widening, and deepening.

IDEQ's streambank erosion inventory explained streambank erosion occurs on the upper reaches above Hooper Lane (IDEQ, 2001). Ferguson (2001) observed the river's channel stability was provided by cobble/boulder substrate and woody/herbaceous vegetation. Ferguson also found the river's channel was dry above Hooper Lane. Trapani (2002) concluded the river functions properly with some riparian limitations and channel sedimentation. Their evaluation also ceased at Hooper Lane because there was insufficient water to support anadromous fish.

In this assessment, all eleven reaches had evidence of some livestock access. Barriers to fish movement were identified on six reaches. Five reaches need more recovery in channel conditions. Additionally, reaches PR11 and PR13 have inadequate riparian buffers; unstable streambanks; and depleted base flows.

Remarkable progress has been made. BMP implementation may increase SVAP scores an average of 6% with increases ranging from 2% to 17% to reach an excellent condition. SECI rankings could be reduced by 70% with reductions ranging from 0% to 90% to reach a very slight erosion condition. IDEQ (2001) recommends sediment from streambank erosion be reduced by 75%, with reductions ranging from 0% to 95%. Combined SVAP and SECI scores might increase an average of 18% with increases ranging from 0% to 56% to attain desired combined SVAP and SECI scores in excellent and very slight condition.

Recommendations

All problems identified can be resolved by following the USBWP's strategy (ISCC, 1995; Loucks, 2000; Trapani, 2002). This strategy protects or reestablishes adult and juvenile fish passage; riparian areas with corridor fencing and easements; grazing systems and riparian pastures; and conservation reserves or use exclusions. The USBWP, Lemhi and Custer SWCDs are successfully applying this strategy. Several projects are complete or in progress (Loucks, 2000; Trapani, 2002; USBWP, 2005). The projects include the installation of riparian fencing; implementation of pasture management programs; irrigation diversion modifications; irrigation efficiency improvements; and irrigation ditch consolidation (USBWP, 2005).

High priority actions for the Pahsimeroi subbasin included (ISCC, 1995):

- *Augmenting Pahsimeroi River flows with Salmon River water*
- *Develop water conservation agreements to reduce stream diversions*
- *Maintain and enhance riparian corridor along 17 miles of critical fish habitat*
- *Reduce streambank erosion on 14 miles of river below Hooper Lane*
- *Stabilize headcut where Sulfur Creek enters the Pahsimeroi River*
- *Improve fish screens and stabilize 12 diversions*

Reaches PR11 and PR13 need considerable improvements for several riparian and erosion conditions. On other reaches livestock access, seasonal dewatering, fish barriers, and channel condition need to be addressed to attain a slightly eroding or excellent habitat condition.

The USBWP's plan for monitoring should be followed. New protocols can be incorporated when necessary. Existing and future reference sites should be monitored to document improvements and measure success.

