Pahsimeroi River Subbasin Assessment and Total Maximum Daily Load

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EXECUTIVE SUMMARY

Water quality, native fish populations and riparian habitat conditions have been issues of concern in the Pahsimeroi River watershed since the combined effects of warm season grazing, introduction of exotic species, and human-caused channelization and diversion have synergized with natural infiltration of stream flows to limit the production and survival of native resident and anadromous fish. The Idaho Department of Environmental Quality (DEQ) has identified the Pahsimeroi River as not supporting the beneficial uses of salmonid spawning and coldwater aquatic life as defined in state Water Quality Standards and the federal Clean Water Act. Additionally the Pahsimeroi River is an important component of the Upper Salmon River bull trout recovery unit for the state of Idaho.

Assessments by DEQ have identified that water quality has been limited by deposition of sediment in the stream channel due to streambank erosion and elevated stream temperature due to the reduction of riparian vegetation. Previous assessments by the Bureau of Land Management, the U.S. Forest Service, and the State Soil Conservation Commission have also identified similar sources of pollutants and the problems associated with water quality in the Pahsimeroi River watershed.

Recent improvement in land management practices have created the future potential for improving water quality, fish habitat conditions, fish passage, spawning success and connectivity within and among the Pahsimeroi River, its tributaries, and the Salmon River. Water quality and habitat conditions have shown improvement where best management practices have been implemented. It is expected that with continued riparian management beneficial uses will be restored in much of the system. It is not likely that beneficial uses will ever be observed in segments of the watershed where natural dewatering from stream flow infiltration occurs during significant periods of the year. The relationship of groundwater and surface water is very important within the Pahsimeroi River watershed. The two cannot be separated. The natural conditions within the watershed play an important role when attempting to identify the reduction of pollutant loads necessary for beneficial use restoration. It is not prudent to pour money into water quality improvement projects where beneficial uses cannot be attained, and likely never existed naturally.

The Clean Water Act requires that the state of Idaho identify water quality limited surface waters and develop a plan to restore beneficial use support to these waters. The Endangered Species Act requires that conservation plans be developed and implemented to restore anadromous and bull trout populations to levels that insure their persistence in the Pahsimeroi River Watershed. To the extent practical and possible the Pahsimeroi total maximum daily load (TMDL), in addition to restoring beneficial uses on water quality limited water bodies, will assist any conservation plan for endangered species recovery by improving water quality and habitat conditions through the implementation of best management practices.

DEQ has developed recommendations for the reduction of stream bank erosion and water temperature within the Pahsimeroi River that would ultimately result in beneficial use support

through improving stream bank stability and subsequently riparian vegetation. Sediment loads are quantified through stream bank erosion inventories that estimate stream bank erosion based on stream bank conditions observed and documented along 17 reaches of the Pahsimeroi River. Instream sediment targets have been identified from literature values that are supportive of salmonid spawning and coldwater biota. These target values will be used to track the progress of stream bank recovery and determine the need for additional management practices to improve water quality. Maximum daily average and daily instantaneous maximum temperatures are quantified through temperature monitoring conducted at the Idaho Power Company's Pahsimeroi Fish Hatchery operated by the Idaho Department of Fish and Game. Instream temperature targets have been identified from existing State of Idaho Water Quality Standards for salmonid spawning and rearing. Temperature targets have been used to identify temperature load reductions that are required to meet state water quality standards.

The recommended load allocation within this TMDL is an overall reduction of 74% in sediment from streambank erosion. Table 1 summarizes the prescribed sediment reductions for the Pahsimeroi River. This reduction of sediment from stream bank erosion should result in a reduction of streambed fine sediment smaller than 6.35 mm (0.25 in) to the target level of 28% or less to a depth of 6 inches in anadromous fish spawning habitat and to a depth of 4 inches in exclusively resident fish spawning habitat. These reductions incorporate an implicit margin of safety to assure restoration of beneficial uses and equate to stream bank erosion rates expected at 80% stream bank stability, which is considered natural background erosion within this TMDL. Monitoring will be conducted by land management agencies to determine the adequacy of reductions and management practices.

The recommendation within this TMDL is that there be no change in the waste load allocation for the Pahsimeroi River Hatchery. Given the site-specific conditions found at the Pahsimeroi River Fish Hatchery, it is felt that the existing National Pollutant Discharge Elimination System (NPDES) permit is adequately protective of water quality at and below the point of discharge of hatchery effluent from the rearing ponds located just downstream from Dowton Lane, and that more restrictive limitations are not required at this time. Additionally, there will be no net increase of future effluent concentration limitations of suspended or settleable solids to the Pahsimeroi River from the Pahsimeroi Hatchery rearing ponds. The NPDES permit sets effluent limitations for suspended solids not to exceed 5.0 mg/l daily average with the daily maximum not to exceed 15 mg/l and the limitation for settleable solids is 0.1 ml/l daily average evaluated from samples collected once per month at the discharge of the rearing ponds (Table 2).

Table 1 Sediment load allocations/reductions by erosion inventory reach.

Reach Number (from downstream to upstream)	Existing Erosion Rate (t/mi/y)	Existing Total Erosion Rate (t/y)	Proposed Erosion Rate (t/mi/y)	Load Allocations (t/y)	Erosion Rate Percent Reduction	Percent of Total Erosion
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	1291.0	73.0	531.0	59	45
17	147.0	833.0	7.0	39.0	95	29
Totals		**2838.2**		**744.1**	**74**	

Table 2 Pahsimeroi River TMDL summary of load reductions.

Total Cumulative Sediment Reduction from Streambank Erosion	Waste Load Allocation for Suspended and Settleable Solids from the Pahsimeroi Hatchery	Reduction of Daily Average Temperature at Pahsimeroi Hatchery Point of Compliance
74 Percent sediment load reduction	5.0 mg/l daily average of suspended solids	6º C (11º F) May and August
2,094 tons sediment load reduction	15 mg/l daily maximum of suspended solids	40% degrees C (18% degrees F) temperature load reduction
	0.1 ml/l daily average of settleable solids	

1.0 Characterization of the Watershed

The Pahsimeroi River subbasin (Hydrologic Unit Code [HUC] #17060202) is located in east-central Idaho between the Lost River Mountain Range and the Lemhi Mountain Range (Figure 1). The Pahsimeroi River originates near the highest peak in Idaho, Borah Peak, within the Lost River Range. The river flows northward and joins the Salmon River near the town-site of Ellis. The Pahsimeroi River 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 is about 839 (Bureau of Land Management [BLM], 1999a) to 845 (Young and Harenberg, 1973) square miles. 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. Elevations in surrounding mountains are as high as 10,971 feet in the Lemhi Mountains, 12,662 feet (Borah Peak) in the Lost River Mountains, and 9,550 feet in the Donkey Hills, which separate the drainage from the Little Lost River.

Portions of this document are excerpted from a biological assessment completed by the BLM (BLM, 1999a) under the requirements of the Endangered Species Act. The Pahsimeroi subbasin assessment and TMDL utilizes factual information from existing authorities that have linkage to the water quality conditions of the Pahsimeroi River Subbasin.

1.1 Climate

The climate of the Pahsimeroi River subbasin is typical of central Idaho mountainous areas with cold winters and hot, dry summers affected by Pacific maritime air masses. Influences of elevation, topography, and aspect cause climate conditions to be variable throughout the subbasin.

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.

1.2 Geology

The Lost River Range and Lemhi Mountain Range parallel the sediment-filled Pahsimeroi Valley. Both ranges are part of the Basin and Range fault block complex of eastern and central Idaho formed nearly 17 million years ago (Alt and Hyndman, 1989). This faulting created the mountain ranges surrounding the flatter Pahsimeroi Valley bottom. The steeper gradients present along the Lemhi range indicate high-angle faulting as compared to the flatter Lost River Range to the west. The divide between the Pahsimeroi and Little Lost River subbasins is formed by the Donkey Hills. It was originally believed that the Pahsimeroi and Little Lost River basins ran together as one, north into the Salmon River until the formation of the Donkey Hills. The Donkey Hills appear to be

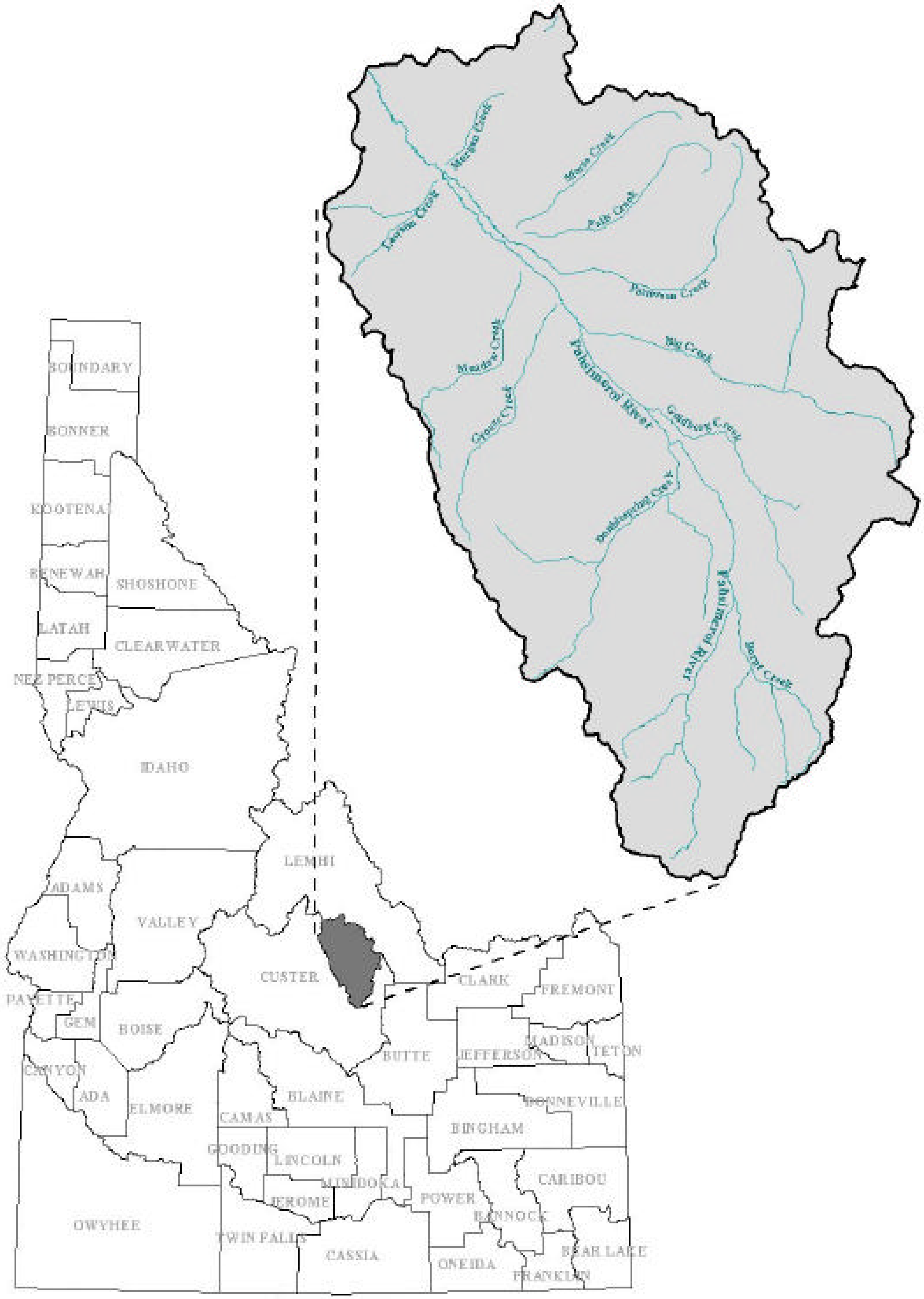

Figure 1. Pahsimeroi Subbasin Watershed.

ancient terraces and alluvial slopes uplifted to form a barrier between the two valleys (Meinzer, 1924).

The last major fault movements occurred in 1983 (the Borah Peak earthquake). Mount Borah is located on the southern edge of the subbasin in the Lost River Range (Maley, 1987). As a result of the earthquake, the Lost River Range raised one foot while the valley floor dropped four feet. Secondary effects induced by the earthquake were landslides, ground cracking along the western side of the Lost River Range, and slight flow alterations of nearby streams.

The geology of the Pahsimeroi subbasin and its mountain ranges is variable (Figure 2). Underlying much of the valley and adjacent mountain ranges are metamorphosed gneiss and schist (Alt and Hyndman, 1989). This undifferentiated complex is referred to as the Precambrian Basement Rocks, which were formed from old continental crust that elevated to the earth surface nearly 1,500 million years ago.

Sedimentary rocks formed during the Paleozoic Era, about 500 to 600 million years ago, were deposited on top of Precambrian formations and are most prevalent along the Lost River Range. Paleozoic sediments consist of predominantly limestone and dolomite with small shale and sandstone zones (Young and Harenberg, 1973).

Volcanic flows, also known as the Challis Volcanics, that occurred approximately 50 million years ago overlie portions of the Lemhi and Lost River Range (Alt and Hyndman, 1989). The Challis Volcanics are a thick series of rhyolytic volcanic flows and tuffs that cover large parts of east-central Idaho. The Challis Volcanics are comprised mostly of brown or black, fine-grained basalt or light colored ash flow tuffs.

Glacial, alluvial, and fluvial deposits cover Pahsimeroi Valley floor (Young and Harenberg, 1973). Portions of the Lemhi and Lost River Ranges got their jagged appearance from glacial erosional processes. Glacial deposits within the valley consist of heterogeneous mixtures of igneous and sedimentary rock fragments originating from the adjacent ranges. Large alluvial fans are present on the margins of the valley and continue along the Pahsimeroi River. The abundance of these deposits on the Pahsimeroi Valley floor cause the Pahsimeroi River to flow virtually underground in certain areas.

1.3 Topography

The Pahsimeroi River valley is a long, linear valley that varies in width from about one mile at its narrow mouth to 10 miles wide at its widest point. The valley is characterized by large alluvial fans spreading out from the mountain ranges and coalescing on the valley floor (Young and Harenberg, 1973). The river travels from the southeast to the northwest, thus most aspects are southwest on the north side of the valley and northeast on the south side. Mountain slopes are very steep at higher elevations, decreasing as one descends the alluvial fans to the broad U-shaped valley.

1.4 Vegetation

The natural vegetation of the Pahsimeroi River valley and lower mountain slopes and alluvial fans is characterized as open, low sagebrush or Wyoming big sagebrush (*Artemisia ssp.*) and bluebunch wheatgrass communities (*Psuedoroegneria spicata*) or alkali-tolerant chenopod shrubs such as

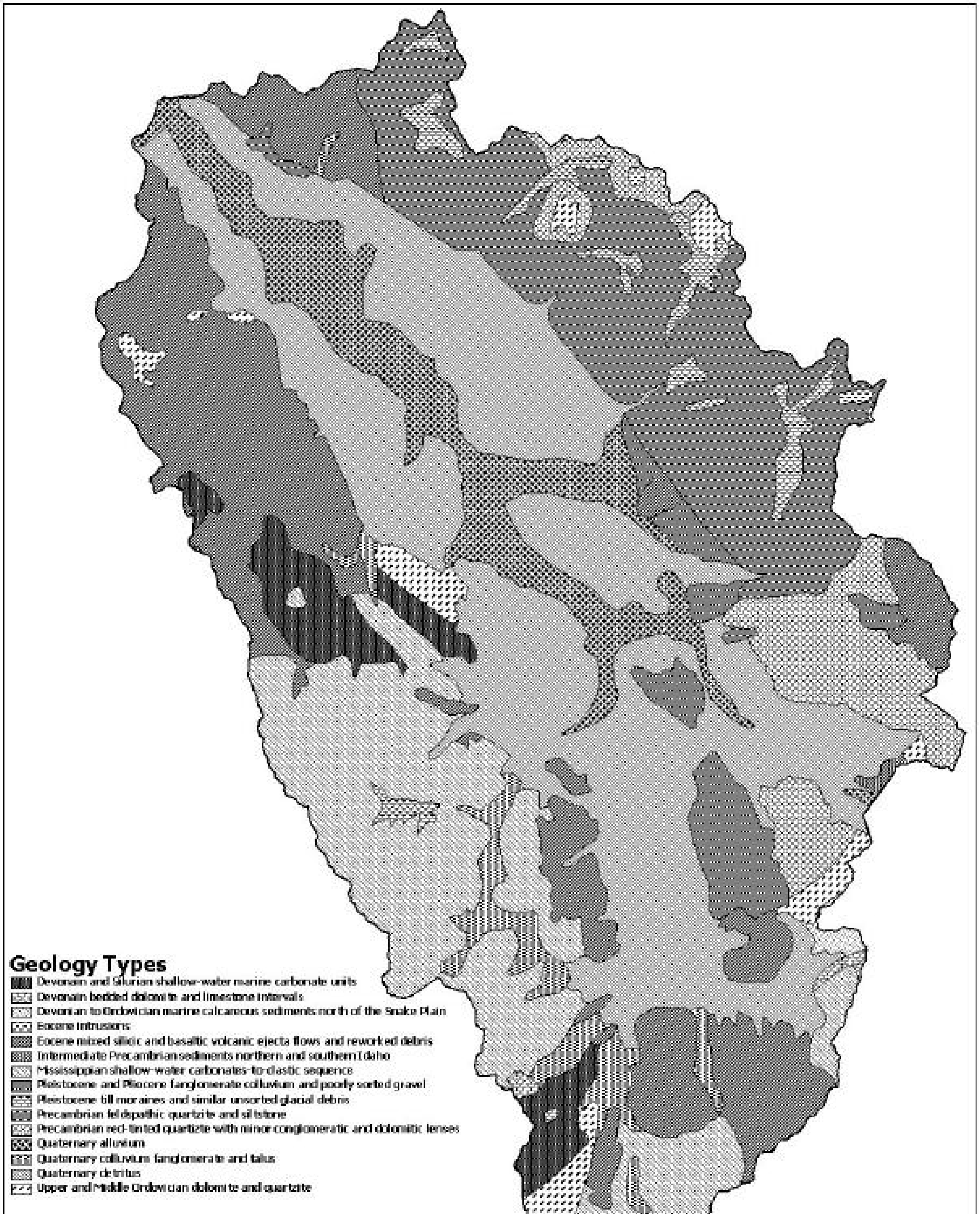

Figure 2. Geology of the Pahsimeroi Subbasin.

saltbush (*Atriplex ssp*.) and greasewood (*Sarcobatus vermiculatus*) (Chatters, 1982). Upper elevations transcend into mountain brush communities containing mountain mahogany (*Cercocarpus ledifolius*), bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpus ssp*.), some occasional junipers (*Juniperus ssp*.), and eventually mixed conifers of two types. The BLM identifies these two forest community types as:

> "Grand Fir/Douglas-fir Forest *(Abies/Pseudotsuga)* communities include tall, needle-leaf evergreen forest dominated by Grand fir *(Abies grandis)* and Douglas-fir *(Pseudotsuga menziesii),* with a mix of *Larix occidentalis, Pinus monticola* and *Populus tremuloides.*
>
> Western Spruce/Fir Forest *(Picea/Abies)* communities include dense to open forest of low to medium tall needle-leaf evergreen trees and open forests with a component of shrubs and herbaceous plants. Dominant vegetation includes subalpine fir *(Abies lasiocarpa)* and Englemann spruce *(Picea engelmannii)."* (BLM, 1999a)

Also, limber pine (*Pinus flexilis*), lodgepole pine (*Pinus contorta*), and whitebark pine (*Pinus albicaulis*) occur at high elevations and rocky, talus areas (Chatters, 1982). Riparian vegetation tends to be dominated by willows and sedges (Idaho Soil Conservation Commission [ISCC], 1995). Wet areas can include cattails and tufted hairgrass (*Deschampsia cespitosa*). Alkaline soils where the water table fluctuates contain alkali Sacaton (*Sporobolus airoides*). The valley floor and several areas in the Big Creek and Patterson Creek drainages have been converted to irrigated agriculture.

1.5 Land Ownership and Use

Most of the land within the subbasin is within public ownership (Figure 3). Both mountain ranges are in the Salmon-Challis National Forest, and lower slopes to the valley floor are BLM lands. Throughout the BLM land are sections of state land, including one large block of state-owned land in the upper Goldberg 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 Forest Service land.

> "The total area of the watershed is 537,210 acres (839 square miles): 224,278 acres (41.7%) of BLM administered public lands (BLM lands); 47,035 acres (8.8%) of private land; 19,159 acres (3.6%) of State land; and 246,717 acres (45.9%) of Forest Service lands." (BLM, 1999a)

The principal land use of the subbasin is agriculture, from irrigated agricultural activities on the valley floor to livestock grazing throughout much of the rangeland areas (Figure 4). In terms of land area, 30,000 acres of the subbasin are in irrigated agriculture (hay, pasture or crop); 263,430 acres are rangelands; and the remaining 244,970 acres are primarily National Forest lands (timber and range) (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 the Goldberg Creek area. 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).

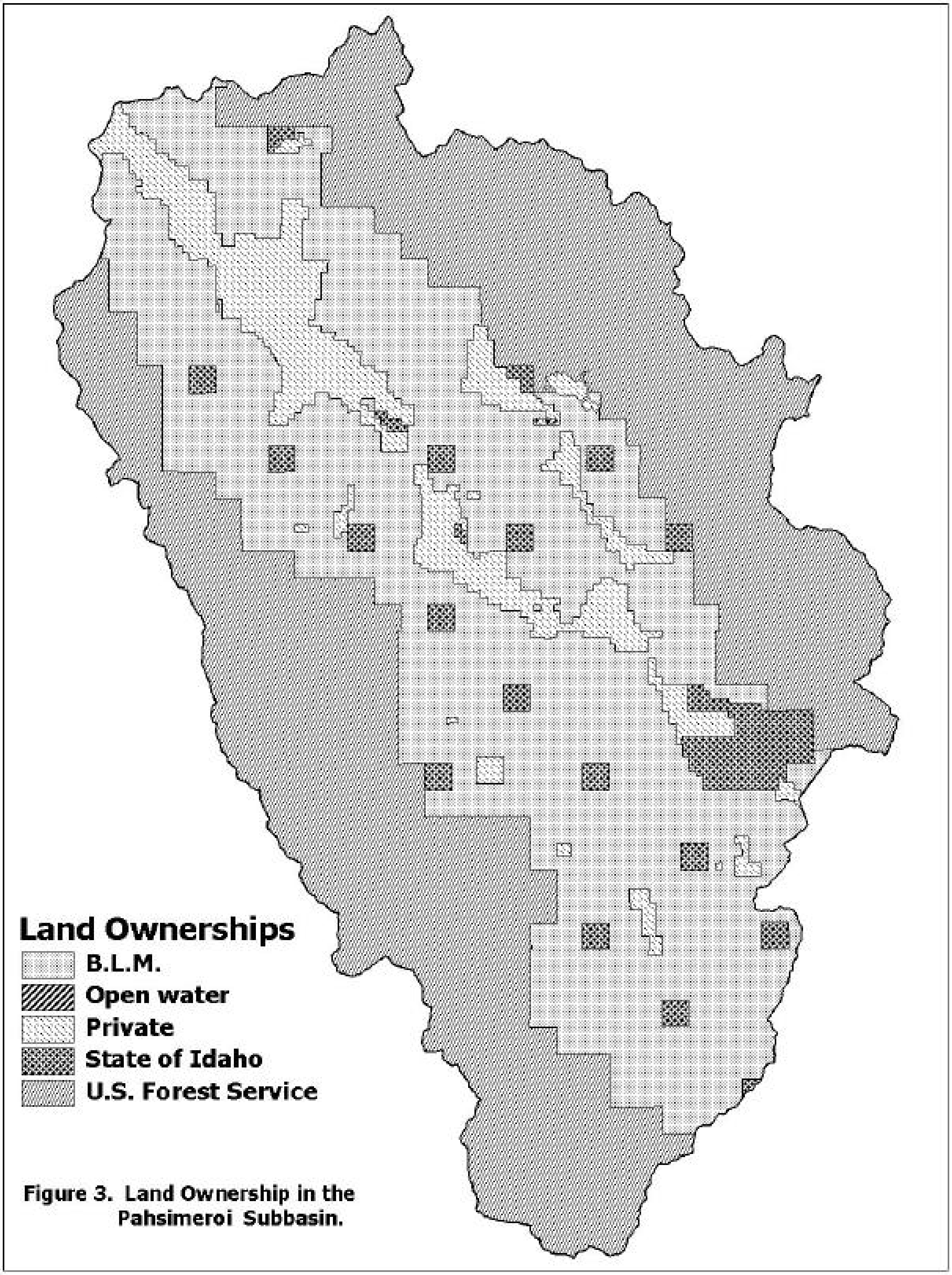

Figure 3. Land Ownership in the Pahsimeroi Subbasin.

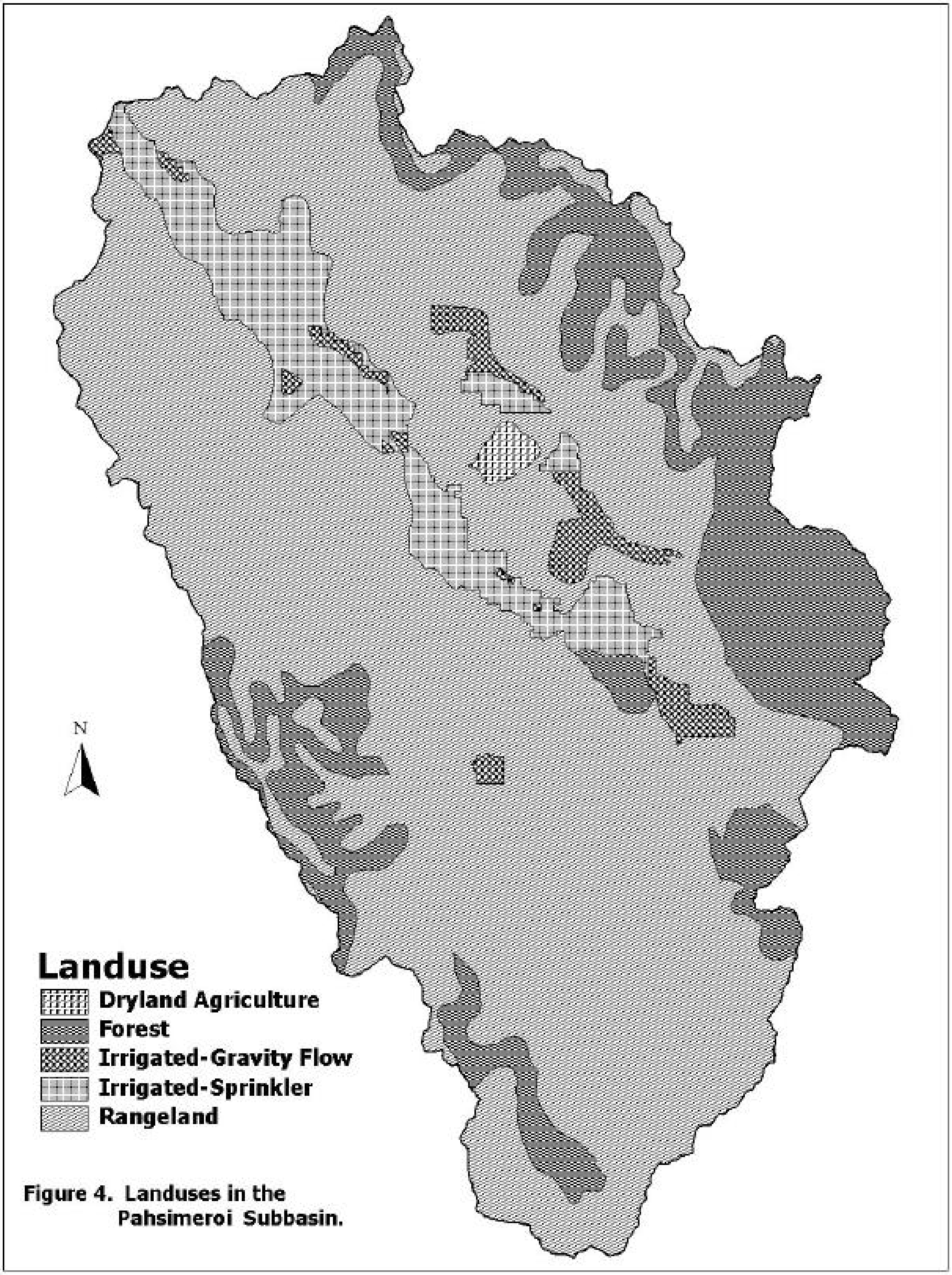

Figure 4. Landuses in the Pahsimeroi Subbasin.

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).

The Pahsimeroi River subbasin is split between Custer and Lemhi Counties, with the Pahsimeroi River and Big Creek forming 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 within 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, Goldberg, 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 these early levels. In 1990 the U.S. Bureau of Census reported 60 people living in May and four people in Patterson. Most of the roads within 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 National Forest boundaries.

1.6 Hydrology

According to the BLM's *Pahsimeroi Watershed Biological Assessment* (BLM, 1999a):

> "The watershed area contains the Pahsimeroi River, a stream approximately 50 miles long from its source on the north face of Leatherman Peak to its confluence with the Salmon River at Ellis…. Major tributaries include Little Morgan, Tater, Morse, Falls, Patterson, Big and Goldburg Creeks draining from the western slopes of the Lemhi Range, and Lawson, Sulphur, Meadow, Grouse and Double Springs Creeks draining from the eastern slopes of the Lost River Range (Figure 5). The upper Pahsimeroi drainage, from the sinks upstream, includes the East and West Forks of the Pahsimeroi River, Mahogany Creek, Burnt Creek and its tributaries Long and Short Creeks. These tributaries potentially contribute up to 1,495 cfs, collectively, to the Pahsimeroi River during average high flows (Young and Harenberg 1973) (Table 3). Extensive irrigation diversions and large natural percolation losses to the coarse alluvial materials associated with each of these tributaries precludes any significant amounts from reaching the river proper except during high surface-runoff periods. Three types of irrigation ditches exist in the watershed: those used for agricultural irrigation; those for livestock watering; and those used to transfer water from one drainage to another to enhance flows for other purposes. The main Pahsimeroi River at its mouth generally has a maximum mean monthly flow of approximately 279 cfs in November, and a minimum mean monthly flow of 133 cfs in May (Young and Harenberg 1973; Meinzer 1924.) The main Pahsimeroi River dries up in sections during late summer and winter, primarily in the 'sinks' area located between the confluence of Goldburg Creek and Summer Crossing road below Burnt Creek and occasionally at locations higher in the watershed. Whether this condition existed prior to settlement is unknown."

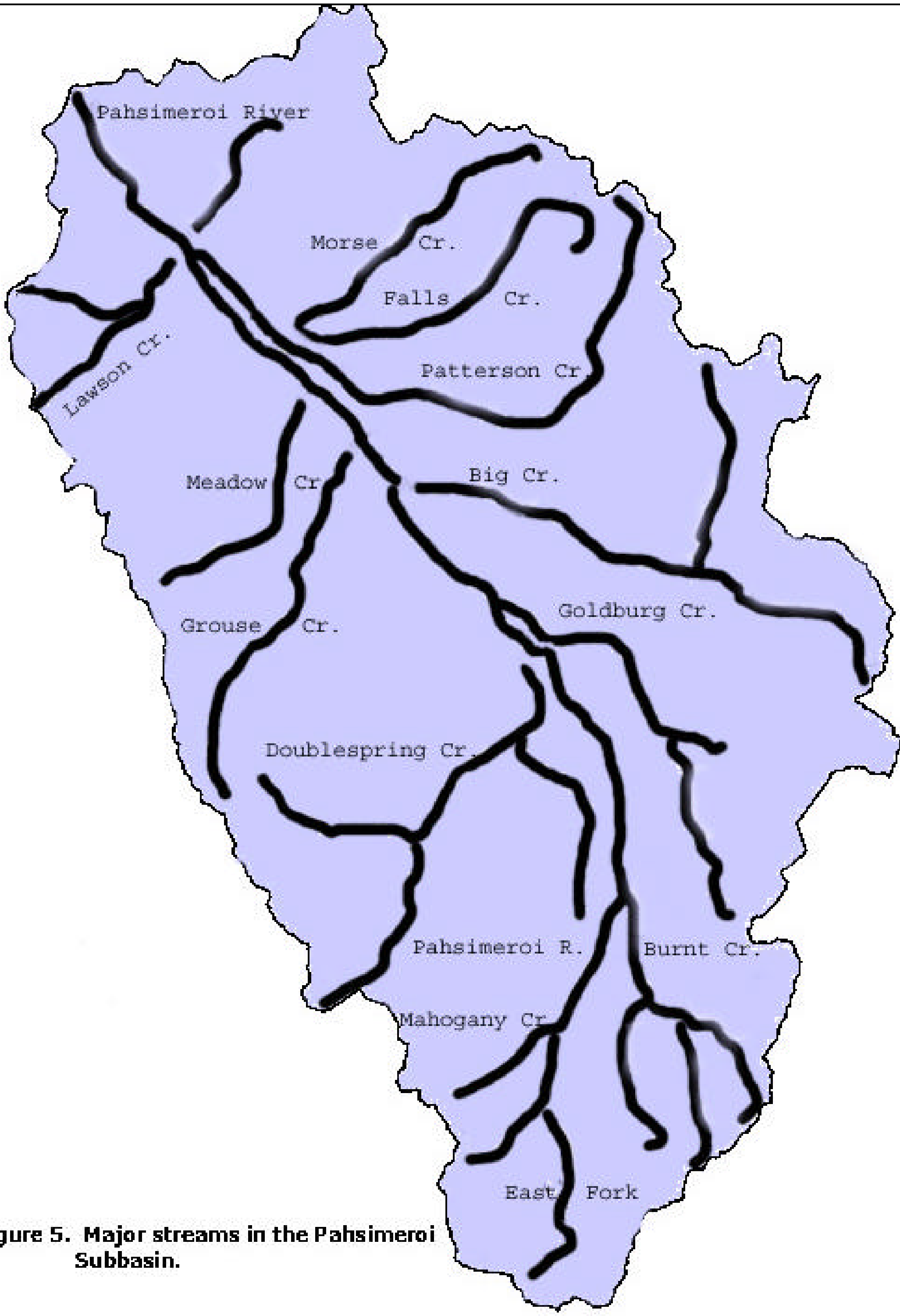

Figure 5. Major streams in the Pahsimeroi Subbasin.

Table 3 Estimated mean monthly discharge in cubic feet per second (cfs) of selected streams in the Pahsimeroi River Basin (adapted from Young and Harenberg 1973).

Stream	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Pahsimeroi River (below forks)	40	180	128	47	25	20	-	-
Mahogany Creek	18	78	44	17	9	7	7	6
Burnt Creek	38	116	47	19	11	8	8	7
Big Creek	86	380	123	56	34	26	24	26
Grouse Creek	2.4	5.5	0.2	0.4	0.9	1.2	0.0	0.0
Meadow Creek	4.1	2.5	1.2	0.5	0.5	0.7	0.4	0.4
Sulphur Creek	2.9	2.0	0.9	0.5	0.8	1.2	0.8	0.8
Trail Creek	3.0	2.0	0.9	0.5	0.8	1.0	0.9	0.8
Patterson Creek	88	257	102	43	26	16	17	14
Falls Creek	50	136	44	19	12	8	9	8
Morse Creek	60	123	30	14	9	7	7	7
Tater Creek	17	39	9	4	3	2	2	2
Lawson Creek	5	3	2	1	1	2	1	1
Little Morgan Creek	78	171	26	14	11	6	7	8
Total	**492**	**1495**	**558**	**236**	**144**	**106**	**84**	**81**

Meinzer (1924) indicated that in the early 1920s the Pahsimeroi River was perennial from Golberg Creek to its mouth. By exclusion, this suggests that above Goldberg Creek the Pahsimeroi River was intermittent, as the BLM has suggested. According to Meinzer (1924) the Pahsimeroi River lost 20 “second-feet” to subsurface flow between the mouth of the canyon near the forest boundary and the first diversion (near Burnt Creek). In the early 1920s the Pahsimeroi River between Burnt Creek and Goldberg Creek (7-8 miles) only had surface flow during very high flow time periods (Meinzer, 1924).

