

Pahsimeroi River Subbasin Total Maximum Daily Loads

**2026 Temperature and Sediment TMDLs and Five-Year
Review**



**State of Idaho
Department of Environmental Quality**



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Abbreviations, Acronyms, and Symbols

§ 303(d)	refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section
μ	micro, one-one thousandth
§	section (usually a section of federal or state rules or statutes)
AU	assessment unit
AWS	agricultural water supply
BAG	basin advisory group
BDA	beaver dam analog
BLM	United States Bureau of Land Management
BMP	best management practice
BOR	United States Bureau of Reclamation
BURP	Beneficial Use Reconnaissance Program
C	Celsius
CFR	Code of Federal Regulations (refers to citations in the federal administrative rules)
cfs	cubic feet per second
cfu	colony forming unit
CGP	Construction General Permit
COLD	cold water aquatic life
CSWCD	Custer Soil and Water Conservation District
DEQ	Idaho Department of Environmental Quality
DO	dissolved oxygen
DWS	domestic water supply
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
F	Fahrenheit
FSBI	fine sediment biotic index
ft²	square feet
FWS	United States Fish and Wildlife Service
GIS	geographic information system
IDAPA	Refers to citations of Idaho administrative rules
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
IPDES	Idaho Pollutant Discharge Elimination System
ISWCC	Idaho Soil and Water Conservation Commission
kWh	kilowatt hour
L	liter
LA	load allocation
lb	pound

LC	load capacity
m	meter
MDMT	maximum daily maximum temperature
MEP	maximum extent practical
mg	milligram
MIM	multiple indicator monitoring
mi	mile
mi²	square mile
mL	milliliter
mm	millimeter
MOS	margin of safety
MS4	Municipal Separate Storm Sewer System
MSGP	Multi-Sector General Permit
MWMT	maximum weekly maximum temperature
NA	not assessed
NB	natural background
NREL	National Renewable Energy Laboratory
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity unit
PCR	primary contact recreation
PNV	potential natural vegetation
SCR	secondary contact recreation
SEI	streambank erosion inventory
SFI	DEQ's Stream Fish Index
SHI	DEQ's Stream Habitat Index
SMI	DEQ's Stream Macroinvertebrate Index
SS	salmonid spawning
SWMP	Storm Water Management Plan
SWPP	Storm Water Prevention Plan
TMDL	total maximum daily load
USC	United States Code
USFS	United States Forest Service
USGS	United States Geological Survey
WAG	watershed advisory group
WLA	wasteload allocation
yr	year

Executive Summary

The Pahsimeroi River subbasin has 22 impaired water bodies on the most recent § 303(d) list (DEQ 2024). The § 303(d) list is published as the list of Category 5 water bodies in Idaho's Integrated Report, which summarizes water quality throughout the state. For waters identified on the § 303(d) list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. After reviewing up-to-date monitoring data from the subbasin, the Idaho Department of Environmental Quality (DEQ) developed five new TMDLs and reviewed data to move to delist three Category 5 water bodies. For those water bodies with existing TMDLs in the subbasin, DEQ collected updated monitoring data and reviewed the status and applicability previously developed TMDL targets. Three additional delistings are recommended in the 5-year review, including one assessment unit (AU) to be removed from Category 4c. This 5-year review has been developed to comply with Idaho Code § 39-3611(7).

Subbasin at a Glance

The Pahsimeroi River subbasin is in east-central Idaho above the confluence of the Pahsimeroi and Salmon Rivers. (Figure A). The subbasin is southeast of the town of Salmon and northeast of Challis. The Pahsimeroi River subbasin is divided between Lemhi and Custer Counties along the main stem of the Pahsimeroi River and Big Creek. The Pahsimeroi River flows northwest between the Lemhi Range and the Big Lost Mountains until its confluence with the Salmon River near the town of Ellis, Idaho.

Approximately 9% of land in the subbasin is privately owned and 91% is publicly owned. The United States Forest Service manages 46% of the publicly-owned land. Figure A depicts the landownership within the subbasin and the 2024 Integrated Report (DEQ 2024) Category 4a and Category 5 AUs.

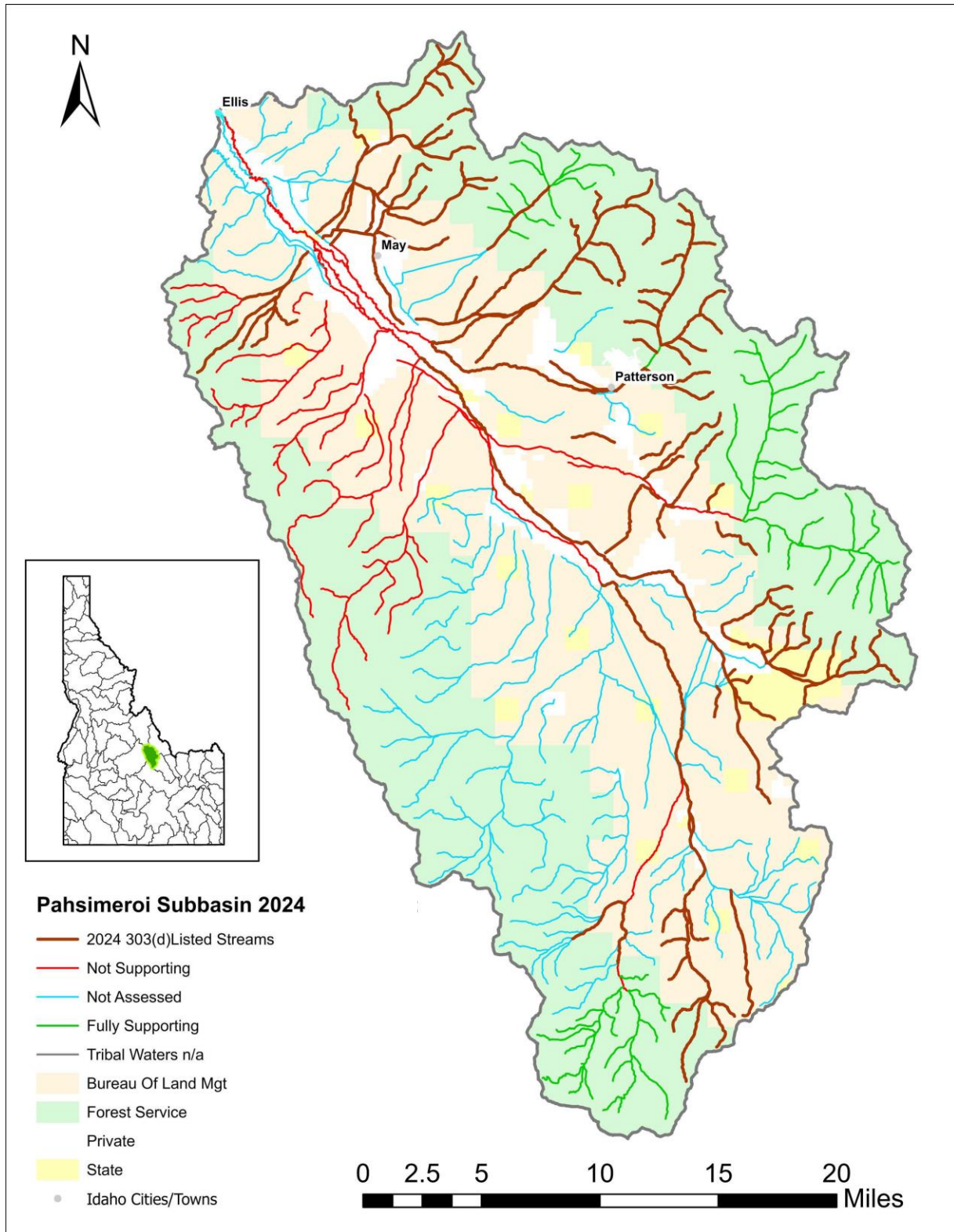


Figure A. Landownership and assessment unit status (2024 Integrated Report) in the Pahsimeroi River subbasin

Key Findings

DEQ developed five new TMDLs, four TMDLs for temperature impairments (section 5.2, Table A, Table B) and one TMDL for sediment impairment (section 5.1, Table A). There are an additional 15 AUs recently listed in the 2024 Integrated Report as Category 5 for temperature impairments. These 15 AUs were not addressed by the effort described in this document and had no TMDLs completed; they will remain in Category 5 until TMDLs can be developed:

ID17060202SL007_04	ID17060202SL026_02	ID17060202SL034_03
ID17060202SL008_04	ID17060202SL028_03	ID17060202SL036_02
ID17060202SL010_03	ID17060202SL029_02	ID17060202SL038_03
ID17060202SL017_04	ID17060202SL030_02	ID17060202SL039_02
ID17060202SL020_03	ID17060202SL031_02	ID17060202SL039_03

Table A. Summary of assessment outcomes for § 303(d)-listed assessment units.