Figure 6. Pahsimeroi River SVAP Total Score Ratings

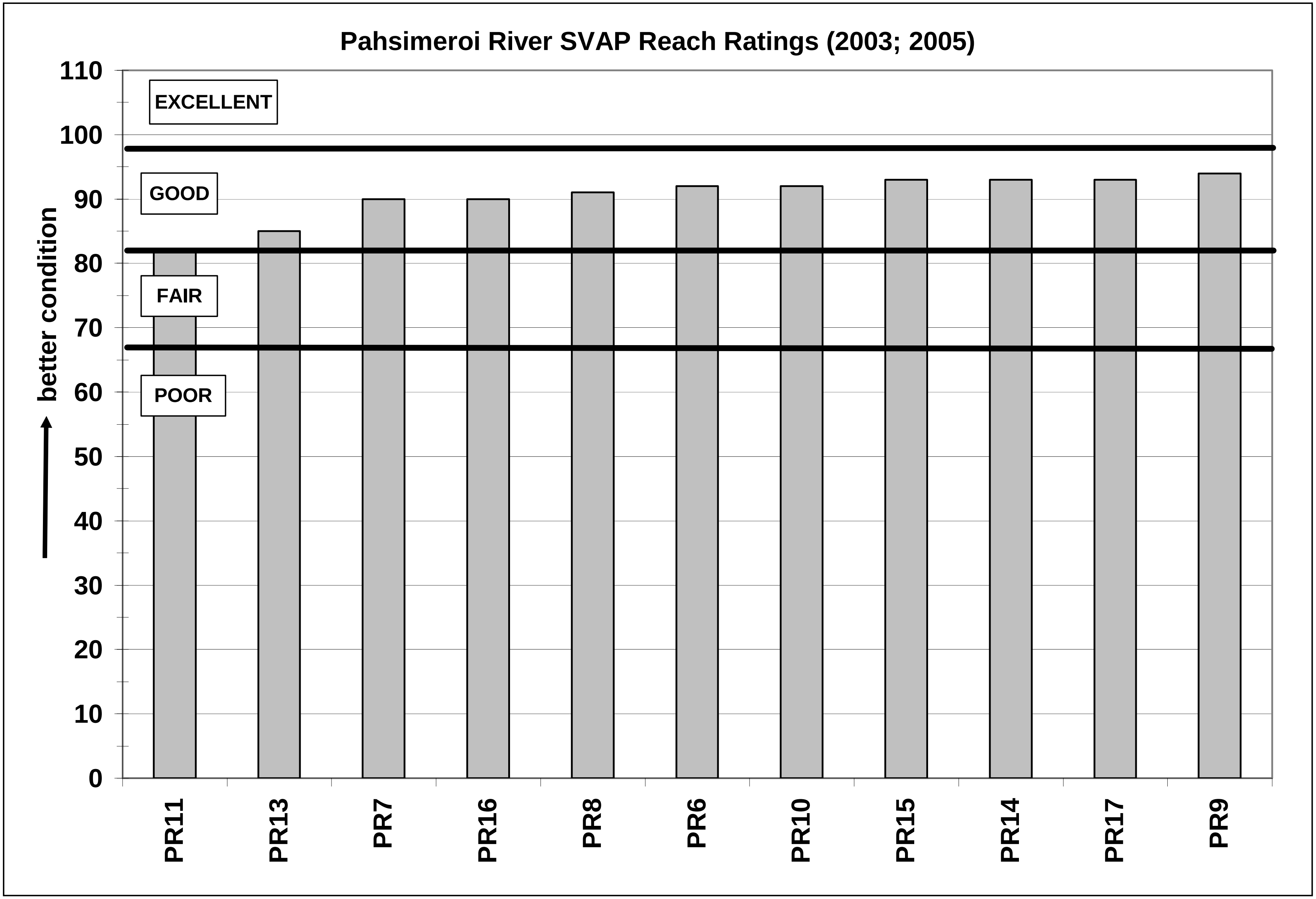