Other streams were similarly flow compromised in the 1920s. Meinzer (1924) described Big Creek below the canyon mouth as loosing more water to subsurface flow than to irrigation diversions. At that time, Big Creek flow reached the Pahsimeroi River for about 20 days out of the year. Patterson Creek flow reached the Pahsimeroi River only during the peak in high flow season. Falls Creek was apparently similar to Patterson Creek in the 1920s except that it was usually completely diverted for agriculture. Double Springs Creek never reached the Pahsimeroi River during Meinzer’s time.

The water table in the Pahsimeroi Valley was at or near the surface for 25 miles from the mouth of the river to Goldberg Creek (Meinzer, 1924). The water table had a large annual fluctuation with well depths shallowest from February to May and deepest (10 – 38 feet) between June and September. Meinzer (1924) also reported water temperatures for springs located throughout the subbasin. Spring water temperatures varied from 44.5^{o} F (6.9^{o} C) to 57^{o} F (13.9^{o} C). Most were below 50^{o} F (10^{o} C), although a few were greater than 50^{o} F.

1.7 Fish

The Pahsimeroi Watershed Biological Assessment (BLM, 1999a) notes:

> "There are 10 known species of fish distributed throughout the Pahsimeroi River watershed. These include Chinook salmon *(Oncorhynchus tshawytscha)*, steelhead rainbow trout (*O. mykiss*), rainbow trout *(O. mykiss)*, westslope cutthroat trout (*O. clarki*), bull trout *(Salvelinus confluentus)*, brook trout (*S. fontinalis*), mountain whitefish *(Prosopium williamsoni)*, redside shiner *(Richardsonius balteatus)*, sculpin *(Cottus spp.)*, dace *(Rhinichthys spp.)*, longnose sucker *(Catostomus catostomus)*, and northern squawfish *(Ptychocheilus oregonensis)*. Of these, all but the brook trout are indigenous to the system. Brook trout hybridization with bull trout has been identified as one of the factors contributing to the decline of bull trout. Table VII [Table 4] shows known distribution of fish species."

> "Distribution of indigenous fish species into what are now disjunct drainages probably occurred prior to colonization and agricultural dewatering. It is unlikely that conditions conducive to fish dispersal were enhanced by agricultural practices. Natural dewatering of stream reaches are known to occur in this watershed, but the extent is unknown and masked by historic and long term agricultural dewatering. A historic hydrologic connection between at least those streams containing bull trout, westslope cutthroat trout and rainbow trout can be inferred from the current distribution of salmonids. Since access to these hydrologic units existed for these fish species, accessibility to these streams by chinook salmon and steelhead rainbow trout is probable. This includes that portion of the Pahsimeroi River above the 'sinks.'"

According to the Model Watershed Plan (ISCC, 1995), spring/summer Chinook and steelhead utilize spring-fed areas in the upper watersheds to spawn. As long as there is adequate flow in the spring to successfully migrate, these fish can utilize these isolated habitats later in the year.

> "There are approximately 237 miles of sensitive fish aquatic habitat distributed between BLM, FS [U.S. Forest Service] and State/private within the watershed, which includes a large but undetermined proportion dewatered by agricultural diversions. Typically, the FS administers the upper reaches of a drainage, BLM manages the middle reaches and the lower reaches are private, State or other; although variations of these ownership patterns exist. The FS sections of streams are usually located in the mountainous regions of the watershed and well above any dewatering point. These reaches are the primary perennial sections of most tributary streams, including the upper Pahsimeroi River. As a result, they are also where most fish populations remain on FS or BLM lands, although there are exceptions. Table lll [Table 5] shows stream miles and primary ownership of the primary perennial streams in the Pahsimeroi River watershed." (BLM, 1999a)

Table 4 Fish species' presence within the Pahsimeroi River watershed (Idaho Department of Fish and Game 1992c; BLM files).

Stream	Date	Fish Species Present[1]
Pahsimeroi River, mouth to Big Creek[2]	8/21/91	CH, SH, BT, BRT, MWF, RS ,SC ,DA, SK, SQ
Pahsimeroi River, above Big Creek[3]	9/1/94	BT, SC
Little Morgan Creek[2]	7/30/91 8/30/94	BT, WSCT BT, WSCT
Tater Creek[2]	7/24/91 6/21/94	BT BT
Morse Creek[2]	7/30/91 8/30/94 10/3/94	BT, WSCT BT, WSCT BT, WSCT
Falls Creek[2]	7/30/91 8/31/94	BT, WSCT (IDFG IRIS[4] Records) BT
Patterson Creek[2]	7/25/91 8/31/94	BT, WSCT (IDFG IRIS[4] Records) BT
Big Creek[2]	8/5/91 7/26/94	BT, SH BT, WSCT
Ditch Creek[2]	6/20/94	BT
Goldburg Creek[2]	7/10/91	BT, BRT
Big Gulch Creek[2]	7/10/91 6/10/94	BT BT
Donkey Creek[2]	6/7/94	WSCT, RB
Burnt Creek[3]	6/1/94	BT, RB
Short Creek[3]	6/2/94	RB
Mahogany Creek	6/2/94	BT
Sulphur Creek[2]	7/9/91 6/28/94	RB No fish observed
Lawson Creek[2]	7/8/91 6/28/94	RB RB

CH=chinook salmon, SH=steelhead/rainbow trout, RB=rainbow trout, BT=bull trout, WSCT=westslope cuttroat trout, BRT=brook trout, MWF=mountain whitefish, RS=redside shiner, SC=sculpin, DA=dace, SK=sucker, SQ=squawfish;

[2] Portions of stream dewatered through agricultural activities

[3] Natural dewatering occurs during annual hydrologic cycle

[4] Idaho Department of Fish and Game Idaho River Information System

Table 5 Distribution of sensitive salmonid species within the Pahsimeroi River watershed, by known occurrence, with probable historic distribution for Chinook salmon.

Drainage	BLM[1] Miles	FS[2] Miles	State Private Miles	Total Stream Miles	Miles Occupied Chinook Habitat	Miles Historical Chinook Habitat	Miles Occupied Steelhead-Rainbow Habitat	Miles Bull Trout Habitat	Miles Westslope Cutthroat Trout Habitat
Pahsimeroi River to Big Creek	1.7	0.0	18.0	19.7	19.7	19.7	19.7	19.7	19.7
Little Morgan Creek	5.7	8.6	0.0	14.3	0.0	14.3	0.0	14.3	14.3
Tater Creek	3.4	2.9	0.0	6.3	0.0	0.0	0.0	6.3	0.0
Morse Creek	4.7	7.1	0.0	11.8	0.0	11.8	0.0	11.8	11.8
Falls Creek	6.0	8.0	0.0	14.0	0.0	14.0	0.0	14.0	14.0
Patterson Creek	7.4	12.3	10.0	29.7	5.0	29.7	5.0	29.7	29.7
Big Creek	7.4	17.7	4.0	29.1	0.0	29.1	29.1	29.1	29.1
Ditch Creek	2.1	2.9	0.6	5.6	0.0	0.0	0.0	5.6	0.0
Goldburg Creek	1.0	0.0	14.3	15.3	0.0	15.3	0.0	15.3	15.6
Big Gulch Creek	0.0	4.6	5.7	10.3	0.0	10.3	0.0	10.3	10.3
Donkey Creek	4.0	0.0	2.4	6.4	0.0	0.0	5.6	0.0	0.0
Pahsimeroi River from Big Creek	17.1	18.9	9.7	45.7	0.0	45.7	17.8	17.8	17.8
Burnt Creek	9.4	4.6	2.9	16.9	0.0	16.9	16.9	16.9	0.0
Short Creek	5.7	0.0	0.0	5.7	0.0	0.0	5.7	0.0	0.0
Mahogany Creek	2.3	3.6	0.0	5.9	0.0	5.9	0.0	5.9	0.0
Total	**77.9**	**91.2**	**67.6**	**236.7**	**24.7**	**212.7**	**99.8**	**196.7**	**162.3**

[1] U.S. Bureau of Land Management
[2] U.S. Forest Service

According to the Model Watershed Plan (ISCC, 1995), habitat for salmon and steelhead within the subbasin is restricted to two areas: the Pahsimeroi River from its mouth to Hooper Lane, and Patterson-Big Springs Creek. The plan indicates that the quality of this fish habitat could be improved and water temperatures could be reduced by implementing voluntary ranch plans, which include water development, fencing of riparian areas, revegetation and planned grazing systems. These projects are the intent and purpose of the Model Watershed Project and are currently being implemented in the subbasin.

2.0 Subwatershed Descriptions

The Pahsimeroi River subbasin is divided into six 4th-field subwatersheds (Figure 6). The Pahsimeroi River itself is divided among four of these subwatersheds, and Patterson Creek and Big Creek are each an additional subwatershed. This method of lumping watersheds may be different from watershed groupings used by other agencies. Caution should be used in extrapolating area-based information between different grouping methods. For example, the Pahsimeroi subbasin review produced by the BLM and the Forest Service (FS) (BLM/FS, 1999) uses an entirely different grouping methodology for subwatersheds.

2.1 Pahsimeroi River

The Pahsimeroi River subwatershed includes the lower end of the Pahsimeroi River from Trail Creek to the confluence with the Salmon River. Tributaries include the Morgan Creek/Tater Creek complex on the east side and Trail Creek, the Lawson Creek complex, Anderson Spring, and John Short Spring on the west side. Morgan Creek is further divided into the North Fork and the East Fork on the Salmon-Challis National Forest in the Lemhi Range. The Lawson Creek drainage includes the North Fork, Middle Fork and South Fork of Lawson Creek, all originating in the Pahsimeroi Mountains of the Lost River Range on the Salmon-Challis National Forest.

The streams on the west side of the subwatershed (e.g., Lawson Creek) are relatively small and usually contribute flow to the valley bottom only during periods of the highest flow (spring runoff) (Meinzer, 1924). The Morgan Creek drainage on the east side is larger. It covers about 20 to 30 square miles and has more flow than west side drainages (Meinzer, 1924). Morgan Creek, according to Meinzer (1924), after leaving the canyon area passes over an area of coarse gravel and boulders that is very porous. Estimated mean monthly flows for Little Morgan Creek range from 6 cfs (October) to 171 cfs (June) (BLM, 1999a). In Lawson Creek, mean monthly flows vary from 1 to 5 cfs (BLM, 1999a). It is important to note that monthly mean flow estimates for these and other streams in the subbasin do not segregate the amount of flow that results in subsurface drainage. In other words, an estimated mean monthly flow of 6 cfs in the fall may occur entirely underground with no visible surface flow in lower reaches.

Little Morgan Creek and Tater Creek have bull trout, and the lower Pahsimeroi River contained Chinook, steelhead, and bull trout among other species (BLM, 1999a). Little Morgan Creek also contained westslope cutthroat trout. According to the same source, Lawson Creek contained rainbow trout.

2.2 Falls Creek

The Falls Creek subwatershed is actually a large swath of land across the Pahsimeroi Valley from Falls Creek and Morse Creek on the east side to Sulphur Creek, Meadow Creek, and Grouse Creek on the west side. The subwatershed includes that portion of the Pahsimeroi River from Big Creek to Sulphur Creek.

Falls Creek and Morse Creek, like Morgan Creek, have drainages 20 to 30 square miles in size and produce a fair amount of water for streams in this subbasin (Meinzer, 1924). In 1924, Falls Creek only contributed water to the Pahsimeroi River during the peak of the runoff period, and lost considerable amounts of water to subsurface drainage (Meinzer, 1924). Also, all low flow water

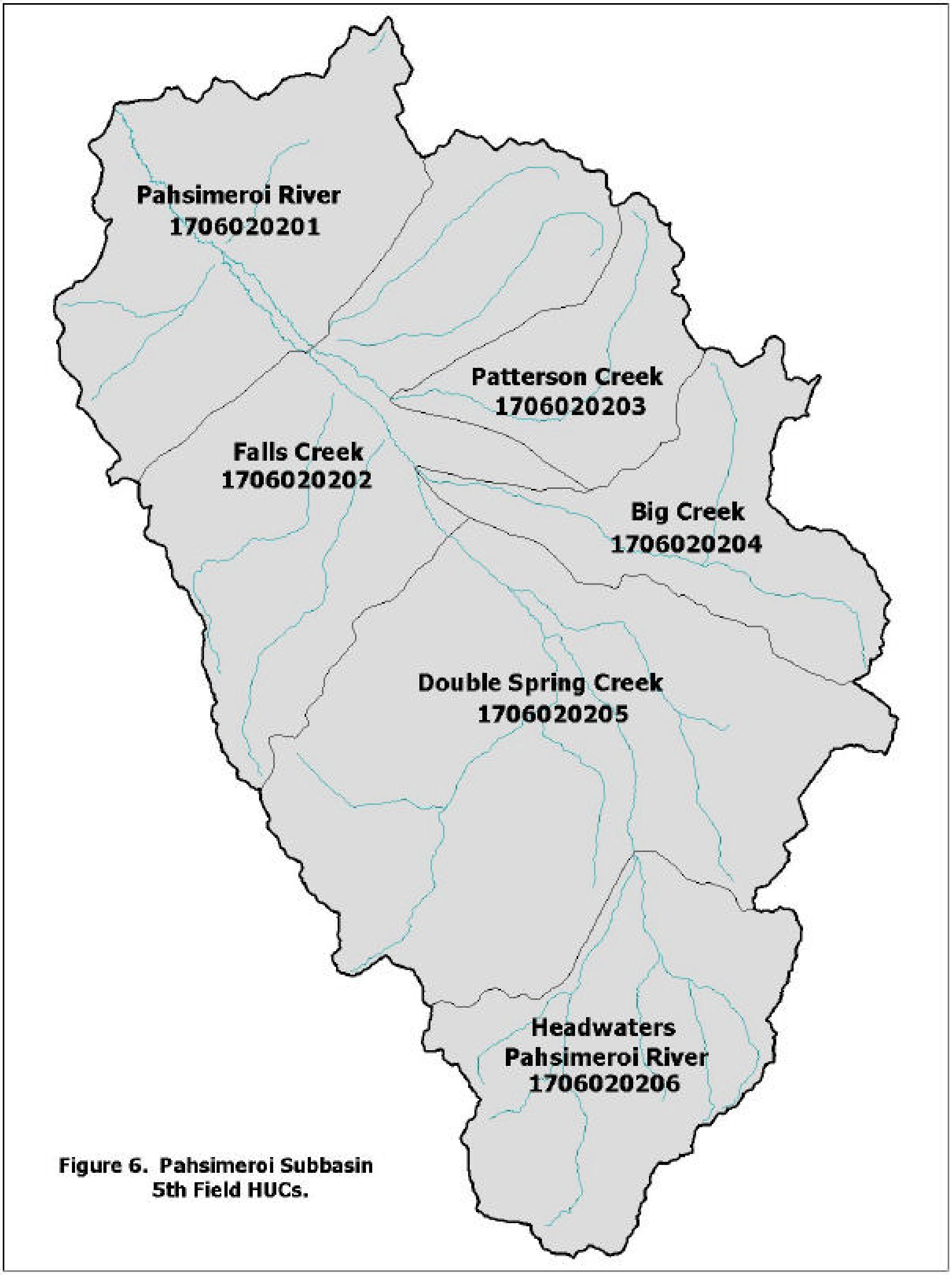

Figure 6. Pahsimeroi Subbasin
5th Field HUCs.

and much of the remaining high flow water was diverted for water rights at that time. In 1924, Morse Creek had a channel width of several hundred feet at the canyon mouth (Meinzer, 1924). Due to losses to the subsurface, Morse Creek would now need twice as much flow to deliver the amount of water required for the last water right diversion. The estimated mean monthly flows for Falls Creek vary from 8 cfs (October) to 136 cfs (June) (BLM, 1999a). Likewise, Morse Creek flows vary from 7 cfs (October) to 123 cfs (June).

Grouse Creek is probably the largest of the west side streams, although all of these streams contribute very little surface water to the valley bottom (Meinzer, 1924). The estimated mean monthly flows for Grouse Creek vary from 0 cfs (November) to 5.5 cfs (June) (BLM, 1999a). Meadow Creek and Sulphur Creek have mean monthly flows ranging from 0.4 cfs (November) to 4.1 cfs (May) and 0.5 cfs (August) to 2.9 cfs (May), respectively (BLM, 1999a).

Morse Creek and Falls Creek both contained bull trout and westslope cutthroat during the early 1990s (BLM, 1999a). Sulphur Creek contained rainbow trout in 1991 but not in 1994 (BLM, 1999a).

2.3 Patterson Creek

The Patterson Creek subwatershed includes only the Patterson Creek drainage from its origination in the Lemhi Mountains to the Pahsimeroi valley floor. Tributaries include the East Fork and Inyo Creek. Patterson Creek has a drainage area from 20 to 30 square miles in size, and was considered one of the more efficient water delivery streams in the valley, from a water rights perspective, because of early diversions (Meinzer, 1924). The estimated mean monthly flows for Patterson Creek vary from 16 cfs (October) to 257 cfs (June) (BLM, 1999a). Patterson Creek contains bull trout and westslope cutthroat trout (BLM, 1999a).

The Patterson Creek drainage is the only drainage in the subbasin to receive any kind of major mining activity. Tungsten ores were mined in the Blue Wing District of the Patterson Creek canyon near Inyo Creek. The Ima Mine operated sporadically from 1881 to 1958 and extracted tungsten, molybdenum, silver, copper, and lead (BLM, 1999a). Drainage from the mine site apparently continues to contribute excessive amounts of zinc to Patterson Creek (BLM, 1999a). There is an un-described mine site near Mahogany Creek between Patterson Creek and Falls Creek (BLM, 1999a).

2.4 Big Creek

The Big Creek subwatershed encompasses the entire Big Creek drainage including the North Fork Big Creek and South Fork Big Creek drainages in the Lemhi Range on the Salmon-Challis National Forest. Below the forest boundary, Big Creek is supplemented by Mill Creek and Stinking Creek subsurface flow.

Big Creek is one of the largest tributaries to the Pahsimeroi River with a drainage area approximately 70 square miles in size (Meinzer, 1924). Big Creek provides significant surface water flows to the Pahsimeroi River in high water years (ISCC, 1995). In 1924, Big Creek flowed to the Pahsimeroi River about 20 days out of the year (Meinzer, 1924). During that time, Big Creek lost more water to subsurface drainage then to irrigation diversions in the area below the canyon. The estimated mean monthly flows for Big Creek vary from 24 cfs (November) to 380 cfs (June) (BLM, 1999a).

Big Creek has bull trout, steelhead, and westslope cutthroat trout residing in it (BLM, 1999a).

2.5 Doublespring Creek

The Doublespring Creek subwatershed includes the Pahsimeroi River from Burnt Creek to Big Creek. This large subwatershed does not include Burnt Creek or Big Creek, but does include all of the Goldberg Creek drainage and the Doublespring Creek drainage. Goldberg Creek includes Donkey Creek and the Big Gulch area, and originates in the Donkey Hills and the Lemhi Mountains. Doublespring Creek originates in the Lost River Range and includes the Christian Gulch area.

The Doublespring Creek drainage is unique in that the stream itself carries very little water in comparison to its drainage basin size and the amount of alluvium built up (Meinzer, 1924). Doublespring Creek contributes no direct surface flow to the Pahsimeroi River. Mountain drainage disappears underground in the Doublespring Creek canyon, emerges briefly near the mouth of the canyon, then disappears again (Chatters, 1982). Doublespring Creek enters into a system of limestone caverns and eventually emerges as springs along the valley bottom contributing water to the Pahsimeroi River near the mouth of Goldberg Creek.

Goldberg Creek is one of the few perennial streams in the valley (Chatters, 1982), although no flow estimates were obtained. Meinzer (1924) reported that Big Gulch was a perennial stream in 1924. Goldberg Creek and Big Gulch contained bull trout; Donkey Creek contained westslope cutthroat trout and rainbow trout (BLM, 1999a).

An old, inactive gold mine exists in the area between Goldberg Creek and the upper Pahsimeroi River (BLM, 1999a).

2.6 Headwaters of the Pahsimeroi River

The headwaters subwatershed includes the Pahsimeroi River from its headwaters in the Lost River Range to, and including Burnt Creek. Tributaries in this subwatershed include Mahogany Creek, Rock Creek, the West Fork Pahsimeroi River, the East Fork Pahsimeroi River, and the Burnt Creek drainage. Tributaries in the Burnt Creek drainage include Long Creek, Short Creek, Baby Creek, Elkhorn Creek, and Poison Springs.

The upper Pahsimeroi River drainage including Mahogany Creek and Burnt Creek is about 100 square miles in size (Meinzer, 1924). These streams are largely mountainous snowmelt runoff - dominated systems, which are typically high gradient, high energy streams originating from numerous springs and seeps. The streams begin to lose water rapidly to subsurface flow as they exit canyon areas and enter alluvial deposits. The estimated mean monthly flows for Mahogany Creek range from 6 cfs (December) to 78 cfs (June), and for Burnt Creek these flows range from 7 cfs (December) to 116 cfs (June) (BLM, 1999a).

Bull trout are present in the Pahsimeroi River above Big Creek and in Mahogany Creek and Burnt Creek (BLM, 1999a). The same source lists rainbow trout present in Short Creek.

3.0 Water Quality Concerns And Status

3.1 Water Quality-limited Waters

In 1998, DEQ established a new 303(d) list based on 1993-1996 assessments performed through the Beneficial Use Reconnaissance Program (BURP) and other pertinent material regarding beneficial use status and water quality standards violations. Waters monitored through BURP after 1996 have not been assessed for 303(d) listing purposes. The 1998 303(d) list included five stream segments in the Pahsimeroi River subbasin (Table 6 and Figure 7). The U.S. Environmental Protection Agency (EPA) approved that list in May 2000. A stream status of "threatened" implies that water quality standards violations are impending, but have not yet occurred.

3.2 Water Quality Standards

Water quality standards are legally enforceable rules and consist of three parts: the designated uses of waters, the numeric or narrative criteria to protect those uses, and an antidegradation policy. Water quality criteria used to protect beneficial uses include narrative "free form" criteria applicable to all waters (IDAPA 58.01.02.200), and numerical criteria that vary according to beneficial uses (IDAPA 58.01.02.250, 251, and 252). Typical numeric criteria include bacteriological criteria for recreational uses, physical and chemical criteria for aquatic life (e.g., pH, temperature, dissolved oxygen, ammonia, toxics, etc.), and toxics and turbidity criteria for water supplies. Idaho's water quality standards are published in the state's rules at *IDAPA 58.01.02 B Water Quality Standards and Wastewater Treatment Requirements.* Designated beneficial uses for waters in the Pahsimeroi River subbasin are listed in Table 7.

Table 6 1998 303(d) listed stream segments for the Pahsimeroi River (17060202) subbasin.

Stream	Boundaries	Pollutant(s)
Pahsimeroi River	Dowton Lane to Salmon River	Nutrients, sediment (threatened)
Pahsimeroi River	Mahogany Cr. to Dowton Lane	Nutrients, sediment (threatened)
Patterson Creek	Inyo Creek to Pahsimeroi River	Sediment, flow alteration
Morse Creek	Forest boundary to Pahsimeroi River	Sediment, nutrient, flow alt.
Big Creek	Forest boundary to Pahsimeroi River	Sediment, nutrient

Table 7 Waters with designated beneficial uses in the Idaho Water Quality Standards.

Map Code	Water Body	Designated Uses
S-1, S-2, S-7, S-8, S-10, S-11, S-17, S-18	Pahsimeroi River – 8 units from Mahogany Creek to Salmon River	Domestic water supply, cold water biota, salmonid spawning, primary contact recreation, special resource water

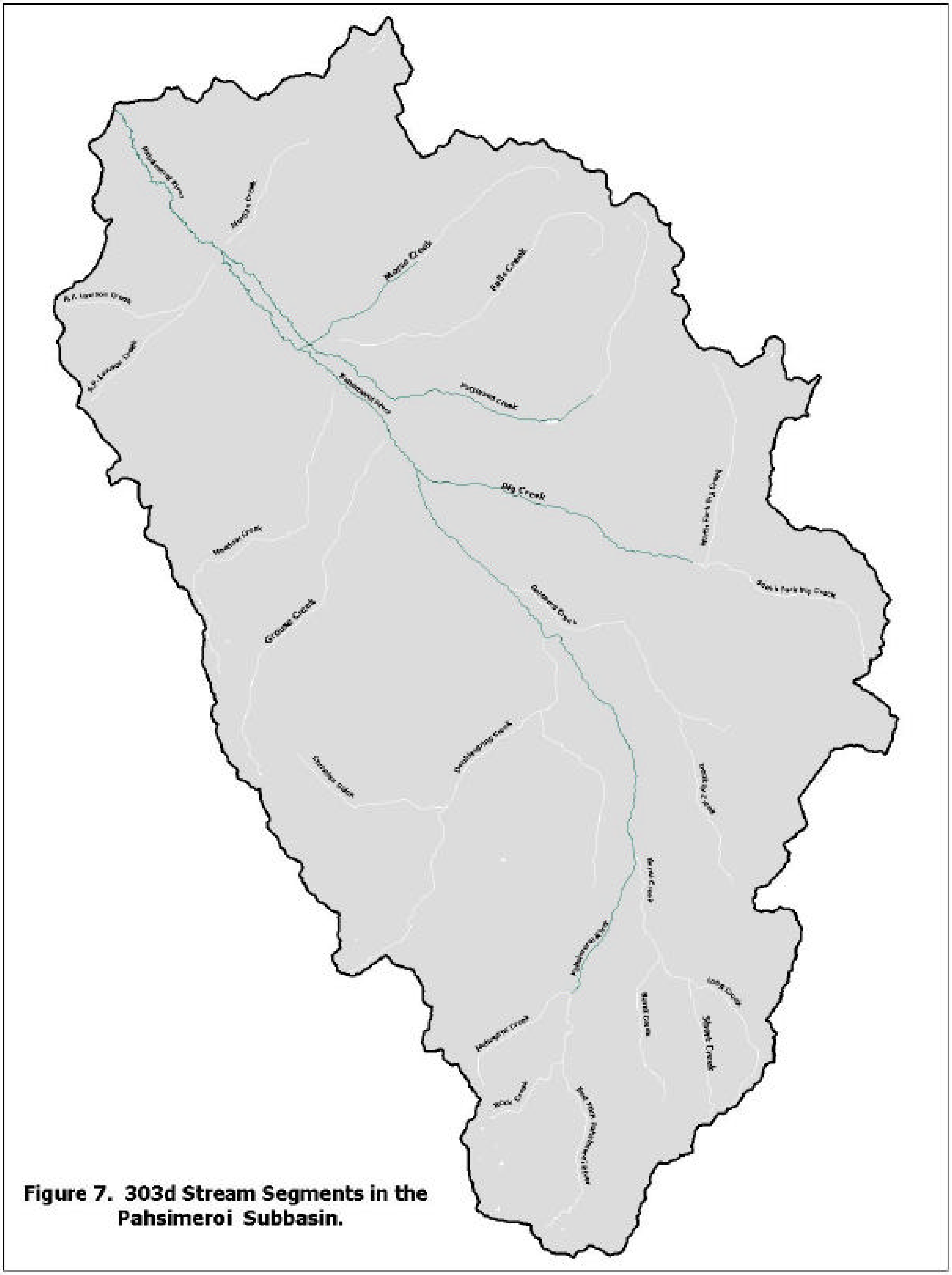

Figure 7. 303d Stream Segments in the Pahsimeroi Subbasin.

Waters not specifically designated in the Idaho water quality standards are undesignated waters (IDAPA 58.01.02.101), which are generally protected for coldwater aquatic life use and primary or secondary contact recreation until designated. In this case, all tributaries to the Pahsimeroi River are undesignated waters. Additionally, all waters of the state are designated for agricultural and industrial water supplies, wildlife and aesthetics.

Of particular importance regarding listed water bodies in this subbasin are the criteria for sediment and nutrients. The narrative criterion for sediment is as follows:

> "Sediment shall not exceed quantities specified in section 250, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determination of impairment shall be based on water quality monitoring and surveillance and the information utilized in section 350.02.b."

Quantities specified in section 250 refer to turbidity criteria identified for cold water biota use and small public domestic water supplies. Turbidity must be measured upstream and downstream from a sediment input in order to determine violation of criteria. Indirectly, specific sediment criteria also include intergravel dissolved oxygen measures for salmonid spawning uses. Intergravels filled with sediment cannot hold enough dissolved oxygen for successful incubation. Intergravel dissolved oxygen measurement requires the placement of special apparatus in spawning gravels. Turbidity and intergravel dissolved oxygen are rarely measured as part of routine reconnaissance-level monitoring and assessment. These measurements are usually conducted in special cases during higher-level investigations of potential problems. Because of access difficulty, such techniques are rarely used in the backcountry settings comprising most of this subbasin.

Because of the lack of specific numeric criteria for sediment, surrogate measures are often used as a mechanism to reflect potential sediment problems. Often the percentage of depth fine sediments found in spawning gravels is used as an indicator of sediment problems that will affect salmonid species. Generally, depth fines greater than 28-30% are considered unhealthful for spawning gravels. Bank stability can be another indicator of sediment problems in streams. When bank stability falls below 80%, these banks may be contributing unhealthy levels of sediment to aquatic habitats. There are other surrogate measures for sediment; however, caution is advised as specific levels can be highly variable depending on stream morphology and geology of the area, and it may be difficult to pinpoint levels that are universally acceptable.

The narrative criterion for nutrients is as follows:

> "Excess Nutrients. Surface Waters of the State shall be free from excess nutrients that can cause visible slime growth or other nuisance aquatic growths impairing designated beneficial uses."

The measures for excess nutrients that are often examined are total nitrogen, total phosphorus, chlorophyll-a, and turbidity. Although there is no maximum level specified by law, it is often recommended that total phosphorus as phosphorus should not exceed 50 micrograms per liter (ug/l) at the point where the stream enters a lake or reservoir, or 25 ug/l within the lake or reservoir (EPA Goldbook, 1986). The desired goal associated with these limits is to prevent eutrophication or nuisance algal growths in the water body. In some cases where phosphorus is not the limiting nutrient, total nitrogen values may give an indication of overall nutrient enrichment. Chlorophyll-a and turbidity measures relate to how much algae growth is occurring and causing cloudiness in the water.

Recreation uses in Idaho's water quality standards are protected through *Escherichia coli* (*E. coli*) bacteria criteria. Waters designated for primary contact recreation are not to contain *E. coli* bacteria significant to the public health in concentrations exceeding:

- a single sample of 406 *E. coli* organisms per 100 milliliters (ml), or
- a geometric mean of 126 *E. coli* organisms per 100 ml based on a minimum of five samples taken every three to five days over a 30 day period.

Waters designated for secondary contact recreation are not to contain *E. coli* bacteria significant to the public health in concentrations exceeding:

- a single sample of 576 *E. coli* organisms per 100 ml, or
- a geometric mean of 126 *E. coli* organisms per 100 ml based on a minimum of five samples taken every three to five days over a 30 day period.

Of particular importance in this subbasin is the relationship between water quality standards and intermittent waters. An intermittent water is defined (in IDAPA 58.01.02.003.51) as a water body that has a period of zero flow for at least one week in most years. Where flow records are available a stream with a 7Q2 flow of less than 0.1 cfs is considered intermittent. Section 070.07 of Idaho's water quality standards (IDAPA 58.01.02.070.07) addresses the application of water quality standards to these types of water bodies. Water quality standards in Idaho apply to intermittent waters during periods of optimum flow sufficient to support the beneficial uses for which the intermittent water body has been designated. In many cases, intermittent waters have not been designated and are protected for the default uses of cold water biota and secondary contact recreation. Optimum flow is described as at least 1 cfs for aquatic life (cold water aquatic life) and at least 5 cfs for recreation uses. When flows drop below these threshold values, water quality standards no longer apply to the water body.

The state water quality standards for temperature are found in State of Idaho Water Quality and Wastewater Treatment Administrative Rules (IDAPA 58.01.02.250.02.b). These require maintenance of the instantaneous maximum temperature below 13ºC (55.4ºF), and the maximum daily average temperature below 9ºC (48.2ºF) during spawning periods (Table 8). The period for salmonid spawning within the Pahsimeroi River is identified as occurring during the months of April and May for spawning steelhead and rainbow trout, and from the last week of August through September for Chinook Salmon.

The federal water quality standard for bull trout spawning and rearing temperature is found in the Code of Federal Regulations Title 40, Volume 14, Parts 87 to 135, section 131.33 (40CFR131.33).

Table 8 Summary of current stream temperature water quality standards in Idaho.

Source of Standard	Beneficial Use	Instantaneous (not to exceed)	Maximum Daily Average	7 Day Sliding Average of Daily Maximum
State of Idaho	Cold Water Biota	22º C 71.6º F	19º C 66.2º F	N/A
State of Idaho (seasonal by species)	Salmonid Spawning	13º C 55.4º F	9º C 48.2º F	N/A
State of Idaho (June – August)	Bull Trout Rearing	N/A	N/A	13º C 55.4º F
State of Idaho (September – October)	Bull Trout Spawning	N/A	9º C 48.2º F	N/A
EPA[1] (June – September)	Bull Trout Spawning and Rearing	N/A	N/A	10º C 50º F

1 Applies to Pahsimeroi River above Big Creek.

The bull trout spawning and rearing temperature standard establishes a temperature criterion of 10ºC (50ºF), expressed as an average of daily maximum temperatures over a seven-day period, and applies to the Pahsimeroi River above Big Creek during the months of June, July, August, and September. The Pahsimeroi River is generally dewatered above Big Creek during this period and no TMDL based on federal water quality standards for this reach will be written.

3.3 Water Quality Assessments

DEQ BURP Assessments

Appendix A shows the number of sites in the Pahsimeroi subbasin that have been sampled through DEQ's BURP process. Only those data from 1996 and older have been assessed and used to create the 1998 303(d) list. The majority of sites in Appendix A were sampled in 1997 and 1998, and as such have not been assessed. However, using the macroinvertebrate biotic integrity (MBI) score and the habitat (HI) score as indicators, most sites are of reasonably good quality (MBI>3.5, HI>70). Assessment details regarding the streams that are listed on the 1998 303(d) list are discussed below.

Big Creek was 303(d) listed in 1998 from the National Forest boundary to the mouth. The only BURP assessment in that segment occurred four to five miles below the National Forest boundary (Table 9). It was assumed that the section of Big Creek above the impacted BURP site was also impacted due to similar land use (agriculture). Also of interest is the next BURP site downstream, a distance of approximately 4.5 miles, which was not assessed due to dry channel.

Multiple year classes of bull trout and cutthroat trout were collected in 1994 from undetermined locations within Big Creek by the Idaho Department of Fish and Game.

Morse Creek had two BURP sites in the National Forest and two sites below the National Forest boundary that were assessed (Table 10). One of the lower sites was directly below the forest boundary, and appeared to be fully supporting cold water biota based on scores. However, this site was included in the not full support category and the stream was 303(d) listed in 1998 from the Forest Service boundary to the mouth. In reality, the impacted section probably begins at the major diversion, which is only a few meters below the BURP site. No fish data were collected by DEQ,

Table 9 Big Creek BURP assessment.

BURP Site Location (elevation above mean sea level)	Assessment	MBI[1] Score	Habitat Score	Flow (cfs)	Year
Below confluence of North Fork and South Fork (6520 ft)	Full support above forest boundary (cold water biota, salmonid spawning)	5.04	88	61.2	1995 (Aug)
4-5 miles below forest boundary (5851 ft)	Not full support (cold water biota)	2.44	77	75	1995 (July)
~1.5 miles above Pahsimeroi River (5440 ft)	Not assessed			Dry channel	1995 (Aug)
North Fork above South Fork confluence (6559 ft)	Not assessed	5.85	114	40	1998 (Aug)
South Fork above North Fork confluence (6559 ft)	Not assessed	6.1	104	18	1998 (Aug)

[1] Macroinvertebrate biotic index

thus salmonid spawning was not an assessed use. According to the BLM (1999a), bull trout and cutthroat trout were surveyed in Morse Creek in 1994. Their existence is probably restricted to above the agricultural diversion.