Assessment Unit Name	Assessment Unit Number	Pollutant	TMDL(s) Completed	Recommended Changes to Next Integrated Report	Justification
Lawson Creek – confluence of North and South Fork Lawson Creek	ID17060202SL003_03	Combined Biota/Habitat Bioassessments	No	Delist for combined biota/habitat bioassessments; include in Category 4c for flow regime modification	AU is dewatered year-round at diversion structure. AU fails to meet water quality standards due to pollution.
North Fork Lawson Creek – source to mouth	ID17060202SL004_03	Combined Biota/Habitat Bioassessments Temperature	Yes	Include in Category 4a for temperature; retain in Category 5 for combined biota/habitat bioassessments	Temperature TMDL completed based on PNV.
South Fork Lawson Creek – source to mouth	ID17060202SL005_02	Combined Biota/Habitat Bioassessments	No	Delist for combined biota/habitat bioassessments; include in Category 3	Improper assessment of intermittent, dewatered, or ephemeral stream. Does not qualify in a sampleable category for BURP assessment.
Mahogany Creek – source to mouth	ID17060202SL019_03	Temperature	No	Retain in Category 5 for temperature	PNV showed no excess solar load, no TMDL was developed.
Burnt Creek – Long Creek to mouth	ID17060202SL023_03	Combined Biota/Habitat Bioassessments Sedimentation/ Siltation	Yes	Include in Category 4a for sediment/ siltation; retain in Category 5 for combined biota/	Sediment TMDL developed based on SEI.

Assessment Unit Name	Assessment Unit Number	Pollutant	TMDL(s) Completed	Recommended Changes to Next Integrated Report	Justification
				habitat bioassessments	
Burnt Creek – source to Long Creek	ID17060202SL024_02	Combined Biota/Habitat Bioassessments Temperature	Yes	Include in Category 4a for temperature; retain in Category 5 for combined biota/habitat bioassessments	Temperature TMDL developed using PNV; excess solar load from a lack of existing shade.
Donkey Creek – source to mouth	ID17060202SL029_02	Combined Biota/Habitat Bioassessments Temperature	No	Retain in Category 5 for combined biota/habitat bioassessments; retain in Category 5 for temperature	2018 BURP assessment received a passing score. Improved habitat and biota score from 1997 assessment. Further investigation into sediment and bacteria is needed before delisting.
Patterson Creek – source to and including Inyo Creek	ID17060202SL035_02	Combined Biota/Habitat Bioassessments	Yes	Include in Category 4a for temperature; retain in Category 5 for combined biota/habitat bioassessments	Temperature TMDL developed using PNV; excess solar load from a lack of existing shade.

During the review of data collected since the last TMDL, DEQ determined the following AUs not require TMDLs:

- Lawson Creek (ID17060202SL003_03)—AU is dewatered and will be included in Category 4c in the 2026 Integrated Report.
- South Fork Lawson Creek (ID17060202SL005_02)—Improper assessment of intermittent or ephemeral stream. Does not qualify in a sampleable category for BURP assessment.
- Donkey Creek (ID17060202SL029_02)—Improved habitat and biota score, needs further investigation to determine if sedimentation and bacteria are a pollution source. AU will remain Category 5 for combined biota.

As part of the 5-year review of water quality targets for water bodies with existing TMDLs, DEQ collected stream temperature data, Beneficial Use Reconnaissance Program (BURP) data, estimated stream solar loads, and performed streambank erosion inventories to update assessment recommendations (Table B).

Table B. Summary of assessment outcomes for 5-year review assessment units.

Assessment Unit Name	Assessment Unit Number	Pollutant	Recommended Changes to Next Integrated Report	Justification
Pahsimeroi River - Patterson Creek to mouth	ID17060202SL001_05	Sedimentation/siltation Temperature	Retain in Category 4a for temperature, sedimentation/siltation	Results for McNeil sediment core show subsurface fines > 28%.
Pahsimeroi River - Meadow Creek to Patterson Creek	ID17060202SL002_02	Sedimentation/siltation Temperature <i>Escherichia coli</i>	Retain in Category 4a for temperature, sedimentation/siltation. Delist for <i>Escherichia coli</i>	SEI TMDL targets set in 2013 TMDL are appropriate. A 30-day geometric mean shows <i>E. coli</i> primary contact recreation criteria is being met.
North Fork Lawson Creek - source to mouth	ID17060202SL004_02	Sedimentation/siltation Temperature	Retain in Category 4a for sedimentation/siltation. Place in Category 4a for temperature	SEI TMDL targets set in 2013 TMDL are appropriate. Temperature exceeded criteria and PNV identified excess solar loads for TMDL development.
Pahsimeroi River - Furey Lane (T15S, R22E) to Meadow Creek	ID17060202SL007_04	Sedimentation/siltation Temperature Low flow alterations	Retain in Category 4a for sedimentation/siltation, in Category 5 for temperature, and in Category 4c for flow regime modification.	SEI TMDL targets are updated. Low flow alterations are primary cause for impairment; banks potentially erodible when water present.
Pahsimeroi River - Big Creek to Furey Lane (T15S, R22E)	ID17060202SL008_04	Sedimentation/siltation Temperature	Retain in Category 4a for sedimentation/siltation and in Category 5 for temperature	SEI TMDL targets set in 2013 TMDL are appropriate.
Pahsimeroi River - Goldburg Creek to Big Creek	ID17060202SL010_04	Sedimentation/siltation Low flow alterations	Retain in Category 4a for sedimentation/siltation and in Category 4c for flow regime modification.	SEI did not show load reduction required. A BURP assessment is needed to determine if beneficial uses are being supported.
Pahsimeroi River-Unnamed Trib (T12N, R23E, Sec. 22) to Goldburg Creek	ID17060202SL011_04	Sedimentation/siltation Low flow alterations	Retain in Category 4a for sedimentation/siltation and in Category 4c for flow regime modification.	Low flow alterations are primary cause for impairment; banks potentially erodible when water present.
Pahsimeroi River-Burnt Creek to Unnamed Trib (T12N, R23E, Sec. 22)	ID17060202SL017_04	Sedimentation/siltation Temperature Low flow alterations	Delist for sedimentation/siltation. Retain in Category 5 for temperature and in Category 4c for flow regime modification.	SEI did not show load reduction required. BURP assessment in 2023 received a passing score (2.5). FSBI score and % fine sediment suggest no sedimentation/siltation impairments

Assessment Unit Name	Assessment Unit Number	Pollutant	Recommended Changes to Next Integrated Report	Justification
Pahsimeroi River - Mahogany Creek to Burnt Creek	ID17060202SL018_04	Sedimentation/siltation Temperature	Retain in Category 4a for sedimentation/siltation, temperature	SEI did not show load reduction required. BURP assessment in 2018 received a failing BURP score (1.67). Cold water aquatic life use remains not supporting.
East Fork Pahsimeroi River – source to mouth	ID17060202SL022_03	Sedimentation/siltation Temperature	Delist for sedimentation/siltation. Retain in Category 4a for temperature	BURP assessment in 2021 received a passing BURP score (2.67). FSBI score and % fine sediment suggest no sedimentation/siltation impairments

Public Participation

The public was provided an opportunity to comment on this document during the public comment period from February 4, 2026, through March 6, 2026. There were no public comments submitted during the comment period. The Salmon Basin Advisory Group (BAG) was presented with pre-public comment drafts on October 23, 2024, and October 22, 2025, to help inform the TMDL process.

Introduction

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. The CWA § 303(d) establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited. This priority list § 303(d) is published as the list of impaired (Category 5) water bodies in Idaho's Integrated Report, which summarizes water quality throughout the state. For waters identified on the § 303(d) list, DEQ must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards.

A TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allows that water body to meet water quality standards (40 CFR 130). Consequently, a TMDL is water body and pollutant specific. The TMDL also allocates allowable discharges of individual pollutants among the various sources discharging the pollutant.