Figure 7. Pahsimeroi River SECI Total Score Ratings

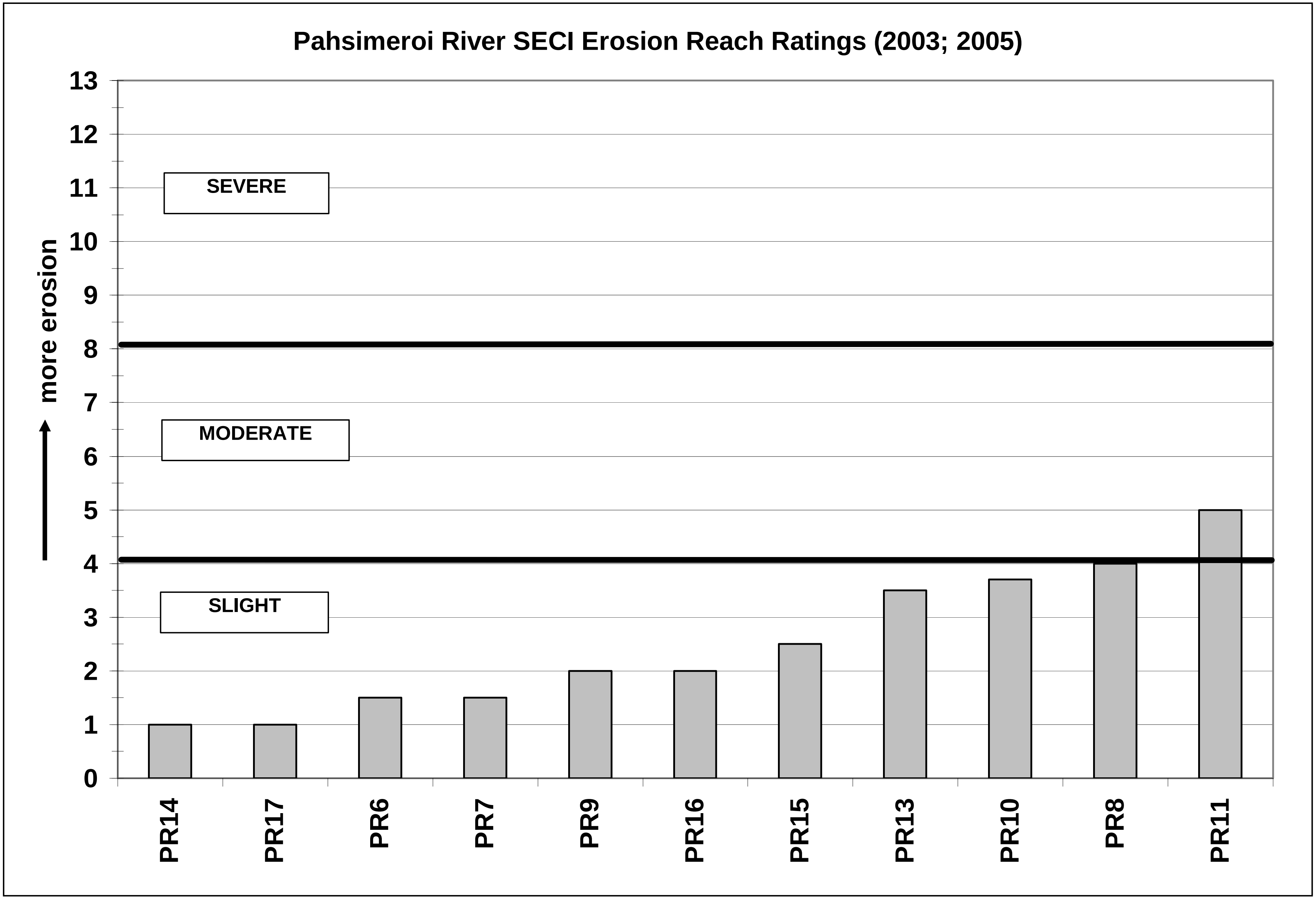


Figure 8. Pahsimeroi River