The 1998 303(d) list identifies Patterson Creek as impacted from Inyo Creek to the mouth. The BURP site directly above Inyo Creek, although not assessed for the 1998 303(d) list, does show higher scores whereas the next BURP site approximately one mile further downstream and below the Ima Mine site had marginal macroinvertebrate scores (Table 11). No fish data were collected through BURP; however, the BLM (1999a) has identified bull trout and cutthroat trout in unspecified locations. Again, agricultural diversion and natural water loss probably restrict fish to upper reaches.

Most Pahsimeroi River BURP sites are higher elevation sites (Table 12). Only one site near the confluence with Doublespring Creek was near the valley; however, it was a dry channel in 1995 when it would have been sampled. Only one site was assessed for the 1998 303(d) listing. This site, as a result of good scores, led to the boundary change of this segment of the Pahsimeroi River (from “headwaters to Dowton Lane” to “Mahogany Creek to Dowton Lane”). Abundant fish data collected in the early 1990s indicated multiple year classes of bull trout in the upper watershed and multiple year classes of Chinook, rainbow/steelhead, brook trout, and mountain whitefish in lower reaches. The middle reaches of the Pahsimeroi River are typically dewatered during the summer from a combination of agricultural diversion and natural water loss. BLM (1999a) data indicated that bull trout and sculpin were found in the Pahsimeroi River above Big Creek in 1994.

Table 10 Morse Creek BURP assessment.

BURP Site Location (elevation above mean sea level)	Assessment	MBI[1] Score	Habitat Score	Flow (cfs)	Year
Above bridge at Morse Creek Campground (6280 ft)	Full support (cold water biota)	5.89	106	5.1	1994
Above bridge at Morse Creek Campground (6280 ft)	Full support (cold water biota)	4.92	110	78.2	1995
Below forest boundary (5889 ft)	Not full support (cold water biota)	4.99	95	74.5	1995
Above highway (5200 ft)	Not assessed			Dry channel	1994
Above highway (5200 ft)	Not full support (cold water biota)	3.34	57	9.8	1995

[1] Macroinvertebrate biotic index

Table 11 Patterson Creek BURP assessment.

BURP Site Location (elevation above mean sea level)	Assessment	MBI[1] Score	Habitat Score	Flow (cfs)	Year
Above East Fork confluence (6520 ft)	Full support (cold water biota)	4.12	84	25.7	1995
Above Inyo Creek (6320 ft)	Not assessed	4.56	117	26	1997
Between Ima Mine and Patterson (6120 ft)	Needs verification (cold water biota)	3.19	89	45.2	1995
Near BLM boundary in valley (5240 ft)	Not assessed			Dry channel	1995

[1] Macroinvertebrate biotic index

<u>BLM Assessments</u>

The Challis Field Office of the BLM has collected some recent water quality data in the Pahsimeroi subbasin. Appendix B includes two sets of data, the first of which includes water temperature, electrical conductivity, total dissolved solids, pH, and turbidity for selected streams in the subbasin. These data were a one-time sampling event in 1999. No standards violations were detected in the data. Also in Appendix B are Wolman pebble count data for selected streams in the subbasin. Mean percent surface fines vary from about 27% in Burnt and Donkey Creeks to as low as 12% in the Pahsimeroi River. Mean percent surface fines for three sites in the Pahsimeroi River are 15%, 11.7%, and 18.3%. No other 303(d) listed waters are represented in these data.

Table 12 Pahsimeroi River BURP assessment.

BURP Site Location (elevation above mean sea level)	Assessment	MBI[1] Score	Habitat Score	Flow (cfs)	Year
Below confluence of East and West Forks (7700 ft)	Full support (cold water biota, salmonid spawning)	4.42	84	59.6	1995
Below confluence of East and West Forks (7700 ft)	Not assessed	5.12	107	52.7	1998
Above road at Doublespring Pass (5900 ft)	Not assessed			Dry channel	1995
East Fork, 2.5 miles above confluence with West Fork (7950 ft)	Not assessed	5.45	86	19.5	1998
West Fork, above East Fork road (7760 ft)	Not assessed	5.55	100	13.5	1998

[1] Macroinvertebrate biotic index

The Challis Field Office of the BLM and the Salmon-Challis National Forest prepared a draft summary review of the Pahsimeroi subbasin to determine issues and areas of highest priority for watershed analysis to improve the resources (BLM/FS, 2000). They concluded that middle reaches of the Pahsimeroi River and the associated lower reaches of tributary streams are of highest priority for resource improvement for instream habitat. Tributaries included in this area are the lower sections of Morse Creek, Falls Creek, Big Creek, Lawson Creek, Trail Creek, Sulphur Creek, Grouse Creek, and Doublespring Creek, and all of Patterson and Goldberg Creeks. This region of the subbasin was targeted for instream habitat improvements primarily because of the irrigation diversion and dewatering that occurs in the lower reaches of all these tributaries. Higher elevation reaches of tributaries and the upper reaches of the Pahsimeroi River were considered of moderate priority for watershed analysis. The upper Morse Creek watershed was considered of low priority because the area already has strong fish populations and no immediate threats.

The following excerpts are from the *Pahsimeroi Watershed Biological Assessment* (BLM, 1999a):

> "Little empirical data exists on habitat quality for streams within the Pahsimeroi watershed. In general, aquatic habitat conditions on upper reaches of most streams, particularly those on Forest Service administered lands and within forested sections, reflect good conditions. Typically, those non-forested reaches accessible to livestock reflect degraded conditions to some degree. Condition trend is unknown for many

streams. As habitat objectives for streams within the watershed are developed, additional riparian and aquatic habitat monitoring sites will be established to monitor both aquatic and riparian habitat condition and trend to measure progress toward meeting these objectives."

"Portions of BLM administered segments of Mahogany Creek, Burnt Creek, Donkey Creek and the upper Pahsimeroi River were surveyed from 1995 through 1997 following R1/R4 habitat inventory protocols (Overton, et al 1995)(Table IVa [Table 13]). These inventories initiated intensive aquatic and riparian habitat evaluation and monitoring in the Pahsimeroi watershed to determine existing habitat conditions in perennial streams and to evaluate progress toward meeting desired future condition objectives patterned after PACFISH. These evaluations are conducted on key areas following protocols identified in Cowley (1992). Results indicate degraded bank and aquatic conditions for all streams surveyed, except for those reaches located within the Burnt Creek exclosures. R1/R4 protocols will be followed for all perennial streams containing sensitive fish species within the Pahsimeroi watershed, and may eventually be applied to all perennial streams."

"Burnt Creek and Mahogany Creek were further surveyed in 1998 using a modified R1/R4 developed by Model Watershed (Table IVb [Table 14]). These procedures provide less detailed information but are much faster to perform. Data is captured by category instead of quantifiably measured. Although not directly comparable to the R1/R4 methodology, certain parameters are comparable. This method may be useful to detect changes in stream morphology which then may initiate a full R1/R4 survey."

"An analysis of sediment delivery from Little Morgan, Morse, Falls, Patterson, Big, and Goldburg creeks and upper Pahsimeroi River, indicates that there are only slight amounts of suspended sediments delivered to the main Pahsimeroi River from these streams (Young and Harenberg 1973). Of those streams sampled, Grouse Creek carried the heaviest load of suspended sediment per volume of water; although, none of the streams contained excessive amounts. Grouse Creek does not enter the Pahsimeroi River except on rare occasions when high runoff events occur. Also, water chemistry and water quality measurements taken during the same period on these streams indicated that all streams appear to fall within normal and expected ranges for their respective soil and landform types. The major source of pollutants or contaminants currently appears to be effluent from irrigated pastures. Runoff from livestock concentration or use areas also contributes minor amounts of effluent. There is considerable sediment, however, delivered into the Pahsimeroi River from Pahsimeroi River stream bank erosion and bank shearing from private lands (Swift 1995)."

"Macroinvertebrate populations are considered indicators of short and long term habitat trends. The BLM began macroinvertebrate sampling in 1993 on selected streams (Attachment 1 Monitoring Protocols). Sampling was repeated as staffing and

Table 13 R1/R4 habitat inventory results for selected streams in the Pahsimeroi River Watershed, 1995 through 1997.

Stream	Habitat Units (N)	Grad- ient (%)	Length (ft)	Mean Width (ft)	Pools (%)	Max. Depth (ft)	Overall Width/ Depth Ratio	Scour Pool Width /Depth Ratio	LWD (#)	Bank Stability Percent	Under Cut Banks (%)	Surface Fines Percent
Mahogany Creek (95) KA-1	13	0.5	212.7	7.7	53.7	1.38	17.6	4.5	8.0	38.5	22.5	19.4
Burnt Cr. (95) KA-1	20	1.6	468.6	8.2	56.1	1.51	18.9	5.1	2.3	33.3	12.4	27.1
Pahsimeroi River (96) KA-3	8	1.8	1169.2	20.8	9.6	0.96	33.6	10.6	0.0	70.2	11.6	11.7
Pahsimeroi River (96) KA-4	5	1.8	446.5	18.0	40.7	1.67	22.9	5.9	0.0	70.2	17.7	15.0
Burnt Cr. Exclosure #6 (96)	47	2.4	1415.1	5.6	36.2	0.68	18.1	5.1	0.0	86.0	27.7	21.3
Burnt Cr. (96) KA-4	9	2.4	944.7	8.9	7.3	0.34	22.7	9.0	0.0	61.8	2.4	16.1
Donkey Cr. (96) KA-1	35	1.8	709.6	2.7	37.1	0.50	15.0	3.2	0.0	46.6	15.0	27.0
Burnt Cr. (97) KA-1	20	1.6	722.5	6.6	40.1	0.50	18.2	6.8	0.0	49.5	21.6	73.8
Burnt Cr. (97) KA-4	89	0.07	3501.1	6.1	25.0	1.13	17.3	5.5	1.5	77.9	23.8	27.7
Pahsimeroi River (97) "Sinks"	115	0.013	7830.2	18.5	27.7	2.48	34.5	5.4	27.6	36.1	5.0	18.3

KA=key area; N=number of habitat units sampled; Gradient=rise/run (estimated from USGS quad maps); Length=total length of sample; Mean Width=average of all habitat unit widths sampled; Pools=length of pool habitats sampled/total length sampled; Max Depth=mean residual pool depth of all reach samples; Overall Width:Depth Ratio=Ratio of mean width and depth of all habitat types in sampled reach; Scour Pool Width/Depth Ratio=mean width and mean max depth of all scour pools in sampled reach; LWD=Large Woody Debns, as woody debris 0.3 feet in diameter and 2/3 the bankfull width; Bank Stability; Bank Stability=Percent of stream bank displaying stable characteristics; Undercut Bank=Percent of stream bank with less than 90 degree angle (undercut); Surface Fines=Ocular estimate of wetted substrate less than 6mm in diameter.

budget permitted up through 1998. Samples are taken from riffles using a Surber sampler net and are sent to an independent laboratory for analysis. EPT are orders of aquatic insects that represent non-polluted water. Richness is a measure of the number of distinct taxa while abundance is a measure of density (number per unit area). The MBHI is an overall summary index of pollution tolerant and intolerant insects within the sample.

"Beginning in 1996, the laboratory no longer analyzed individual pollution tolerant or intolerant richness or abundance [as shown as NA on Table 15 below]. Initial samples collected from three sites on Burnt Creek, a tributary of the upper Pahsimeroi River, found that the stream failed to meet all but one standard for good habitat quality [Table 15]. Mahogany Creek was sampled in 1995 and found to be in

Table 14 Model watershed modified R1/R4 habitat inventory results for selected streams in the Pahsimeroi River Watershed, 1998.

Stream	Habitat Units (N)	Length (ft)	Mean Width (ft)	Overall width/ Depth ratio	Bank Stability Percent
Burnt Creek between Excl 3 & 4 (KA-1)	49	7451	6.2	9.7	56.2
Burnt Creek Excl #4	22	2990	5.5	5.8	69.4
Burnt Creek between Excl 4 & 5	43	5341	7.1	8.3	47.8
Burnt Creek Excl #5	42	3428	6.8	7.3	42.5
Burnt Creek between Excl 5 & 6 (KA-3)	30	5370	7.0	9.0	10.9
Burnt Creek Excl #6	40	5215	5.1	10.9	78.0
Burnt Creek between Excl 6 & 7 (KA-4)	27	4789	7.8	21.8	11.5
Burnt Creek Excl #7	8	918	2.8	5.8	100.0
Mahogany Creek diversion to fence	40	4491	7.0	9.1	19.6
Mahogany Creek above fence	47	3831	5.8	9.1	58.4

KA=key area; N=number of habitat units sampled; Length=Total length of sampled stream reaches; Mean Width=weighted average of all habitat unit widths sampled; Overall Width:Depth Ratio=Ratio of weighted mean width and depth of all habitat types sampled; Bank Stability=Percent of stream bank displaying stable characteristics.

good condition, meeting four of seven standards. Later samples showed some improvement in aquatic insect populations in Burnt Creek and static trends in Mahogany Creek. MBHI stayed relatively constant ranging between 2 and 4 indicating slightly polluted. In general, based on studies in other watersheds within the resource area, streams which have been adversely affected by livestock grazing reflect poor macroinvertebrate population indices. Those streams unaffected by livestock, or other human activities, generally meet or exceed DFC indices values; indices developed from analyzing representative samples from excluded, relatively healthy aquatic systems. It should also be noted that these indices are also very susceptible to high flow events, temperature extremes, timing of sampling, and sample error."

Table 15. Macroinvertebrate richness and abundance indices for sites on Burnt Creek and Mahogany Creek (bold numbers are standards met or exceeded).

Indices: (DFC) Stream (year)	Pollution Intolerant Richness ($60%)	Pollution Intolerant Abundance ($60%)	Pollution Tolerant Richness (#20%)	Pollution Tolerant Abundance (#20%)	EPT Richness ($70%)	EPT Abundance ($80%)	MHBI (#2.00)
Big Creek KA-1 (97)	NA	NA	NA	NA	64.5	**91.5**	3.53
Burnt Creek Excl #7 (93)	33.3	10.7	**16.7**	48.5	33.3	10.7	5.46
Burnt Creek Excl #7 (97)	NA	NA	NA	NA	50.0	10.6	3.45
Burnt Creek (1993)*	42.1	59.5	26.3	28.2	68.4	73.8	3.43
Burnt Creek KA-1 (95)	45.5	5.2	22.7	33.8	59.1	27.3	3.74
Burnt Creek KA-1 (96)	NA	NA	NA	NA	60.0	51.1	4.08
Burnt Creek KA-1 (97)	NA	NA	NA	NA	**70.0**	26.0	4.56
Burnt Creek KA-4 (96)	NA	NA	NA	NA	**76.0**	**82.1**	3.63
Burnt Creek KA-4 (97)	NA	NA	NA	NA	**75.0**	**81.0**	3.51
Burnt Creek Excl #1 (97)	NA	NA	NA	NA	52.9	20.9	5.33
Burnt Creek Excl #6 (97)	NA	NA	NA	NA	56.7	57.8	3.58
Donkey Cr. KA-1 (96)	NA	NA	NA	NA	54.1	53.7	3.17
Mahogany Cr. KA-1 (95)	52.9	**73.2**	**11.8**	**19.0**	64.7	**89.6**	2.82
Mahogany Cr. KA-1 (96)	NA	NA	NA	NA	57.7	35.7	3.57
Mahogany Cr. KA-1 (97)	NA	NA	NA	NA	57.7	76.7	3.52
Pahsimeroi River KA-3 (96)	NA	NA	NA	NA	68.4	**90.0**	3.41
Pahsimeroi River KA-3 (97)	NA	NA	NA	NA	**70.0**	**88.1**	2.80
Pahsimeroi River KA-4 (96)	NA	NA	NA	NA	63.6	45.3	4.75
Pahsimeroi River KA-4 (97)	NA	NA	NA	NA	68.4	76.6	4.17
Patterson Cr. KA-1 (97)	NA	NA	NA	NA	65.4	**81.6**	3.77

'1993 Data collected from area outside of exclosures
DFC=Desired Future Condition; EPT=Orders Ephemeroptera, Plecoptera, Tricoptera; MHBI=Modified Hilsenhoff Biotic Index

The BLM has monitored water temperature in a number of streams in the Pahsimeroi River subbasin over the past several years (BLM, 1999b; see Appendix D). In general, the streams are relatively cool in the mountains and the tops of alluvial fans until they reach the valley flow where they warm up in summer due to low flow and exposure to the sun. Since the mid-1990s, Long Creek (in 1997), Burnt Creek (in 1999), and Donkey Creek (in 1999) have been the only streams to exceed 22° C with their highest recorded temperatures. Most tributary streams on BLM land had relatively warm temperatures during the summer months, and then experience substantial drops in temperature around the first of September, likely in response to seasonal changing air temperatures. These streams typically remain below 20° C throughout the summer and often meet salmonid spawning temperatures (13° C daily maximum, 9° C daily average) in September and/or October. Mahogany Creek and Morse Creek can meet salmonid spawning temperatures all summer long at the point of monitoring (usually the top of the alluvial fan). Only Patterson Creek met the federal standard of 10° C (7-day moving average of daily maximums) for bull trout in 1999. It is likely that Ditch Creek, Little Morgan Creek, Mahogany Creek, Morse Creek, the Pahsimeroi River above Mahogany Creek, and Patterson Creek could also meet the state temperature standards for bull trout (12° C daily average in summer; 13° C daily maximum and 9° C daily average in September and October). Short Creek came close to meeting state criteria in 1999 with a daily average of 13° C during the summer. The BLM described these same data as follows:

> "A program of measuring water temperatures in many of the streams in the watershed, using constant recording thermographs, was begun in 1994. Due to high water, however, several thermographs were lost in 1995 and these data sets were lost. Late fall low water levels also resulted in faulty data in 1998. Table VI [Appendix D] displays the available data obtained from 1994 through 1998. These data were compared against standards in PACFISH and Bull Trout Conservation Strategies (PACFISH 1995; INFISH 1995; Bull Trout Conservation Strategy 1995). Thresholds which should not be exceeded were: Chinook salmon - a seven day moving average of daily maximum temperatures of 64° F [18° C] for rearing and migration and a seven day moving average of daily maximum temperatures of 60° F [16° C] for spawning; Bull Trout - a seven day moving average of daily maximum temperatures of 59° F [15° C] for migration/holding, a seven day moving average of daily maximum temperatures of 54° F [12° C] for rearing, a seven day moving average of daily maximum temperatures of 48° F [9° C] for spawning, and a seven day moving average of daily maximum temperatures of 41° F [5° C] for incubation. Refer to Temperature Charts in Appendix for a depiction of the 7-day moving average and daily high temperatures for those streams with thermographs." (BLM, 1999a)

> "Results of the few streams measured in 1994, 1995 and 1996 indicate that all streams but Short Creek meet PACFISH standards for salmon rearing and migration and only Little Morgan Creek, Mahogany Creek and Pahsimeroi River complied with salmon spawning requirements. Little Morgan Creek, Mahogany Creek, and Pahsimeroi River met bull trout migration requirements but failed to meet rearing requirements. More recent data obtained in 1997 and 1998 followed similar trends. Few systems met the 48 ° F [9° C] bull trout spawning requirements, however, during the period of spawning (late September) and incubation (October-December) the

critical temperatures are likely not being exceeded. The thermographs are removed prior to these critical times and the number of days indicated as exceeding the temperature standards are cumulative throughout the summer months. The high number of failed thermographs indicated as NO DATA was due to high flows when the thermographs were placed in the stream followed by exceptionally low flows. This situation left the thermographs high and dry out of the stream channel.” (BLM, 1999a)

> “Based on observations in 1992-1998 in the Pahsimeroi watershed, it is likely that Little Morgan Creek, Tater Creek, Morse Creek, Falls Creek, Patterson Creek, Big Creek, Goldburg/Big Gulch Creek, Ditch Creek, Mahogany Creek and the upper Pahsimeroi River comply with both salmon and bull trout temperature requirements under most circumstances. It is the smaller streams without sufficient vegetative cover that reflect poor temperature regimes. These include Burnt Creek, Long Creek and Short Creek. Another factor influencing temperatures in these streams is the low flow volume combined with effects of ambient air temperatures.” (BLM, 1999a)

It is important to point out that the “thresholds” just described are not related to the state’s water quality standards, and are not equivalent to these standards. Not only do specific values differ for certain species and life stages, but the method of calculation differs quite often. State standards often use daily average calculations, not seven-day moving averages of daily maximum temperatures. The draft bull trout problem assessment concluded from BLM’s data that most bull trout tributaries in the subbasin, including Little Morgan, Tater, Morse, Falls, Patterson, Big, Goldberg/Big Gulch, Ditch, and Mahogany Creeks, and the upper Pahsimeroi River, comply with both salmon and bull trout temperature requirements under most circumstances (USRITAT, 1999). This problem assessment also indicated that Burnt Creek, Long Creek, and Short Creek lack sufficient vegetative cover to produce adequate temperature regimes (USRITAT, 1999).

Most of the fish-bearing segments of streams are in the mountainous regions above any de-watering segments. These areas appear cool enough to support salmonid spawning; therefore, temperature does not seem to be affecting this beneficial use. Lower reaches that are affected by flow alteration or natural water loss are obviously affected by temperature. Should hydrologic connections be restored in these areas, then temperature may become an issue related to safe passage for salmonid migration.

The Department of Environmental Quality was able to obtain some quantitative temperature data from the Idaho Department of Fish and Game’s Pahsimeroi River Hatchery. The IDFG temperature data is adequate to show that the Pahsimeroi River exceeds state temperature standards for salmonid spawning, and a load reduction based on applicable water quality standards can be formulated to show the percent reduction in water temperature needed to bring the Pahsimeroi River into compliance with state water quality standards. The cause of temperature loading is strongly related to flow alteration due to irrigation diversions and irrigation return flow as well as removal of riparian vegetation from overgrazing along certain reaches. At such time that flow is restored to these streams further analysis of temperature loading can be undertaken.

The BLM's Proper Functioning Condition ratings for the Pahsimeroi subbasin are listed in Appendix E (from BLM, 1999a). Of the 1998 303(d) listed streams, the Pahsimeroi River and Patterson Creek were identified as "functioning at risk" and Big Creek and Morse Creek were identified as in "proper functioning condition."

USGS Assessments

Appendix C lists water quality data (nutrients, sediment, temperature) collected at various U.S. Geological Survey stations throughout the subbasin since 1971. Measurements are very sporadic, and in general show no specific criteria violations. However, in recent years total phosphorus has been periodically greater than 0.05 mg/l (50 ug/l) at station #13302005, the Pahsimeroi River at Ellis, ID. These data suggest the possibility of nutrient enrichment at the mouth of the Pahsimeroi River.

Environmental Science and Research Foundation Contract

During the summer of 2000, a contractor for DEQ sampled nutrients and bacteria quantities in the Pahsimeroi River, Morse Creek, and Big Creek (Blew, 2000). Sediment sampling also took place on Pahsimeroi River, Morse Creek, and Patterson Creek. The McNeil core sediment sampling showed depth fines (<6 mm) in excess of 50% in Patterson Creek and at one sample site in the middle Pahsimeroi River. Morse Creek and upper Pahsimeroi River had 32% and 34% depth fine sediments, respectively.

E. coli and fecal coliform samples were taken from several locations within the Pahsimeroi River as well as in Morse Creek and Big Creek, on June 8, 2000, or August 17, 2000 (Blew, 2000). All *E. coli* samples from the Pahsimeroi River on June 8, 2000 exceeded state bacteriological standards for primary contact recreation (standard = 406 colony forming units (cfu)/100 as a single sample). *E. coli* samples on that day ranged from 547.5 cfu/100 to 1413.6 cfu/100. Big Creek also had a high *E. coli* sample on June 8, 2000 (488.4 cfu/100); however, the sample was taken from an irrigation diversion because the creek bed was dry. Total phosphorus samples were also high at two locations in the Pahsimeroi River (0.15 – 0.43 mg/l). Morse Creek had much lower sample values for bacteria and nutrients.

Follow-up sampling during July of 2001 at two sites on the Pahsimeroi River were below water quality standards: 200 cfu/100 ml on 7/27/01 at Dowton Lane and 150 cfu/100 ml on 7/27/01 at the USGS gauging station just above the Salmon River confluence. DEQ will continue monitoring e-coli in conjunction with wadable and large river Beneficial Use Reconnaissance Program monitoring at an additional site on the lower river to evaluate the potential need for a TMDL for pathogens in the future.

Blew (2000) also conducted stream and road erosion surveys at two sites on the Pahsimeroi River and one site each on Big Creek and Patterson Creek. Erosion severity was rated as severe to moderate for the two Pahsimeroi River sites primarily due to trampling by cattle. Big Creek and Patterson Creek were rated as having moderate erosion severity. Big Creek may have been affected by a flow event in the recent past. Patterson Creek showed signs of down cutting.

Idaho Model Watershed

The Idaho *Model Watershed Plan* (ISCC, 1995) indicates that the two major limiting factors affecting salmon and steelhead habitat in the Pahsimeroi River are: 1) the insufficient flows for adult migration below the Ellis diversion, and 2) high sediment levels in spawning gravels caused by poor stream bank stability, head cutting at Sulphur Creek, and diversion structures needing improvements. The plan reports cobble embeddedness in the Pahsimeroi River is approximately 50%. The Patterson Creek/Big Springs Creek area has similar major limiting factors (ISCC, 1995). Additionally, the plan reports that streamside cover and barrier-free migration for juvenile out-migration need improvement.

3.4 Assessment Data Gaps

In general, the amount of information applicable to the listed segments of streams on the 1998 303(d) list is sparse. The listed segments are generally below National Forest boundaries, which often coincide with the point at which the stream leaves the mountains and enters the alluvial fans on the valley floor. Very few of these segments have been monitored through BURP, mainly because of a lack of flow. These streams are often diverted for agricultural irrigation, and some naturally enter the subsurface alluvial gravels. Additionally, there have been no BURP monitoring sites in listed segments of the Pahsimeroi River.

In its draft sub-basin review (BLM/FS, 2000) the BLM indicated that the middle reaches of the Pahsimeroi River and lower segments of Morse, Big, and Patterson Creeks were high priority for resource improvement to provide access for salmonid fishes. Again, this priority ranking is likely due to the dewatered nature of these portions of streams preventing pathways for fish migration.

The BLM has extensively surveyed Burnt Creek and Mahogany Creek and, to a lesser extent, Donkey Creek and the Pahsimeroi River. Their data suggest that these streams have substantial bank stability problems and sedimentation. In fact, the BLM has indicated that non-forested reaches of streams accessible to livestock are in a degraded condition (BLM, 1999a). It is not clear if the authors were referring to all such streams in the subbasin, or just a few streams. This information may or may not apply to the listed segments of Big, Morse, and Patterson Creeks.

Big Creek, Morse Creek, and Patterson Creek are all 303(d) listed for sediment pollution. Additionally, Big Creek and Morse Creek are listed for nutrient related pollution. Morse Creek and Patterson Creek are listed for flow alteration, although load allocations, and thus TMDLs, are not developable for flow alteration. One sample of depth fines in Patterson Creek indicated excessive fines (>50%) (Blew, 2000). One such sample in Morse Creek is less conclusive (32%). In general, there is insufficient information to determine if these streams are impacted by sediment and/or nutrients. At issue is the lack of flow. These streams may lack sufficient flow to be assessed extensively, and that lack of flow is probably the result of both natural and human-related causes.

The Pahsimeroi River from Mahogany Creek to its mouth is listed as threatened by nutrient and sediment pollution. BLM information suggests that the river is not impacted by sediment, largely because sediment-bearing streams do not sufficiently reach the Pahsimeroi River to deposit sediment. However, one depth fine measurement in a middle reach of the Pahsimeroi River showed excessive fines (>50%) (Blew, 2000), and excessive bank erosion has been described. Limited total phosphorus and total Kjeldahl nitrogen data does suggest that the Pahsimeroi River may carry excess nutrients; however, the extent of the problem needs further study. Bacteria may also be a problem in the Pahsimeroi River during spring runoff; however, more data are needed to adequately characterize the source and extent of the bacteria problem.

3.5 Pollutant Source Inventory

Pollution sources are primarily nonpoint source related and are probably all agricultural and grazing related. Much of this subbasin is used for grazing both as rangeland and as irrigated pasture. There is some irrigated pasture and crop production and a small amount of dryland crop production. The largest source of pollution is likely to be the usage of water, which dewaters streams and causes low flow conditions in the Pahsimeroi River. Such low flow conditions tend to concentrate pollutants of both natural and human-related origin.

There are two National Pollutant Discharge Elimination System (NPDES) permits in the subbasin according to the EPA permits compliance system (PCS) database. Both permits are for the Pahsimeroi River Rearing Ponds, a fish hatchery owned by Idaho Power and operated by the Idaho Department of Fish and Game. Permit # IDG130039, as listed in the PCS database, does not describe a specific discharge. This permit probably relates to general provisions under a general permit for hatcheries. Permit # ID0022527 describes discharges to the Pahsimeroi River during September through May, but no discharge during the summer months.

3.6 Pollutant Source Data Gap

Sediment and nutrient pollution may be from the same sources and linked at the particulate level. Some stream bank erosion surveys have been completed. Other sources of nutrients, such as feedlots and pastures, should be analyzed for possible contributions. These sources should also be investigated for possible bacteria contributions.

3.7 Summary of Pollution Control Efforts

The Idaho Model Watershed project has been implementing its goals to achieve better salmon and steelhead habitat and migration over the past five years. According to its website (www.modelwatershed.org), as of October 20, 2000, six projects have been implemented constructing 16 miles of fence to protect six miles of stream in the Pahsimeroi subbasin. Additionally, the project has eliminated a diversion structure through water rights transfer, which resulted in the reconnection of seven miles of habitat in the Pahsimeroi River.

The BLM uses a number of techniques to mitigate impacts from livestock grazing in the Pahsimeroi River subbasin (BLM, 1999a). PACFISH/INFISH standards and guides are used overall on all activities within the subbasin. The BLM will use photo point monitoring on streams inaccessible to livestock and operational grazing standards, long-term effectiveness monitoring, and photo point monitoring on accessible streams.

3.8 Summary

Patterson Creek, Inyo Creek to Mouth, Sediment and Flow Alteration

Patterson Creek below Inyo Creek is dewatered by diversions and natural subsurface flow. Flow occurs in this section only during high flow spring runoff. It is likely that insufficient flow is available to carry sediment. It is suggested that this section of Patterson Creek be listed for flow alteration only.

Morse Creek, Forest Boundary to Mouth, Sediment, Nutrients, and Flow Alteration
Morse Creek below the forest boundary is dewatered by diversions and natural subsurface flow. Flow occurs in this section only during high flow spring runoff. It is likely that insufficient flow is available to carry sediment. There is no evidence of nutrient enrichment in this stream. Upper Morse Creek is one of the more pristine streams in the subbasin. It is suggested that the lower section be listed for flow alteration only.

Big Creek, Forest Boundary to Mouth, Sediment and Nutrients
Big Creek below the forest boundary is dewatered by diversions and natural subsurface flow. Flow occurs in this section only during high flow spring runoff. It is likely that insufficient flow is available to carry sediment and nutrients in this section. It is suggested that this section be listed for flow alteration only.

Pahsimeroi River, Mahogany Creek to Dowton Lane and Dowton Lane to Salmon River, Threatened by Sediment and Nutrients
There is some evidence that bank erosion along the river itself may be contributing excess sediment to the Pahsimeroi River. Nutrients may be accumulating in the lowest reaches of the Pahsimeroi River, which are then exacerbated by low flow conditions. Likewise, limited bacteria sampling suggests high bacteria in spring high flows. The lack of hydrologic connections probably prevent tributaries from contributing sediment or nutrients to the river, thus all sources are likely internal. There may be sufficient information on stream bank erosion rates to calculate a potential sediment load. More nutrient and bacteriological information is needed to adequately characterize the extent of any problems. These pollutants may only be associated with spring runoff events, thus only those flows would contribute loadings. In addition, sources of nutrients and bacteria may be very site-specific.

Additional Concerns
Information suggests that Burnt Creek, Short Creek, and Long Creek may experience elevated water temperatures due to the lack of sufficient shading from streamside vegetation.

4.0 Pahsimeroi River TMDL

4.1 Loading Capacities and Targets
The current state of science does not allow specification of a sediment load or load capacity to meet the narrative criteria for sediment and to fully support beneficial uses for coldwater biota and salmonid spawning. All that can be said is that the load capacity lies somewhere between current loading and levels that relate to natural stream bank erosion levels. We presume that beneficial uses were or would be fully supported at natural background sediment loading rates that are assumed to equate to the 80% bank stability regimes required to meet state water quality standards.

Beneficial uses may be fully supported at higher rates of sediment loading. The strategy is to establish a declining trend in sediment load indicator targets, and to regularly monitor water quality and beneficial use support status. If it is established that full support of beneficial uses is achieved at intermediate sediment loads above natural background levels, and that narrative sediment standards are being met the TMDL will be revised accordingly.

Elevated stream temperature can affect the success of salmonid spawning, overall distribution and survival of salmonids and the presence and type of macroinvertebrate species in streams. State of Idaho Water Quality Standards for temperature have been adopted to support coldwater biota and salmonid spawning beneficial uses during the critical periods of the year when stream temperatures are naturally elevated. Likewise the US Environmental Protection Agency Water Quality Standards for temperature have been adopted to support bull trout spawning and rearing beneficial uses during the critical periods of the year when stream temperatures are naturally elevated. Additional elevation of stream temperature can result from human activities that affect streams by reducing shading plants, increasing the surface area (width) of the stream exposed to sunlight, or returning water used for agricultural purposes to the Pahsimeroi River at temperatures above those specified in state or federal Water Quality Standards.

The observed heat load within the Pahsimeroi River varies slightly from year to year depending upon winter and summer precipitation, ambient air temperature and the percent of maximum potential solar radiation. The load capacity for heat for the purpose of this TMDL is determined by EPA water quality standards for temperature based on bull trout juvenile rearing and bull trout spawning, as numeric water quality standards must be supported in the absence of site-specific criteria, or alternative beneficial use designations. Water quality standards specific to bull trout are the most restrictive of current temperature standards, and at the level of compliance with bull trout temperature standards, other temperature standards for salmonid spawning and coldwater biota would be assumed to be met during the warmest period of the year. The target for stream temperature within the Pahsimeroi River is identified as the federal (EPA) bull trout temperature standard. It is assumed that the water quality standard for bull trout juvenile rearing and spawning also incorporates an implicit margin of safety adequate to insure self sustaining populations of all salmonids including bull trout.

Sediment Targets

To improve the quality of spawning substrate and rearing habitat in the Pahsimeroi River, it is necessary to reduce the component of subsurface fine sediment less than 6.35 mm to below 28%.

Temperature Targets

The state water quality standards for temperature are found in State of Idaho Water Quality and Wastewater Treatment Administrative Rules (IDAPA 58.01.02.250.02.b). To improve the quality of coldwater biota and salmonid spawning, particularly for anadramous steelhead and Chinook salmon and resident rainbow trout, within the Pahsimeroi River, it will be necessary to maintain the instantaneous maximum temperature below 13ºC (55.4ºF), and the maximum daily average temperature below 9ºC (48.2ºF) during spawning periods. The period for salmonid spawning within the Pahsimeroi River is identified as occurring during the months of April and May for spawning steelhead and rainbow trout, and from the last week of August through September for Chinook Salmon.

The federal water quality standard for bull trout spawning and rearing temperature is found in the Code of Federal Regulations Title 40, Volume 14, Parts 87 to 135, section 131.33 (40CFR131.33). The bull trout spawning and rearing temperature standard establishes a temperature criterion of 10ºC (50ºF), expressed as an average of daily maximum temperatures over a seven-day period, and applies to the Pahsimeroi River above Big Creek during the months of June, July, August, and

September. The Pahsimeroi River is generally dewatered above Big Creek during this period and no TMDL based on federal water quality standards for this reach will be written.

4.2 Loading Summary

Existing Sediment Sources

The primary source of sediment to the Pahsimeroi River has been identified as stream bank erosion (ISCC, 1995; Swift, 1995). The DEQ conducted stream bank erosion inventories from the confluence of Morgan Creek in the upper watershed to below Burstedt Lane (approximately 3 miles above the mouth of the Pahsimeroi) to estimate the amount of sediment loading to the Pahsimeroi River from stream bank erosion.