To date, DEQ has developed two subbasin-wide TMDL documents for the Pahsimeroi River subbasin; the 2001 *Pahsimeroi River Subbasin Assessment and Total Maximum Daily Load* and the *Pahsimeroi River Subbasin Assessment and Total Maximum Daily Load: 2013 Addendum and Five-Year Review* (DEQ 2001 and DEQ 2013). In these previous efforts, DEQ developed TMDLs for temperature, *Escherichia coli* (*E. coli*), and sediment. In the years since the last TMDL, DEQ has collected monitoring data, conducted water body assessments, and collected data from partner agencies. The purpose of this document is to present an updated description of pollutant loads and water quality issues in the Pahsimeroi River subbasin. To this end, DEQ will address that objective in the following sections: (1) an updated description of key characteristics or updated information for the subbasin characterization; (2) current water quality concerns; (3) pollutant source inventory; (4) a 5-year review of existing EPA-approved TMDLs; and (5) development of new TMDLs for impaired water bodies.

The TMDL analysis establishes water quality targets and load capacities, estimates existing pollutant loads, and allocates responsibility for load reductions needed to return listed waters to a condition meeting water quality standards. DEQ reviewed 14 existing EPA-approved TMDLs (section 4) and developed five new TMDL (section 5).

Regulatory Requirements

This document was prepared in compliance with both federal and state regulatory requirements. DEQ implements the Clean Water Act (CWA) in Idaho, while the United States Environmental Protection Agency (EPA) oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Congress passed the Federal Water Pollution Control Act, or CWA, in 1972. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 USC § 1251). The act and programs it generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was

protecting and managing waters to ensure “swimmable and fishable” conditions. These goals relate water quality to more than just chemistry.

The CWA requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation’s waters. States and tribes, pursuant to the CWA § 303, are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the nation’s waters whenever possible. DEQ must review those standards every 3 years, and EPA must approve Idaho’s water quality standards. Idaho adopts water quality standards to protect public health and welfare, enhance water quality, and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

The CWA § 303(d) establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). Every 2 years states and tribes must publish a priority list (a “§ 303(d) list”) of impaired waters. Currently, this list is published every 2 years as the list of Category 5 waters in Idaho’s Integrated Report. For waters identified on this list, states and tribes must develop a TMDL for the pollutants, set at a level to achieve water quality standards.

DEQ monitors waters, and for those not meeting water quality standards, DEQ must establish a TMDL for each pollutant impairing the waters. However, some conditions that impair water quality do not require TMDLs. EPA considers certain unnatural conditions—such as flow alteration, human-caused lack of flow, or habitat alteration—that are not the result of discharging a specific pollutant as *pollution*. TMDLs are not required for water bodies impaired by pollution, rather than a specific pollutant. A TMDL is only required when a pollutant can be identified and quantified.

1 Subbasin Characterization

Features of the Pahsimeroi River subbasin, the tributary watersheds, and individual streams are detailed in the Pahsimeroi River subbasin TMDL (DEQ 2001). Comprehensive biological and instream water quality data were also presented and analyzed in the original TMDL (DEQ 2001). This TMDL summarized pertinent subbasin characteristics and any additional data that affect waters quality and beneficial uses in the Pahsimeroi River subbasin. Figure 1 shows the major tributaries and geography of the Pahsimeroi River subbasin.

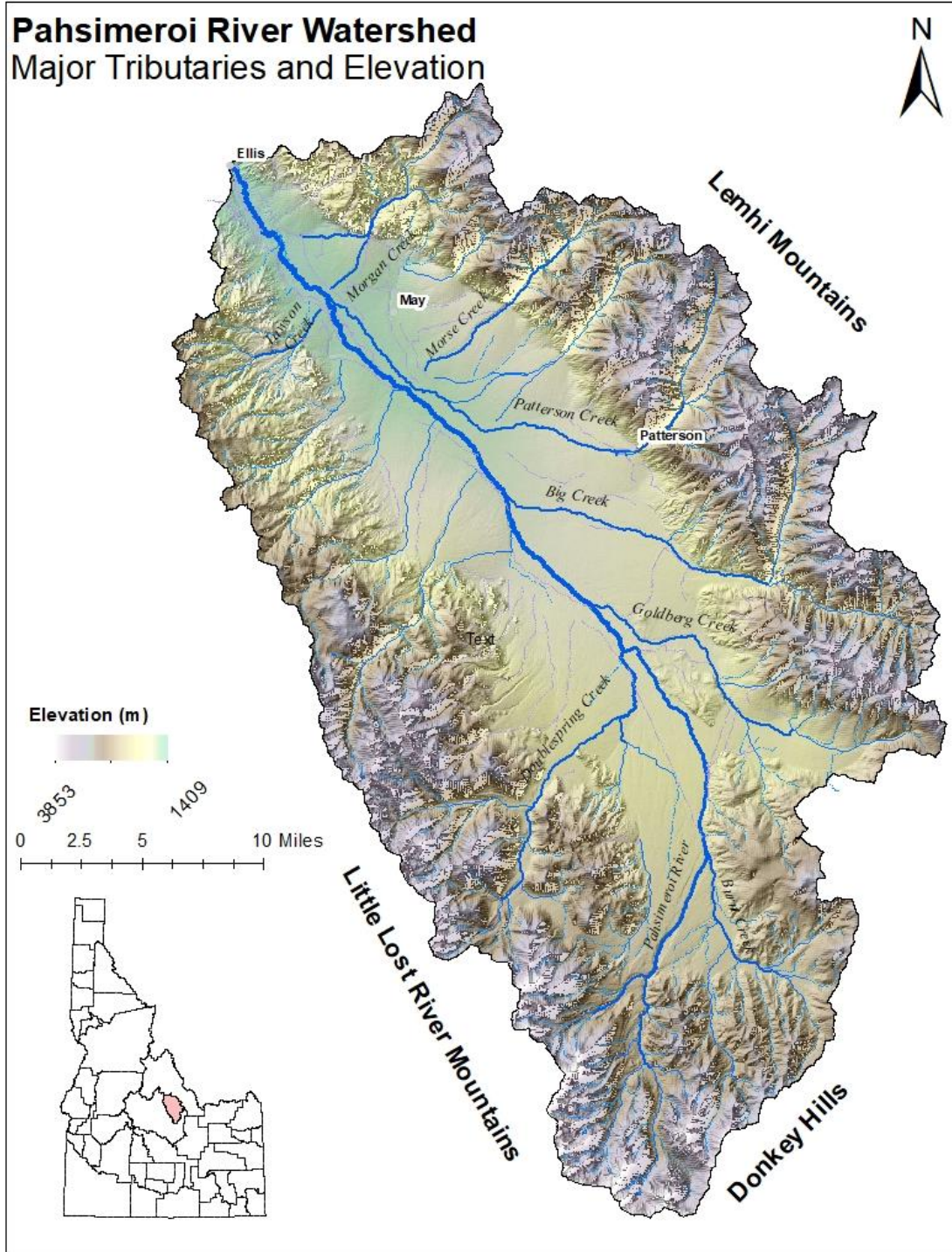


Figure 1. Pahsimeroi River subbasin with major tributaries.

1.1 Climate and Hydrology

During the period of record from January 1, 1991, through December 31, 2020, the National Oceanic and Atmospheric Administration station operating in May, Idaho, recorded the following annual averages (NOAA 2022).

- Average maximum temperature = 58.9°F
- Average minimum temperature = 26°F
- Average total precipitation = 8.5 inches

Agriculture has long been established in the Pahsimeroi River valley. Since the region is semiarid, averaging less than 9 inches of rain per year, surface water is extensively diverted for agricultural irrigation (Williams et al. 2006). However, the highly porous alluvium causes many nonappropriated streams to become “lost” to infiltration to the groundwater, where it then re-emerges as springs or recharge near the Pahsimeroi River. In progressively higher elevations up the slopes of the subbasin, precipitation increases to approximately 30 inches per year (Young and Harenberg 1973).

1.2 Cultural Characteristics

1.2.1 Landownership and Population

Since the original Pahsimeroi River subbasin TMDL (DEQ 2001), many watershed delineations have been altered by a cooperative effort among the Idaho Department of Water Resources (IDWR), the Natural Resources Conservation Service (NRCS), and various state and local agencies. The Idaho Watershed Boundary 5th and 6th Field Delineation Project (IDWR 2008) implemented changes in many Idaho watershed boundaries to coordinate with surrounding states and more accurately reflect drainage patterns. Consequently, the total acreage, landownership proportions, and other land area characteristics for the Pahsimeroi River subbasin may differ from the original TMDL analysis and implementation plan (Table 1, Figure A).