Combined SVAP+SECI[-1] Ratings

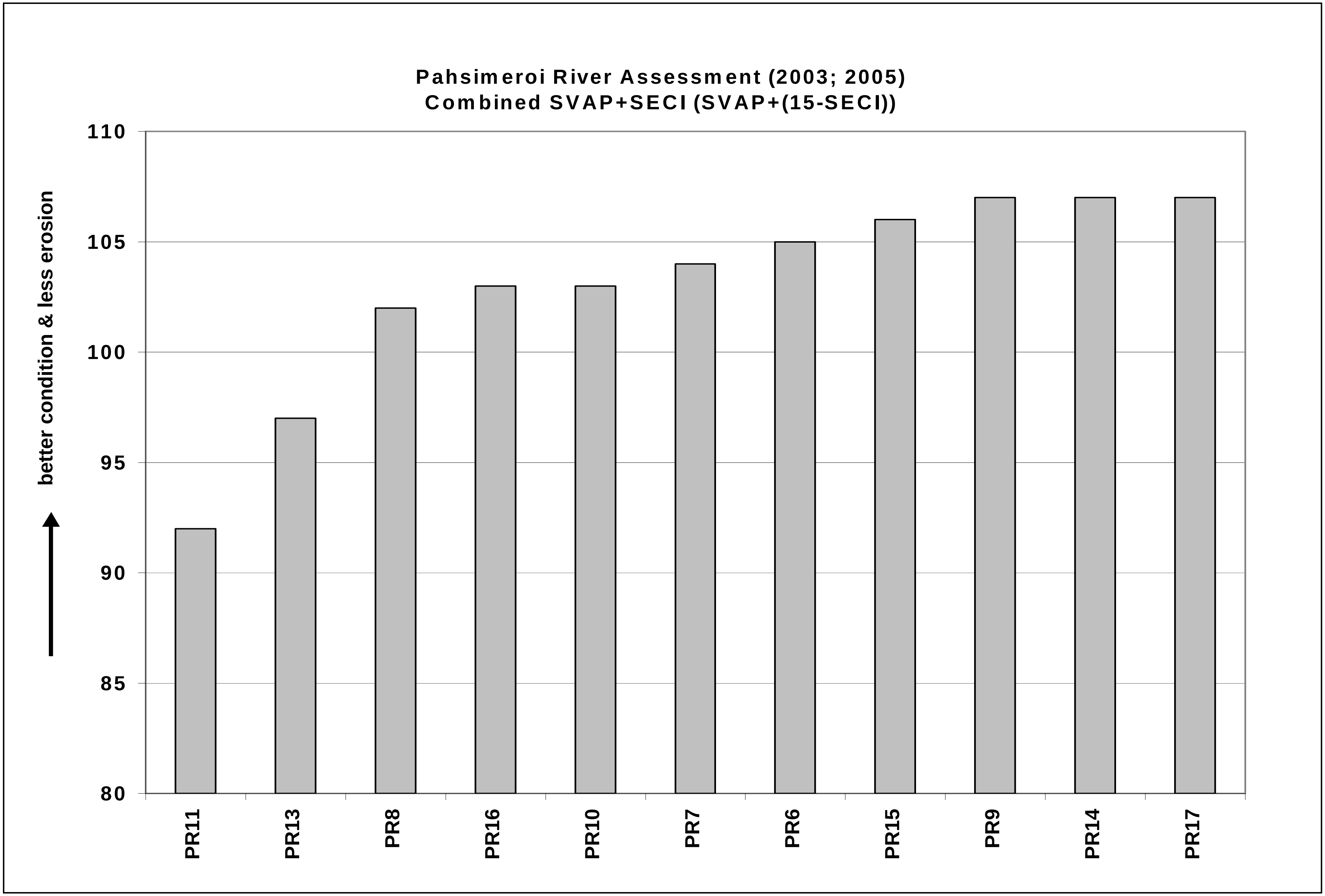
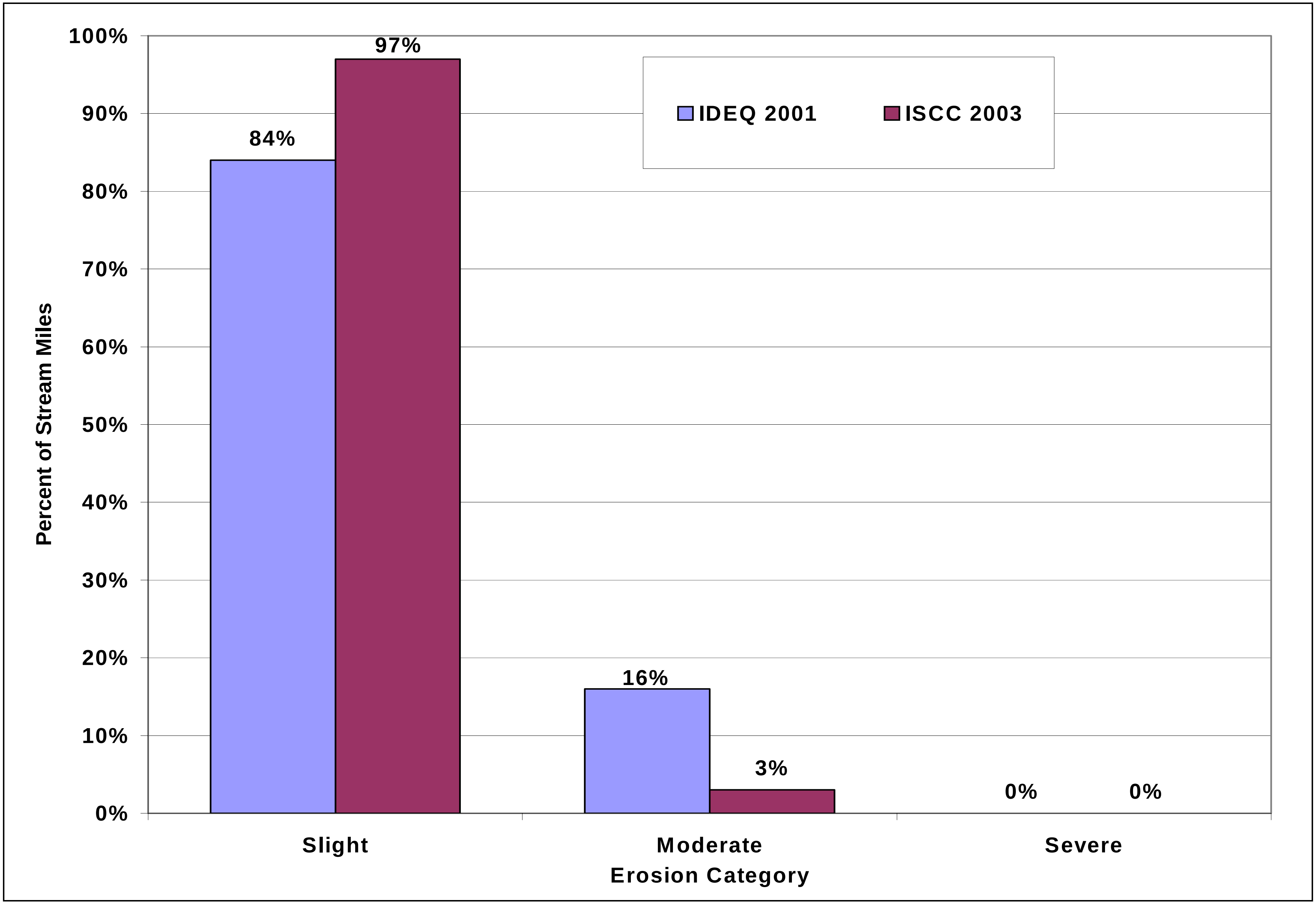