Historic overgrazing has accelerated stream bank erosion. Riparian management has been implemented in some areas resulting in improved conditions over limited areas, though increased stream bank erosion from overgrazing within the riparian vegetation zone remains the single most significant source of sediment to the Pahsimeroi River. The stream bank erosion inventory conducted on the Pahsimeroi River shows that the primary source of sediment from stream bank erosion occurs over the upper evaluation reaches above Hooper Lane. Stream bank erosion below Hooper Lane is also significant, particularly because of the low gradient of the river over its course. The upper river is often naturally dry due to infiltration of flow into the alluvium substrate. This condition is often exacerbated by diversion of water for irrigation. During periods of peak flow the sediment from the upper reach that accumulates during the dewatered period is transported and deposited along lower gradients reaches. The erosive action of high water on unstable stream banks during peak flow also acts to increase erosion and transport of sediment to depositional reaches.

Reduction of stream bank erosion prescribed within this TMDL is directly linked to the improvement of riparian vegetation density and structure to armor stream banks, reduce lateral recession, trap sediment and reduce the erosive energy of the stream thus reducing sediment loading. In reaches that are down-cut, or that have vertical erosive banks, continued erosion will be necessary to re-establish a functional flood-plain that would subsequently be colonized with stabilizing riparian vegetation. This process could take many years. It is also expected that improvement of riparian vegetation density and structure would reduce the potential for temperature and bacteria loading in the future.

Existing Heat Sources

Energy responsible for elevating stream temperature enters the Pahsimeroi River, and irrigation ditches that return flow to the river, primarily through direct solar radiation such as sunlight directly striking the water. Geothermal inflow can also influence stream temperature, however, no discrete geothermal features have been identified that contribute flow to the lower Pahsimeroi River. Indirect scattered and reflected radiation from the sky and clouds and long-wave thermal radiation from the atmosphere also contribute to a lesser degree (Wetzel 1983). The accumulation of heat within a stream can be referred to as heat loading. Heat loading is a cumulative function; it increases along the course of a stream. Heat loading is reduced by riparian vegetation that is capable of shading the stream, and buffered by cooler water from tributaries and spring source inflow. Streams that have healthy riparian vegetation tend to have less heat loading because of direct shading. Additionally the surface area of streams with healthy riparian communities is often reduced due to lower width to depth ratios. Streams that have reduced riparian vegetation tend to have greater width to depth ratios resulting from streambank erosion that increases the width of the stream channel and reduces the depth of the stream channel. Reduced shade and increased stream surface area can result from historic and current flow alteration and inadequate grazing management practices within the riparian zone.

Reduction of streambank erosion prescribed within this TMDL is directly linked to the improvement of riparian vegetation density, vigor, and structure to armor stream banks, reduce lateral recession, trap sediment and reduce the erosive energy of the stream thus reducing sediment loading. It is also expected that improvement of riparian vegetation density, vigor, and structure would reduce the width of streambanks and increase stream shading, which would reduce stream heat loading. Heat loading from irrigation return water is likely a significant source as well, and could be addressed through voluntary implementation projects on private land.

<u>Estimates of Existing Load</u>
Based on estimates from stream bank erosion inventories on the Pahsimeroi River the existing accumulated stream bank erosion rate for the 17 inventory reaches including extrapolated reaches over the current 303(d) listed segment is 2,838 tons per year. The inventory reaches are distributed from the confluence of Mahogany Creek to just above the mouth of the Pahsimeroi River.

<u>Waste Load Allocation</u>
The only point source discharge in the Pahsimeroi River Watershed is the Idaho Power Company's Pahsimeroi River Rearing Ponds. The Pahsimeroi River Rearing Ponds, operated by the Idaho Department of Fish and Game, consist of two earthen, single pass rearing ponds with a large quiescent zone over the lower 1/3 of the ponds due to the nature of the pond design and the species of fish cultured (Chinook salmon). There are two large settling ponds below the two rearing ponds that are dredged annually with the dredge material spread over upland crop production land.

Fry are placed in the ponds in April or May of each year and fed with four stationary demand feeders. No pond cleaning or fish size grading that would re-suspend sediment occurs during the 10-11 month rearing cycle. "Harvesting" of fish at the Pahsimeroi facility consists of liberation of the anadromous Chinook stocks directly into the Pahsimeroi River. When fish are released, the level of the rearing and settling ponds are gradually lowered to prevent re-suspending sediment. After release, inflow is shut off, the ponds are allowed to dry, and deposited sediment is removed for land application. Solids that are deposited are not large quantities.

The NPDES permit for this facility identifies effluent limitations monitoring requirements and best management practices to minimize discharge of total suspended solids and settlable solids based on a daily average determined by monthly samples. The NPDES permit sets effluent limitations for suspended solids at a 5.0 mg/l daily average with a 15 mg/l daily maximum. The limitation for settleable solids is a 0.1 ml/l daily average evaluated from samples collected once per month.

Given the site-specific conditions found at this facility, it is felt that the NPDES permit is adequately protective of water quality at and below the point of discharge of hatchery effluent and that more restrictive limitations are not required at this time. Additionally, there will be no net increase of effluent limitations to the Pahsimeroi River from the Pahsimeroi hatchery rearing ponds.

Load Allocations

Using water quality targets identified in this TMDL sediment load allocations and sediment load reductions are outlined in this section. Because the primary chronic source of sediment loading to the Pahsimeroi River is stream bank erosion, quantitative allocations have been developed. These sediment load reductions are designed to meet the established instream water quality target of 28% or less fine sediment <6.35 mm in areas suitable for salmonid spawning. Stream bank erosion reductions are quantitatively linked to tons of sediment per year. An inferential link is identified to show how sediment load allocations will reduce subsurface fine sediment to or below target levels. This link assumes that by reducing chronic sources of sediment, there will be a decrease in subsurface fine sediment that will ultimately improve the status of beneficial uses. Stream bank erosion load allocation is based upon the assumption that natural background sediment production from stream banks equates to 80% stream bank stability as described in Overton et al. (1995), where stable banks are expressed as a percentage of the total estimated bank length. Natural condition stream bank stability potential is generally at 80% or greater for A, B, and C channel types in plutonic, volcanic, metamorphic and sedimentary geology types. Based on the existing sediment load from bank erosion on the Pahsimeroi River an overall reduction of 75% is recommended. Individual load reductions by reach range from 95% to 0%. Pahsimeroi River stream bank erosion load allocations are broken down by individual inventory segment in Table 16. Appendix F contains stream bank erosion inventory data for each of the inventory reaches as well as maps.

Available temperature data for development of the TMDL includes the maximum and minimum observed daily temperature and temperature readings collected at two hour or 4 hour intervals during select months of the year. The maximum observed daily temperature and the average daily temperature were calculated from temperature data collected in 1999 and 2000 by the Idaho Department of Fish and Game at the Pahsimeroi Hatchery using in-stream temperature data loggers.

The maximum instantaneous temperature and the daily average temperature observed at the Pahsimeroi Hatchery intake were used to determine the percent temperature reduction for the lower Pahsimeroi River (below Hooper Lane) to comply with temperature standards. The Pahsimeroi Hatchery intake point of diversion will be used as the point of compliance for this TMDL for temperature. It is assumed that by using a lower elevation point of compliance that higher elevation reaches will also be in compliance, and that over the remaining run of the Pahsimeroi River to the Salmon River there would be compliance with temperature criteria. The reduction was identified by subtracting the applicable criteria from the observed temperatures and calculating the percent reduction required to comply with the current state standard (Table 17). Maximum exceedances of the most restrictive criteria were used to identify needed temperature reductions based upon the assumption that if temperature reductions are directed at eliminating the maximum exceedance of the most restrictive criteria, any other exceedances of criteria will be eliminated during other seasons of the year.

For state salmonid spawning criteria the steelhead/rainbow trout spawning season's (April and May) largest exceedance occurs in May 1999 with a maximum instantaneous temperature of 19.1ºC (66.4ºF) with 17 days exceedance. The maximum daily average criteria maximum exceedance for May is 14.9ºC (58.9ºF) with 19 days exceedance. This equates to a needed instantaneous maximum temperature reduction of 6ºC (11ºF) and a reduction in maximum daily average of 5.9ºC (10.7ºF).

Table 16 Sediment load allocations/reductions by erosion inventory reach.

Reach Number (from downstream to upstream)	Existing Erosion Rate (t/mi/y)	Total Erosion Rate (t/y)	Proposed Erosion Rate (t/mi/y)	Load Allocations (t/y)	Erosion Rate Percent Reduction	Percent of Total Erosion
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	1291.0	73.0	531.0	59	45
17	147.0	833.0	7.0	39.0	95	29
Totals		**2838.2**		**744.1**	**74**	

For state salmonid spawning criteria the steelhead/rainbow trout spawning season's (April and May) largest exceedance occurs in May 1999 with a maximum instantaneous temperature of 19.1ºC (66.4ºF) with 17 days exceedance. The maximum daily average criteria maximum exceedance for May is 14.9ºC (58.9ºF) with 19 days exceedance. This equates to a needed instantaneous maximum temperature reduction of 6ºC (11ºF) and a reduction in maximum daily average of 5.9ºC (10.7ºF).

The Chinook salmon spawning season's (August and September) largest exceedance occurs in August 1999 with a maximum instantaneous temperature of 18.3ºC (65ºF) with 30 days exceedance. The maximum daily average criteria maximum exceedance for August 1999 is 15.1ºC (59.19ºF) with 29 days exceedance. The needed instantaneous maximum temperature reduction during Chinook spawning is 9.3ºC (9.6ºF) and a reduction in maximum daily average of 6.1ºC (10.9ºF).

<u>Margin of Safety</u>
The Margin of Safety (MOS) factored into load allocations for the Pahsimeroi River is implicit. The MOS includes the conservative assumptions used to develop existing sediment loads. Conservative assumptions made as part of the sediment loading analysis include: 1) desired bank erosion rates are representative of background conditions; 2) water quality targets for percent depth fines are consistent with values measured and set by local land management agencies based on established literature values and incorporate an adequate level of fry survival to provide for stable salmonid production.

Table 17 Maximum exceedances/necessary reductions for state water temperature standards.

Summary of Standard	Largest Exceedance	Necessary Reduction
State of Idaho steelhead/rainbow trout spawning season (April and May) maximum instantaneous temperature of 13º C (55.4º F)	May 1999 19.1º C (66.4º F) 17 days exceedance	6.1º C (10.9º F) 32% (17%)
State of Idaho steelhead/rainbow trout spawning season (April and May) maximum daily average temperature of 9º C (48.2º F)	May 1999 14.9º C (58.9º F) 19 days exceedance	5.9º C (10.7º F) 40% (18%)
State of Idaho chinook salmon spawning season (August and September) maximum instantaneous temperature of 13º C (55.4º F)	August 1999 18.3º C (65.0º F) 30 days exceedance	5.3º C (9.6º F) 29% (15%)
State of Idaho chinook salmon spawning season (August and September) maximum daily average temperature of 9º C (48.2º F)	August 1999 15.1º C (59.2º F) 29 days exceedance	6.1º C (10.9º F) 40% (18%)

The Margin of Safety factored into load allocations for water temperature are implicit within the state water quality standards. It is assumed that water quality standards incorporate a margin of safety adequate to protect for aquatic life beneficial uses within the Pahsimeroi River.

Seasonal Variation and Critical Time Periods of Sediment Loading

To qualify the seasonal and annual variability and critical timing of sediment loading, climate and hydrology must be considered. This sediment analysis characterizes sediment loads using average annual rates determined from empirical characteristics that developed over time within the influence of peak and base flow conditions. While deriving these estimates it is difficult to account for seasonal and annual variation within a particular time frame; however, the seasonal and annual variation is accounted for over the longer time frame under which observed conditions have developed.

Annual erosion and sediment delivery are functions of a climate where wet water years typically produce the highest sediment loads. Additionally, the annual average sediment load is not distributed equally throughout the year. Erosion typically occurs during a few critical months. For example, in the Pahsimeroi River watershed, most stream bank erosion occurs during spring runoff.

This sediment analysis uses empirically derived hydrologic concepts to help account for variation and critical time periods. First, field-based methods consider critical hydrologic mechanisms. For example stream bank erosion inventories account for the fact that most bank recession occurs during peak flow events when banks are saturated. Second, the estimated annual average sediment delivery from a given watershed is a function of bankfull discharge or the average annual peak flow event. Finally, it is assumed that the accumulation of sediment within dry channels is continuous until flow resumes and the accumulated sediment is transported and deposited.

5.0 Public Participation

The Challis Experimental Stewardship Group is the approved Watershed Advisory Group for the Upper Salmon and Pahsimeroi watersheds. On April 27th, 2001, a meeting was held in Challis, Idaho to present the Pahsimeroi Subbasin Assessment and TMDL to the Challis Experimental Stewardship Group. There were 31 names on the sign-in sheet, though there were more people in attendance.

The Challis Experimental Stewardship Group is a cooperative group consisting of citizens and agency representatives involved in issues relating to improving land management practices to enhance range conditions and associated water quality while protecting the cultural heritage and economics of the local community. The Challis Experimental Stewardship Group has been involved throughout the development period of the Pahsimeroi Subbasin Assessment and TMDL, as well as the Upper Salmon Subbasin Review, and the Upper Salmon River Bull Trout Key Watershed Problem Assessment that included the Pahsimeroi River watershed.

The Pahsimeroi River Subbasin Assessment has been distributed to members of the Experimental Stewardship Program, land management agencies, Custer Soil and Water Conservation District board members, and the interested public that have requested the document. The Pahsimeroi River Subbasin Assessment and TMDL was distributed to the same individuals during the 30-day public comment period for their review.

Comments and the response to comments were incorporated into the Final Draft of the Pahsimeroi River Subbasin Assessment and TMDL for submission to the EPA for approval. The following comments were received and addressed.

Comments from Rick Philps, Chairman of the Challis Experimental Stewardship Program

1) *A list of all the acronyms used in the document might make it somewhat easier to understand. For example, on page 23 paragraph 4 what is the definition of 7Q2.*

   We will add 7Q2 and it's definition to the Pahsimeroi River TMDL Glossary. 7Q2 is a term used in the State Water Quality Standard to express the lowest 7 day average flow with an average frequency of recurrence of every 2 years.

2) *On page 24 Table 7 what do the measurements in feet, in the first column represent?*

   We will show in the table that the measurements in feet represent elevation.

3) *On page 31 paragraph 2 and 3 use either metric or English units. It is confusing jumping from one to the other.*

   Paragraph 2 represents the text of the TMDL and uses metric units. Paragraph 3 is an excerpt from another document that uses English units. We have tried to use metrics where possible throughout the document. We will bracket the metric unit equivalent within the excerpt.

4) *On page 3 paragraph 2 is there any data that shows the amount of sediment that is transported out of the Pahsimeroi River and delivered to the Salmon River? How much sediment can the Pahsimeroi River transport out of the system without increasing the fines?*

   In the process of developing the Middle Salmon River-Panther Creek Subbasin Assessment and TMDL (the document that covers the Salmon River from the confluence of the Pahsimeroi downstream to the confluence of the North Fork of the Salmon River) we did not find any data that indicated the sediment load to the Salmon River contributed by the Pahsimeroi River.

   Within the Pahsimeroi River TMDL the sediment load allocation is intended to reduce sediment load to a level that is felt to approach the natural load. At, or slightly above, this load it is expected that fine sediment deposited within spawning habitat would be decreased and channel stability would be enhanced. As described in the TMDL it is felt that the load capacity that would result in proportions of intragravel fine sediment that would facilitate full support of aquatic life related beneficial uses likely lies between the natural background sediment load and that currently experienced by the Pahsimeroi River. One of the basic premises of stable river channels is that they are able to transport their sediment load and to have access to their flood plain. Streams are self formed and self maintained to manage sediment transport, however when sediment load increases by removal of riparian vegetation or alteration of flow regime, the river adjusts it's channel to accommodate sediment load and to regain access to the flood plain. Implementation of Best Management Practices (BMPs), and monitoring of sediment and beneficial use support after projects are implemented should show the level of sediment that the Pahsimeroi River can transport under current climatic and flow conditions and still fully support beneficial aquatic life uses.

Comments from William Stewart, Environmental Protection Specialist, EPA Region 10 Idaho Operations Office

General Comments

1) *Better maps would be useful to gain an understanding of the watershed. The stream names on the map on page 21 are difficult to read on this copy.*

   We will attempt to increase the font size of the maps within the TMDL. Additionally, an overview map that shows the distribution of erosion inventory reaches will be added.

2) *The discussion on temperature on pages 31 – 32 seems to indicate that not all of the segments are in compliance with state or federal standards. The data should be displayed in a manner which allows comparison with the standards to determine whether or not there is a basis for future 303(d) listing of some or all of these segments for temperature exceedances.*

   The narrative on page 31 and 32 within the TMDL is based on the summary of data provided by the BLM. Prior to developing the Subbasin Assessment for a particular watershed, a letter requesting water quality data is sent to land management agencies.

Often the data that is submitted is summarized in relation to agency standards and Publications only, and often the raw data is not submitted for analysis in development of the Subbasin Assessment or TMDL. This was the case with the Pahsimeroi River Subbasin Assessment and TMDL, and the narrative reflects the ambiguous nature of the data summary provided.

The discrepancies between the data summary and the state's water quality standards are identified on page 32 in paragraph 3. The summary of BLM temperature data does not provide adequate data to develop a temperature loading analysis for the streams identified in the summary. Perhaps future data collection will result in more comprehensive quantitative data with which to develop a loading analysis.

The Department of Environmental Quality was able to obtain some quantitative temperature data from the Idaho Department of Fish and Game's Pahsimeroi River Hatchery. The IDFG temperature data is adequate to show that the Pahsimeroi River exceeds state temperature standards for salmonid spawning, and a load reduction based on applicable water quality standards can be formulated to show the percent reduction in water temperature needed to bring the Pahsimeroi River into compliance with state water quality standards. The cause of temperature loading is strongly related to flow alteration due to irrigation diversions and irrigation return flow as well as removal of riparian vegetation from overgrazing along certain reaches.

In addition to requesting public comment on the draft assessment of water quality conditions in the Pahsimeroi River comment was solicited on proposed changes to the subbasin's 303(d) listing on streams primarily affected by flow alteration. At such time that flow is restored to these streams further analysis of temperature loading can be undertaken.

3) *On page 33, it appears that E. coli levels in the Pahsimeroi exceed the state water quality standards, but there is not enough data to determine impairment of beneficial uses. Please explain what the IDEQ plans are to confirm E. coli levels and establish whether a pathogen TMDL is needed for the river.*

During the 2000 field season DEQ contracted E-coli and Fecal Coliform sampling in the Pahsimeroi watershed. The final report was obtained in October 2000, and as you state in your comment, elevated levels were shown. Follow-up sampling during July of 2000 at two sites on the Pahsimeroi River were below water quality standards: 200cfu/100 ml on 7/27/01 at Dowton Lane and 150cfu/100 ml on 7/27/01 at the USGS gauging station just above the Salmon River confluence. DEQ will continue monitoring e-coli in conjunction with wadable and large river Beneficial Use Reconnaissance Program monitoring at an additional site on the lower river to evaluate the potential need for a TMDL for pathogens in the future. Other sites sampled during the 2000 field season were dry.

4) *On page 37, the second paragraph, substitute the word "irrigation" for the word "irritation."*

This typographic error will be corrected.

5) *Please give a clear description of the method used to determine the reductions in sediment for each reach and how this correlated with bank stability for the reach. It is difficult to understand how a 75% total reduction on the river relates to a condition of 80% bank stability.*

The relationship between the sediment load, in tons of sediment produced by a stream reach, and the proportion of stable streambanks is described under Load Allocations on Page 38, and the method for estimating the sediment load from the inventory of stream bank erosion is explained in Appendix F, which is referenced on Page 38 under Load Allocations.

The prescribed load reduction, or the load allocation, is the difference between the sediment load estimate based on current observed streambank conditions and the sediment load that is estimated based on the future desired condition of 80% streambank stability. An erosion estimate based on current conditions may show that a stream has 60% streambank stability that equates to an erosion rate of 10 tons per mile per year. After appropriate riparian management is established, and given time for riparian vegetation to recover, streambank stability may improve to 80%, which may equate to an erosion rate of 25 tons per mile per year. This would be a reduction in streambank erosion of 75% correlated with an improvement in streambank stability of 33%. Within the streambank erosion inventory sediment load estimate the variables that affect the estimate include average height of the streambank and the lateral recession rate (the horizontal loss of streambank to the stream through crumbling, sloughing, rotational failure, clumping etc.), as well as the portion of the stream banks that are not stable (erosive). A reduction in any of the variables would result in a reduction in the erosion associated with that particular streambank. The most responsive and detectable change under riparian management is improved streambank stability, though a reduction in streambank height and lateral recession would likely accompany an improvement in streambank stability (an increase in stability or a reduction in instability). When current or observed streambank erosion that is related to streambank stability that is less than 80% is compared with streambank of 80% stability the difference in sediment loading becomes the load reduction. The erosion rate under the prescribed condition of 80% or more streambank stability becomes the load allocation, or the permissible rate of erosion that would fully support beneficial uses. The rate of erosion may change at a rate different than the change in streambank stability. We will expand upon the description of the methods used to determine the reductions in sediment based on streambank condition under Load Allocations on Page 38.

6) *In table 14, sediment load allocations/reductions by erosion inventory reach., on page 39, the "proposed total erosion rate" appears to show an increase from the total erosion rate for reach numbers 1,7, and 14. We don't understand why 3 of the reaches are allowed to degrade slightly.*

The erosion estimate for the reaches you cite (1,7, and 14) are based on the current observed condition which equates to streambank stability of 80%, 90%, and 80% respectively. The current observed conditions for these reaches also exhibit an estimated recession rate of 0.04, 0.05, and 0.04 respectively. The recession rate for reaches 1 and 14 are lower than the rate set for the overall desired future condition of 0.05 which shows that there could be a net increase of erosion and the reach would still be within the sediment allocation set for that reach under the desired future condition.

Reach 7 has an estimated current streambank stability of 90%. With the streambank stability target set at 80%, the sediment reduction shows as an increase. This is not to say that the stream segment will be allowed to "degrade." It does show that conditions of some reaches are actually better than the level set within the TMDL. It should not be assumed that where conditions are better than those prescribed in the TMDL that they will be allowed to degrade. It would be better to view the TMDL as the total maximum daily load as opposed to the total minimum daily load.

7) *On Table 1 and Table 14, the column labeled "Proposed Total Erosion Rate (t/y)" should be called "Load Allocations."*

   We will make the recommended change to the column title.

8) *The waste load allocation needs to be clearly defined with a direct statement or table in the executive summary and in the discussion on page 37-38.*

   We will add a direct statement and Waste Load Allocation table pertaining to the point source discharge solids from the Idaho Fish and Game Pahsimeroi Hatchery.

GLOSSARY

7Q2 – A term used in the state Water Quality Standard to express the lowest 7-day average flow with an average frequency of recurrence of every two years.

"A" channel - A Rosgen channel type characterized by a fairly straight (sinuosity < 1.2), steep (high gradient 2-10%), highly confined (<1.4), single channel, with a low (<12) width to depth ratio.

Adaptive Management – An explicit and analytical process for adjusting management and research decisions to better achieve management objectives; this process should quantitative wherever feasible. Adaptive management recognizes that knowledge about natural resource systems is uncertain. Therefore, some management actions are best conducted as experiments in a continuing attempt to reduce the risk arising from that uncertainty. The aim of such experimentation is to find a way to achieve the objectives as quickly as possible while avoiding inadvertent mistakes that could lead to unsatisfactory results. The concept of adaptive management is readily understood because it represents the common sense of "learning by doing."

Agriculture Water Supply - A beneficial use, designated by the Division of Water Quality, which indicates that water quality is at such a level that it can be used for irrigation or livestock watering.

Aesthetics and Human Health - A beneficial use, designated by the Division of Water Quality, which indicates that water quality is good enough to not pose a significant health risk or be aesthetically unpleasant.

Allotment - An area of land designated and managed for the grazing of livestock.

Allotment Management Plan - A plan designed by the permitting agency and the user which prescribes the grazing management for the allotment, including rotation system and resource objectives.

Anadromous - An aquatic life history strategy where freshwater habitat is used for spawning and juvenile rearing and the ocean (saltwater) is used for maturation to adult.

Aspect - The direction a surface is facing, generally related to a magnetic bearing. A south aspect would face south.

Attainable Beneficial Use or Attainable Use – A beneficial use, that with appropriate point and nonpoint source controls, a water body could support in the future.

Background – The biological, chemical, or physical conditions of waters measured at a point immediately upstream (up gradient) of the influence of an individual point or nonpoint source discharge, or existing prior to the point or nonpoint discharge if no valid up gradient site is available.

Base Flow - The water flow as measured during the period of lowest standard flow; in this area, it is usually mid-summer.

"B" channel - A Rosgen channel type characterized by a moderately straight (sinuosity 1.2-1.4), steep (high gradient < 2-9%), moderately confined (1.4-2.2), single channel, with moderate (14-26) width to depth ratio.

Beneficial Use - A term used by the Idaho Department of Environmental Quality to identify uses which water quality supports in a given stream or lake.

Best Management Practice (BMP) - A state of Idaho standard that defines a component practice or combination of component practices determined to be the most effective, practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

Biological Evaluation/Assessment - A process document that evaluates the effect of a regulated action on the biologic species under investigation and quantifies the extent of that effect. If it is determined that an action "may affect" the given species, consultation with the designated oversight agency (either National Marine Fisheries Service or US Fish and Wildlife Service) is required.

BLM - Bureau of Land Management, United States Department of the Interior.

C - Celsius; a temperature scale where freezing occurs at 0 degrees and boiling at 100 degrees.

Candidate Species - A species under investigation for listing under the Endangered Species Act, but for which limited information is known about its current status or biological vulnerability, or for which regulatory rules have been created but not issued.

"C" channel - A Rosgen channel type characterized by a winding (sinuosity > 1.4), flat (low gradient < 1-3.9%), unconfined (> 2.2), single channel, with a moderate to high (> 12) width to depth ratio .

***Carex/Juncus* Community** - A vegetative community composed predominately of sedges and rushes.

cfs - cubic feet per second; used for characterizing the volume of moving water in a stream.

Channelization - The action of altering the natural stream channel and hydrology of the system to redirect water flow or prevent soil loss.

Channel Type - A classification system which seeks to identify the hydrologic characteristics of a stream, such as sinuosity, gradient, meander potential and bank characteristics.

Cobble Embeddedness - The degree to which cobbles are surrounded or covered by fine sediment (sand or silt); usually expressed as a percentage.

Cold Water Biota - A beneficial use, designated by the Idaho Division of Water Quality, which indicates that water quality is high enough to support macroinvertebrates and fish.

Cumulative Effects - All of the combined actions and resultant effects which must be considered to effectively evaluate the effect of an additional, new action (i.e., a review to see if this is "the straw that will break the camel's back").

Deferred Rotation - A grazing system in which pastures are used at different times each year.

Degradation - The alteration of a given biological community in a negative manner which reduces the viability or diversity of the community and results in a change in ecological processes.

DEQ – State of Idaho Department of Environmental Quality.

Discretionary Action - An action that a land management agency has the ability to regulate.

Dispersed Recreation - Any recreational activity that doesn't occur at a designated recreational site or area.

Diversion - A physical structure that redirects water flow from a stream or spring into a ditch used for irrigation purposes.

Diversity - A variety of plants, animals or community types.

Ecological Condition - A reflection of the dynamic equilibrium of an overall watershed; the long term health of the complete system and not individual parts of it.

Ephemeral - A water source that only flows at certain, irregular times of the year, such as at spring runoff or during thunderstorms.

F - Fahrenheit; a temperature scale where freezing occurs at 32 degrees and boiling at 212 degrees.

Fault - A fracture or a zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture.

Fecal Coliform Bacteria – A type of bacteria common to the digestive tract of warm blooded animals that is identified as an indicator of the presence of a range of pathogenic bacteria that can cause illness to humans or livestock if ingested.

Fines – A particle of sediment below a designated diameter (such as 6.35 mm) that is known to effect salmonid egg or fry survival through emergence.

Fish Screen - A screen on a diversion designed to allow water to flow through it while preventing passage by fish and directing them back into the stream.

Flood Irrigation - A method of irrigation using water diverted from a stream or spring through a ditch that allows the water to flow across a wide area, using gravity or topography to spread the water.

Forb - Any herbaceous plant, other than a grass, especially one growing in a field or meadow.

Forest Land - Forested lands of ten or more acres capable of being ten percent stocked by forest tree species, and not currently set aside for non-timber use.

FS – United States Forest Service, Department of Agriculture

Full Support – A category of water quality status. A water body whose status is "Full Support" is in compliance with those levels of water quality criteria listed in Idaho's *Water Quality Standards and Wastewater Treatment Requirements*, or with reference conditions approved by the Idaho Department of Environmental Quality Director in consultation with the appropriate Basin Advisory Group.

Functional at Risk Condition - Riparian-wetland areas that are in a functional condition but an existing soil, water or vegetation attribute makes them susceptible to degradation.

Geometric Mean – The nth root of the product of n data: $((X_1)(X_2)(X_3))^{1/3}$ Used to establish the central tendency when averages of rates or index numbers are required.

Gradient - A measure of steepness of ascent or descent. In this document it is usually used in reference to streams and the topographical rate of descent.

Habitat Inventory - A stream habitat inventory evaluates and attempts to characterize the stream channel. A riparian habitat inventory evaluates the vegetative characteristics of the riparian corridor.

Herbaceous (vegetation) - A vegetative group including grasses and forbs, but excluding woody vegetation such as willows or sagebrush.

Habitat Index (HI) - A tool used to evaluate whether beneficial uses of aquatic life are being supported; aquatic habitat criteria are scored and compared against a standard based on the ecoregion being evaluated.

Hydrologic Divide - Topographical feature that bounds a watershed or watershed by forcing all water to flow one direction (e.g., Continental Divide).

Hydrology - The scientific study of the properties, distribution and effects of water on and below the earth surface; the effect of flowing water on the land or stream channel.

Instantaneous – A characteristic of a substance measured at any moment (instant) in time.

Interdisciplinary Team - A team comprised of people with various educational or professional backgrounds and individual abilities.

Intermittent - A water source which only flows on the surface at irregular intervals along the stream channel. It flows subsurface along the remainder of the stream channel.
Issue - A matter of wide concern.

Land Disposal - A process of transferring land from public ownership to private ownership.

Land Exchange - A transfer of land of nearly equal value between public and public ownership.

Lateral Recession Rate - The rate at which a stream bank erodes away from its original position in relation to the stream.

Loading: Acute – The relatively short duration of the presence or addition of a pollutant, such as sediment or bacteria, to surface water above specified water quality criteria.

Loading: Chronic – The longer term duration of the presence of a pollutant, such as sediment or bacteria, to surface water above specified water quality criteria.

Macroinvertebrate Biotic Index (MBI) - A tool used to evaluate water quality based on quantitative measurements of biological attributes of the communities of aquatic insects present at a sample site. Scores are adjusted based on the ecoregion being evaluated.

Margin of Safety – The additional load reduction applied to a load allocation to increase the likelihood that beneficial uses will be restored in a reasonable period of time.

Monotype - A community that contains only one species of vegetation, lacking the normal diversity found in similar locations.

Moraine - A pile of debris, including rocks and dirt, which is pushed ahead of, or along the sides of a glacier.

Natural Condition – A condition without human-based disruptions.

Needs Verification - A category of water quality status. A water body whose status is “Needs Verification” has not been assessed due to a need for additional information that will allow the distinction between “Full Support” and “Not Full Support.”

Non-Functioning Condition - Riparian-wetland areas that are clearly not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality, etc. The absence of certain physical attributes such as a floodplain where one should be is an indicator of nonfunctioning conditions.

Non-point Source Pollution – A pollution source that is ill-defined or comes from a broad area, such as sedimentation.

Not Full Support – A category of water quality status. A water body whose status is "Not Full Support" is not in compliance with those levels of water quality criteria listed in Idaho's *Water Quality Standards and Wastewater Treatment Requirements*, or with reference conditions approved by the Idaho Department of Environmental Quality Director in consultation with the appropriate Basin Advisory Group.

Noxious Weed - A weed arbitrarily defined by law as being especially undesirable, troublesome and difficult to control.

OHV - Off-highway vehicle; any vehicle capable of traveling off the highway.

Outmigration - The action of fish leaving their birthplace, rearing or spawning area and moving a significant distance out of a given system into another for the needs of a different life stage.

PACFISH - A BLM and FS directed, comprehensive and coordinated strategy for restoring and protecting the habitat of anadromous fish affected by dam construction and operation, water diversions, hatchery operations, fish harvest and the widespread degradation of the habitats of these species.

Parcel - Any piece of land.

Patented Land - Land that has been transferred to private ownership, and that is still retained by the original owner.

Perennial - A water source that flows throughout the year, each and every year.

Physiographic Province - A region of which all parts are similar in geologic structure and climate, and which has consequently had a unified geomorphic history.

Pollution – Any alteration in the character or quality of the environment that renders it unfit or less suited for beneficial uses.

Primary Contact Recreation - A beneficial use, designated by the Division of Water Quality, that indicates that water quality is good enough for any activity in which full or partial, unprotected bodily contact occurs with water (e.g. swimming or wading).

Proper Functioning Condition - Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris are present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality. This vegetation also filters sediment; captures bedload; and aids floodplain development; improves flood-water retention and ground-water recharge; develops root masses that stabilize stream banks against cutting action; develops diverse ponding and channel characteristics to provide the habitat and the water depth, duration and temperature necessary for fish production, waterfowl breeding and other uses; and supports great biodiversity. The functioning condition of riparian wetland areas is a result of interaction among geology, soil, water and vegetation.

Range Condition - A classification system (Excellent, Good, Fair or Poor), which provides an indication of the ecological health of the area and the degree of management necessary to maintain or improve the current condition. These classifications are generally indicated by differences in species composition, or deviation from the perceived potential of the site. Differences between condition classes are somewhat arbitrary because they form a continuum across a spectrum with ill-defined borders.

Reconnaissance – An exploratory or preliminary survey of an area.

Redd - The spawning nest of a fish dug in the stream bottom, which covers the eggs until emergence.

Reference Condition – A condition that fully supports applicable beneficial uses, with little effect from human activity and represents the highest level of support attainable.

Regression Analysis – Regression Analysis is the analysis of the relationship of two variables that may allow prediction of one variable from another variable. The dependent variable is assumed to be determined by (is a function of) the magnitude of the second (independent) variable.

Resident Fish – Non-anadromous fish that are generally native or naturalized exotic species. Resident fish may migrate within or between subbasins or watersheds at various life history stages to utilize various habitat aspects within their preferred range.

Resource Objective - An objective to be reached or maintained, which defines the desired condition of the resources.

Riparian - A vegetative community associated with surface or subsurface waters and watercourses within active watersheds. This community is rich in diversity of plants, as well as wildlife and aquatic organisms. The habitat includes not only lake and river ecosystems, but also wetland communities.

Riparian Habitat Conservation Agreement (RHCA) - A PACFISH term designating portions of watersheds where riparian-dependant resources receive primary emphasis, and management activities are subject to specific standards and guidelines. These areas include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological processes are crucial to the maintenance of the stream's water, sediment, woody debris, and nutrient delivery systems.

Riparian Management Objective (RMO) - Objectives that are designed to measure the functionality of the riparian area and its affected stream channel. PACFISH has a set of RMO's that must be met for streams with anadromous fish unless local biologists have data that can define ones better suited to local conditions.

Salable Timber - Timber in an area designated for commercial timber harvest, accessible for harvest, and which contains trees favorable for sale.

Salmonid Spawning - A beneficial use, designated by the Idaho Division of Water Quality, which indicates that water quality is good enough for salmonid fish to use for spawning with a high chance of egg survival.

Screened Diversion - A diversion which has a fish screen on it.

Secondary Contact Recreation - A beneficial use, designated by the Idaho Division of Water Quality, which indicates that water quality supports any activity in which partial or incidental, protected bodily contact occurs with water (e.g., fishing).

Sediment-Sorbed – Molecules adhering to the surface of a solid sediment.