Table 1. Current landownership in the Pahsimeroi River subbasin.

Landowner	Acreage	Percent of Total (%)
Private	45,413	9
Public		
Bureau of Land Management	219,949	41
State of Idaho	19,285	4
US Forest Service	246,401	46
Total	531,048	100

This subbasin contains more than 90% public lands. The Salmon-Challis National Forest manages the upland regions on the shrubland and forested slopes. The river valley adjacent to

the river is primarily privately owned. The land between the upland and the river bottom is typically managed by the Challis Field Office of the Bureau of Land Management (BLM).

The population base within the Pahsimeroi River valley is very small and associated with private agricultural lands in the valley bottom. The land area in this subbasin is almost all rural. 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. The 2020 population of 7,974 residents in Lemhi County increased from 7,936 in 2010. The county is sparsely populated, with less than two residents per square mile (US Census Bureau 2023). The 2020 population of 4,275 residents in Custer County decreased from 4,368 in 2010. Custer County is also sparsely populated, with less than one resident per square mile (US Census Bureau 2023). Challis, the nearest large town (approximately 20 miles from the Salmon River–Pahsimeroi River confluence), had 902 residents in 2020, down from 1,081 in 2010 (US Census Bureau 2023).

Most of the roads within the Pahsimeroi River valley are associated with agricultural lands. Two main roads travel the length of the valley on either side of the Pahsimeroi River. Numerous primitive roads travel perpendicular to the valley bottom up through the BLM land to the national forest boundaries.

1.2.2 Economics

Employment in Lemhi County is predominantly in the service industries and state and local government. In 2021 the top employers were Steele Memorial Medical Center, United States Forest Service (USFS) and Salmon School District (Idaho Department of Labor 2023b). In 2012 top average employment for Custer County were natural resources and mining positions. The average wages of these positions boosted the per capita income to above the state average. As of 2022, natural resources and mining employment have decreased by nearly 25%. Leisure and hospitality positions now make up the top average employment and the per capita income has been below the state average since 2017 (Idaho Department of Labor 2023a). Both county's unemployment rate is just above 3%.

2 Water Quality Concerns and Status

2.1 Water Quality Limited Assessment Units Occurring in the Subbasin

The CWA § 303(d) states that waters that are unable to support their beneficial uses and do not meet water quality standards must be listed as water quality limited. Subsequently, these waters are required to have TMDLs developed to bring them into compliance with water quality standards.

The assessment units (AUs) are groups of similar streams that have similar land use practices, ownership, or land management. However, stream order is the main basis for determining

AUs—even if ownership and land use change significantly, the AU usually remains the same for the same stream order.

Using AUs to describe water bodies offers many benefits, primarily that all waters of the state are defined consistently. The AUs are a subset of water body identification numbers, which allows them to relate directly to the water quality standards.

The most recent Integrated Report (DEQ 2024) lists 22 AUs as Category 5 in the Pahsimeroi River (Table 2).

Table 2. Pahsimeroi River subbasin assessment units listed as Category 5 in the 2024 Integrated Report.

Assessment Unit Name	Assessment Unit Number	Impaired Stream Miles	Listed Pollutants	§ 303(d) list Year
Lawson Creek – confluence of North and South Fork Lawson Creek	ID17060202SL003_03	1.82	Combined biota/habitat bioassessments	2002
North Fork Lawson Creek – source to mouth	ID17060202SL004_03	1.9	Combined biota/habitat bioassessments	2022
South Fork Lawson Creek – source to mouth	ID17060202SL005_02	11.91	Combined biota/habitat bioassessments	2002
Pahsimeroi River – Furey Lane (T15S, R22E) to Meadow Creek	ID17060202SL007_04	1.56	Temperature	2024
Pahsimeroi River – Big Creek to Furey Lane (T15S, R22E)	ID17060202SL008_04	3.18	Temperature	2024
Pahsimeroi River – Goldburg Creek to Big Creek	ID17060202SL010_03	5.32	Temperature	2024
Pahsimeroi R – Burn Ck to Unnamed Trib (T12N, R23E, Sec. 22)	ID17060202SL017_04	10.34	Temperature	2024
Mahogany Creek – source to mouth	ID17060202SL019_03	2.96	Temperature	2024
Pahsimeroi River	ID17060202SL020_03	2.96	Temperature	2024
Burnt Creek – Long Creek to mouth	ID17060202SL023_03	5.06	Combined biota/habitat bioassessments	2002
Burnt Creek – source to Long Creek	ID17060202SL024_02	23.23	Combined biota/habitat bioassessments	2018/2020
			Temperature	2024
Short Creek – source to mouth	ID17060202SL026_02	5.83	Temperature	2024
Goldburg Creek – Donkey Creek to mouth	ID17060202SL028_03	9.39	Temperature	2024

Assessment Unit Name	Assessment Unit Number	Impaired Stream Miles	Listed Pollutants	§ 303(d) list Year
Donkey Creek – source to mouth	ID17060202SL029_02	12.56	Combined biota/habitat bioassessments	2002
			Temperature	2024
Goldburg Creek – source to Donkey Creek	ID17060202SL030_02	32.09	Temperature	2024
Big Creek	ID17060202SL031_02	24.32	Temperature	2024
Patterson Creek – Inyo Creek to mouth	ID17060202SL034_03	13.61	Temperature	2024
Patterson Creek – source to and including Inyo Creek	ID17060202SL035_02	28.36	Combined biota/habitat bioassessments	2018/2020
Falls Creek – source to mouth	ID17060202SL036_02	39.29	Temperature	2024
Morse Creek – source to Irrigation junction (T15S, R23E)	ID17060202SL038_03	3.8	Temperature	2024
Morgan Creek – source to mouth	ID17060202SL039_02	47.03	Temperature	2024
Morgan Creek	ID17060202SL039_03	14.07	Temperature	2024

There are currently nine AUs that are listed in Category 4c of the 2024 Integrated Report as impaired by pollution (Table 3). ID17060202SL034_04, Patterson Creek—Inyo Creek to mouth will be removed from Category 4c and moved to Category 3 until a BURP assessment can be completed. Closure of the PBSC-8 diversion as part of the P-9 Ditch closure removed a major diversion on Patterson Big Springs Creek that dewatered the creek. Additionally, the PBSC-9 diversion resulted in additional water savings. Both projects are detailed in the 2013 TMDL (DEQ 2013).

Table 3. Pahsimeroi River subbasin assessment units listed as Category 4c in the 2024 Integrated Report.

Assessment Unit Name	Assessment Unit Number	Impaired Stream Miles	Listed Pollutants
Meadow Creek – source to mouth	ID17060202SL006_02	28.5	Flow regime modification
Pahsimeroi River – Furey Lane (T15S, R22E) to Meadow Creek	ID17060202SL007_04	1.56	Flow regime modification
Grouse Creek – source to mouth	ID17060202SL009_02	35.97	Flow regime modification
Pahsimeroi River – Goldburg Creek to Big Creek	ID17060202SL010_04	6.74	Flow regime modification
Pahsimeroi R-Unnamed Trib (T12N, R23E, Sec. 22) to Goldburg Creek	ID17060202SL011_04	2.54	Flow regime modification
Pahsimeroi River – Burnt Creek to unnamed tributary (T12N, R23E, Sec. 22)	ID17060202SL017_04	10.34	Flow regime modification
Big Creek – confluence of North and South Fork Big Creeks to mouth	ID17060202SL031_03	13.56	Flow regime modification
Patterson Creek – Inyo Creek to mouth	ID17060202SL034_03	13.61	Flow regime modification
	ID17060202SL034_04	9.65	
Morgan Creek – source to mouth	ID17060202SL039_03	14.07	Flow regime modification

DEQ developed load allocations in the *Pahsimeroi River Subbasin Assessment and Total Maximum Daily Load* (DEQ 2001) and the *Pahsimeroi River Subbasin Assessment and Total Maximum Daily Load: 2013 Addendum and Five-Year Review* (DEQ 2013, Table 4).

Table 4. Pahsimeroi River subbasin assessment units reported in Category 4a of the 2024 Integrated Report.