Figure 9. Pahsimeroi River IDEQ and ISCC SECI Comparison of Ratings (IDEQ, 2001 and ISCC, 2003)



Problem Statement

Pollutants of Concern

The Pahsimeroi River Subbasin Assessment and TMDL specified sediment and nutrients as the pollutants of concern. In the Pahsimeroi River there is a current sediment load of 2,838 tons/year and 744 tons/year proposed erosion rate, which equates to a 74% reduction in sediment as shown in Table 9 (IDEQ, 2001). The source of sediment to the river has been identified as stream bank erosion (ISCC, 1995: Swift, 1995)

Identified Problems

IDEQ (2001) recommends existing sediment from streambank erosion be reduced by 75%, with reductions ranging from 0% to 95%. Sediment sources originally identified for the subbasin include; streambank, rangeland, gully, irrigated cropland, pasture and hayland, and forestland. Of the six, four were determined as possible accelerated sediment sources; streambank, rangeland, gully and irrigated cropland. There is little evidence of erosion from pasture and hayland in the subbasin (Stevenson, 1994).

Table 9. Sediment load allocations/reductions by erosion inventory reach (IDEQ, 2001)

Reach Number (downstream to upstream)	Existing Erosion (tons/mi/yr)	Total Erosion (tons/yr)	Proposed Erosion (tons/mi/yr)	Load Allocation (tons/yr)	Percent Reduction (%)	Percent of Total (%)
1	1.8	6.0	2.2	7.7	0	<1
2	14.8	40.0	6.7	18.3	55	1
3	9.4	30.0	3.4	10.6	64	1
4	24.7	43.0	7.9	13.7	68	2
5	10.0	27.0	6.0	15.0	40	1
6	63.0	115.0	9.0	16.4	86	4
7	2.0	4.0	4.0	8.0	0	<1
8	15.0	43.0	6.0	16.0	60	2
9	111.0	60.0	7.0	4.0	94	2
10	92.0	65.0	13.0	9.6	86	2
11	67.0	236.0	11.0	39.3	84	8
12	2.2	1.2	2.2	1.2	0	0
13	40.0	21.0	7.0	3.5	83	1
14	2.0	1.0	2.0	1.6	0	<1
15	8.0	22.0	3.0	9.1	63	1
16	177.0	1,291.0	73.0	531.0	59	45
17	147.0	833.0	7.0	39.0	95	29
Totals		**2,838.2**		**744.1**	**74**	

Beneficial uses can only be achieved if reductions in sediment are made on the public as well as private lands. Reaches from Table 9 that are on public lands have a proposed reduction in sediment of 1,663 tons per year. Private reaches from the same table have a proposed reduction in sediment of 491 tons per year. Consequently, 30% of the proposed reduction in sediment is on private lands and 70% is on public lands.