Shrub - Multi-stemmed woody vegetation not large enough to be considered a tree, such as a rose, willow, current, etc.

Sinuosity - The ratio of stream channel length to valley length.

Subbasin - A collection of watersheds that forms a much larger area, which yet drains into another, larger system.

Substrate - The stream bottom, composed of silt, sand, gravel, cobble, boulder or bedrock. The type of substrate and its looseness affects the ability of fish to spawn and the survivability of the eggs.

Suspended Sediment - Fine sediment suspended within the water column of moving or standing water.

Synoptic Sampling - Sampling at an upstream site, and timing sampling at a downstream site, such that the sample is collected at the time the same water sampled upstream is passing the sampling location downstream. The purpose is to take out any diurnal variance in water conditions.

Terminal Moraine - A pile of dirt and rocks pushed in front of a moving glacier that was left behind when the glacier receded.

Thermal Sanctuary - A refuge area that has water temperatures lower or higher than the surrounding waters, to the degree that it reduces the metabolic stress to the fish (e.g., a tributary spring or upwelling groundwater source).

Thrust Fault - A fault with a dip of 45 degrees or less over much of its extent, on which the hanging block appears to have moved upward relative to the footwall. Horizontal compression rather than vertical displacement is its characteristic feature.

Topography - The physical features of a place or region.

Transverse Fault - A fault that strikes obliquely or perpendicular to the general structural trend of the region.

Tributary - A river or stream that flows into a larger river or stream.

Unauthorized Use - An action or use of federal lands that has not been authorized by the regulatory agency or is outside the allowable season of use.

Unscreened Diversion - A diversion that does not have a fish screen on it.

Viability - Capability to grow or develop under normal conditions.

Warranted but Precluded - A phrase used to indicate that a species under consideration for listing as threatened or endangered probably should be listed but other species are in more immediate danger and time or monies don't allow for equal consideration at this time.

WEPP – Water Erosion Prediction Project: the WEPP model is a process-based, distributed parameter, continuous simulation, erosion prediction model for use on personal computers. The software is produced by the U.S. Department of Agriculture National Soil Erosion Research Laboratory at Purdue University and is available for free download at: http://topsoil.nserl.purdue.edu/weppmain/wepp.html.

Water Body – A homogeneous classification that can be assigned to rivers, lakes, estuaries, coastlines, streams or other water features.

Water Quality – A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.

Water Quality Target – An interim goal of water quality or habitat condition that provides the potential for beneficial use status of "Full Support." Percent subsurface or instream surface fine sediment, stream bank stability, percent overhead cover, riparian buffer width and average daily stream temperature are examples of possible targets.

Watershed - A side stream and all the land that it drains, which is a tributary to a much larger stream or river.

Wolman Pebble Count - A monitoring tool used to determine the amount of surface fines (material < 6.35 mm) as an index of sedimentation and beneficial use impairment. The samples are conducted at the same sites macroinvertebrates are collected. The sampler walks across the stream, from bankfull width to bankfull width, selecting pebbles at equidistant intervals. The intermediate axis is measured and recorded for each sample. A minimum of 50 samples from each cross-section must be obtained.

Woodland - Forested land used to provide forest resources such as firewood and Christmas trees, and is not used in the determination of the annual allowable cut.

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Appendix A
BURP Monitoring Data

1998 303(d)	Site ID No.	Stream Name	Eco-Region	Elevation Feet	Stream Order	Rosgen Type	HI	MBI*	% Fines	W/D Ratio	% Stable		% Cover	
											LB	RB	LB	RB
	95-A088	Big Creek	NR	6520	3	B	88	5.04	27	24.3	100	87	73	68
Y	95-B046	Big Creek	SR	5851	3	B	77	2.44	1	26	100	100	0	0
	98-D130	Big Creek North Fork	SR	6559	2	A	114	5.85	10	9	100	100	100	100
	98-D131	Big Creek South Fork	SR	6559	2	A	104	6.10	28	18.7	100	100	100	100
	97-M029	Big Gulch Creek	NR	7800	1	A	122	5.07	48	3.5	100	100	100	100
	97-M030	Big Gulch Creek	SR	7100	2	A	91	5.77	32	8.9	100	100	100	100
	97-M021	Burnt Creek	SR	7400	2	C	91	5.49	61	7.5	90	100	100	100
	98-D136	Burnt Creek	SR	6820	3	E	51	3.89	100	8.5	72	95	79	95
	97-M020	Burnt Creek East Fork	NR	7760	1	A	78	2.20	55	26.1	92	94	84	88
	97-M031	Ditch Creek	SR	6700	2	A	68	4.81	59	10	100	100	100	100
	97-M028	Donkey Creek	SR	6562	1	B	66	3.54	62	14.2	78	58	100	100
	97-M024	Elbow Creek	NR	6600	1	A	69	3.75	70	18.7	95	95	96	98
	97-M018	Elkhorn Creek	SR	7400	1	B	64	1.81	61	10.4	34	33	100	100
	97-M034	Falls Creek	SR	5880	2	A	80	5.32	43	12.3	69	78	100	100
	98-D127	Goldburg Creek	SR	7040	1	A	77	5.78	41	8.4	62	71	100	100
	98-D128	Goldburg Creek	SR	7020	2	A	72	5.81	66	11.7	84	91	100	100
	97-M027	Goldburg Creek	SR	6093	3	B	82	4.72	65	17.6	95	84	100	100
	98-D122	Grouse Creek	SR	6480	2	B	59	3.78	71	11.7	94	99	100	100
	98-D129	Hillside Creek	SR	7333	1	Aa+	89	4.77	57	2.1	100	100	100	100
	98-D134	Inyo Creek	SR	6460	2	A	118	6.05	17	11.5	100	100	100	100
	97-M040	Lawson Creek	SR	5120	3	B	78	3.91	56	10.7	100	100	100	100
	97-M038	Lawson Creek Middle Fork	SR	5840	2	A	73	3.23	61	20	44	55	100	100
	97-M039	Lawson Creek North Fork	SR	5852	2	A	69	3.28	59	24.3	94	98	94	98
	97-M037	Lawson Creek South Fork	SR	5760	1	A	79	2.72	74	11.2	97	89	100	92
	97-M017	Long Creek	SR	7262	3	B	52	2.52	62	14.6	40	36	100	100
	98-D135	Mahogany Creek	SR	6800	1	Aa+	88	3.95	19	17.9	100	100	100	100
	97-M022	Mahogany Creek	SR	7720	3	A	91	5.11	56	4.8	88	98	100	100
	97-M025	Meadow Creek	NR	6600	1	A	105	3.97	65	7.2	100	100	100	100

1998 303(d)	Site ID No.	Stream Name	Eco-Region	Elevation Feet	Stream Order	Rosgen Type	HI	MBI*	% Fines	W/D Ratio	% Stable		% Cover	
											LB	RB	LB	RB
	97-M026	Meadow Creek	SR	6200	2	B	85	3.81	61	11.1	88	80	75	80
	98-D133	Mill Creek	SR	6980	1	A	78	5.25	41	10.9	85	86	90	92
	98-D121	Mill Creek	SR	6480	1	A	87	4.26	48	8.4	99	96	99	96
	97-M023	Mill Creek	NR	6457	1	A	104	4.15	57	4.2	93	95	100	100
	97-M036	Morgan Creek	SR	5080	3	B	74	4.15	20	22.6	100	100	100	100
	95-A023	Morse Creek	NR	6280	3	A	110	4.92	11	10.3	95	90	85	75
	94-57	Morse Creek	NR	6280	3		106	5.89	12	26.1	100	100	60	65
	95-A040	Morse Creek	SR	5889	3	B	95	4.99	28	15.9	55	55	45	60
Y	95-A024	Morse Creek	SR	5200	3	C	57	3.34	21	12.3	90	100	0	0
Y	94-58	Morse Creek	SR	5200	3									
Y	95-A086	Pahsimeroi River	NR	7700	3	C	84	4.42	38	14.5	31	43	77	82
Y	98-D125	Pahsimeroi River	SR	7700	3	A	107	5.12	45	12	88	85	100	100
Y	95-A087	Pahsimeroi River	SR	5900	4									
	98-D124	Pahsimeroi River East Fork	SR	7950	1	A	86	5.45	35	11.4	80	80	70	70
	98-D123	Pahsimeroi River West Fork	SR	7760	2	A	100	5.55	27	14.7	100	100	100	100
	95-A083	Patterson Creek	NR	6520	2	A	84	4.12	21	15.6	100	100	4	6
	97-M128	Patterson Creek	NR	6320	3	C	117	4.56	14	16.2	84	98	100	100
Y	95-A084	Patterson Creek	SR	6120	3	A	89	3.19	23	10.5	100	100	24	6
Y	95-A085	Patterson Creek	SR	5240	3									
	97-M019	Short Creek	SR	7400	1	B	79	4.23	61	21.9	75	87	92	100
	98-D126	Snowslide Creek	SR	7035	1	A	63	3.66	33	11.3	100	72	70	100
	98-D132	Stinking Creek	SR	6740	1	A	68	3.43	41	8.4	84	80	99	88
	97-M035	Tater Creek	SR	5200	2	A	72	2.99	71	19	100	100	100	100
	97-M032	Trail Creek	SR	5850	2	B	88	3.76	63	10.6	90	100	95	100
	97-M033	Trail Creek Blind Fork	SR	6380	1	G	84	3.61	60	23.4	85	100	90	100

Appendix B
BLM Water Quality Data

CHALLIS FIELD OFFICE : SUMMARY OF STREAMFLOW AND WATER QUALITY COLLECTED BY BLM*, 1999-2000

February 2000

Streams are generally listed in downstream order

Stream	Site	Elev. ft.	Flows into	W[1]	yr. mo. day time	Q cfs.	Water °C °F	E.C uS	TDS ppm	pH	Turb. NTU	Comments	Quadrangle USGS 7.5 minute
Kinnikinic Cr.	KI1	7160	Salmon R.	US	1999 09 01 1240	4.09	9.0 48.2	80	50	8.1	Clear		Clayton
Lyon Cr.	LY1	5500	Salmon R.	US	1999 10 12 1330	2.56	11.0 51.8	260	170	8.4	0.94		Bald Mountain
Birch Cr.	BI1	5500	Salmon R.	US	1999 10 08 1115	0.45	9.0 48.2	190	120	8.3	1.22		Bald Mountain
Sink Cr.	SI1	5380	Salmon R.	US	1999 10 08 1115	0.42	10.0 50.0	160	100	8.2	0.80	Diversion takes 90% of flow.	Bald Mountain
Bayhorse Cr.	BA1	6520	Salmon R.	US	1999 10 01 1125	4.27	6.5 43.7	160	100	8.4	0.86		Bayhorse
Birch Cr.	BR1	5380	Salmon R.	US	1999 10 01 1125	0.60	8.0 46.4	200	130	8.3	4.86		Bradbury Flat
Wickiup Cr.	WI1	6240	E. F. Salmon R.	EFSR	1999 12 21 1430	0.35	2.5 35.6	100	65	8.0	2.57		Bowery Cr.
East Fork Salmon R.	EFS1	6150	Salmon R.	EFSR	1999 12 23 1420	40.57	1.0 33.8	160	105	8.4	0.61		Bowery Cr.
					2000 02 10 1210	40.38	3.0 37.4	150	105	8.6			
Little Boulder Cr.	LB1	6440	E. F. Salmon R.	EFSR	1999 08 24 1500	14.00	13.5 56.3	60	40	8.2	Clear		Bowery Cr.
Big Boulder Cr.	BB1	6120	E. F. Salmon R.	EFSR	1999 12 21 1320	16.00	2.5 36.5	110	70	7.8	0.98		Bowery Cr.
Corral Creek	CO1	6480	Jimmy Smith Lake	EFSR	1999 09 02 1155	0.27	10.0 50.0	180	120	8.2	6.18		Potoman P.
Jimmy Smith Cr.	JS1	6410	Jimmy Smith Lake	EFSR	1999 09 02 1450	0.13	10.0 50.0	240	160	8.4	3.79		Potoman P.
Big Lake Cr.	BL1	6120	E. F. Salmon R.	EFSR	1999 09 02 1510	2.27	17.0 62.6	130	85	8.8	30.70	Water slightly cloudy.	Potoman P.
Lake Cr.	LA1	6140	Herd Cr.	EFSR	1999 08 19 1415	2.86	15.5 59.9	110	70	8.2	Clear		Herd Lake
Herd Cr.	HE1	5800	E. F. Salmon R.	EFSR	1999 08 19 1210	32.93	14.0 57.2	150	100	8.4	0.81		Ziegler Basin
Road Cr.	RO1	5740	E. F. Salmon R.	EFSR	1999 08 19 1025	1.22	15.0 59.0	250	160	8.4	6.55		Ziegler Basin
Gooseberry Cr.	BO1	7520	Warm Spring Cr.	US_EF	1999 11 04 1255	0.11	5.0 41.0	430	280	8.6	1.15	Limestone in watershed.	Grouse Cr. Mountai
Lime Cr.	LI1	6110	Warm Spring Cr.	US_EF	1999 11 10 1355	0.32	6.0 42.8	350	230	8.6	8.27		Little Antelope Flat
Garden Cr.	GA1	6540	Salmon R.	US_EF	1999 10 13 1245	4.32	6.5 43.7	120	80	8.2	0.92	No BLM land adjacent to stream	Bayhorse
Eddy Cr.	ED1	5440	Challis Cr.	US_EF	1999 08 31 1500	2.06	14.0 57.2	90	60	8.2	Clear		Pats Cr.
Challis Cr.	CH1	5400	Salmon R.	US_EF	1999 08 16 1530	35.32	17.0 62.6	60	40	8.0	2.51	Gauge height = 3.56 ft.	Pats Cr.
					1999 10 05 1430	23.00	10.0 50.0	60	40	8.1	3.47	Gauge height = 3.44 ft.	
Mill Cr.	MI1	5310	Challis Cr.	US_EF	1999 08 16 1200	7.90	13.5 56.3	140	90	8.0	Clear		Pats Cr.
Bear Cr.	BE1	5960	Morgan Cr.	US_EF	1999 12 01 1330	0.06	3.0 37.4	260	170	8.3	4.73	Q = 28.7 gpm	Blowfly Cr.
Block Cr.	BL1	5700	Morgan Cr.	US_EF	1999 12 01 1205	0.12	3.5 38.3	120	80	8.2	6.32	Q = 55.7 gpm	Blowfly Cr.
West Fork Morgan Cr.	WM1	6080	Morgan Cr.	US_EF	1999 10 05 1125	2.24	6.5 43.7	120	80	8.2	1.59		Blowfly Cr.
Gooseberry Cr.	GO1	5660	Morgan Cr.	US_EF	1999 12 01 1005	0.07	4.0 39.2	180	120	8.5	1.43	Q = 31.4 gpm	Gooseberry Cr.
Blue Cr.	BL1	5550	Morgan Cr.	US_EF	1999 10 26 1435	0.09	8.5 47.3	140	90	8.4	4.33		Gooseberry Cr.
Morgan Cr.	MO1	5550	Salmon R.	US_EF	1999 07 22 1325	20.00	18.0 64.4	120	80	7.9	Clear		Gooseberry Cr.
					1999 09 09 1020	9.32	10.5 51.0	120	80	8.0	5.32		
					1999 10 25 1325	10.08	7.5 45.5	120	80	8.3	1.72		
					2000 03 03 1330	9.87	4.0 39.2	110	70	8.0	2.02		
Upper Pahsimeroi R.	UP2	6810	Salmon R.	P	1999 12 28 1245	E 15	1.0 33.8	230	150	8.5	0.56		Spring Hill
Donkey Cr.	DO1		Pahsimeroi R.	P	1999 07 29 1405	0.18	12.0 54.0	90	60	8.4	1.94		Donkey Cr.
Grouse Cr.	GR1	6320	Pahsimeroi R.	P	1999 09 09 1455	0.00						All of stream channel on BLM is dry.	Meadow Peak
Goldberg Cr.	GO1	6070	Pahsimeroi R.	P	1999 09 09 1550	12.91	15.0 59.0	250	160	8.4	6.03		Donkey Hills NW

Stream	Site	Elev. ft.	Flows into	W[1]	yr. mo. day time	Q cfs.	Water °C °F	E.C uS	TDS ppm	pH	Turb. NTU	Comments	Quadrangle
Stinking Cr.	ST1	6540	Big Cr.	P	1999 07 27 1205	0.02	15.0 59.0					Q = 10.8 gpm	Donkey Hills
Mill Cr.	ML1	7000	Big Cr.	P	1999 07 27 1550	0.41	10.5 51.0	30	20	8.2	6.67		Donkey Hills
Meadow Cr.	ME1	6140	Pahsimeroi R.	P	1999 09 08 1430	0.66	15.0 59.0	270	180	8.5	35.30	Most of stream channel on BLM is dry	Meadow Peak
Falls Cr.	FA1	5960	Patterson Cr.	P	1999 09 03 1455	7.32	8.0 46.4	70	45	8.2	0.49	Diversion at N.F. takes 95% of flow.	East of May
Morse Cr.	MO1	5880	Patterson Cr.	P	1999 09 03 1145	6.65	8.0 46.4	30	20	8.1	0.68	Diversion at N.F. takes 95% of flow.	East of May
Trail Cr.	TR1	5660	Pahsimeroi R.	P	1999 09 08 1135	0.47	10.0 50.0	230	150	8.0	17.90		May
Tater Cr.	TA1		Patterson Cr.	P	1999 08 30 1325	2.74	8.0 46.4	60	40	8.0	0.75		
Little Morgan Cr.	LM1	5480	Pahsimeroi R.	P	1999 08 26 1415	10.78	12.5 54.5	20	13	8.0	0.79		Ennis Gulch
Sage Cr.	SA1	6870	Thous. Spr. Cr.	BL	1999 12 15 1445	0.89	1.0 33.8	200	130	8.4	4.00		Jerry Peak
Big Lost R.	BL1	6570	Mackay Res.	BL	1999 09 22 1245	71.93	11.5 52.7	140	90	8.2	0.84		Chilly Buttes

* Most of the streamflow and water quality data was collected by Steve Markman, Hydrologist, Challis Field Office, BLM. Additional information on location of sites is available.

[1] US = Upper Salmon River watershed ; Hydrologic Unit Code 17060201.
EFSR = East Fork Salmon River watershed ; Hydrologic Unit Code 17060201.
US_EF = Upper Salmon River watershed below East Fork Salmon River ; Hydrologic Unit Code 17060201.
P = Pahsimeroi River watershed ; Hydrologic Unit Code 17060202
BL = Big Lost River watershed ; Hydrologic Unit Code 17040218

Q = discharge, in cubic feet per second
Water temperature is degrees centigrade and degrees fahrenheit
E.C. = electrical conductivity, in micromhos per centimeter
TDS = total dissolved solids, parts per million. EPA drinking water guideline is 500 ppm.
pH is in standard units, scale 0.0 to 14.0 Idaho standard is 6.5 to 9.5
Turb. = turbidity, in nephelometric turbidity units (NTU). Idaho standard is not to exceed 50 NTU above "background." "Background" is not defined in the Idaho water quality standards.
Quadrange = USGS 7.5 minute quadrangle that contains the streamflow measuring site

B_P05 v3.0n

R1/R4 FISH HABITAT INVENTORY SYSTEM
Summary of Main Channel Substrate Condition
Listing by Survey Reach and by Habitat Group

Run date: 10/25/1995
Page 1

Stream ID: ID7397
EPA Reach: 1706020202000.00
Stream Name: BURNT CR (mo. to Long Cr)
Forest: CHALLIS NF
District: CHALLIS RD
Study: 195

Habitat Group	Total Number of Units	Number of Meas. Units	Number of Est. Units	Mean Percent Substrate Coverage: Fines	Small Gravel	Gravel	Small Cobble	Cobble	Small Boulder	Boulder	Bedrock	Mean % Surface Fines
Survey Reach:1 — Survey Reach Lower Boundary: LOWER MARKER OF KA1												
Reach Type: C — Survey Reach Upper Boundary: UPPER MARKER OF KA1												
DMC	2	-	-	-	-	-	-	-	-	-	-	-
NTW	2	-	-	-	-	-	-	-	-	-	-	-
SLA	5	2	-	37.0	23.0	33.0	5.5	1.5	0.0	0.0	0.0	33.0
SMD	1	-	-	-	-	-	-	-	-	-	-	100.0
SPL	2	-	-	-	-	-	-	-	-	-	-	10.0
SUS	2	-	-	-	-	-	-	-	-	-	-	15.0
TUR	6	-	-	-	-	-	-	-	-	-	-	16.3
Subtotals	20	2										
Means			-	37.0	23.0	33.0	5.5	1.5	0.0	0.0	0.0	27.1
Totals	20	2										
Means			-	37.0	23.0	33.0	5.5	1.5	0.0	0.0	0.0	27.1

Wollman pebble count

This was a problem with the 195 database and does not indicate 100% fines.

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R1/R4 FISH HABI[illegible]ENTORY SYSTEM
Summary of Main Channel Substrate Condition
Listing by Survey Reach and by Habitat Group

Stream ID: ID7397
EPA Reach: 17060202020000.00
ream Name: BURNT CR

Forest: CHALLIS NF   District: LOST RIVER RD   Study: 196

Habitat Group	Total Number of Units	Number of Meas. Units	Number of Est. Units	Mean Percent Substrate Coverage: Fines	Small Gravel	Gravel	Small Cobble	Cobble	Small Boulder	Boulder	Bedrock	Mean % Surface Fines
Survey Reach: 14 / Reach Type: C												
SLA	23	5	-	32.8	13.2	50.8	4.0	-	-	-	-	23.3
SMD	2	-	-	-	-	-	-	-	-	-	-	25.0
SPL	1	1	-	40.0	5.0	55.0	-	-	-	-	-	40.0
TUR	21	5	-	39.2	11.0	45.6	4.5	3.0	-	-	-	17.9
Subtotals	47	11										
Means			-	36.4	11.5	48.8	4.3	3.0	-	-	-	21.3
Survey Reach: 15 / Reach Type: C												
SLA	5	-	-	-	-	-	-	-	-	-	-	16.0
TUR	4	1	-	21.0	16.0	56.0	5.0	3.0	-	-	-	16.3
Subtotals	9	1										
Means			-	21.0	16.0	56.0	5.0	3.0	-	-	-	16.1
Totals	56	12										
Means			-	35.1	11.8	49.4	4.3	3.0	-	-	-	2[illegible].4

Survey Reach: 14 — Survey Reach Lower Boundary: LOWER BOUNDARY EXCLOSURE; Survey Reach Upper Boundary: UPPER BOUNDARY EXCLOSURE — near Spring (Source)

Survey Reach: 15 — Survey Reach Lower Boundary: LOWER BOUNDARY KA4; Survey Reach Upper Boundary: UPPER BOUNDARY KA4 — near Buck Cr

Wollman pebble count

ROS v9[illegible]

Stream ID: ID7397
HPA Reach: 17060202020000.00
ream Name: BURNT CR

R1/R4 FISH HA[illegible] INVENTORY SYSTEM
Summary of Main Channel Substrate Condition
Listing Overall and by Habitat Group

[illegible]e: 11/25/1997
Page 1

Forest: CHALLIS NF   District: LOST RIVER RD   Study: 197

Habitat Group	Total Number of Units	Number of Meas. Units	Number of Est. Units	Mean Percent Substrate Coverage: Fines	Small Gravel	Gravel	Small Cobble	Cobble	Small Boulder	Boulder	Bedrock	Mean % Surface Fines
	2	-	-	-	-	-	-	-	-	-	-	95.0
DNC	2	-	-	-	-	-	-	-	-	-	-	-
NTU	1	-	-	-	-	-	-	-	-	-	-	-
SLA	36	2	-	27.5	12.5	60.0	0.0	0.0	0.0	0.0	0.0	29.3
SMC	5	1	-	50.0	15.0	35.0	0.0	0.0	0.0	0.0	0.0	51.[illegible]
SFL	6	1	-	18.0	23.0	45.0	14.0	0.0	0.0	0.0	0.0	27.5
TUR	37	2	-	41.5	17.5	27.5	10.0	4.0	0.0	0.0	0.0	2[illegible].4
Totals	83	6										
Means	.		-	34.3	16.3	42.7	5.7	1.3	0.0	0.0	0.0	27.[illegible]

27.7%

Wollman pebble count

0.5 mi below spring

FOS v96.[illegible]

Stream ID: I82010
HPA Reach: 1706020202680.00
ream Name: DONKEY CR

R1/R4 FISH HABI[illegible]NVENTORY SYSTEM
Summary of Main Channel Substrate Condition
Listing by Survey Reach and by Habitat Group

Run [illegible] 09/25/1996
Page 1

Forest: CHALLIS NF
District: CHALLIS RD
Study: I96

Habitat Group	Total Number of Units	Number of Meas. Units	Number of Est. Units	Mean Percent Substrate Coverage: Fines	Small Gravel	Gravel	Small Cobble	Cobble	Small Boulder	Boulder	Bedrock	Mean % Surface Fines
Survey Reach:2 Reach Type: C	Survey Reach Lower Boundary: STATE BLM BOUNDARY; Survey Reach Upper Boundary: HEADWATERS											
SLA	18	-	-	-	-	-	-	-	-	-	-	30.8
TUR	17	-	-	-	-	-	-	-	-	-	-	22.9
Subtotals Means	35	-	-	-	-	-	-	-	-	-	-	27.0
Totals Means	35	-	-	-	-	-	-	-	-	-	-	27.0

Occular estimate

BLM CHALLIS FIELD OFFICE

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…/96

R1/R4 FISH HA[illegible] INVENTORY SYSTEM
Summary of Main Channel Substrate Condition
Listing Overall and by Habitat Group

Ru[illegible]: 11/24/1997
Page 1

…ream ID: ID7118
…A Reach: 17060202000800.00
…eam Name: PAHSIMEROI R.

Forest: CHALLIS NF

District: CHALLIS RD

Study: I97

Habitat Group	Total Number of Units	Number of Meas. Units	Number of Est. Units	Mean Percent Substrate Coverage: Fines	Small Gravel	Gravel	Small Cobble	Cobble	Small Boulder	Boulder	Bedrock	Mean % Surface Fines
SLA	42	-	-	-	-	-	-	-	-	-	-	24.8
SMD	13	-	-	-	-	-	-	-	-	-	-	23.9
SPL	4	-	-	-	-	-	-	-	-	-	-	19.8
TUR	56	2		28.0	15.5	41.5	8.0	5.0	2.5	0.0	0.0	[illegible]
Totals Means	115	2		28.0	15.5	41.5	8.0	5.0	2.5	0.0	0.0	18.3

18.3

Wollman pebble count

Reach is between Goldburg Cr & Burnt Cr

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)_FOS v96.

R1/R4 FISH HAB[illegible]NVENTORY SYSTEM
Summary of Main Channel Substrate Condition
Listing by Survey Reach and by Habitat Group

Run [illegible] 09/25/1996
Page 1

Stream ID: ID7118
EPA Reach: 17060202600100.00
Stream Name: PAHSIMEROI R

Forest: CHALLIS NF
District: CHALLIS RD
Study: I96

Habitat Group	Total Number of Units	Number of Meas. Units	Number of Est. Units	Fines	Small Gravel	Gravel	Small Cobble	Cobble	Small Boulder	Boulder	Bedrock	Mean % Surface Fines
Survey Reach: 5 Reach Type: B	Survey Reach Lower Boundary: BURNT CR	Survey Reach Upper Boundary: MAHOGANY CR										
				-	-	-	-	-	-	-	-	-
NTU	1	-	-	18.0	11.0	57.0	13.0	1.0	-	-	-	12.5
SLA	2	1	-	-	-	-	-	-	-	-	-	15.0
SMD	1	-	-	16.0	9.0	53.0	13.0	9.0	-	-	-	10.0
TUR	4	1	-									
Subtotals Means	8	2	-	17.0	10.0	55.0	13.0	5.0	-	-	-	11.7
Survey Reach: 6 Reach Type: B	Survey Reach Lower Boundary: MAHOGANY CR	Survey Reach Upper Boundary: ROCK CR										
SLA	3	1	-	25.0	13.0	44.0	8.0	3.0	7.0	-	-	16.7
TUR	2	1	-	10.0	3.0	61.0	13.0	8.0	6.0	-	-	12.5
Subtotals Means	5	2	-	17.5	8.0	52.5	10.5	5.5	6.5	-	-	15.0
Totals Means	13	4	-	17.3	9.0	53.8	11.8	5.3	6.5	-	-	13.2

wollman pebble count

KA3 - between Burnt cr + mahogany

KA 4 - between mahogany cr + Rock cr

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FB_P05 v3.0n

R1/R4 FISH HABITAT INVENTORY SYSTEM
Summary of Main Channel Substrate Condition
Listing by Survey Reach and by Habitat Group

Run date: 10/25/1995
Page 1

Stream ID: ID8703
EPA Reach: 1706020201600.00
Stream Name: MAHOGANY CR

Forest: CHALLIS NF

District: LOST RIVER RD

Study: I95

Habitat Group	Total Number of Units	Number of Meas. Units	Number of Est. Units	Mean Percent Substrate Coverage: Fines	Small Gravel	Gravel	Small Cobble	Cobble	Small Boulder	Boulder	Bedrock	Mean % Surface Fines
Survey Reach:1 Reach Type: B	Survey Reach Lower Boundary: LOWER MARKER KA1 Survey Reach Upper Boundary: UPPER MARKER KA1											
DNC	3	-	-	-	-	-	-	-	-	-	-	-
NTU	1	-	-	-	-	-	-	-	-	-	-	-
SLA	2	-	-	-	-	-	-	-	-	-	-	17.5
SUS	3	-	-	-	-	-	-	-	-	-	-	20.0
TUR	4	1	-	22.0	11.0	41.0	4.0	3.0	9.0	10.0	0.0	20.0
Subtotals Means	13	1	-	22.0	11.0	41.0	4.0	3.0	9.0	10.0	0.0	19.4
Totals Means	13	1	-	22.0	11.0	41.0	4.0	3.0	9.0	10.0	0.0	19.4

Wollman pebble count
1mi below stream crossing

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Appendix C
USGS Water Quality Data

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13299390	PAHSIMEROI RIVER BL FORKS NR DICKEY ID	05/22/1971	1530	24.3	3	N/A	N/A	N/A	N/A
13299390	PAHSIMEROI RIVER BL FORKS NR DICKEY ID	06/15/1971	N/A	N/A	6	N/A	0.03	N/A	N/A
13299390	PAHSIMEROI RIVER BL FORKS NR DICKEY ID	06/15/1971	1800	141	6	N/A	N/A	N/A	N/A
13299390	PAHSIMEROI RIVER BL FORKS NR DICKEY ID	07/16/1971	1300	115	8	N/A	N/A	N/A	N/A
13299390	PAHSIMEROI RIVER BL FORKS NR DICKEY ID	08/12/1971	1735	44.7	11	N/A	N/A	N/A	N/A
13299390	PAHSIMEROI RIVER BL FORKS NR DICKEY ID	09/18/1971	1100	23.8	2	N/A	N/A	N/A	N/A
13299390	PAHSIMEROI RIVER BL FORKS NR DICKEY ID	10/15/1971	1015	N/A	1.5	N/A	0.06	N/A	N/A
13299705	PAHSIMEROI RIVER BL BURNT CREEK NR DICKEY ID	05/23/1971	1225	16.8	6	N/A	N/A	N/A	N/A
13299705	PAHSIMEROI RIVER BL BURNT CREEK NR DICKEY ID	06/16/1971	1430	116	10	N/A	N/A	N/A	N/A
13299705	PAHSIMEROI RIVER BL BURNT CREEK NR DICKEY ID	07/14/1971	1725	92.8	13.5	N/A	N/A	N/A	N/A
13299705	PAHSIMEROI RIVER BL BURNT CREEK NR DICKEY ID	08/12/1971	1555	49.6	14	N/A	N/A	N/A	N/A
13299705	PAHSIMEROI RIVER BL BURNT CREEK NR DICKEY ID	10/15/1971	1200	16	1	N/A	N/A	N/A	N/A
13299705	PAHSIMEROI RIVER BL BURNT CREEK NR DICKEY ID	11/16/1971	1525	0.19	0	N/A	N/A	N/A	N/A
13299850	PAHSIMEROI RIVER AT MILE 36.2 NR PATTERSON ID	06/16/1971	1405	60.4	10	N/A	N/A	N/A	N/A
13299850	PAHSIMEROI RIVER AT MILE 36.2 NR PATTERSON ID	07/14/1971	1630	54.5	13	N/A	N/A	N/A	N/A
13299850	PAHSIMEROI RIVER AT MILE 36.2 NR PATTERSON ID	08/12/1971	1500	11.6	14	N/A	N/A	N/A	N/A
13299850	PAHSIMEROI RIVER AT MILE 36.2 NR PATTERSON ID	09/18/1971	1400	10.8	5	N/A	N/A	N/A	N/A
13299900	PAHSIMEROI RIVER AT MILE 32.1 NR PATTERSON ID	06/17/1971	1110	56.5	7.5	N/A	N/A	N/A	N/A
13299900	PAHSIMEROI RIVER AT MILE 32.1 NR PATTERSON ID	07/14/1971	1335	33	14	N/A	N/A	N/A	N/A
13299900	PAHSIMEROI RIVER AT MILE 32.1 NR PATTERSON ID	08/11/1971	1250	4.28	20.5	N/A	N/A	N/A	N/A
13300100	PAHSIMEROI RIVER AT MCCOY LANE NR PATTERSON ID	06/17/1971	1650	0.54	9	N/A	N/A	N/A	N/A
13300100	PAHSIMEROI RIVER AT MCCOY LANE NR PATTERSON ID	07/14/1971	1200	0.9	11	N/A	N/A	N/A	N/A
13300100	PAHSIMEROI RIVER AT MCCOY LANE NR PATTERSON ID	11/17/1971	1040	47.4	3.5	N/A	N/A	N/A	N/A
13301000	GOLDBURG CREEK NR PATTERSON ID	05/23/1971	1315	9.17	14.5	N/A	N/A	N/A	N/A
13301000	GOLDBURG CREEK NR PATTERSON ID	07/14/1971	1430	51.6	15.5	N/A	N/A	N/A	N/A
13301000	GOLDBURG CREEK NR PATTERSON ID	08/12/1971	1330	50.93	14	N/A	N/A	N/A	N/A

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13301000	GOLDBURG CREEK NR PATTERSON ID	11/17/1971	1040	47.4	3.5	N/A	N/A	N/A	N/A
13301100	GOLDBURG CREEK AT MCCOY LANE NR PATTERSON ID	05/24/1971	1200	236	15.5	N/A	N/A	N/A	N/A
13301100	GOLDBURG CREEK AT MCCOY LANE NR PATTERSON ID	06/17/1971	1615	93.3	12.5	N/A	N/A	N/A	N/A
13301100	GOLDBURG CREEK AT MCCOY LANE NR PATTERSON ID	07/14/1971	1130	89.5	11	N/A	N/A	N/A	N/A
13301100	GOLDBURG CREEK AT MCCOY LANE NR PATTERSON ID	08/12/1971	1145	63	12.5	N/A	N/A	N/A	N/A
13301100	GOLDBURG CREEK AT MCCOY LANE NR PATTERSON ID	09/19/1971	1050	54.2	6	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	04/30/1971	1400	20.2	8	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	05/22/1971	1215	55.6	2.5	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	06/16/1971	1150	N/A	6	N/A	0.05	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	07/16/1971	1055	112	7.5	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	08/12/1971	1605	54.6	14	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	09/17/1971	1800	32.3	6	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	10/13/1971	1350	N/A	5.5	N/A	0.07	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	11/19/1971	1320	22.3	1.5	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	09/13/1973	1130	30.6	7	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	10/22/1974	1120	21.2	2.5	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	09/28/1975	1550	28.3	6.5	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	09/28/1976	1322	39.7	7	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	09/28/1977	1500	26.6	7.5	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	09/13/1978	940	55	4.5	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	11/30/1983	1225	0.7	0	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	01/04/1984	1255	23	12.5	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	08/20/1987	1615	28	12	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	09/24/1987	1612	22	10	N/A	N/A	N/A	N/A
13301500	BIG CREEK AB DIV NR PATTERSON ID	11/04/1987	1030	18	3.5	N/A	N/A	N/A	N/A
13301504	BIG CREEK AT PATTERSON-HOWE ROAD NR PATTERSON ID	06/17/1971	1440	132	9.5	N/A	N/A	N/A	N/A
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	04/30/1971	1230	0.49	10	N/A	N/A	N/A	N/A