Assessment Unit Name	Assessment Unit Number	Impaired Stream Miles	Listed Pollutants	Listing Basis
Pahsimeroi River – Patterson Creek to mouth	ID17060202SL001_05	10.27	Sedimentation/siltation; temperature	2001 TMDL
	ID17060202SL002_02	50.68	Sedimentation/siltation; temperature, bacteria (<i>E. coli</i>)	2013 TMDL addendum
Pahsimeroi River – Meadow Creek to Patterson Creek	ID17060202SL002_04	2.47	Sedimentation/siltation	2001 TMDL
	ID17060202SL002_05	10.21	Sedimentation/siltation	2001 TMDL
			Temperature	2013 TMDL addendum
North Fork Lawson Creek – source to mouth	ID17060202SL004_02	11.83	Sedimentation/siltation	2013 TMDL addendum
Pahsimeroi River – Furey Lane (T15S, R22E) to Meadow Creek	ID17060202SL007_04	1.56	Sedimentation/siltation	2001 TMDL
Pahsimeroi River – Big Creek to Furey Lane (T15S, R22E)	ID17060202SL008_04	3.18	Sedimentation/siltation	2001 TMDL
	ID17060202SL010_03	5.32	Sedimentation/siltation	2001 TMDL

Assessment Unit Name	Assessment Unit Number	Impaired Stream Miles	Listed Pollutants	Listing Basis
Pahsimeroi River – Goldberg Creek to Big Creek	ID17060202SL010_04	6.74	Sedimentation/siltation	2001 TMDL
Pahsimeroi R-Unnamed Trib (T12N,R23E,Sec. 22) to Goldberg Ck	ID17060202SL011_04	2.54	Sedimentation/siltation	2001 TMDL
Pahsimeroi R-Burnt Ck to Unnamed Trib (T12N, R23E, Sec. 22)	ID17060202SL017_04	10.34	Sedimentation/siltation	2001 TMDL
Pahsimeroi River – Mahogany Creek to Burnt Creek	ID17060202SL018_04	6.17	Sedimentation/siltation; temperature	2001 TMDL
East Fork Pahsimeroi River – source to mouth	ID17060202SL022_03	1.42	Sedimentation/siltation; temperature	2001 TMDL
Short Creek – source to mouth	ID17060202SL026_02	5.83	Sedimentation/siltation	2013 TMDL addendum

2.2 Applicable Water Quality Standards and Beneficial Uses

Idaho water quality standards (IDAPA 58.01.02) list beneficial uses and set water quality goals for waters of the state. Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as existing uses, designated uses, and presumed uses as described briefly in Appendix A. The *Water Body Assessment Guidance* (DEQ 2016a) provides a more detailed description of beneficial use identification for use assessment purposes.

Beneficial uses include the following:

- Aquatic life support—cold water, warm water, salmonid spawning, and modified
- Contact recreation—primary (e.g., swimming) or secondary (e.g., boating)
- Water supply—domestic, agricultural, and industrial
- Wildlife habitats
- Aesthetics

2.2.1 Beneficial Uses in the Subbasin

The beneficial uses within the Pahsimeroi River subbasin for the AUs addressed in this document and whether they are designated or existing are listed in Table 5. Further information for each of the listed AUs is found in section 2.3.7. Beneficial uses specific to the Pahsimeroi River subbasin include the following:

- Cold water aquatic life (COLD)—Applies to water quality appropriate for protecting and maintaining a viable aquatic life community for coldwater species.
- Salmonid spawning (SS)—Applies to waters that provide or could provide a habitat for active self-propagating populations of salmonid fishes.

- Primary contact recreation (PCR)—Applies to waters where people engage in activities that involve immersion in and likely ingestion of water. Examples of these activities include swimming, waterskiing, and skin diving.
- Secondary contact recreation (SCR)—Applies to waters where people engage in activities in which ingestion of water may occasionally occur. Examples of these activities include fishing, boating, wading, and infrequent swimming/
- Domestic water supply (DWS)—Applies to water quality appropriate for drinking water supplies.

Designated uses under the CWA are “those uses specified in water quality standards for each water body or segment, whether or not they are being attained.” Any water body in Idaho that has been assigned a designated use has been officially recognized by the state and will be listed in IDAPA 58.01.02.150.16. These uses include aquatic life support, recreation in or on the water, domestic water supply, and agricultural uses. Water quality must be maintained to support the most sensitive use. Existing uses under the CWA are “those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards.” Existing uses for undesignated water bodies are identified using water quality data, such as Beneficial Use Reconnaissance Program (BURP) data. If there is evidence of salmonids or SS that has occurred in the past or is currently occurring in a stream, the existing use of SS would be applied to the stream. The PCR or SCR uses can be determined by the characteristics of a water body. PCR would be the assumed recreation category for a water body that is a minimum of 2 feet deep, swimmable, and where ingestion of water is likely; SCR would be the assumed recreation category for a water body where activities such as boating or fishing would occur and where water ingestion is not as likely.

The Pahsimeroi River subbasin TMDL (DEQ 2001) provides detailed information on the beneficial uses in the subbasin.

Table 5. Pahsimeroi River subbasin beneficial uses of streams investigated for potential TMDL development or other support status updates.

Assessment Unit Name	Assessment Unit Number	Beneficial Use Type ^a		
		Existing	Designated	Presumed
Pahsimeroi River - Meadow Creek to Patterson Creek	ID17060202SL002_02		COLD, SS, PCR	
Lawson Creek – confluence of North and South Fork Lawson Creek	ID17060202SL003_03	COLD		SCR
North Fork Lawson Creek - source to mouth	ID17060202SL004_02	SS		COLD, SCR
North Fork Lawson Creek – source to mouth	ID17060202SL004_03	COLD, SS		SCR
South Fork Lawson Creek – source to mouth	ID17060202SL005_02	COLD, SS		SCR
Pahsimeroi R-Burnt Ck to Unnamed Trib (T12N, R23E, Sec. 22)	ID17060202SL017_04		COLD, SS	

Assessment Unit Name	Assessment Unit Number	Beneficial Use Type ^a		
		Existing	Designated	Presumed
Mahogany Creek - source to mouth	ID17060202SL019_03	COLD, SS		SCR
East Fork Pahsimeroi River - source to mouth	ID17060202SL022_03	COLD		SCR
Burnt Creek – Long Creek to mouth	ID17060202SL023_03	COLD		SCR
Burnt Creek – source to Long Creek	ID17060202SL024_02	COLD, SS		SCR
Donkey Creek – source to mouth	ID17060202SL029_02	COLD, SS		SCR
Patterson Creek – source to and including Inyo Creek	ID17060202SL035_02	COLD, SS		SCR

a. Cold water aquatic life (COLD), salmonid spawning (SS), primary contact recreation (PCR), secondary contact recreation (SCR)

2.2.2 Protection of Downstream Uses

Idaho’s water quality standards require that all waters “shall maintain a level of water quality at their pour point into downstream waters that provides for the attainment and maintenance of the water quality standards of those downstream waters, including waters of another state or tribe” (IDAPA 58.01.02.070.08).

The temperature and sediment TMDL targets described in this document are equivalent to the downstream criteria for the Pahsimeroi and Salmon Rivers. With the development of TMDLs and partnering with external agencies who support restoration efforts, the protection and restoration of headwaters and lower order streams can help maintain and/or improve the downstream water quality (EPA 2014a).

2.2.3 Water Quality Criteria to Support Beneficial Uses

Beneficial uses are protected by a set of water quality criteria, which include *numeric* criteria for pollutants such as bacteria, dissolved oxygen, pH, ammonia, temperature, and turbidity (Appendix B), and *narrative* criteria for pollutants such as sediment and nutrients (IDAPA 58.01.02.250–251). Table 6 includes the numeric criteria referenced in this TMDL.

Table 6. Applicable aquatic life temperature criteria in the Pahsimeroi River subbasin(IDAPA 58.01.02.250).

Parameter	Designated and Existing Beneficial Uses	
	Cold Water Aquatic Life	Salmonid Spawning ^a
Temperature ^b	22 °C or less daily maximum; 19 °C or less daily average	13 °C or less daily maximum; 9 °C or less daily average Bull Trout: Not to exceed 13 °C maximum weekly maximum temperature over warmest 7-day period, June–August; not to exceed 9 °C daily average in September and October
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR 131		
Temperature	—	7-day moving average of 10 °C or less maximum daily temperature for June–September

a. During spawning and incubation periods for inhabiting species (Appendix B, Table B-2)

b. Temperature exemption: Exceeding the temperature criteria will not be considered a water quality standard violation when the air temperature exceeds the ninetieth percentile of the 7-day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather reporting station.