Critical Areas

Critical areas are those areas having the most significant impact on the quality of the receiving waters. These critical areas include pollutant source and transport areas. The subbasin consists of approximately 537,210 acres with private land accounting for 46,704 acres. The predominant private land uses within the subbasin are cropland and pasture, 35,550 acres, herbaceous rangeland and mixed rangeland 5,047 and 4,724 acres respectively. In order to allocate available resources most effectively, implementation should be focused toward the tiers shown in Table 10.

Implementation Tiers

Critical areas adjacent to the Pahsimeroi 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 four tiers delineated within the subbasin. 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**

Tier 4 **Animal Feeding Operations (AFOs)**

Proposed Treatment

The subbasin is divided into four treatment units that have similar land uses, soils, productivity, resource concerns, and treatment needs.

AFOs

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 2003, ISDA and ISCC conducted a preliminary inventory of 19 animal feed operations and corral facilities in the subbasin and have approximately 20 more to assess.

Table 10. Treatment Units in the Pahsimeroi River Subbasin

	TU 1	TU 2	TU 3	TU 4
Subbasin	**Riparian Acres**	**Pasture and Hayland Acres**	**Rangeland and Forest Land**	**Animal Facilities**
Pahsimeroi River	705	35,159	10,820	40
Total	**705**	**35,159**	**10,820**	**20**

Treatment Unit (TU1) Stream Channels and Riparian Areas

Acres	Soils	Resource Problems
468	**Biglost-Copperbasin-Thosand:** Very deep, nearly level, poorly drained to moderately well drained soils formed in mixed alluvium	Unstable and erosive streambanks Dewatered stream reaches Barriers to fish migration and movement
237	**Mooretown-Tohobit-Bursteadt:** Very deep, nearly level, somewhat poorly drained to moderately well drained soils formed in mixed alluvium.	Unstable and erosive streambanks Dewatered stream reaches Barriers to fish migration and movement

Treatment Unit (TU2) Pasture and Hayland

Acres	Soils	Resource Problems
10,639	**Biglost-Copperbasin-Thosand:** Very deep, nearly level, poorly drained to moderately well drained soils formed in mixed alluvium	Surface irrigation erosion Sprinkler irrigation erosion Ephemeral gully erosion
3,938	**Mooretown-Tohobit-Bursteadt:** Very deep, nearly level, somewhat poorly drained to moderately well drained soils formed in mixed alluvium.	Surface irrigation erosion Sprinkler irrigation erosion Ephemeral gully erosion
523	**Arbus-Fandow-Mountainboy:** Shallow to moderately deep to hardpan and very deep, undulating to hilly, somewhat excessively drained soils formed in alluvium from limestone.	Surface irrigation erosion Sprinkler irrigation erosion Ephemeral gully erosion
12,343	**Pahsimeroi-Whiteknob-Leadore:** Very deep, undulating to hilly, somewhat excessively drained and well drained soils formed in alluvium from extrusive igneous, quartzitic and mixed rock.	Surface irrigation erosion Sprinkler irrigation erosion Ephemeral gully erosion
7,716	**Simeroi-Whitecloud-Ringle:** Very deep, undulating to hilly, somewhat excessively drained and well drained soils formed in alluvium from limestone.	Surface irrigation erosion Sprinkler irrigation erosion Ephemeral gully erosion