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	05/21/1971	1445	1.57	6	N/A	N/A	N/A	N/A
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	06/14/1971	1845	N/A	12.5	N/A	0.4	N/A	N/A
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	06/14/1971	1850	4.96	12.5	N/A	N/A	N/A	N/A
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	07/14/1971	1910	0.14	20	N/A	N/A	N/A	N/A
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	09/17/1971	1415	0.88	8.5	N/A	N/A	N/A	N/A
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	10/13/1971	1210	N/A	5	N/A	0.06	N/A	N/A
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	11/17/1983	1530	0.95	1.5	N/A	0.02	N/A	N/A
13301510	GROUSE CREEK AT ROAD CROSSING NR MAY ID	12/01/1983	1400	0.2	0.5	N/A	N/A	N/A	N/A
13301515	PAHSIMEROI RIVER AT FUREY LANE NR MAY ID	04/30/1971	1830	16.2	12	N/A	N/A	N/A	N/A
13301515	PAHSIMEROI RIVER AT FUREY LANE NR MAY ID	06/18/1971	1050	6.14	10	N/A	N/A	N/A	N/A
13301515	PAHSIMEROI RIVER AT FUREY LANE NR MAY ID	11/17/1971	1200	44.7	2	N/A	N/A	N/A	N/A
13301520	MEADOW CREEK AT ROAD CROSSING NR MAY ID	04/30/1971	1115	0.68	7.5	N/A	N/A	N/A	N/A
13301520	MEADOW CREEK AT ROAD CROSSING NR MAY ID	05/21/1971	1615	2.78	4.5	N/A	N/A	N/A	N/A
13301520	MEADOW CREEK AT ROAD CROSSING NR MAY ID	06/14/1971	1730	2.24	13	N/A	0.5	N/A	N/A
13301520	MEADOW CREEK AT ROAD CROSSING NR MAY ID	07/14/1971	2000	1.2	14.5	N/A	N/A	N/A	N/A
13301520	MEADOW CREEK AT ROAD CROSSING NR MAY ID	09/17/1971	1300	0.5	7.5	N/A	N/A	N/A	N/A
13301520	MEADOW CREEK AT ROAD CROSSING NR MAY ID	10/13/1971	1110	N/A	5	N/A	0.06	N/A	N/A
13301520	MEADOW CREEK AT ROAD CROSSING NR MAY ID	11/18/1971	1700	0.44	0	N/A	N/A	N/A	N/A
13301520	MEADOW CREEK AT ROAD CROSSING NR MAY ID	07/17/1984	1150	10	14.5	N/A	N/A	N/A	N/A
13301525	PAHSIMEROI RIVER AT HOOPER LANE NR MAY ID	05/24/1971	1915	20	13.5	N/A	N/A	N/A	N/A
13301525	PAHSIMEROI RIVER AT HOOPER LANE NR MAY ID	06/18/1971	1200	1.32	N/A	N/A	N/A	N/A	N/A
13301525	PAHSIMEROI RIVER AT HOOPER LANE NR MAY ID	07/13/1971	1620	7.69	14.5	N/A	N/A	N/A	N/A
13301525	PAHSIMEROI RIVER AT HOOPER LANE NR MAY ID	08/11/1971	1540	4.06	14	N/A	N/A	N/A	N/A
13301525	PAHSIMEROI RIVER AT HOOPER LANE NR MAY ID	09/19/1971	1425	0.92	7	N/A	N/A	N/A	N/A
13301525	PAHSIMEROI RIVER AT HOOPER LANE NR MAY ID	10/14/1971	1430	2.39	9	N/A	N/A	N/A	N/A
13301525	PAHSIMEROI RIVER AT HOOPER LANE NR MAY ID	11/17/1971	1345	44.6	2	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	04/30/1971	930	1.8	3.5	N/A	N/A	N/A	N/A

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	05/21/1971	1745	1.91	5.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	06/14/1971	1545	N/A	14.5	N/A	0.15	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	06/14/1971	1550	1.75	14.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	07/14/1971	2040	0.88	12.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	08/10/1971	1445	161	16.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	09/17/1971	1140	0.8	5.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	10/13/1971	1010	N/A	4.5	N/A	0.08	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	11/18/1971	1555	0.82	1.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	11/30/1983	1225	0.7	0	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	07/17/1984	1150	10.3	14.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	09/11/1984	1240	2.1	10.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	10/11/1984	1030	2.14	10.5	N/A	N/A	N/A	N/A
13301530	SULPHUR CREEK AT MOUTH OF CANYON NR MAY ID	11/07/1984	1150	1.9	1	N/A	N/A	N/A	N/A
13301532	SULPHUR CREEK BL SULPHUR SPRING	11/30/1983	1400	27	12.5	N/A	N/A	N/A	N/A
13301532	SULPHUR CREEK BL SULPHUR SPRING	07/17/1984	1210	25	15	N/A	N/A	N/A	N/A
13301532	SULPHUR CREEK BL SULPHUR SPRING	08/07/1984	1405	25	15	N/A	N/A	N/A	N/A
13301532	SULPHUR CREEK BL SULPHUR SPRING	09/11/1984	1300	28	15	N/A	N/A	N/A	N/A
13301532	SULPHUR CREEK BL SULPHUR SPRING	10/11/1984	1100	22	14.5	N/A	N/A	N/A	N/A
13301532	SULPHUR CREEK BL SULPHUR SPRING	11/07/1984	1205	25	14	N/A	N/A	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	07/13/1971	1650	6.7	20	N/A	N/A	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	11/16/1983	1730	25	13.5	N/A	0.04	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	11/16/1983	1750	25	13.5	N/A	N/A	768	52
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	11/30/1983	1455	25	12.5	N/A	N/A	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	12/14/1983	1410	26	11.5	N/A	N/A	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	01/04/1984	1255	23	12.5	N/A	N/A	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	01/18/1984	1415	24	11.5	N/A	N/A	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	02/09/1984	1005	26	12	N/A	N/A	N/A	N/A

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	03/08/1984	858	26	11	N/A	N/A	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	04/05/1984	1002	22	13.5	N/A	N/A	N/A	N/A
13301535	SULPHUR CREEK AT ROAD XING NR MAY 14N 21E 13AAC1	05/03/1984	1715	20	16	N/A	N/A	N/A	N/A
13301595	PATTERSON CREEK BL INYO CREEK NR PATTERSON ID	10/13/1971	1115	N/A	5	N/A	N/A	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	04/29/1971	1425	12.3	9	N/A	N/A	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	05/22/1971	1030	53.8	3.5	N/A	N/A	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	06/15/1971	1420	N/A	6	N/A	0.04	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	06/15/1971	1430	200	6	N/A	N/A	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	07/16/1971	1000	90.8	6.5	N/A	N/A	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	08/12/1971	1145	41.9	9	N/A	N/A	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	09/15/1971	1650	23.5	8	N/A	N/A	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	10/13/1971	1145	N/A	5.5	N/A	0.06	N/A	N/A
13301600	PATTERSON CREEK AT PATTERSON ID	11/19/1971	1200	16	2.5	N/A	N/A	N/A	N/A
13301620	FALL CREEK NR MAY ID	04/29/1971	1445	10.4	5.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	04/29/1971	1135	11.8	3	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	05/21/1971	1030	39.2	3.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	06/15/1971	1015	N/A	4	N/A	0.05	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	06/15/1971	1030	95.7	4	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	07/14/1971	1855	28.9	9	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	08/12/1971	1000	12.6	8	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	09/15/1971	1450	8.16	6.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	10/13/1971	1020	N/A	4	N/A	0.06	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	11/19/1971	1020	6.38	0.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	05/08/1973	1115	23	6	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	06/06/1973	1720	48	8	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	09/13/1973	1435	8.67	8.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	05/16/1974	1050	29.4	N/A	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	06/18/1976	1705	50.7	8	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	09/28/1976	1132	12.3	6	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	03/12/1977	1730	4.62	2	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	06/23/1977	1800	16.6	9	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	09/28/1977	1330	7.48	7.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	04/20/1978	1035	15.4	4	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	06/29/1978	915	65.3	5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	09/13/1978	1200	12.3	6.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	06/05/1979	1830	74	6.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	10/04/1979	840	6.7	5.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	05/14/1980	1330	57	5.5	N/A	N/A	N/A	N/A
13301700	MORSE CREEK AB DIV NR MAY ID	09/18/1981	1615	5.9	9.5	N/A	N/A	N/A	N/A
13301850	MORGAN CREEK AB DIV NR MAY ID	04/29/1971	1005	9.51	2.5	N/A	N/A	N/A	N/A

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	05/25/1971	1245	42.03	10.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	06/19/1971	1215	56	11	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	07/13/1971	1430	670	14.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	08/11/1971	1320	61.3	14	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	09/19/1971	1050	71.3	9	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	10/14/1971	1535	177	9	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	11/17/1971	1630	272	5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	07/18/1985	1040	63	13	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	08/22/1985	1040	73	11.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	09/26/1985	1023	237	8	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	11/07/1985	1120	290	7	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	12/19/1985	1214	281	2	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	01/30/1986	1338	291	N/A	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	03/12/1986	1202	301	7	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	04/24/1986	942	361	8	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	05/19/1986	1630	55	13.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	06/24/1986	1650	146	15.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	07/24/1986	1005	75	11.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	08/26/1986	1510	52	15.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	10/09/1986	1030	252	8	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	11/19/1986	1050	300	6.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	12/17/1986	830	273	1.5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	01/28/1987	1030	264	5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	03/04/1987	1015	266	5	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	04/01/1987	1405	243	10	N/A	N/A	N/A	N/A
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	04/29/1987	950	53.7	9	N/A	N/A	N/A	N/A

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13301900	PAHSIMEROI RIVER AT DOWTON LANE NR MAY ID	06/03/1987	1445	484	15	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	05/25/1971	1245	42	10.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	06/19/1971	1555	110	13	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	07/13/1971	1115	145	12	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	09/20/1971	1310	146	10	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	10/14/1971	1225	236	7	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	11/18/1971	1100	320	4	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	07/18/1985	953	98	12.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	08/22/1985	935	133	11.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	09/26/1985	1200	306	9	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	11/07/1985	957	327	7	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	12/19/1985	1326	322	2	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	01/30/1986	1457	347	N/A	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	03/12/1986	1418	326	8.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	04/24/1986	1100	356	10	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	05/21/1986	1530	102	12	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	05/29/1986	1722	102	19	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	06/26/1986	1450	182	15.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	07/24/1986	1100	139	11.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	08/26/1986	1325	111	17	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	10/09/1986	1145	303	8.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	11/19/1986	1140	322	6.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	12/17/1986	930	300	1.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	01/28/1987	1120	311	5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	03/04/1987	1110	303	5.5	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	04/01/1987	1450	282	10.5	N/A	N/A	N/A	N/A

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	04/29/1987	1040	80.5	10	N/A	N/A	N/A	N/A
13301990	PAHSIMEROI RIVER AT BURSTEAD LANE NR ELLIS ID	06/03/1987	1545	129	17	N/A	N/A	N/A	N/A
13301995	PAHSIMEROI RIVER AT ELLIS LANE NR ELLIS ID	05/26/1971	1200	121	14	N/A	N/A	N/A	N/A
13301995	PAHSIMEROI RIVER AT ELLIS LANE NR ELLIS ID	06/20/1971	1050	156	11	N/A	N/A	N/A	N/A
13301995	PAHSIMEROI RIVER AT ELLIS LANE NR ELLIS ID	08/10/1971	1525	20.2	17.5	N/A	N/A	N/A	N/A
13301995	PAHSIMEROI RIVER AT ELLIS LANE NR ELLIS ID	09/20/1971	1530	181	11	N/A	N/A	N/A	N/A
13301995	PAHSIMEROI RIVER AT ELLIS LANE NR ELLIS ID	10/14/1971	1035	280	8	N/A	N/A	N/A	N/A
13301995	PAHSIMEROI RIVER AT ELLIS LANE NR ELLIS ID	11/18/1971	1225	352	4.5	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	10/01/1965	N/A	N/A	10.5	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	06/03/1967	N/A	N/A	14	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	07/12/1967	N/A	N/A	19.5	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	09/25/1967	N/A	N/A	10.5	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	04/16/1968	1035	N/A	7	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	08/02/1968	N/A	N/A	17	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	10/09/1968	1900	N/A	8	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	12/17/1969	1010	N/A	2	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	04/14/1970	1330	N/A	6	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	04/23/1970	1120	N/A	12	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	08/11/1970	830	N/A	11	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	05/06/1971	1200	151	9	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	05/06/1971	1250	N/A	9	N/A	0.1	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	05/27/1971	1200	138	N/A	N/A	N/A	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	06/20/1971	1210	N/A	12.5	N/A	0.06	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	10/13/1971	1555	N/A	10.5	N/A	0.06	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	11/18/1971	1420	N/A	5	N/A	0.06	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	05/24/1972	1730	N/A	9	N/A	0.05	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	06/15/1972	930	N/A	12	N/A	0.06	N/A	N/A
13302000	PAHSIMEROI RIVER NR MAY ID	11/07/1985	1430	351	7.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/09/1984	1118	246	9.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/17/1984	1440	417	17	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/11/1984	1435	360	14	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	10/11/1984	825	484	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/07/1985	1515	393	3.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/24/1985	900	150	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/26/1985	1600	180	17	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/18/1985	1530	158	17	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/22/1985	1139	203	12.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/26/1985	1539	340	11	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/07/1985	1430	351	7.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	12/19/1985	845	308	1	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/30/1986	1730	343	N/A	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/12/1986	1507	348	8.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/24/1986	1131	243	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/24/1986	840	206	12	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/27/1986	1243	198	15	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	10/09/1986	1215	345	9	N/A	N/A	N/A	N/A

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/19/1986	1220	357	6.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	12/16/1986	1320	366	3.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/28/1987	1145	225	5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/04/1987	1150	328	5.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/31/1987	1200	310	7	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/28/1987	1415	119	9	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/03/1987	1250	188	13	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/23/1987	1443	200	15	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/19/1987	800	188	10.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/25/1987	848	210	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/04/1987	1145	313	8.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	12/16/1987	1535	263	3	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/27/1988	1137	276	3	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/09/1988	855	310	4	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/20/1988	920	170	8	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/18/1988	1220	119	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/14/1988	1340	161	15	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/20/1988	720	133	12	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/24/1988	1500	134	16	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	10/05/1988	1250	210	11	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/16/1988	800	278	5.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/05/1989	835	244	3	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	02/22/1989	1245	261	6	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/15/1989	1115	278	5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/26/1989	1515	148	11.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/24/1989	920	130	7.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/21/1989	908	134	9.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/26/1989	902	120	13.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/12/1989	830	159	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	10/24/1989	853	262	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	12/13/1989	847	240	5.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/24/1990	1340	246	3.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	02/26/1990	1510	243	7.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/04/1990	1600	198	12	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/16/1990	950	122	7.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/18/1990	1610	155	15	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/06/1990	1550	141	17	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/18/1990	1015	160	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	10/30/1990	1130	286	7.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	12/11/1990	1517	266	6	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/29/1991	1250	271	N/A	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/29/1991	1450	232	1	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	02/25/1991	1500	271	7	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/09/1991	1520	233	7.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/21/1991	1300	102	11	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/24/1991	1610	189	11	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/06/1991	1400	143	7	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/16/1991	1500	177	12	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	10/28/1991	1600	239	7.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/08/1991	900	301	5.6	0.3	0.04	10	8.1
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/08/1991	955	295	5.6	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	12/11/1991	1100	277	2	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/29/1992	1430	271	4.8	0.3	0.08	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/11/1992	930	290	5.5<	0.2	0.03	29	23

Station #	Station Name	Date	Time	Flow(cfs)	Temp(C)	N(nh3+org)	TP	SS(mg/l)	SS(t/day)
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/21/1992	1240	173	N/A	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/06/1992	845	120	9.6<	0.2	0.02	7	2.3
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/01/1992	1537	124	17.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/07/1992	1625	160	17	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/28/1992	1300	148	14.5<	.2<	0.01	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/17/1992	1505	125	17.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/29/1992	1420	165	12.1<	0.2	0.05	3	1.3
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/04/1992	915	238	6	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	12/16/1992	1540	243	2	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/27/1993	1105	218	1	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/03/1993	1042	271	2.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/13/1993	1230	240	7	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/22/1993	1545	97.6	5.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/22/1993	1455	173	17.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/20/1993	735	153	N/A	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/04/1993	830	157	13.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	10/26/1993	905	285	7	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	12/01/1993	1015	283	5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/12/1994	1050	277	4	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	02/24/1994	850	277	3.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/29/1994	1415	255	9.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/10/1994	740	101	10	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/20/1994	1555	131	18	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/09/1994	1205	134	14	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/21/1994	1345	137	14	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/15/1994	1030	227	2.9<	0.2	0.03	15	9.2
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/25/1995	1015	234	2.3	0.2	0.03	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/20/1995	1430	244	7.3<	0.2	0.03	20	13
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/08/1995	1100	360	8.7	0.4	0.07	24	23
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/11/1995	1330	534	15	0.5	0.07	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/12/1995	1345	196	13.1	0.2	0.04	4	2.1
13302005	PAHSIMEROI RIVER AT ELLIS ID	10/19/1995	825	306	6.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	11/28/1995	1420	327	6	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	01/23/1996	1515	286	1	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	03/26/1996	1410	281	7	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/21/1996	832	124	8.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/23/1996	817	175	12	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/24/1996	1255	237	9.5	N/A	N/A	N/A	N/A
13302005	PAHSIMEROI RIVER AT ELLIS ID	04/15/1998	1045	288	6.<	0.1	0.021	19	15
13302005	PAHSIMEROI RIVER AT ELLIS ID	05/12/1998	1200	208	9.5	0.159	0.028	13	7.3
13302005	PAHSIMEROI RIVER AT ELLIS ID	06/18/1998	945	244	9.5	0.257	0.063	11	7.2
13302005	PAHSIMEROI RIVER AT ELLIS ID	07/13/1998	1230	410	14.5	0.243	0.056	9	10
13302005	PAHSIMEROI RIVER AT ELLIS ID	08/11/1998	945	218	11.5	0.157	0.022	4	2.4
13302005	PAHSIMEROI RIVER AT ELLIS ID	09/15/1998	1030	236	11.5	.166E	0.036	7	4.5

Appendix D
BLM Temperature Data

Table D-1 Water temperatures for selected streams in the Pahsimeroi River watershed compared against PACFISH riparian management objectives (PACFlSH 1995) and bull trout conservation strategy guidelines.

		# Days Exceeding 7-Day Moving Average Thresholds					
Stream	Year	Salmon Rearing (64º F)	Salmon Spawning (60º F)	Bull Trout Migration (59º F)	Bull Trout Rearing (54º F)	Bull Trout Spawning (48º F)	Bull Trout Incubation (41º F)
Big Creek	1997	0	0	0	0	50	70
Big Creek	1998	0	0	0	62	92	NA
Burnt Creek	1994	0	22	66	NA	138	NA
Burnt Creek	1995	0	0	29	NA	107	NA
Burnt Creek	1996	0	6	46	NA	73	NA
Burnt Creek Exc 1	1997	0	0	0	69	110	110
Burnt Creek Exc 6	1997	0	0	0	59	94	94
Burnt Creek Exc 1	1998	NO	DATA				
Burnt Creek Exc 6	1998	0	0	0	66	94	NA
Ditch Creek KA-1	1998	0	0	0	0	74	117
Donkey Creek KA-1	1997	0	0	0	61	81	85
Donkey Creek KA-1	1998	NO	DATA				
Falls Creek KA-1	1997	0	0	0	0	0	68
Falls Creek KA-1	1998	NO	DATA				
Little Morgan Creek	1994	0	0	0	NA	114	NA
Little Morgan Creek	1997	0	0	0	0	53	64
Little Morgan Creek	1998	0	0	0	21	79	100
Long Creek KA-1	1997	13	50	50	64	72	72
Long Creek KA-1	1998	6	56	64	75	88	95
Mahogany Creek KA-1	1996	0	0	0	NA	41	NA
Mahogany Creek KA-1	1997	0	0	0	0	66	72
Mahogany Creek KA-1	1998	0	0	0	3	72	94
Mill Creek KA-1	1997	0	0	0	11	61	61
Morse Creek KA-1	1997	0	0	0	0	62	62
Morse Creek KA-1	1998	0	0	0	0	74	98
Pahsimeroi River at Grouse Creek	1997	1	44	46	68	68	68
Pahsimeroi River At Grouse Creek	1998	NO	DATA				

		# Days Exceeding 7-Day Moving Average Thresholds					
Stream	**Year**	**Salmon Rearing (64º F)**	**Salmon Spawning (60º F)**	**Bull Trout Migration (59º F)**	**Bull Trout Rearing (54º F)**	**Bull Trout Spawning (48º F)**	**Bull Trout Incubation (41º F)**
Pahsimeroi River at Culvert	1994	0	0	1	NA	127	80
Pahsimeroi River at Culvert	1996	0	0	54	NA	NA	69
Pahsimeroi River at Culvert	1997	0	0	0	14	89	89
Pahsimeroi River at Culvert	1998	NO	DATA				
Pahsimeroi River at Mahogany Creek	1997	LOST					
Pahsimeroi River at Mahogany Creek	1998	0	0	0	41	84	96
Patterson Creek	1997	0	0	0	0	0	62
Patterson Creek	1998	0	0	0	0	76	103
Short Creek KA-1	1994	53	73	83	NA	83	NA
Short Creek KA-1	1997	3	47	47	75	87	87
Short Creek KA-1	1998	NO	DATA				
Tater Creek KA-1	1998	0	0	0	0	0	99

All temperatures evaluated from mid-June into mid-October depending on water flows and weather conditions that limit late fall access.

Appendix E
BLM Proper Functioning Condition Ratings (from BLM, 1999)

Table E-1 Selected results of BLM Pahsimeroi Watershed Riparian Inventory (1995, 1998).

Stream (year inventoried)	Inventory Reach #	Miles	Dominant Vegetation Community Type	Functionality Rating
Baby Creek (98)	1	1.1	Geyers willow CT	FAR
	2	0.7	Geyers willow CT	FAR
Bear Creek (98)	1	0.7	Potentilla/hairgrass HT Geyers willow CT	FAR
Big Creek (95)	1	0.9	Aspen/dogwood CT Geyer willow CT Black cottonwood/bluegrass CT	PFC
Buck Creek (98)	1	0.5	Mixed conifer DT	PFC
Blind Fork Trail Creek (98)	1	1.1	Basin sagebrush DT	FAR
	2	0.3	Basin sagebrush DT	FAR
	3	0.3	Rose CT Basin sagebrush DT	FAR
	4	1.2	Mixed herbaceous DT Rose CT	FAR
Burnt Creek (95)	1	1.0	Geyers willow CT Coyote willow CT	FAR
	2	0.9	Basin sagebrush DT Kentucky bluegrass CT	FAR
	3	0.1	Kentucky bluegrass CT	FAR
	4	0.2	Kentucky bluegrass CT Baltic rush CT	PFC
	5	0.2	Kentucky bluegrass CT	PFC
	6	0.4	Kentucky bluegrass CT	FAR
	7	0.4	Geyers willow CT	PFC
	8	1.3	Geyers willow CT	FAR
	9	0.5	Geyers willow CT	PFC
	10	1.0	Geyers willow CT	FAR
	11	0.6	Aspen/dogwood CT	PFC
	12	0.5	Baltic rush CT Geyers willow/beaked sedge HT	PFC
	13	1.0	Geyers willow CT	FAR
	14	0.7	Geyers willow/beaked sedge HT Geyers willow/reedgrass HT	PFC
	15	0.7	Geyers willow CT	FAR

Stream (year inventoried)	Inventory Reach #	Miles	Dominant Vegetation Community Type	Functionality Rating
Ditch Creek (98)	1	0.6	Kentucky bluegrass CT	NF
	2	0.5	Aspen/dogwood HT	FAR
	3	0.5	Scoulers willow DT Douglas fir/dogwood HT	PFC
Donkey Creek (95)	1	0.9	Aspen/dogwood HT	FAR
	2	1.3	Aspen/dogwood HT	PFC
	3	1.2	Geyers willow CT Aspen/dogwood HT	PFC
East Fork Burnt Creek (95)	1	0.7	Mixed conifer DT Kentucky bluegrass CT	FAR
	2	0.8	Fowl bluegrass CT Mixed conifer DT	FAR
East Fork Morgan Creek (95)	1	0.6	Aspen/dogwood HT	PFC
	2	0.5	Aspen/dogwood HT Scoulers willow DT	PFC
Elbow Creek (98)	1	0.3	Water birch CT Rose CT	FAR
	2	0.4	Rose CT Water birch CT	FAR
Elkhorn Creek (98)	1	0.8	Kentucky bluegrass CT	FAR
	2	1.6	Geyers willow CT Kentucky bluegrass CT	FAR
	3	0.4	Geyers willow CT	FAR
Falls Creek (98)	1	0.3	Black cottonwood/dogwood	PFC
Grouse Creek (98)	1	0.5	Quackgrass DT	NF
	2	0.9	Kentucky bluegrass CT	NF
Lawson Creek (98)	1	0.3	Water birch CT	FAR
Little Morgan Creek (95)	1	0.7	Aspen/dogwood HT	PFC
	2	0.7	Aspen/dogwood CT	PFC
Long Creek lower (95)	1	0.4	Basin sagebrush DT	FAR
	2	1.2	Basin sagebrush DT Kentucky bluegrass CT	FAR
Long Creek upper (98)	1	0.6	Potentilla/hairgrass HT	FAR

Stream (year inventoried)	Inventory Reach #	Miles	Dominant Vegetation Community Type	Functionality Rating
	2	1.2	Geyers willow CT	FAR
	3	0.9	Geyers willow CT	PFC
	4	0.7	Geyers willow CT Hairgrass HT	FAR
Mahogany Creek (95)	1	0.7	Geyers willow CT	FAR
	2	0.7	Geyers willow CT	FAR
	3	0.8	Geyers willow CT Spruce/dogwood HT	FAR
Meadow Creek (98)	1	0.8	Kentucky bluegrass CT Rose CT	FAR
	2	1.1	Water birch CT	FAR
	3	0.3	Rose CT	PFC
	4	0.3	Douglas fir/cottonwood HT	PFC
Middle Fork Lawson Creek (98)	1	0.3	Rose CT Water birch CT	FAR
Mill Creek (98)	1	0.5	Aspen/dogwood HT	FAR
	2	1.1	Aspen/dogwood HT	FAR
	3	0.8	Aspen/dogwood HT Douglas fir/dogwood HT	FAR
Morse Creek (98)	1	0.6	Black cottonwood/dogwood CT	PFC
North Fork Lawson Creek (98)	1	0.7	Water birch CT	FAR
	2	0.6	Water birch CT	FAR
	3	0.9	Water birch CT	FAR
North Fork Morgan Creek (95)	1	0.6	Aspen/dogwood HT	PFC
Pahsimeroi River (95)	1	0.7	Geyers willow CT	FAR
	2	1.0	Geyers willow CT	FAR
	3	1.0	Geyers willow CT Yellow willow CT	FAR
	4	0.5	Geyers willow CT	FAR
	5	1.2	Geyers willow CT	FAR
	6	0.9	Geyers willow CT	FAR
	7	0.8	Geyers willow CT	FAR

Stream (year inventoried)	Inventory Reach #	Miles	Dominant Vegetation Community Type	Functionality Rating
	8	0.6	Geyers willow CT	FAR
	9	1.1	Geyers willow CT	FAR
	10	0.8	Geyers willow CT Spruce/dogwood HT	PFC
	11	0.7	Geyers willow CT	FAR
Pahsimeroi River (98)	1	9.7	Black cottonwood CT	FAR
Patterson Creek (95)	1	0.9	Black cottonwood/dogwood CT Water birch CT	FAR
	2	0.8	Black cottonwood/dogwood CT	FAR
Short Creek (95)	1	0.1	Basin sagebrush DT Kentucky bluegrass CT	FAR
	2	0.7	Kentucky bluegrass CT Basin sagebrush DT	FAR
	3	0.7	Geyers willow CT Kentucky bluegrass CT	FAR
	4	1.1	Geyers willow CT	FAR
	5	0.9	Geyers willow CT	FAR
	6	0.7	Geyers willow CT	FAR
	7	0.9	Geyers willow CT	FAR
South Fork Lawson Creek (98)	1	0.5	Bare ground Weedy forbs	NF
	2	1.4	Rose CT Kentucky bluegrass CT	FAR
	3	1.1	Rose CT	FAR
Squaw Creek (98)	1	0.9	Hairgrass HT	FAR
	2	1.1	Aspen/dogwood HT	FAR
Squaw Creek (98)	3	0.9	Geyers willow CT	FAR
Stinking Creek (98)	1	1.2	Aspen/dogwood HT	FAR
	2	1.0	Scoulers willow DT	PFC
Sulphur Creek (95)	1	0.2	Coyote willow CT	FAR
	2	0.9	Water birch CT Coyote willow CT	FAR
	3	0.6	Geyers willow CT Aspen/dogwood HT	PFC

Stream (year inventoried)	**Inventory Reach #**	**Miles**	**Dominant Vegetation Community Type**	**Functionality Rating**
	4	1.0	Aspen/dogwood HT	FAR
	5	0.6	Aspen/dogwood HT Woods rose CT	FAR
Tater Creek (98)	1	1.2	Yellow willow CT Geyers willow CT	FAR
	2	1.0	Bebbs willow CT Aspen/dogwood HT	FAR
	3	0.9	Douglas fir/dogwood HT	PFC
Trail Creek (98)	1	0.4	Water birch CT	FAR
	2	0.4	Nebraska sedge CT Coyote willow CT	PFC
	3	1.1	Water birch CT Rose CT	FAR
	4	1.0	Catabrosia DT Rose CT	FAR
	5	0.9	Rose CT Coyote willow CT	FAR

PFC=Proper Functioning Condition; FAR=Functional-at-Risk; NF=Non Functional.
HT=Habitat Type (consisting of potential natural community species); CT=Community Type (consisting of seral or disclimax species); DT=Dominance Type (dominated by species typically not associated with hydric communities).

Appendix F
Stream Bank Erosion Methods and Results

Sediment TMDL Methods and Results

Introduction
This appendix documents the analytical techniques and data used to develop the gross sediment budget and instream sediment measures used in this TMDL. It describes the methods, data, and results for the 1) stream bank erosion inventory and 2) for surface and subsurface fine sediment data. These data are intended to characterize the natural and existing condition of the landscape, estimate the desired level of erosion and sedimentation, and provide baseline data that can be used in the future to track the effectiveness of TMDL implementation. For example, the stream bank erosion inventories can be repeated and will ultimately provide an adaptive management or feedback mechanism.

Stream bank Erosion Inventory
The stream bank erosion inventory used to estimate background and existing stream bank erosion followed methods outlined in the proceedings from the Natural Resource Conservation Service (NRCS) Channel Evaluation Workshop (1983). Using the direct volume method, sub-sections of 1996 303(d) watersheds were surveyed to determine the extent of chronic bank erosion and estimate the needed reductions.

The NRCS stream bank erosion inventory is a field-based methodology, which measures stream bank/channel stability, length of active eroding banks, and bank geometry. The stream bank/channel stability inventories were used to estimate the long-term lateral recession rate. The recession rate is determined from field evaluation of stream bank characteristics that are assigned a categorical rating ranging from 0 to 3. The categories of rating the factors and rating scores are:

Bank Stability:
- Do not appear to be eroding - 0
- Erosion evident - 1
- Erosion and cracking present - 2
- Slumps and clumps sloughing off - 3

Bank Condition:
- Some bare banks, few rills, no vegetative overhang - 0
- Predominantly bare, some rills, moderate vegetative overhang - 1
- Bare, rills, severe vegetative overhang, exposed roots - 2
- Bare, rills and gullies, severe vegetative overhang, falling trees - 3

Vegetation / Cover On Banks:
- Predominantly perennials or rock-covered - 0
- Annuals / perennials mixed or about 40% bare - 1
- Annuals or about 70% bare - 2
- Predominantly bare - 3

Bank / Channel Shape:
- V - shaped channel, sloped banks - 0
- Steep V - shaped channel, near vertical banks - 1
- Vertical Banks, U - shaped channel - 2
- U - shaped channel, undercut banks, meandering channel – 3

Channel Bottom:

Channel in bedrock / non-eroding - 0
Soil bottom, gravels or cobbles, minor erosion - 1
Silt bottom, evidence of active downcutting - 2

Deposition:

No evidence of recent deposition - 1
Evidence of recent deposits, silt bars - 0

Cumulative Rating

Slight (0-4)   Moderate (5-8)   Severe (9+)

From the cumulative rating, the lateral recession rate is assigned.

0.01 - 0.05 feet per year	**Slight**
0.06 - 0.15 feet per year	**Moderate**
0.16 - 0.3 feet per year	**Severe**
0.5+ feet per year	**Very Severe**

Stream bank stability can also be characterized through the following definition and the corresponding stream bank erosion condition rating. Ratings from Bank Stability or Bank Condition, above, are included in italics.

Stream banks are considered stable if they do not show indications of any of the following features:

Breakdown - Obvious blocks of bank broken away and lying adjacent to the bank. *Bank Stability Rating 3*
Slumping or False Bank - Bank has obviously slipped down, cracks may or may not be obvious, but the slump feature is obvious. *Bank Stability Rating 2*
Fracture - A crack is visibly obvious on the bank indicating that the block of bank is about to slump or move into the stream. *Bank Stability Rating 2*
Vertical and Eroding - The bank is mostly uncovered and the bank angle is steeper than 80 degrees from the horizontal. *Bank Stability Rating 1*

Stream banks are considered covered if they show any of the following features:

Perennial vegetation ground cover is greater than 50%. *Vegetation/Cover Rating 0*
Roots of vegetation cover more than 50% of the bank (deep rooted plants such as willows and sedges provide such root cover). *Vegetation/Cover Rating 1*
At least 50% of the bank surfaces are protected by rocks of cobble size or larger. *Vegetation/Cover Rating 0*
At least 50% of the bank surfaces are protected by logs of 4-inch diameter or larger. *Vegetation/Cover Rating 1*

Stream bank stability is estimated using a simplified modification of Platts, Megahan, and Minshall (1983, p. 13) as stated in *Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams* (Bauer and Burton, 1993). The modification allows for measuring stream bank stability in a more objective fashion. The lengths of banks on both sides of the stream throughout the entire linear distance of the representative reach are measured and proportioned into four stability classes as follows:

Mostly covered and stable (non-erosional). Stream banks are over 50% covered as defined above. Stream banks are stable as defined above. Banks associated with gravel bars having perennial vegetation above the scourline are in this category. *Cumulative Rating 0 - 4 (slight erosion) with a corresponding lateral recession rate of 0.01 - 0.05 feet per year*.

Mostly covered and unstable (vulnerable). Stream banks are over 50% covered as defined above. Stream banks are unstable as defined above. Such banks are typical of "false banks" observed in meadows where breakdown, slumping, and/or fracture show instability, yet vegetative cover is abundant. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year*.

Mostly uncovered and stable (vulnerable). Stream banks are less than 50% covered as defined above. Stream banks are stable as defined above. Uncovered, stable banks are typical of stream banks trampled by concentrations of cattle. Such trampling flattens the bank so that slumping and breakdown do not occur even though vegetative cover is significantly reduced or eliminated. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year*.

Mostly uncovered and unstable (erosional). Stream banks are less than 50% covered as defined above. They are also unstable as defined above. These are bare eroding stream banks and include ALL banks mostly uncovered, which are at a steep angle to the water surface. *Cumulative Rating 9+ (severe erosion) with a corresponding lateral recession rate of over 0.5 feet per year.*

Stream banks were inventoried to quantify bank erosion rate and annual average erosion. These data were used to develop a quantitative sediment budget to be used for TMDL development.