Narrative criteria for excess sediment are described in the water quality standards:

Sediment shall not exceed quantities specified in Sections 250 and 252, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350. (IDAPA 58.01.02.200.08)

DEQ's procedure to determine whether a water body fully supports designated and existing beneficial uses is outlined in IDAPA 58.01.02.050.02. The procedure relies heavily upon biological parameters and is presented in detail in the *Water Body Assessment Guidance* (DEQ 2016a). This guidance requires DEQ to use the most complete data available to make beneficial use support status determinations.

2.3 Summary and Analysis of Existing Water Quality Data

Water quality data described below were collected to evaluate sediment and temperature impairments. Multiple government agencies have collected data in the Pahsimeroi River subbasin. The United States Geological Survey (USGS) provided flow data. The Idaho Department of Fish and Game (IDFG) provided fish data and management information. DEQ collected and provided the following data: BURP, temperature, streambank erosion inventory (SEI), potential natural vegetation (PNV), and Solar Pathfinder. These data were analyzed to establish the current water quality status of the water bodies compared to previously collected water quality data subbasin (DEQ 2001).

2.3.1 Beneficial Use Reconnaissance Program Data

In 1994, DEQ implemented the Beneficial Use Reconnaissance Program (BURP), a statewide ambient monitoring program aimed at integrating biological and chemical monitoring with physical habitat assessment (DEQ 2017). BURP conducts annual monitoring at selected sites, as

outlined in the BURP Field Manual for Streams, emphasizing sampling and analysis to support assessment of biological assemblages and physical habitat structure of streams (DEQ 2017). From 2013 to 2023, DEQ collected BURP monitoring data at 44 sites in the Pahsimeroi River subbasin (Table 7).

The BURP monitoring protocol provides data on three important stream quality indicators: macroinvertebrates, fish, and habitat. A stream macroinvertebrate index (SMI2) is generated from seven different qualities of the macroinvertebrates found, including species diversity, richness of species diversity, species guilds, and pollutant tolerance. A stream fish index (SFI2) is developed based on species present, abundance of the different species, and presence/absence of juveniles. A stream habitat index (SHI2) uses both quantitative and qualitative measures of stream habitat, including substrate composition, channel structure, streamside vegetation, and streambank condition. Scores of 0, 1, 2, or 3 are assigned to each index based on reference conditions. At least two scores are needed to evaluate a stream's support status; those scores must average 2 or greater for beneficial uses to be considered supported (DEQ 2016a). If the average index score is less than 2, this is an indication the AU does not fully support cold water aquatic life.

The *Water Body Assessment Guidance* (DEQ 2016a) describes DEQ's method for evaluating biological data and determining beneficial use support of Idaho water bodies. Assessing a water body involves analyzing and integrating multiple types of data to determine the degree of beneficial use support and biological integrity. DEQ (2016b) considers data most relevant to current support status determinations to be data less than 5 years old. Table 7 provides the BURP data for the cold water aquatic life and salmonid spawning beneficial use support collected for this review.

Table 7. Summary of BURP scores within the Pahsimeroi River subbasin, 2013–2023.

Assessment Unit Number	BURP Site ID	Stream Name	2024 IR Support Status	2024 IR 303(d) list	SMI2 Score	SMI2 Rating	SFI2 Score	SFI2 Rating	SHI2 Score	SHI2 Rating	Average Rating
001_05	2018SIDFA030	Pahsimeroi River	Not Supporting		Nonwadeable Reach						
002_02	2014SIDFA046	Trail Creek	Not Supporting	303(d) list	Dry/No Flow						
	2016SIDFA018	Trail Creek			Dry/No Flow						
	2018SIDFA029	Sulphur Creek			66	3	100	3	63	2	2.67
	2018SIDFA031	Blind Fork Trail Creek			Dry/No Flow						
	2018SIDFA032	Trail Creek			Dry/No Flow						
003_03	2016SIDFA017	Lawson Creek	Not Supporting	303(d) list	Dry/No Flow						
	2018SIDFA027	Lawson Creek			44	1			48	1	1
004_02	2022SIDFA041	North Fork Lawson Creek	Not Supporting		Dry/No Flow						
004_03	2018SIDFA028	North Fork Lawson Creek	Not Assessed	303(d) list	52	1			39	1	1
005_02	2018SIDFA033	South Fork Lawson Creek	Not Supporting	303(d) list	Dry/No Flow						
006_02	2014SIDFA028	Meadow Creek	Not Supporting	303(d) list	54	2			27	1	1.5
	2016SIDFA045	Meadow Creek			Dry/No Flow						
017_04	2023SIDFA018	Pahsimeroi River	Not Supporting	303(d) list	64	2			64	3	2.5
018_04	2014SIDFA042	Pahsimeroi River	Not Supporting		Dry/No Flow						

Assessment Unit Number	BURP Site ID	Stream Name	2024 IR Support Status	2024 IR 303(d) list	SMI2 Score	SMI2 Rating	SFI2 Score	SFI2 Rating	SHI2 Score	SHI2 Rating	Average Rating
	2018SIDFA038	Pahsimeroi River			27	1	58	1	78	3	1.67
019_03	2016SIDFA025	Mahogany Creek	Not Supporting	303(d) list	66	2	90	2	53	2	2
022_02	2016SIDFA024	East Fork Pahsimeroi River			64	3	100	3	64	2	2.67
	2017SIDFA035	East Fork Pahsimeroi River			62	2	90	3	83	3	2.67
	2018SIDFA039	East Fork Pahsimeroi River			65	2	85	2	86	3	2.33
	2019SIDFA035	East Fork Pahsimeroi River	Fully Supporting		62	2	96	3	81	3	2.67
	2021SIDFA031	East Fork Pahsimeroi River			61	2	90	3	75	2	2.33
	2023SIDFA019	East Fork Pahsimeroi River			59	2	100	3	69	3	2.67
022_03	2014SIDFA043	East Fork Pahsimeroi River			46	1	100	3	67	2	2.0
	2021SIDFA030	East Fork Pahsimeroi River	Not Supporting		54	2	100	3	70	3	2.67
023_03	2018SIDFA037	Burnt Creek	Not Supporting	303(d) list	44	1			51	2	1.5
024_02	2016SIDFA022	Burnt Creek			43	1	100	3	47	1	1.67
	2022SIDFA050	Burnt Creek	Not Supporting	303(d) list	56	2	100	3	61	2	2.33
026_02	2016SIDFA023	Short Creek	Not	303(d) list	30	1			53	2	1.5

Assessment Unit Number	BURP Site ID	Stream Name	2024 IR Support Status	2024 IR 303(d) list	SMI2 Score	SMI2 Rating	SFI2 Score	SFI2 Rating	SHI2 Score	SHI2 Rating	Average Rating
	2018SIDFA036	Short Creek	Supporting		44	1	99	3	65	2	2.0
028_03	2016SIDFA021	Goldburg Creek	Not Supporting	303(d) list	46	1	83	2	64	3	2.0
029_02	2018SIDFA035	Donkey Creek	Not Supporting	303(d) list	55	2	100	3	56	2	2.33
031_03	2016SIDFA020	Big Creek	Not Supporting		66	2	72	2	60	2	2.0
032_02	2014SIDFA044	South Fork Big Creek	Fully Supporting		70	3	79	2	76	2	2.33
	2016SIDFA019	South Fork Big Creek			82	3	87	2	87	3	2.67
	2018SIDFA034	South Fork Big Creek			82	3	100	3	88	3	3.0
	2019SIDFA025	South Fork Big Creek			71	3	92	3	90	3	3.0
	2022SIDFA042	South Fork Big Creek			78	3	88	3	85	3	3.0
034_03	2014SIDFA047	Patterson Creek	Not Supporting	303(d) list	77	3	100	3	100	3	3.0
	2021SIDFA029	Patterson Creek			64	3	100	3	76	3	3.0
035_02	2016SIDFA034	Inyo Creek	Not Supporting	303(d) list	65	3	95	2	93	2	2.67
035_03	2016SIDFA035	Patterson Creek	Fully Supporting		68	3	100	3	73	3	3.0
036_02	2021SIDFA028	Falls Creek	Not Supporting	303(d) list	77	3	100	3	81	3	3.0
038_03	2017SDEQA0349	Morse Creek	Not Supporting	303(d) list	79	3	91	3	79	3	3.0
039_03	2014SIDFA028	Morgan Creek	Not Supporting	303(d) list	77	3	100	3	79	3	3.0