Treatment Unit (TU3) Rangeland and Forest Lands

Acres	Soils	Resource Problems
4,392	**Pahsimeroi-Whiteknob-Leadore:** Very deep, undulating to hilly, somewhat excessively drained and well drained soils formed in alluvium from extrusive igneous, quartzitic and mixed rock.	Sheet and rill erosion Ephemeral gully erosion Classic Gully erosion
1,690	**Calcids-Dawtonia-Venum:** Moderately deep to very deep, rolling to very steep, well drained soils formed in colluvium from quartzitic and mixed rock sources.	Sheet and rill erosion Ephemeral gully erosion Classic Gully erosion
1,083	**Arbus-Fandow-Mountainboy:** Shallow to moderately deep to hardpan and very deep, undulating to hilly, somewhat excessively drained soils formed in alluvium from limestone.	Sheet and rill erosion Ephemeral gully erosion Classic Gully erosion
337	**Biglost-Copperbasin-Thosand:** Very deep, nearly level, poorly drained to moderately well drained soils formed in mixed alluvium	Sheet and rill erosion Ephemeral gully erosion Classic Gully erosion
285	**Mooretown-Tohobit-Bursteadt:** Very deep, nearly level, somewhat poorly drained to moderately well drained soils formed in mixed alluvium.	Sheet and rill erosion Ephemeral gully erosion Classic Gully erosion
270	**Cryolls-Zeale-Zeelnot:** Moderately deep to very deep, hilly to very steep, well drained soils formed in colluvium from limestone and mixed rock sources.	Sheet and rill erosion Ephemeral gully erosion Classic Gully erosion
800	**Zeebar-Donkehill-Parkay:** Shallow to very deep, hilly to very steep, well drained soils formed in colluvium and residuum from extrusive igneous rock sources.	Sheet and rill erosion Ephemeral gully erosion Classic Gully erosion
1,963	**Simeroi-Whitecloud-Ringle:** Very deep, undulating to hilly, somewhat excessively drained and well drained soils formed in alluvium from limestone.	Sheet and rill erosion Ephemeral gully erosion Classic Gully erosion

Treatment Unit (TU4) Animal Feeding Operations (AFOs)

Units	Soils	Resource Problems
??	**Biglost-Copperbasin-Thosand:** Very deep, nearly level, poorly drained to moderately well drained soils formed in mixed alluvium	Lack of drinking water sources Inadequate waste storage Runoff from corrals or pens
??	**Mooretown-Tohobit-Bursteadt:** Very deep, nearly level, somewhat poorly drained to moderately well drained soils formed in mixed alluvium.	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 when technical and financial assistance is available. The proposed treatment for pollutant reduction will be to implement BMPs through conservation plans. Table 11 lists the BMP amounts and costs of BMPs that may be used to restore beneficial uses in the subbasin. In 1997, IASCD estimated the cost of BMP implementation was $1,901,500 (Koester, 1997). Final costs will be developed on a site specific basis with each landowner, through program and project implementation activities.

Table 11. Estimated BMP Installation Costs for the Pahsimeroi River Subbasin

Treatment Unit	Best Management Practice	Unit Type	Unit Cost	Unit Amount	C/S Funds	Participant Funds	Total Funds
TU1 Stream Channels & Riparian	Channel Vegetation	foot	$5.35	21,120	$84,744	$28,248	$112,992
	Fence, Jack	foot	$5.35	62,000	$248,775	$82,925	$331,700
	Fence, 4-wire	foot	$1.60	17,200	$20,640	$6,880	$27,520
	Heavy Use Area Protection	each	$667.00	20	$10,005	$3,335	$13,340
	Prescribed Grazing	aum	$1.00	475	$356	$119	$475
	Riparian Forest Buffer	tree	$5.35	5,000	$20,063	$6,688	$26,750
	Stream Bank Protection	cuyd	$46.70	800	$28,020	$9,340	$37,360
	Stream Channel Stabilization	cuyd	$46.70	900	$31,523	$10,508	$42,030
	Tree/Shrub Establishment	each	$5.35	5,000	$20,063	$6,688	$26,750
	Use Exclusion	aum	$12.00	300	$2,700	$900	$3,600
				Subtotal	**$466,888**	**$155,629**	**$622,517**
TU2 Irrigated Ag Lands	Irrigation System, CP and WL	acre	$620.00	5,000	$2,325,000	$775,000	$3,100,000
	Irrigation System, Handline	acre	$350.00	750	$196,875	$65,625	$262,500
	Structure for Water Control, Concrete	cuyd	$500.00	120	$45,000	$15,000	$60,000
	Irrigation Water Management	acre	$2.00	15,000	$22,500	$7,500	$30,000
	Nutrient Management	field	$55.00	300	$12,375	$4,125	$16,500
	Pasture & Hayland Planting	acre	$100.00	500	$37,500	$12,500	$50,000
	Structure for Water Control, Metal	each	$2,670.00	20	$40,050	$13,350	$53,400
	Prescribed Grazing	aum	$1.00	3,500	$2,625	$875	$3,500
				Subtotal	**$2,681,925**	**$893,975**	**$3,575,900**
TU3 Dry Grazing Lands	Fence, 4-wire	foot	$1.60	5,000	$6,000	$2,000	$8,000
	Pipeline, PE 100 psi, 2.0"	foot	$2.55	10,000	$19,125	$6,375	$25,500
	Prescribed Grazing	aum	$1.00	4,000	$3,000	$1,000	$4,000
	Spring Development	each	$1,333.00	15	$14,996	$4,999	$19,995
	Watering Facility, Trough	each	$1,330.00	35	$34,913	$11,638	$46,550
	Water Well	feet	$26.70	300	$6,008	$2,003	$8,010
				Subtotal	**$84,041**	**$28,014**	**$112,055**
TU4 AFOs	Corral Berm, Imported	cuyd	$20.00	9,750	$146,250	$48,750	$195,000
	Corral Berm, Earthen Fill	cuyd	$4.00	32,500	$97,500	$32,500	$130,000
	Nutrient Management	field	$55.00	125	$5,156	$1,719	$6,875
	Waste Storage Facility, Flat Concrete	cuyd	$200.00	500	$75,000	$25,000	$100,000
	Waste Storage Facility, Concrete Wall	cuyd	$400.00	500	$150,000	$50,000	$200,000
	Fence, Corral	foot	$10.00	47,500	$356,250	$118,750	$475,000
	Pipeline, PE 100 psi, 2.0"	foot	$2.55	8,000	$15,300	$5,100	$20,400
	Watering Facility, Trough	each	$1,330.00	50	$49,875	$16,625	$66,500
	Water Well	foot	$26.70	1,500	$30,038	$10,013	$40,050
				Subtotal	**$925,369**	**$308,456**	**$1,233,825**
				Total	**$4,158,223**	**$1,386,074**	**$5,544,297**