Site Selection

The first step in the bank erosion inventory is to identify key problem areas. Stream bank erosion tends to increase as a function of watershed area (NRCS, 1983). As a result, the lower stream segment of larger watersheds tend to be problem areas. These stream segments tend to be alluvial streams commonly classified as response reaches (Rosgen B and C channel types).

Because it is often unrealistic to survey every stream segment, sampled reaches were used and bank erosion rates were extrapolated over a larger stream segment. The length of the sampled reach is a function of stream type variability where streams segments with highly variable channel types need a large sample, whereas segments with uniform gradient and consistent geometry need less. Typically between 10 and 30 percent of stream bank needs to be inventoried. Often, the location of some stream inventory reaches is more dependent on land ownership than watershed characteristics. For example, private land owners are sometimes unwilling to allow access to stream segments within their property.

Stream reaches are subdivided into *sites* with similar channel and bank characteristics. Breaks between sites are made where channel type and/or dominate bank characteristics change substantially. In a stream with uniform channel geometry there may be only one site per stream reach, whereas in an area with variable conditions there may be several sites. The subdivision of stream reaches is at the discretion of the field crew leader.

Field Methods

Stream bank erosion or channel stability inventory field methods were originally developed by the U.S. Forest Service (Pfankuch, 1975). Further development of channel stability inventory methods are outlined in Lohrey (1989) and NRCS (1983). As stated above, the NRCS (1983) document outlines field methods used in this inventory. However, slight modifications to the field methods were made and are documented.

Field crews typically consist of two to four people and are trained as a group to ensure quality control or consistent data collection. Field crews survey selected stream reaches measuring bank length, slope height, bankfull width and depth, and bank content. In most cases, a Global Positioning System is used to locate the upper and lower boundaries of inventoried stream reaches. Additionally, while surveying field crews photograph key problem areas.

Bank Erosion Calculations

The direct volume method is used to calculate average annual erosion rates for a given stream segment based on bank recession rates determined in the survey (NRCS, 1983). The erosion rate (tons/mile/year) is used to estimate the total bank erosion of the selected stream corridor. The direct volume method is summarized in the following equations:

$$E = [A_E * R_{LR} * \rho_B]/2000 \text{ (lbs/ton)}$$

where:
E = bank erosion over sampled stream reach (tons/yr/sample reach)
A_E = eroding area (ft^2)
R_{LR} = lateral recession rate (ft/yr)
ρ_B = bulk density of bank material (lps/ft^3)

The bank erosion rate (E_R) is calculated by dividing the sampled bank erosion (E) by the total stream length sampled:

$$E_R = E/L_{BB}$$

where:
E_R = bank erosion rate (tons/mile/year)
E = bank erosion over sampled stream reach (tons/yr/sample reach)
L_{BB} = bank to bank stream length over sampled reach

Total bank erosion is expressed as an annual average. However, the frequency and magnitude of bank erosion events are greatly a function of soil moisture and stream discharge (Leopold et al. 1964). Because channel erosion events typically result from above average flow events, the annual average bank erosion value should be considered a long term average. For example, a 50-year flood event might cause five feet of bank erosion in one year and over a ten-year period this events accounts for the majority of bank erosion. These events have less of an influence where bank trampling is the major cause of channel instability.

The *eroding area* (A_E) is the product of linear horizontal bank distance and average bank slope height. Bank length and slope heights are measured while walking along the stream channel. Pacing is used to measure horizontal distance, and bank slope heights are continually measured and averaged over a given reach or site. The horizontal length is the length of the right or left bank, not both. Typically, one bank along the stream channel is actively eroding, such as the bank on the outside of a meander. However, both banks of channels with severe headcuts or gullies will be eroding and are to be measured separately and eventually summed.

Determining the *lateral recession rate* (R_{LR}) is one of the most critical factors in this methodology (NRCS, 1983). Several techniques are available to quantify bank erosion rates, such as aerial photo interpretation, anecdotal data, bank pins, and channel cross-sections.

To facilitate consistent data collection, the NRCS developed rating factors used to estimate lateral recession rate. Similar to methods developed by Pfankuch (1975), the NRCS method measures bank and channel stability, and then uses the ratings as surrogates for bank erosion rates.

The *bulk density* (ρ_B) of bank material is measured ocularly in the field. Soil bulk density is the weight of material divided by its volume, including the volume of its pore spaces. A table of typical soil bulk densities can be used, or soil samples can be collected and soil bulk density measured in the laboratory.

Subsurface Fine Sediment Sampling

McNeil Sediment Core samples were collected to describe size composition of bottom materials in salmonid spawning beds of streams on the 303(d) list for sediment. Research has shown that subsurface fine sediment composition is important to egg and fry survival (Hall 1986); (Reiser and White 1988). Data gathered as part of this TMDL and other studies relevant to the Pahsimeroi River Subbasin are presented after the narrative section of this appendix.

Site Selection

Sample sites selected displayed characteristics of gravel size, depth, and velocity required by salmonids to spawn and were determined to be adequate spawning substrate by an experienced fisheries biologist. Samples were collected during periods of low discharge, as described in McNeil and Ahnell (1964), to minimize loss of silt in suspension within the core sampling tube. Sample sites were generally in the lower reach of streams where spawning habitat was determined to exist.

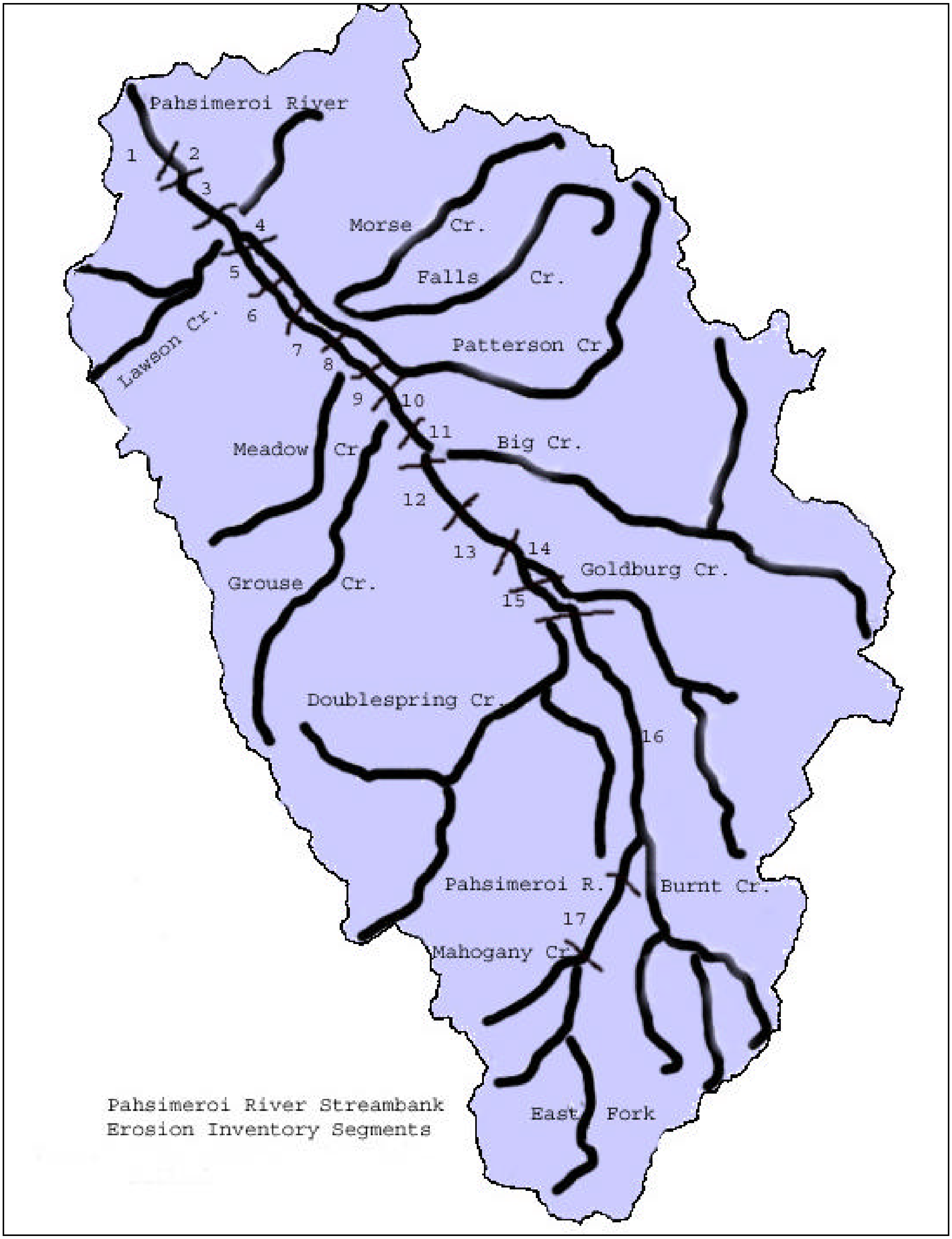
Field Methods

A 12-inch stainless steel open cylinder was worked manually as far as possible, at least 4 inches, into spawning substrate without allowing flowing water to top the core sampling tube. Samples of bottom materials were removed by hand, using a stainless steel mixing bowl, to a depth of at least 4 inches and placed into buckets. After solids were removed from the core sampling tube and placed into buckets, the remaining suspended material was discarded. It is felt that this fine material would be removed through the physical action of excavating a redd and would not be a significant factor with regard to egg to fry survival. Additionally, rinsing of sieves to process the sample results in some loss of the fraction below the smallest (0.053 mm) mesh size.

Samples were placed wet into a stack of sieves and were separated into 10 size classes by washing and shaking them through nine standard Tyler sieves having the following square mesh openings (in mm): 63, 25, 12.5, 6.3, 4.75, 2.36, .85, .212, .053. Silt passing the finest screen was discarded.

The volume of solids retained by each sieve was measured after the excess water drained off. The contents of each of the sieves were placed in a bucket filled with water to the level of a spigot for measurement by displacement. The water displaced by solids was collected in a plastic bucket and transferred to a 2,000 ml graduated cylinder and measured directly. Water displaced by solids retained by the smaller diameter sieves was also collected in a plastic bucket and measured in a 250 ml graduated cylinder. Variation in sample volumes was caused by variation in porosity and core depth. All sample fractions were expressed as a percentage of the sample with and without the 63 mm fraction.

Three sediment core samples were collected at each sample site and grouped together by fractions 6.3 mm and greater and 4.75 mm to 0.53 mm. The results for a particular site are the percentage of 4.75 mm to 0.53 mm as a percent of the total sample. Standard deviation is calculated for estimates including and excluding particles 63 mm and above.


Pahsimeroi River
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Morse Cr.
Falls Cr.
Lawson Cr.
Patterson Cr.
Meadow Cr.
Big Cr.
Grouse Cr.
Goldburg Cr.
Doublespring Cr.
Pahsimeroi R.
Burnt Cr.
Mahogany Cr.
East Fork
Pahsimeroi River Streambank
Erosion Inventory Segments

Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section Riparian Exclosure to above Burstedt Lane

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Date/Time: 3/26/2001 10:00

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	39.459	4737	0.38 %
	W	114	0.991		
Downstream	N	44	41.04	4668	
	W	114	2.337		

Stream Bank Erosion Calculations

AVE. Bank Height:	0.5	feet	**. bank to bank length (L_{BB})**	2640	feet
bank to bank Eroding Seg. Length	528	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.20				
Bank erosion over sampled reach (E)	0.45	tons/year/sample reach			
Erosion Rate (E_R)	1.80	tons/mile/year			
Feet of Similar Stream Type	16896	feet			
Eroding bank extrapolation	7286.40	feet			
Total stream bank erosion	6	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	0.6	tons/year/sample reach
Erosion Rate (E_R)	2.2	tons/mile/year
Feet of Similar Stream Types	16896.00	feet
Eroding bank extrapolation	7286.40	feet
Total stream bank erosion	7.7	tons/year

Comments

Flow a contributing factor?: Increased erosional energy at high flows. Flow is predominantly from Gldburg Creek and Springs.
Big Creek is dry below the USFS boundary diversion and not contributing flow at this time.
Other contributing factors?: Previous heavy livestock use is evident and has likely predisposed this reach to significant bank erosion.
Other Notes: This segment is developing a new flood plain over much of the reach. Inside meanders are vegetated with colonizing woody species, some sedge and perennial/annual grasses. Outside meanders are vertical and erosive over most of the reach.

Individual Bank Measurements

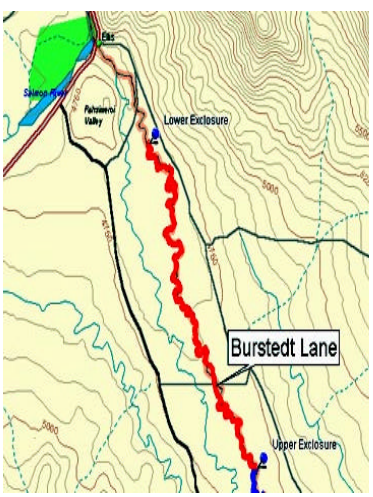
Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		Eroding Area with Load Reductions	Reach erosion rate load reduction	
1320	264	0.5			1	1	ss	Riparian exclosure fence to just above Burstedt Lane.	264	0	tons/year	264.0	1	tons/year
					2	0			Recession Rate			Recession Rate		
					3	0			0.04			0.05		
					4	0			Bulk Density			Bulk Density		
					5	1			85			85	**Total for segments after reductior**	
					6	1				0	tons/year		1	tons/year/sample
1320	264	0.5	#DIV/0!	#DIV/0!	sec. total	3								
			W/D Ratio	#DIV/0!	ecession Rate	0.04								
Total Inventoried Length	Total Erosive Length								Eroding Area	Average Reach erosion rate			**Total Reduction**	
1320	264	0.50			Ave. Rec.Rank	3			264	0	tons/year/sample		0	tons/year/sample
					Ave. Rec.Rate	0.04			Recession Rate					
									0.04					
									Avg. Bulk Density					
									85					

Listed From:

Total Inventoried Stream Length:

Listed Length:

Total Stream Length



Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section Above the Riparian Exclosure

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Date/Time: 3/26/2001 10:00

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	38.457	4783	0.31 %
	W	114	0.001		
Downstream	N	44	39.459	4738	
	W	114	0.991		

Stream Bank Erosion Calculations

AVE. Bank Height:	1.5	feet	**. bank to bank length (L$_{BB}$)**	2640	feet
bank to bank Eroding Seg. Length	1056	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.40				
Bank erosion over sampled reach (E)	3.70	tons/year/sample reach			
Erosion Rate (E$_R$)	14.81	tons/mile/year			
Feet of Similar Stream Type	13041	feet			
Eroding bank extrapolation	11488.80	feet			
Total stream bank erosion	**40**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	1.7	tons/year/sample reach
Erosion Rate (E$_R$)	6.7	tons/mile/year
Feet of Similar Stream Types	13041.00	feet
Eroding bank extrapolation	5744.40	feet
Total stream bank erosion	**18.3**	tons/year

Comments

Flow a contributing factor?: Increased erosional energy at high flows.

Other contributing factors?: Increasing livestock use with direct access to streambanks along reach.

Other Notes: Inside meanders are largely vegetated with mature willows. Some sedge and perennial/annual grasses

Outside meanders are generally vertical and erosive over most of the reach.

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		Eroding Area with Load Reductions	Reach erosion rate load reduction	
1320	528	1.5			1	1	ss-gvl	Riparian exclosure fence to just above Burstedt Lane.	1584	4	tons/year	792.0	2	tons/year
					2	0			Recession Rate			Recession Rate		
					3	1			0.055			0.05		
					4	0.5			Bulk Density			Bulk Density		
					5	1			85			85	**Total for segments after reductior**	
					6	1				4	tons/year		2	tons/year/sample
1320	528	1.5	#DIV/0!	#DIV/0!	sec. total	4.5								
			W/D Ratio	#DIV/0!	ecession Rate	0.055								

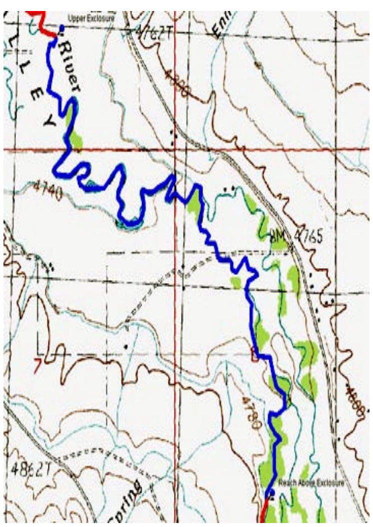
Total Inventoried Length	Total Erosive Length			Eroding Area	Average Reach erosion rate		Total Reduction
1320	528	1.50	Ave. Rec.Rank 5	1584	4	tons/year/sample	2 tons/year/sample
			Ave. Rec.Rate 0.055	Recession Rate			
				0.055			
				Avg. Bulk Density			
				85			

Listed From:

Total Inventoried Stream Length:

Listed Length:

Total Stream Length



Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section From upper bound of Above Exclosure to Hatchery Ponds

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Date/Time: 3/26/2001 10:00

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	37.35	4829	0.28 %
	W	113	59.124		
Downstream	N	44	38.457	4783	
	W	114	0.001		

Stream Bank Erosion Calculations

AVE. Bank Height:	0.8	feet	**ank to bank length (L BB)**	2640	feet
bank to bank Eroding Seg. Length	1848	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.70				
Bank erosion over sampled reach (E)	2.36	tons/year/sample reach			
Erosion Rate (ER)	9.42	tons/mile/year			
Feet of Similar Stream Type	15259	feet			
Eroding bank extrapolation	23210.60	feet			
Total stream bank erosion	**30**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	0.8	tons/year/sample reach
Erosion Rate (ER)	3.4	tons/mile/year
Feet of Similar Stream Types	15259.00	feet
Eroding bank extrapolation	6631.60	feet
Total stream bank erosion	**10.6**	tons/year

Comments

Flow a contributing factor?: No.

Other contributing factors?: Increasing livestock use with direct access to streambanks along reach.

Other Notes: Inside meanders are largely vegetated with mature willows. Some sedge and perennial/annual grasses

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments
1320	924	0.75			1	0	ss-gvl	Riparian exclosure fence to just above Burstedt Lane.
					2	0		
					3	1		
					4	0		
					5	1		
					6	1		
1320	924	0.75	#DIV/0!	#DIV/0!	sec. total	3		
			W/D Rati	#DIV/0!	cession Rate	0.04		
Total Inventoried Lengt	Total Erosive Length							
1320	924	0.75			Ave. Rec.Rank	3		
					Ave. Rec.Rate	0.040		

Eroding Area	Reach erosion rate		Eroding Area with Load Reductions	Reach erosion rate load reduction	
1386	2	tons/year	396.0	1	tons/year
Recession Rate			Recession Rate		
0.04			0.05		
Bulk Density			Bulk Density		
85			85	**Total for segments after reduction**	
	2	tons/year		1	tons/year/sample

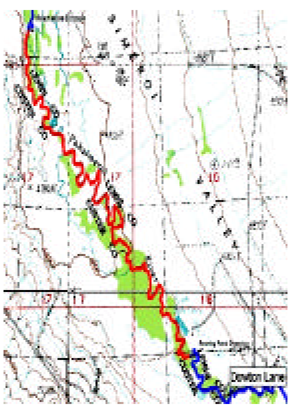
Eroding Area	Average Reach erosion rate		**Total Reduction**	
1386	2	tons/year/sample	2	tons/year/sample
Recession Rate				
0.04				
Avg. Bulk Density				
85				

Listed From:

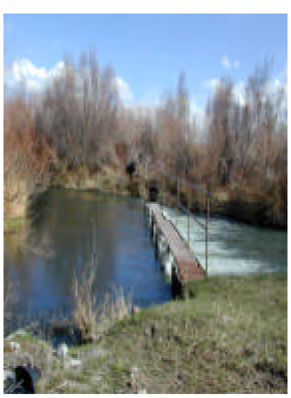
Total Inventoried Stream Length:

Listed Length:

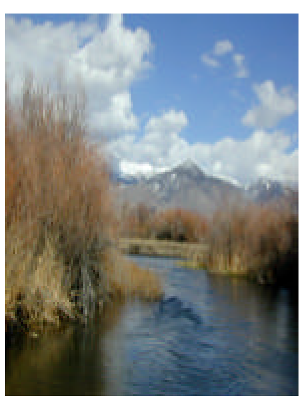
Total Stream Length



Looking Downstream from Hatchery Pond Diversion



Hatchery Pond Diversion



Looking Upstream from Hatchery Pond Diversion

Stream Bank Erosion Inventory Worksheet

Stream	Pahsimeroi River
Section	Hatchery Ponds to Patterson Creek Confluence
Field Crew	Tom Herron DEQ; Sr. Water Quality Analyst
Data reduced by	Tom Herron, DEQ
Date/Time:	3/26/2001 10:00
Land Use	Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	37.652	4863	0.37 %
	W	113	58.862		
Downstream	N	44	37.35	4829	
	W	113	59.124		

Stream Bank Erosion Calculations

AVE. Bank Height:	1.8	feet	**ank to bank length (L BB)**	5280	feet
bank to bank Eroding Seg. Length	1848	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.35				
Bank erosion over sampled reach (E)	12.37	tons/year/sample reach			
Erosion Rate (E R)	24.74	tons/mile/year			
Feet of Similar Stream Type	6600	feet			
Eroding bank extrapolation	6468.00	feet			
Total stream bank erosion	**43**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	3.9	tons/year/sample reach
Erosion Rate (E R)	7.9	tons/mile/year
Feet of Similar Stream Types	6600.00	feet
Eroding bank extrapolation	3696.00	feet
Total stream bank erosion	**13.7**	tons/year

Comments

Flow a contributing factor?: Increased erosional energy at high flows.

Other contributing factors?: Increasing livestock use with direct access to streambanks along reach.

Other Notes: Inside meanders are largely vegetated with mature willows. Some sedge and perennial/annual grasses

Outside meanders are generally vertical and erosive over most of the reach.

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Bank Slope	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		with Load Reductions	Reach erosion rate load reduction	
2640	924	1.75			1	1	ss-gvl	Riparian exclosure fence to just above Burstedt Lane.	3234	12	tons/year	1848.0	4	tons/year
					2	1			Recession Rate			Recession Rate		
					3	1			0.09			0.05		
					4	1			Bulk Density			Bulk Density		
					5	1			85			85	**Total for segments after reductio**	
					6	1				12	tons/year		4	tons/year/sample
2640	924	1.75	#DIV/0!	#DIV/0!	sec. total	6								
			W/D Rati	#DIV/0!	:ession Rate	0.09								

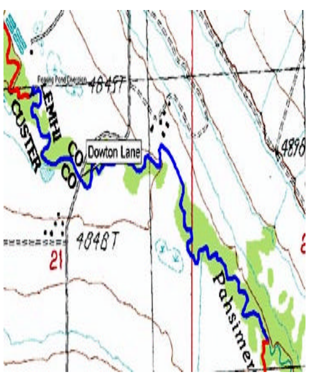
Total Inventoried Lengtl	Total Erosive Length					Eroding Area	Average Reach erosion rate		**Total Reduction**	
2640	924	1.75	Ave. Rec.Ran	6		3234	12	tons/year/sample	8	tons/year/sample
			Ave. Rec.Rat	0.090		Recession Rate				
						0.09				
						Avg. Bulk Density				
						85				

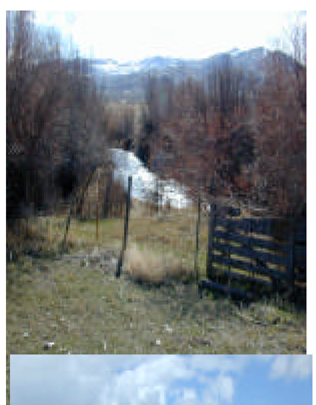
Listed From:

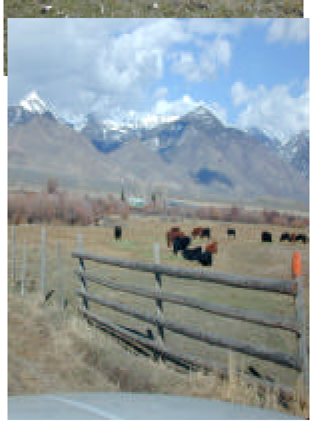
Total Inventoried Stream Length:

Listed Length:

Total Stream Length







Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section Patterson Creek Confluence to Lower Martiny Reach

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Date/Time: 3/26/2001 13:30

Land Use Grazing/irrigated pasture

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	35.397	4921	0.41 %
	W	113	56.84		
Downstream	N	44	36.815	4863	
	W	113	56.84		

Stream Bank Erosion Calculations

AVE. Bank Height:	1.3	feet	**. bank to bank length (L_{BB})**	2640	feet
bank to bank Eroding Seg. Length	792	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.30				
Bank erosion over sampled reach (E)	3	tons/year/sample reach			
Erosion Rate (E_R)	10	tons/mile/year			
Feet of Similar Stream Type	12830	feet			
Eroding bank extrapolation	8490.00	feet			
Total stream bank erosion	**27**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	1	tons/year/sample reach
Erosion Rate (E_R)	6	tons/mile/year
Feet of Similar Stream Types	12830.00	feet
Eroding bank extrapolation	5660.00	feet
Total stream bank erosion	**15.0**	tons/year

Comments

Flow a contributing factor?: No, good access to well vegetated flood plain over most of reach.

Other contributing factors?: Riparian wetland is hummocked due to livestock use diminishing bank storage and filtering.

Other Notes: Partitioned rotational grazing in effect: moderate seasonal. Thick willow dominated riparian zone on east edge of stream. Occasional clumping from adjacent cattle trails along of reach. Entire flow is diverted at upper section in dry years. Diversion improvement planned by IDFG

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments
1320	396	1.25			1	1	ss-gvl	
					2	1.5		
					3	0		
					4	0		
					5	1.5		
					6	1		
1320	396	1.25	#DIV/0!	#DIV/0!	sec. total	5		
			W/D Ratio	#DIV/0!	Recession Rate	0.05		
Total Inventoried Length	Total Erosive Length							
1320	396	1.25			Ave. Rec.Rank	5		
					Ave. Rec.Rate	0.06		

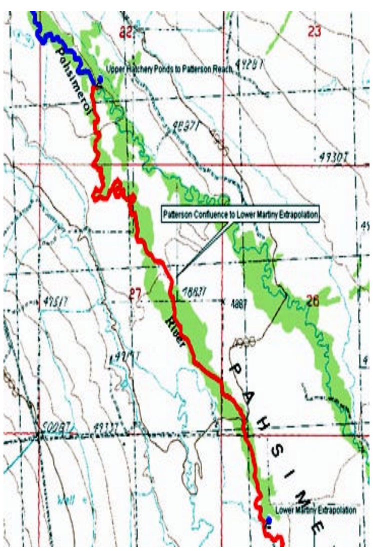
Eroding Area	Reach erosion rate		Eroding Area with Load Reductions	Reach erosion rate load reduction	
990	2	tons/year	660.0	1	tons/year
Recession Rate			Recession Rate		
0.05			0.05		
Bulk Density			Bulk Density		
85			85	**Total for segments after reduction**	
	2	tons/year		1	tons/year/sample
Eroding Area	Average Reach erosion rate			**Total Reduction**	
990	3	tons/year/sample		1	tons/year/sample
Recession Rate					
0.06					
Avg. Bulk Density					
85					

Listed From:

Total Inventoried Stream Length:

Listed Length:

Total Stream Length



Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River
Section Jimmy Martiny Land Inventory Below Hooper Lane
Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ
Date/Time:
Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	34.599	4968	0.49 %
	W	113	55.785		
Downstream	N	44	34.892	4921	
	W	113	55.891		

Stream Bank Erosion Calculations

AVE. Bank Height:	2.0	feet	**Inv. bank to bank length (L$_{BB}$)**	6102	feet
bank to bank Eroding Seg. Length	3660	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.60				
Bank erosion over sampled reach (E)	37	tons/year/sample reach			
Erosion Rate (E$_R$)	63	tons/mile/year			
Feet of Similar Stream Type	6547	feet			
Eroding bank extrapolation	11513.82	feet			
Total stream bank erosion	**115**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	5	tons/year/sample reach
Erosion Rate (E$_R$)	9	tons/mile/year
Feet of Similar Stream Types	6547.00	feet
Eroding bank extrapolation	3839.20	feet
Total stream bank erosion	**16.4**	tons/year

Comments

Flow a contributing factor?: No. Spring Creek conditions.

Other contributing factors?: Cattle access to stream and severe chilselling.

Other Notes: Whitefish and brook trout observed at several points over this reach.

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments
1542	925	2.5			1	1	silt-clay-loam	
					2	2		
					3	2		
					4	3		
					5	2		
					6	0		
1542	925	2.5	#DIV/0!	#DIV/0!	sec. total	10		
			Ratio	#DIV/0!	Recession Rate	0.33		

Eroding Area	Reach erosion rate		Eroding Area with Load Reduction	Reach erosion rate load reduction	
4625	65	tons/year	1542.0	3	tons/year
Recession Rate			Recession Rate		
0.33			0.05		
Bulk Density			Bulk Density		
85			85		

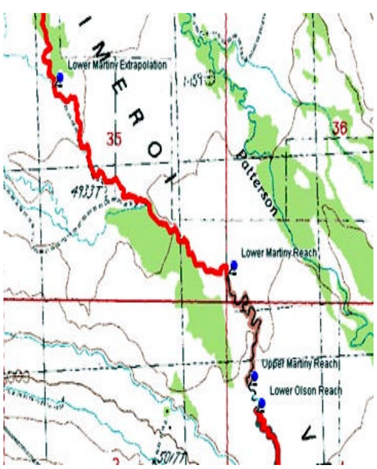
Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments
1509	905	1.5			1	1	silt-clay-loam	
					2	1		
					3	1		
					4	2		
					5	2		
					6	0		
1509	905	1.5	#DIV/0!	#DIV/0!	sec. total	7		
			Ratio	#DIV/0!	Recession Rate	0.14		

Eroding Area	Reach erosion rate		Eroding Area with Load Reduction	Reach erosion rate load reduction	
2715	16	tons/year	905.4	2	tons/year
Recession Rate			Recession Rate		
0.14			0.05		
Bulk Density			Bulk Density		
85			85		
				Total for segments after reductior	
	81	tons/year		5	tons/year/sample

Total Inventoried Length	Total Erosive Length			
3051	1830	2.00	Ave. Rec.Rank	9
			Ave. Rec.Rate	0.24

Eroding Area	Average Reach erosion rate		**Total Reduction**
3660	37	tons/year/sample	76 tons/year/sample
Recession Rate			
0.235			
Avg. Bulk Density			
85			

Listed From:
Total Inventoried Stream Length:
Listed Length:
Total Stream Length



Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section Olson Land Inventory Below Hooper Lane

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Date/Time: 3/26/2001 13:30

Land Use Grazing/irrigated pasture

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	33.9517	5002	0.47 %
	W	113	55.2133		
Downstream	N	44	34.526	4974	
	W	113	55.719		

Stream Bank Erosion Calculations

AVE. Bank Height:	0.8	feet	**bank to bank length (L_{BB})**	3346	feet
bank to bank Eroding Seg. Length	328	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.10				
Bank erosion over sampled reach (E)	1	tons/year/sample reach			
Erosion Rate (E_R)	2	tons/mile/year			
Feet of Similar Stream Type	9820	feet			
Eroding bank extrapolation	2253.26	feet			
Total stream bank erosion	**4**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	1	tons/year/sample reach
Erosion Rate (E_R)	4	tons/mile/year
Feet of Similar Stream Types	9820.00	feet
Eroding bank extrapolation	4597.20	feet
Total stream bank erosion	**8.0**	tons/year

Comments

Flow a contributing factor?: No, good access to well vegetated flood plain over most of reach. Watergap: 50' X 5.5' and erosive

Other contributing factors?: Riparian wetland is hummocked due to livestock use diminishing bank storage and filtering.

Other Notes: Partitioned rotational grazing in effect: moderate seasonal. Thick willow dominated riparian zone on east edge of stream. Occasional clumping from adjacent cattle trail along most of reach. Entire flow is diverted at upper section in dry years. Diversion improvement planned by IDFG

Individual Bank Measurements

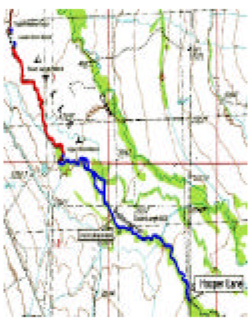
Total Inventoried Bank Length	Erosive Bank Lngth	Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		with Load Reductions	Reach erosion rate load reduction	
1673	164	0.82	8	0.5	1	0.5	ss-gvl		268.96	1	tons/year	548.7	1	tons/year
				1.5	2	0.5			Recession Rate			Recession Rate		
				2.5	3	1			0.05			0.05		
				2	4	0			Bulk Density			Bulk Density		
				1	5	1			85			85	**Total for segments after reduction**	
					6	1				1	tons/year		1	tons/year/sample
1673	164	0.82	8	1.50	sec. total	4								
			W/D Ratio	5.33333	cession Rate	0.05								
Total Inventoried Lengt	Total Erosive Length								Eroding Area	Average Reach erosion rate			**Total Reduction**	
1673	164	0.82			Ave. Rec.Rank	4			269	1	tons/year/sample		-1	tons/year/sample
					Ave. Rec.Rate	0.05			Recession Rate					
									0.05					
									Avg. Bulk Density					
									85					

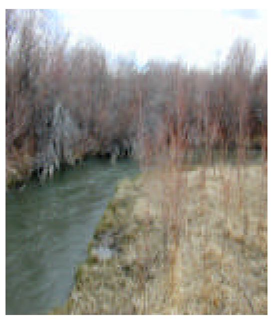
Listed From:

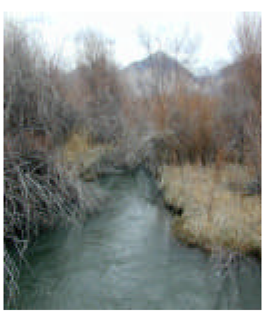
Total Inventoried Stream Length:

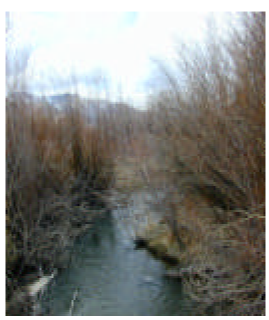
Listed Length:

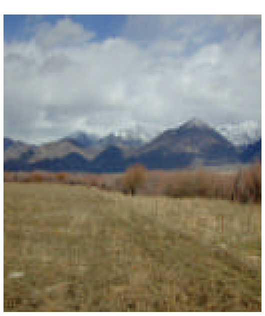
Total Stream Length

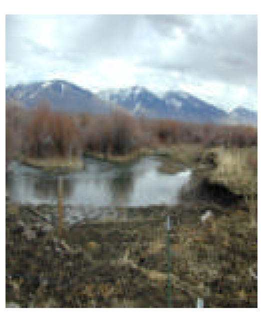












Stream Bank Erosion Inventory Worksheet

Stream	Pahsimeroi River		
Section	Hooper Lane to Lower BLM Land		
ield Crew	Tom Herron DEQ; Sr. Water Quality Analyst	**Data reduced by**	Tom Herron, DEQ
ate/Time:	######## 13:30		
Land Use	Grazing/irrigated pasture		

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	31.988	5174	0.72 %
	W	113	51.493		
Downstream	N	44	33.228	5065	
	W	113	53.77		

Stream Bank Erosion Calculations / **Stream Bank Erosion Reduction Calculations**

AVE. Bank Height:	1.3	feet	**: to bank length (L BB)**	2640	feet
Eroding Seg. Length	792	feet	(Inventoried stream length X 2)		
ercent eroding bank	0.30				
r sampled reach (E)	4	tons/year/sample reach	**Bank erosion over sampled reach (E)**	1	tons/year/sample reach
Erosion Rate (E R)	15	tons/mile/year	**Erosion Rate (E R)**	6	tons/mile/year
imilar Stream Type	13728	feet	**Feet of Similar Stream Types**	13728.00	feet
g bank extrapolation	9028.80	feet	**Eroding bank extrapolation**	6019.20	feet
tream bank erosion	**43**	tons/year	**Total stream bank erosion**	**16.0**	tons/year

Comments

Flow a contributing factor?: Yes, downcut over upper channel increasing erosion at elevated flow.