2.3.1.1 Category 5 BURP Data

BURP assessments were attempted on seven of the 22 water bodies listed in the 2022 § 303(d) list (Table 2, DEQ 2022). Six water bodies were successfully sampled, but an assessment was not possible on South Fork Lawson Creek, as it was dry. Donkey Creek (ID17060202SL029_02) and Inyo Creek (ID17060202SL035_02) received passing BURP scores while Lawson Creek (ID17060202SL003_03), North Fork Lawson Creek (ID17060202SL004_03), and Burnt Creek (ID17060202SL024_02 and ID17060202SL023_03) received failing BURP scores. The passing BURP score along Inyo Creek (ID17060202SL035_02) indicates that the cold water aquatic life beneficial use criteria is being met. However, salmonids < 100 millimeters (mm) were not found indicating salmonid spawning is not being met, resulting in the addition of Inyo Creek to the 2018/2020 § 303(d) list.

2.3.1.2 Five-Year Review BURP Data

BURP assessments were completed on five AUs listed in Category 4a. Sulphur Creek (ID17060202SL002_02), Pahsimeroi River (ID17060202SL017_04), and East Fork Pahsimeroi River (ID17060202SL022_03) received passing BURP scores. However, cold water aquatic life criteria for these AUs are associated with temperature and sedimentation/siltation impairments. Sulphur Creek (ID17060202SL002_02) will remain in Category 4a for temperature and sedimentation/siltation. The AU ID17060202SL002_02 includes both Sulphur and Trail Creeks. BURP assessments were attempted four times along Trail Creek, but an assessment was not possible, as the stream was dry. In addition, the BLM collected continuous instream temperature logger data at Sulphur Creek (2018–2022). The recorded temperature data loggers exceeded the temperature criteria for cold water aquatic life and salmonid spawning indicating the AU is still not supporting beneficial uses. The Pahsimeroi River (ID17060202SL017_04) will remain in Category 5 for temperature and in Category 4c for flow regime modification but will be delisted for sedimentation/siltation based on 2023 BURP data. East Fork Pahsimeroi River (ID17060202SL022_03) will remain in Category 4a for temperature but will be delisted for sedimentation/siltation based on 2021 BURP data.

Pahsimeroi River – Mahogany Creek to Burnt Creek (ID17060202SL018_04) received a failing BURP score indicating the AU is still not supporting beneficial uses. Short Creek (ID17060202SL026_02) has received a BURP assessment twice since 2013; once resulting in a failing score and once resulting in a passing score. During 2018–2022, the BLM collected continuous instream temperature logger data at multiple locations at Short Creek. The recorded maximum weekly maximum temperatures (MWMT) at Short Creek regularly violated the 1997 EPA Bull Trout temperature criteria of 10 °Celsius MWMT, indicating the AU is still not supporting beneficial uses. In addition, this AU is associated with an approved TMDL for sedimentation/siltation.

Four AUs listed in Category 4c for flow regime modification were assessed. The following three AUs received passing BURP scores: Big Creek (ID17060202SL031_03), Patterson Creek

(ID17060202SL034_03), and Morgan Creek (ID17060202SL039_03). Meadow Creek was visited twice resulting in a failing BURP score once and a dry stream once.

Five AUs listed in Category 2, fully supporting assessed beneficial uses, were assessed and each received passing BURP scores.

2.3.2 United States Geologic Survey Flow Data

The USGS currently maintains one gage (#13302005) along the Pahsimeroi River at Ellis, Idaho, just before its confluence with the Salmon River. Figure 2 shows the flow record at Ellis from 2013 when the previous Pahsimeroi River TMDL and Five-Year Review was completed (DEQ 2013) through 2021, the timespan in which water quality data was collected as part of this TMDL and 5-year review. The widespread effects of irrigation withdrawals can be seen, as flows drop dramatically during the irrigation season from April 1 to October 31 each year. From October 1, 2012, through September 30, 2021, , the average discharge from November 1 to March 31 was 279 cubic feet per second (cfs), while the average discharge during irrigation season, April 1–October 31, was 199 cfs. During irrigation season, there is a slight snow-melt runoff pulse during June. On average, the lowest flows are recorded during July and August. Data are available from the [USGS Water Data website](#).

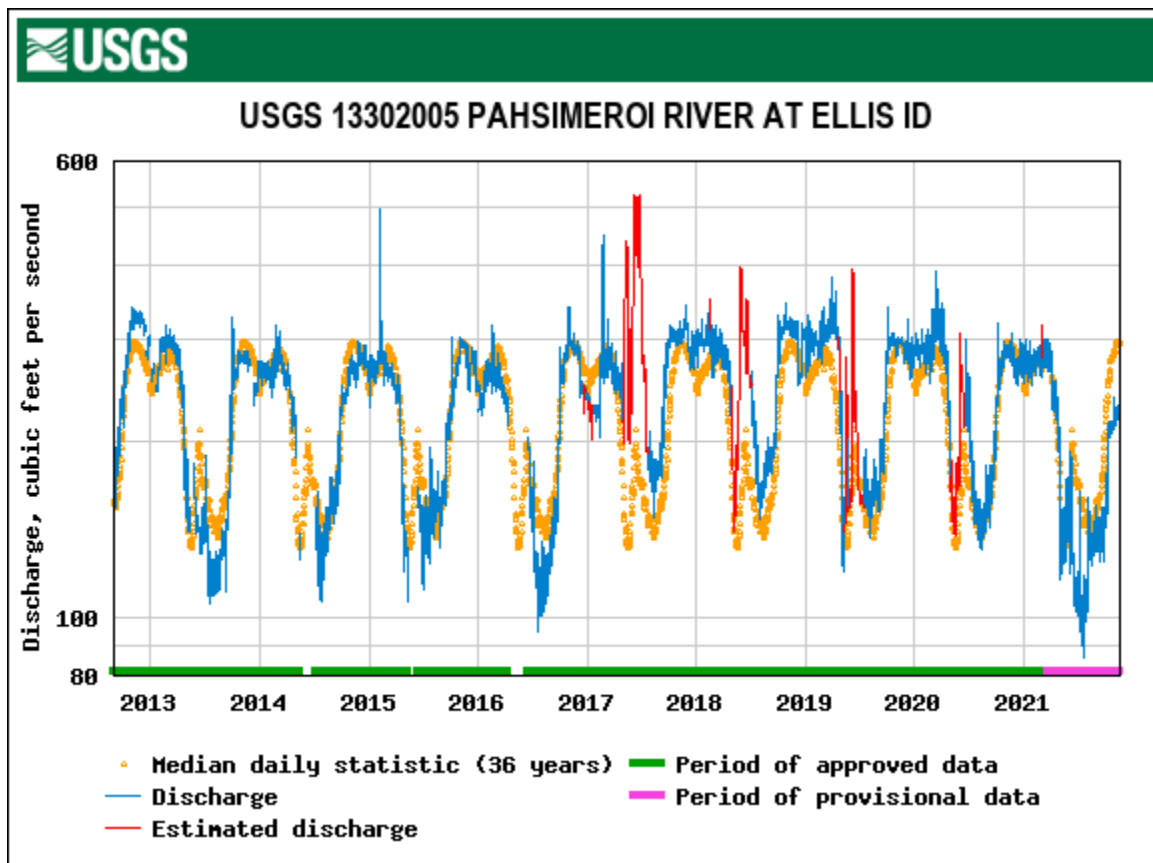


Figure 2. Pahsimeroi River flow records from USGS gage #13302005 at Ellis, Idaho, 2013–2021.

Figure 3 and Figure 4 show the flow records from the 2018 and 2021 water years, respectively, when data for this TMDL was recorded. Water supply was above average in 2018 resulting in an estimated spring-runoff maximum of approximately 400 cfs, twice the maximum daily median of approximately 200 cfs for the same month (Figure 3). Conversely, 2021 was marked by an exceptionally dry and warm summer and spring resulting in discharge values well below average (Figure 4). The effects of this drought were observed while conducting field work as several stream reaches that were wetted in 2018 were dry when visited in 2021. In both 2018 and 2021 discharge levels drop dramatically on April 1, the start of the irrigation season, and rebound October 31 when irrigation season ends.