Implementation Alternatives

Implementation alternatives were developed that focused on the identified treatment units. The following alternatives were developed for consideration utilizing treatment levels discussed in the Model Watershed Plan:

1. No Planned Action
2. Level I-High priority actions would be implemented
3. Level II-High and medium priority actions would be implemented
4. Riparian and stream channel restoration
5. Animal facility waste management

Description of Alternatives

Alternative 1 – No Planned Action

This alternative represents existing resource conditions if no new actions take place. The identified problems would continue to negatively impact beneficial uses in Pahsimeroi River.

Alternative 2 – Level I

This alternative would implement high priority actions in Tiers 1 and 4. This alternative would reduce sediment and nutrient runoff from animal facilities, reduce surface and sprinkler irrigation erosion, and ephemeral gully erosion from fields with direct impact to the stream improving water quality in the subbasin and reducing pollutant loading to the Pahsimeroi River. Developing water conservation agreements, voluntary landowner participation in the reducing accelerated streambank erosion, eliminating barriers to fish passage, and where possible, returning flow to dewatered reaches would improve water quality, riparian vegetation, aquatic habitat and fish passage in subbasin. Part of this improvement would be achieved through maintenance and enhancement of the riparian corridor along 17 miles of critical habitat in the reach from the mouth to Hooper Lane. Reducing levels of stream diversion would also be part of this alternative, along with improving five irrigation diversions. Beneficial uses may be achieved or improved with implementation of this alternative. This alternative includes voluntary and mandatory landowner participation.

Alternative 3 – Level II

This alternative would implement the high priority actions mentioned above and medium priority actions in Tiers 2 and 3. It would help reduce surface and sprinkler irrigation erosion, and ephemeral gully erosion from fields with indirect, yet substantial impact to the stream. There would likely be erosion reductions in sheet and rill, ephemeral gully, and classic gully on range and forest lands that indirectly influence the stream. This will improve water quality in the subbasin and reduce pollutant loading to the Pahsimeroi River. Beneficial uses will be supported with implementation of this alternative. This alternative includes voluntary landowner participation.

Alternative Selection

The Custer SWCD selected Alternative 2 for this subbasin. These alternatives meet objectives set forth in their resource conservation plan by improving water quality in the subbasin (Custer SWCD, 2005).

Table 12. Estimated Timeline for TMDL Agricultural Implementation

Task	Output	Milestone
Develop conservation plans and contracts	Completed contract agreements	2007
Finalize BMP designs	Completed BMP plans and designs	2009
Design and install approved BMPs	Certify BMP installations	2012
Track BMP installation	Implementation progress report	2012
Evaluate BMP & project effectiveness	Complete project effectiveness report	2014

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