Other contributing factors?: Riparian Vegetation decreases to upper bound of reach decreasing stability of streambanks.

Other Notes: This reach is often dry during irrigation season.

Individual Bank Measurements

Inventoried Bank	Erosive Bank Lngth	Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments
1320	396	1.25			1	1	ss	
					2	1		
					3	1		
					4	1		
					5	1		
					6	1		
1320	396	1.25	#DIV/0!	#DIV/0!	sec. total	6		
			W/D Rati	#DIV/0!	sion Rate	0.09		
ıventoried I	Erosive Length							
1320	396	1.25			Ave. Rec.Ra	6		
					Ave. Rec.Ra	0.09		

Eroding Area	Reach erosion rate		Area with Load	Reach erosion rate load reduction	
990	4	tons/year	660.0	1	tons/year
Recession Rate			Recession Rate		
0.09			0.05		
Bulk Density			Bulk Density		
85			85	**Total for segments after reduction**	
	4	tons/year		1	tons/year/sample

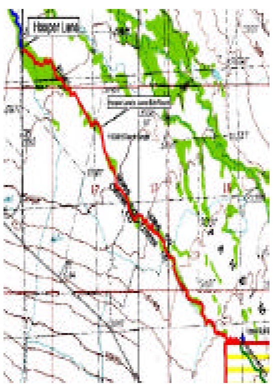
Eroding Area	Average Reach erosion rate		**Total Reduction**	
990	4	tons/year/sample	2	tons/year/sample
Recession Rate				
0.09				
Avg. Bulk Density				
85				

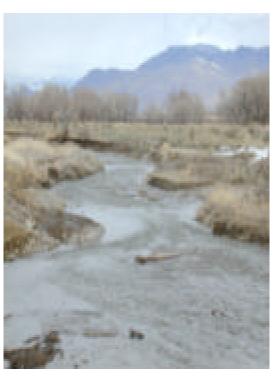
Listed From:

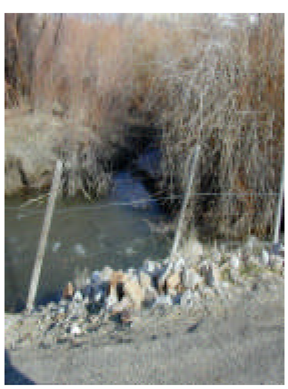
Total Inventoried Stream Length:

Listed Length:

Total Stream Length







Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section BLM Land Inventory above Hooper Lane

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Date/Time:

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	31.785	5200	0.92 %
	W	113	51.206		
Downstream	N	44	31.862	5174	
	W	113	51.347		

Stream Bank Erosion Calculations

AVE. Bank Height: 1.7 feet **ank to bank length (L BB)** 1968 feet

bank to bank Eroding Seg. Length 1968 feet (Inventoried stream length X 2)

Percent eroding bank 1.00

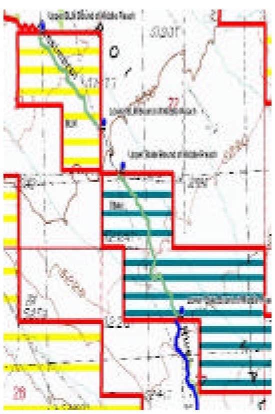
				Stream Bank Erosion Reduction Calculations		
Bank erosion over sampled reach (E)	21	tons/year/sample reach		**Bank erosion over sampled reach (E)**	1	tons/year/sample reach
Erosion Rate (E R)	111	tons/mile/year		**Erosion Rate (E R)**	7	tons/mile/year
Feet of Similar Stream Type	1846	feet		**Feet of Similar Stream Types**	1846.00	feet
Eroding bank extrapolation	5660.00	feet		**Eroding bank extrapolation**	1132.00	feet
Total stream bank erosion	**60**	tons/year		**Total stream bank erosion**	**4.0**	tons/year

Comments

Flow a contributing factor?: Increased erosional energy at high flows. Flow is predominantly from Gldburg Creek and Springs.
Big Creek is dry below the USFS boundary diversion and not contributing flow at this time. Evidence of ice damming over reach.
Other contributing factors?: Previous heavy livestock use is evident and has likely predisposed this reach to significant bank erosion.
Other Notes: Mostly sagebrush to streambank, progressively increasing cottonwood density, maturity, and canopy closure downstream.
This section will dewater with the biginning of irrigation season. Only flows in winter/moderat runoff: Jud Witworth.

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Bank Slope	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		with Load Reductions	Reach erosion rate load reduction	
984	984	1.65	10	2.5	1	1	lt-ss-gvl-cbl		3247.2	21	tons/year	649.4	1	tons/year
				2	2	1			Recession Rate			Recession Rate		
				0.5	3	2			0.15			0.05		
					4	1			Bulk Density			Bulk Density		
					5	2			85			85	**Total for segments after reductio**	
					6	1				21	tons/year		1	tons/year/sample
984	984	1.65	10	1.67	sec. total	8								
			W/D Rati	6	:ession Rate	0.15								
Total Inventoried Lengt	Total Erosive Length								Eroding Area	Average Reach erosion rate			**Total Reduction**	
984	984	1.65			Ave. Rec.Ran	8			3247	21	tons/year/sample		19	tons/year/sample
					Ave. Rec.Rat	0.15			Recession Rate					
									0.15					
Listed From:									Avg. Bulk Density					
Total Inventoried Stream Length:									85					
Listed Length:														
Total Stream Length														



Stream Bank Erosion Inventory Worksheet

Stream	Pahsimeroi River
Section	State Land Inventory above Hooper Lane
Field Crew	Tom Herron DEQ; Sr. Water Quality Analyst
Data reduced by	Tom Herron, DEQ
Date/Time:	3/26/2001 10:00
Land Use	Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	31.267	5240	0.80 %
	W	113	50.615		
Downstream	N	44	31.554	5210	
	W	113	50.894		

Stream Bank Erosion Calculations

AVE. Bank Height:	3.0	feet	**ank to bank length (L_{BB})**	4298	feet
bank to bank Eroding Seg. Length	3248	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.76				
Bank erosion over sampled reach (E)	37	tons/year/sample reach			
Erosion Rate (E_R)	92	tons/mile/year			
Feet of Similar Stream Type	1609	feet			
Eroding bank extrapolation	5679.84	feet			
Total stream bank erosion	**65**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	5	tons/year/sample reach
Erosion Rate (E_R)	13	tons/mile/year
Feet of Similar Stream Types	1609.00	feet
Eroding bank extrapolation	1503.20	feet
Total stream bank erosion	**9.6**	tons/year

Comments

Flow a contributing factor?: Increased erosional energy at high flows. Flow is predominantly from Gldburg Creek and Springs.
Big Creek is dry below the USFS boundary diversion and not contributing flow at this time.
Other contributing factors?: Previous heavy livestock use is evident and has likely predisposed this reach to significant bank erosion.
Other Notes: This segment is developing a new flood plain over much of the reach. Inside meanders are vegetated with colonizing woody species, some sedge and perennial/annual grasses. Outside meanders are vertical and erosive over most of the reach.

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Bank Slope	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments
2149	1624	3	15	0.2	1	1	ss-gvl-cbl	
				0.5	2	1		
				1	3	1		
				1.5	4	1		
				0.5	5	1		
				0.2	6	1		
2149	1624	3	15	0.65	sec. total	6		
			W/D Rati	23.0769	:ession Rate	0.09		

Eroding Area	Reach erosion rate		with Load Reductions	Reach erosion rate load reduction	
9744	37	tons/year	2578.8	5	tons/year
Recession Rate			Recession Rate		
0.09			0.05		
Bulk Density			Bulk Density		
85			85	**Total for segments after reductic**	
	37	tons/year		5	tons/year/sample

Total Inventoried Lengtl	Total Erosive Length			
2149	1624	3.00	Ave. Rec.Ran	6
			Ave. Rec.Rat	0.09

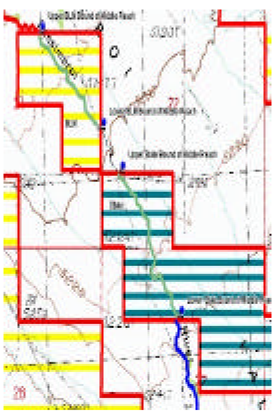
Eroding Area	Average Reach erosion rate		**Total Reduction**	
9744	37	tons/year/sample	32	tons/year/sample
Recession Rate				
0.09				
Avg. Bulk Density				
85				

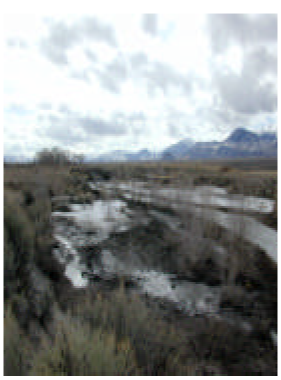
Listed From:

Total Inventoried Stream Length:

Listed Length:

Total Stream Length





Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section State Land Inventory above Hooper Lane

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst   **Data reduced by** Tom Herron, DEQ

Date/Time: 3/26/2001 10:00

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	31.698	5385	0.78 %
	W	113	51.037		
Downstream	N	44	31.983	5240	
	W	113	51.049		

Stream Bank Erosion Calculations

AVE. Bank Height:	2.5	feet	**bank to bank length (LBB)**	2640	feet
bank to bank Eroding Seg. Length	1320	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.50				
Bank erosion over sampled reach (E)	17	tons/year/sample reach			
Erosion Rate (ER)	67	tons/mile/year			
Feet of Similar Stream Type	17160	feet			
Eroding bank extrapolation	18480.00	feet			
Total stream bank erosion	**236**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	3	tons/year/sample reach
Erosion Rate (ER)	11	tons/mile/year
Feet of Similar Stream Types	17160.00	feet
Eroding bank extrapolation	7392.00	feet
Total stream bank erosion	**39.3**	tons/year

Comments

Flow a contributing factor?: Increased erosional energy at high flows. Flow is predominantly from Gldburg Creek and Springs.

Big Creek is dry below the USFS boundary diversion and not contributing flow at this time.

Other contributing factors?: Previous heavy livestock use is evident and has likely predisposed this reach to significant bank erosion.

Other Notes: This segment is developing a new flood plain over much of the reach. Inside meanders are vegetated with colonizing woody species, some sedge and perennial/annual grasses. Outside meanders are vertical and erosive over most of the reach.

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		with Load Reductions	Reach erosion rate load reduction	
1320	660	2.5			1	1	ss-gvl-cbl		3300	17	tons/year	1320.0	3	tons/year
					2	1			Recession Rate			Recession Rate		
					3	2			0.12			0.05		
					4	1			Bulk Density			Bulk Density		
					5	1			85			85	**Total for segments after reduction**	
					6	1				17	tons/year		3	tons/year/sample
1320	660	2.5	#DIV/0!	#DIV/0!	sec. total	7								
			W/D Ratio	#DIV/0!	cession Rate	0.12								

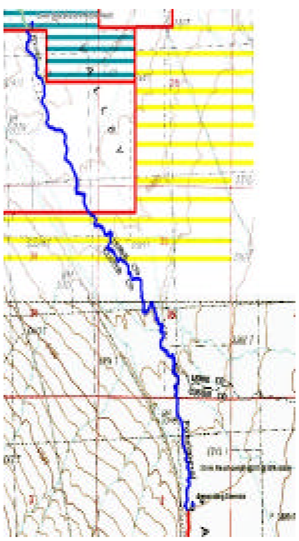
Total Inventoried Lengt	Total Erosive Length						Eroding Area	Average Reach erosion rate		Total Reduction	
1320	660	2.50			Ave. Rec.Rank	7	3300	17	tons/year/sample	14	tons/year/sample
					Ave. Rec.Rate	0.12	Recession Rate				
							0.12				
							Avg. Bulk Density				
							85				

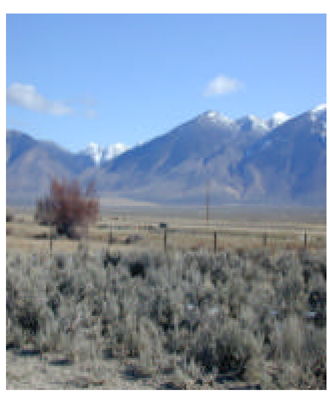
Listed From:

Total Inventoried Stream Length:

Listed Length:

Total Stream Length





Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section Below Impoundment/Above Big Creek: Lower Section

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Date/Time: 3/26/2001 10:00

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	28.672	5414	1.01 %
	W	113	48.953		
Downstream	N	44	29.112	5385	
	W	113	49.000		

Stream Bank Erosion Calculations

AVE. Bank Height:	0.5	feet
Bank to bank length (LBB)	2640	feet
Bank Eroding Seg. Length	528	feet (Inventoried stream length X 2)
Percent eroding bank	0.20	
Bank erosion over sampled reach (E)	0.6	tons/year/sample reach
Erosion Rate (BR)	2.2	tons/mile/year
Feet of Similar Stream Type	1555	feet
Eroding bank extrapolation	1150.00	feet
Total stream bank erosion	1.2	tons/year

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	0.6	tons/year/sample reach
Erosion Rate (BR)	2.2	tons/mile/year
Feet of Similar Stream Types	1555.00	feet
Eroding bank extrapolation	1150.00	feet
Total stream bank erosion	1.2	tons/year

Comments

Flow a contributing factor?:

Big Creek is dry below the USFS boundary diversion and not contributing flow at this time.

Other contributing factors?: Previous heavy livestock use is evident and has likely predisposed this reach to significant bank erosion.

Other Notes: This segment is developing a new flood plain over much of the reach. Inside meanders are vegetated with colonizing woody species, some sedge and perennial/annual grasses. Outside meanders are vertical and erosive over most of the reach.

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments
1320	264	0.5			1	1	ss-gvl-cbl	
					2	0		
					3	1		
					4	0		
					5	1		
					6	1		
1320	264	0.5	#DIV/0!	#DIV/0!	sec. total	4		
			W/D Ratio	#DIV/0!	Recession Rate	0.05		

Eroding Area	Reach erosion rate		Eroding Area with Load Reduction	Reach erosion rate load reduction	
264	1	tons/year	264.0	1	tons/year
Recession Rate			Recession Rate		
0.05			0.05		
Bulk Density			Bulk Density		
85			85	**Total for segments after reduction**	
	1	tons/year		1	tons/year/sample

Inventoried Length	Erosive Length	
1320	264	0.50

Ave. Rec.Rank 4

Ave. Rec.Rate 0.05

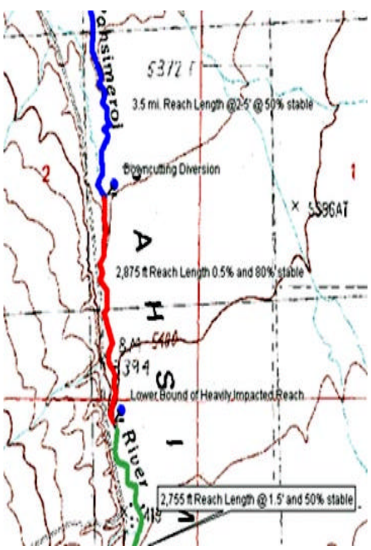
Eroding Area	Average Reach erosion rate	Total Reduction
264	1 tons/year/sample	0 tons/year/sample
Recession Rate		
0.05		
Avg. Bulk Density		
85		

Listed From:

Total Inventoried Stream Length:

Listed Length:

Total Stream Length



Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section Below Impoundment/Above Big Creek: Middle Section

Field Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Date/Time: ####### 10:00

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	28.662	5434	0.73 %
	W	113	48.948		
Downstream	N	44	28.267	5414	
	W	113	48.878		

Stream Bank Erosion Calculations

AVE. Bank Height:	1.5	feet	**: to bank length (LBB)**	2640	feet
Eroding Seg. Length	1320	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.50				
er sampled reach (E)	10	tons/year/sample reach			
Erosion Rate (ER)	40	tons/mile/year			
f Similar Stream Type	1435	feet			
ng bank extrapolation	2755.00	feet			
stream bank erosion	**21**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	2	tons/year/sample reach
Erosion Rate (ER)	7	tons/mile/year
Feet of Similar Stream Types	1435.00	feet
Eroding bank extrapolation	1102.00	feet
Total stream bank erosion	**3.5**	tons/year

Comments

Flow a contributing factor?:

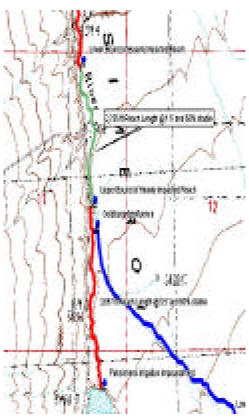
Big Creek is dry below the USFS boundary diversion and not contributing flow at this time.

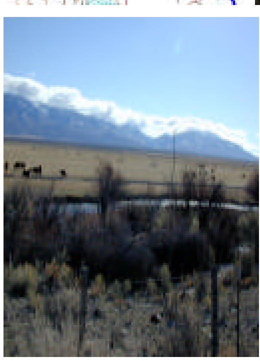
Other contributing factors?: Previous heavy livestock use is evident and has likely predisposed this reach to significant bank erosion.

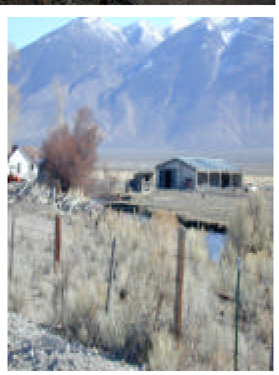
Other Notes: This segment is developing a new flood plain over much of the reach. Inside meanders are vegetated with colonizing woody species, some sedge and perennial/annual grasses. Outside meanders are vertical and erosive over most of the reach.

Individual Bank Measurements

Total Inventoried Bank	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		Eroding Area with Load Reductio	Reach erosion rate load reduction	
1320	660	1.5			1	1	ss-gvl-cbl		1980	10	tons/year	792.0	2	tons/year
					2	1			Recession Rate			Recession Rate		
					3	2			0.12			0.05		
					4	1			Bulk Density			Bulk Density		
					5	1			85			85	**Total for segments after reduction**	
					6	1				10	tons/year		2	tons/year/sample
1320	660	1.5	#DIV/0!	#DIV/0!	sec. total	7								
			W/D Rati	#DIV/0!	sion Rate	0.12								
nventoried	Erosive Length								Eroding Area	Average Reach erosion rate			**Total Reduction**	
1320	660	1.50			Ave. Rec.Rar	7			1980	10	tons/year/sample		8	tons/year/sample
					Ave. Rec.Ra	0.12			Recession Rate					
									0.12					
Listed From:									Avg. Bulk Density					
Total Inventoried Stream Length:									85					
Listed Length:														
Total Stream Length														







Stream Bank Erosion Inventory Worksheet

Stream	Pahsimeroi River		
Section	Below Impoundment/Above Big Creek: Upper Section		
ield Crew	Tom Herron DEQ; Sr. Water Quality Analyst	**Data reduced by**	Tom Herron, DEQ
ate/Time:	######## 10:00		
Land Use	Grazing		

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	27.73	5463	0.79 %
	W	113	48.813		
Downstream	N	44	28.262	5434	
	W	113	48.875		

Stream Bank Erosion Calculations

AVE. Bank Height:	0.5	feet	**: to bank length (LBB)**	2640	feet
Eroding Seg. Length	528	feet	(Inventoried stream length X 2)		
ercent eroding bank	0.20				
r sampled reach (E)	0	tons/year/sample reach			
Erosion Rate (E R)	2	tons/mile/year			
imilar Stream Type	2337	feet			
j bank extrapolation	1462.80	feet			
tream bank erosion	**1**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	1	tons/year/sample reach
Erosion Rate (E R)	2	tons/mile/year
Feet of Similar Stream Types	2337.00	feet
Eroding bank extrapolation	1462.80	feet
Total stream bank erosion	**1.6**	tons/year

Comments

Flow a contributing factor?:

Big Creek is dry below the USFS boundary diversion and not contributing flow at this time.

Other contributing factors?: Previous heavy livestock use is evident and has likely predisposed this reach to significant bank erosion.

Other Notes: This segment is developing a new flood plain over much of the reach. Inside meanders are vegetated with colonizing woody species, some sedge and perennial/annual grasses. Outside meanders are vertical and erosive over most of the reach.

Individual Bank Measurements

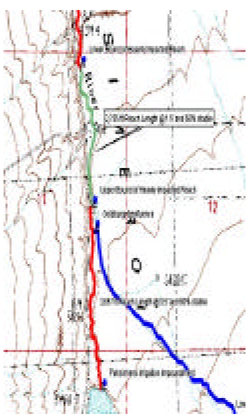
Inventoried Bank	Erosive Bank Lngth	Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		Area with Load	Reach erosion rate load reduction	
1320	264	0.5			1	0	ss-gvl-cbl		264	0	tons/year	264.0	1	tons/year
					2	0			Recession Rate			Recession Rate		
					3	1			0.04			0.05		
					4	0			Bulk Density			Bulk Density		
					5	1			85			85	**Total for segments after reduction**	
					6	1				0	tons/year		1	tons/year/sample
1320	264	0.5	#DIV/0!	#DIV/0!	sec. total	3								
			W/D Rati	#DIV/0!	sion Rate	0.04								
ıventoried I	Erosive Length								Eroding Area	Average Reach erosion rate			**Total Reduction**	
1320	264	0.50			Ave. Rec.Ra	3			264	0	tons/year/sample		0	tons/year/sample
					Ave. Rec.Ra	0.04			Recession Rate					
									0.04					
									Avg. Bulk Density					
									85					

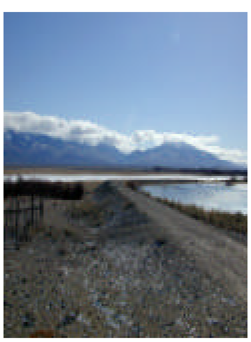
Listed From:

Total Inventoried Stream Length:

Listed Length:

Total Stream Length





Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section Above Impoundment/

eld Crew Tom Herron DEQ; Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

ate/Time: ######## 10:00

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	26.273	5610	0.99 %
	W	113	46.495		
Downstream	N	44	27.552	5470	
	W	113	48.572		

Stream Bank Erosion Calculations

AVE. Bank Height:	0.8	feet	**‹ to bank length (LBB)** 2640 feet	**Stream Bank Erosion Reduction Calculations**		
Eroding Seg. Length	1056	feet	(Inventoried stream length X 2)			
ercent eroding bank	0.40					
r sampled reach (E)	2	tons/year/sample reach		**Bank erosion over sampled reach (E)**	1	tons/year/sample reach
Erosion Rate (E R)	8	tons/mile/year		**Erosion Rate (E R)**	3	tons/mile/year
imilar Stream Type	12883	feet		**Feet of Similar Stream Types**	12883.00	feet
g bank extrapolation	11362.40	feet		**Eroding bank extrapolation**	5681.20	feet
tream bank erosion	**22**	tons/year		**Total stream bank erosion**	**9.1**	tons/year

Comments

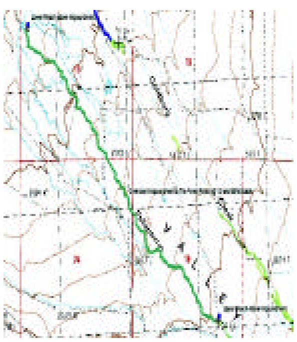
Flow a contributing factor?:

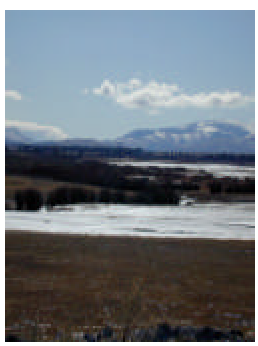
Other contributing factors?:

Other Notes:

Individual Bank Measurements

Inventoried Bank	Erosive Bank Lngth	Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		Area with Load	Reach erosion rate load reduction	
1320	528	0.75			1	1	ss-gvl-cbl		792	2	tons/year	396.0	1	tons/year
					2	0			Recession Rate			Recession Rate		
					3	1			0.06			0.05		
					4	1			Bulk Density			Bulk Density		
					5	1			85			85	**Total for segments after reduction**	
					6	1				2	tons/year		1	tons/year/sample
1320	528	0.75	#DIV/0!	#DIV/0!	sec. total	5								
			W/D Rati	#DIV/0!	sion Rate	0.06								
ıventoried I	Erosive Length								Eroding Area	Average Reach erosion rate			**Total Reduction**	
1320	528	0.75			Ave. Rec.Ra	5			792	2	tons/year/sample		1	tons/year/sample
					Ave. Rec.Ra	0.06			Recession Rate					
									0.06					
Listed From:									Avg. Bulk Density					
Total Inventoried Stream Length:									85					
Listed Length:														
Total Stream Length														





Stream Bank Erosion Inventory Worksheet

Stream	Pahsimeroi		
Section	(16) Upper BLM Reach above Pahsimeroi Road		
Field Crew	Tom Herron DEQ; Sr. Water Quality Analyst	**Data reduced by**	Tom Herron, DEQ
Land Use	Grazing		

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	19.575	6531	1.84 %
	W	113	39.061		
Downstream	N	44	19.964	6479	
	W	113	39.221		

Stream Bank Erosion Calculations

AVE. Bank Height:	3.0	feet	**Inv. bank to bank length (L BB)**	5642	feet
bank to bank Eroding Seg. Length	2630	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.47				
ank erosion over sampled reach (E)	95	tons/year/sample reach			
Erosion Rate (E R)	177	tons/mile/year			
Feet of Similar Stream Type	35640	feet			
Eroding bank extrapolation	35856.94	feet			
Total stream bank erosion	**1291**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	39	tons/year/sample reach
Erosion Rate (E R)	73	tons/mile/year
Feet of Similar Stream Types	35640.00	feet
Eroding bank extrapolation	15384.40	feet
Total stream bank erosion	**531.9**	tons/year

Comments

Flow a contributing factor?: No. Stream has developed a secondary flood plain after historic downcutting

Other contributing factors?: Variable cattle access related to bank slope and vegetative cover.

Other Notes: Mature cottonwood overstory with variable density understory. Stream course effected by combination of large coarse woody debris deposited in channel and erosive banks.

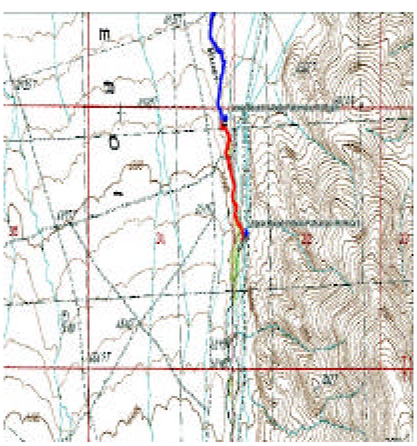
Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		Area with Load	Reach erosion rate load reduction	
1870	935	3			1	2	ss-silt	Cattle accessing entire bank except for few willow thic	5610	83	tons/year	2244.0	33	tons/year
					2	2		This area covered with 1-3' of fine soil deposits and lik	Recession Rate			Recession Rate		
					3	2		a beaver meadow at one time. Large gully from bench	0.33			0.33		
					4	2		valley: not connected at this time.	Bulk Density			Bulk Density		
					5	2			90			90		
					6	0								
1870	935	3	#DIV/0!	#DIV/0!	sec. total	10								
			Ratio	#DIV/0!	Recession Rate	0.33								

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		Area with Load	Reach erosion rate load reduction	
459	184	4			1	1	ss-silt	Cattle not accessing stream in this reach. Large coarse	1472	9	tons/year	734.4	5	tons/year
					2	1		debris affecting channel	Recession Rate			Recession Rate		
					3	1			0.14			0.14		
					4	2			Bulk Density			Bulk Density		
					5	2			90			90		
					6	0								
459	184	4	#DIV/0!	#DIV/0!	sec. total	7								
			Ratio	#DIV/0!	Recession Rate	0.14								

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments	Eroding Area	Reach erosion rate		Area with Load	Reach erosion rate load reduction	
492	196	2			1	1	ss-silt	Little access by cattle.	784	2	tons/year	393.6	1	tons/year
					2	1			Recession Rate			Recession Rate		
					3	1			0.06			0.06		
					4	1			Bulk Density			Bulk Density		
					5	1			90			90		
					6	0								
492	196	2.00	#DIV/0!	#DIV/0!	sec. total	5							**Total for segments after reductio**	
			Ratio	#DIV/0!	Recession Rate	0.06				95	tons/year		39	tons/year/sample

Total Inventoried Length	Total Erosive Length						Eroding Area	Average Reach erosion rate		**Total Reduction**	
2821	1315	3.00			Ave. Rec.Rank	7	7890	63	tons/year/sample	56	tons/year/sample
					Ave. Rec.Rate	0.18	Recession Rate				
							0.17667				
Listed From:							Avg. Bulk Density				
Total Inventoried Stream Length:							90				
Listed Length:											
Total Stream Length											



Stream Bank Erosion Inventory Worksheet

Stream Pahsimeroi River

Section (17) Above Goldburg diversions to just below the confluence of Mahogany Creek

Field Crew Ann Dold;Oversite,Tom Herron DEQ; Sr. Water Quality **Data reduced by** Tom Herron, DEQ

Date/Time: 5/4/2001 14:00

Land Use Grazing

Stream Segment Location

		Degrees	Minutes	Elevation	Reach Gradient
GPS: Upstream	N	44	16.358	6873	1.48 %
	W	113	39.39		
Downstream	N	44	16.904	6815	
	W	113	39.184		

Stream Bank Erosion Calculations

AVE. Bank Height:	1.5	feet	**ık to bank length (LBB)**	7854	feet
k Eroding Seg. Length	6200	feet		(Inventoried stream length X 2)	
Percent eroding bank	0.79				
ver sampled reach (E	110	tons/year/sample reach			
Erosion Rate (ER)	147	tons/mile/year			
of Similar Stream Type	25924	feet			
ing bank extrapolation	47129.16	feet			
l stream bank erosion	**833**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	5	tons/year/sample reach
Erosion Rate (ER)	7	tons/mile/year
Feet of Similar Stream Types	25924.00	feet
Eroding bank extrapolation	11940.40	feet
Total stream bank erosion	**39.1**	tons/year

Comments

Flow a contributing factor?: Yes, Many Raw / down cut banks with some limited access to flood plain. High Flow does transport sediment to lower river though this section is dry at this time.

Other contributing fact Appears to be little recruitment of willows. Recently heavily grazed though it is now fenced, needs long rest.

Other Notes: Flow infiltrates 4 miles below Mahogany Creek and 1.6 miles above the Road. The point of infiltration is variable depending upon flow, depth to groundwater and season. Conditions improve progressively upstream

Individual Bank Measurements

Total Inventoried Bank Length	Erosive Bank Lngth	Average Bank Slope Hgt	Strm Wdth	Strm Depth	Indv Rating	Recession Rank	Bank Material	Comments
3927	3100	1.54			1	2	ss-gvl-cbl	
					2	1		
					3	2		
					4	2		
					5	2		
					6	1		
3927	3100	1.54	#DIV/0!	#DIV/0!	sec. total	10		
			W/D Ratio	#DIV/0!	ssion Rate	0.27		
nventoried l	Erosive Length							
3927	3100	1.54			Ave. Rec.Ra	10		
					Ave. Rec.Ra	0.27		

Eroding Area	Reach erosion rate		Eroding Area with Load Reduction	Reach erosion rate load reduction	
9548	110	tons/year	2419.0	5	tons/year
Recession Rate			Recession Rate		
0.27			0.05		
Bulk Density			Bulk Density		
85			85	**Total for segments after reduction**	
	110	tons/year		5	tons/year/sample

Eroding Area	Average Reach erosion rate		**Total Reduction**
9548	110	tons/year/sample	104 tons/year/sample
Recession Rate			
0.27			
Avg. Bulk Density			
85			

Listed From:

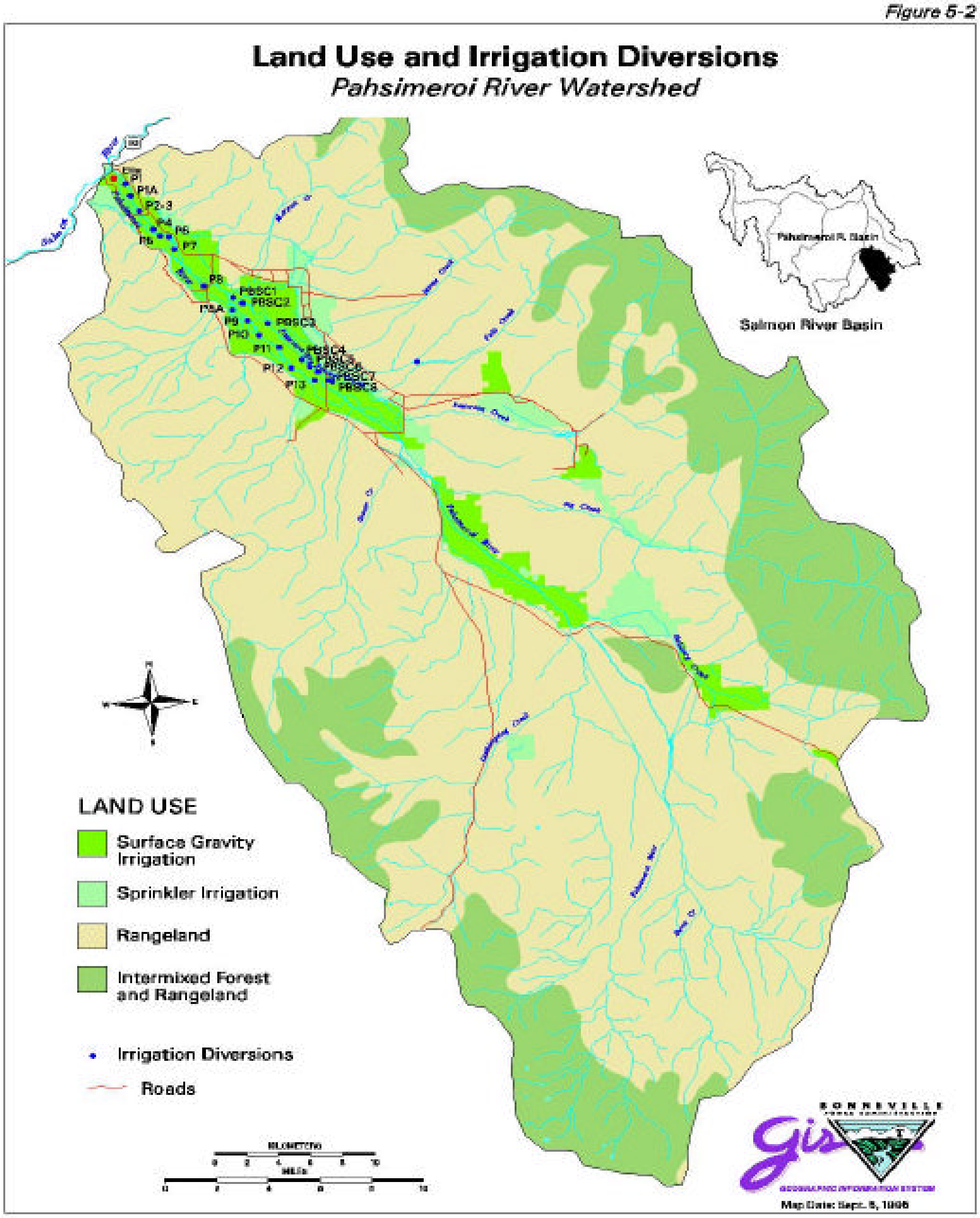
Total Inventoried Stream Length:

Listed Length:

Total Stream Length

Appendix G
Bonneville Power Administration
Land Use and Irrigation Diversions Map for the Pahsimeroi Subbasin

Figure 5-2



Land Use and Irrigation Diversions
Pahsimeroi River Watershed
P1
P1A
P2-3
P4
P5
P6
P7
P8
P8A
P9
P10
P11
P12
P13
PBSC1
PBSC2
PBSC3
PBSC4
PBSC7
PBSC8
Pahsimeroi R. Basin
Salmon River Basin
LAND USE
Surface Gravity Irrigation
Sprinkler Irrigation
Rangeland
Intermixed Forest and Rangeland
Irrigation Diversions
Roads
BONNEVILLE
Map Date: Sept. 5, 1996