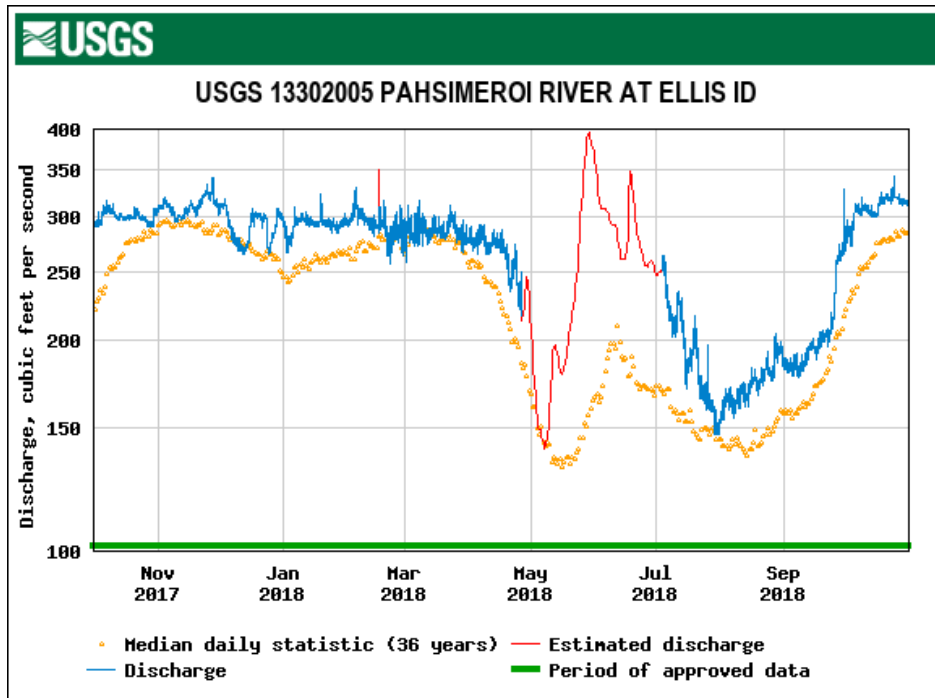


Figure 3. Pahsimeroi River flow records from 2018 water year at Ellis, Idaho (USGS gage #13302005).

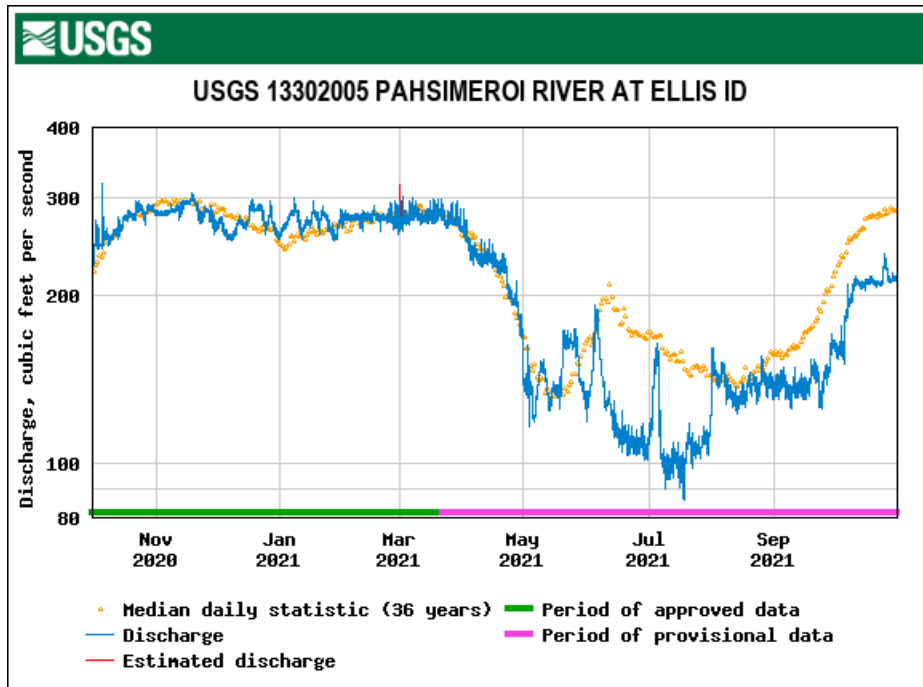


Figure 4. Pahsimeroi River flow records from 2021 water year at Ellis, Idaho (USGS gage #13302005).

2.3.3 Temperature

DEQ deployed temperature data loggers in four AUs listed in Category 5 and one AU listed in Category 3 during the 2021 field season (Table 8). Detailed temperature data are found in Appendix C.

Table 8. Temperature criteria exceedances in the Pahsimeroi River subbasin, 2021–2022.

Stream Name	Assessment Unit Number	Criteria Exceeded?			
		Cold Water Aquatic Life	Salmonid Spawning	Idaho Bull Trout	EPA Bull Trout
Category 5					
Burnt Creek	ID17060202SL024_02	No	Yes	Yes	Yes
Patterson Creek	ID17060202SL035_02	No	No	No	Yes
Middle Fork Lawson Creek	ID17060202SL004_03	Yes	Yes	Yes	Yes
Mahogany Creek	ID17060202SL019_03	No	Yes	No	Yes
Category 3					
North Fork Lawson Creek	ID17060202SL004_02	No	Yes	Yes	Yes

2.3.4 Sedimentation Monitoring

Several parameters measured during BURP sampling directly relate to the stream sediment conditions. These BURP-derived sediment parameters were reviewed for water bodies listed in Category 5 (Table 9).

Table 9. Sediment data from BURP sampling in the Pahsimeroi River subbasin for streams with suspected or listed sediment impairments, 2016–2023.

Stream Name	Assessment Unit Number	BURP Site	Year Data Collected	FSBI Score	% Fines	% Bank Stability	SHI Habitat Scores
Category 5 Combined Biota/Habitat Bioassessments							
Lawson Creek	ID17060202SL003_03	2018SIDFA027	2018	15	15	92	1
North Fork Lawson Creek	ID17060202SL004_03	2018SIDFA028	2018	15	61.8	84	1
Burnt Creek	ID17060202SL023_03	2018SIDFA037	2018	10	71.1	100	1
Burnt Creek	ID17060202SL024_02	2016SIDFA022	2016	15	35.4	82.5	1
Donkey Creek	ID17060202SL029_02	2018SIDFA035	2018	15	25	100	2
Inyo Creek	ID17060202SL035_02	2016SIDFA034	2016	60	3.7	57.5	3
Category 4a Sedimentation/Siltation							
Pahsimeroi River	ID17060202SL017_04	2023SIDFA018	2023	110	11.3	95	3
East Fork Pahsimeroi River	ID17060202SL022_03	2021SIDFA030	2021	100	6.8	97.5	2

The fine sediment biotic index (FSBI) reflects the number of sediment sensitive taxa present. A higher FSBI represents more sediment sensitive taxa, while a low score represents more sediment tolerant taxa. Based on BURP data collected in the Pahsimeroi River subbasin from 2013 to 2021, the maximum FSBI in the subbasin was 125 while the minimum was 10, and the average FSBI score was 62. The percentage fines reflect the percentage of sediment < 2.5 mm within the wetted width. Within the subbasin, Burnt Creek (ID17060202SL023_03) has the highest % fines, 71.1%, measured since 2013. The minimum % value measured was 1.6% and the average was 17.6%. With the exception of Inyo Creek (ID17060202SL035_02), all AUs with suspected sediment impairments surveyed under BURP protocol met the subbasin bank stability target of 80%. While Inyo Creek (ID17060202SL035_02) did not meet bank stability targets, the FSBI score and % fines did not indicate a sediment impairment. The East Fork Pahsimeroi River (ID17060202SL022_03) and the Pahsimeroi River (ID17060202SL017_04) are currently in Category 4a for sedimentation/siltation and are candidates for delisting based on data presented in Table 9. Section 4.3.5.2 discusses these AUs in further detail.

DEQ completed SEIs on two AUs listed in Category 5 for a combined biota/habitat bioassessment. Of the two assessment surveys, only Burnt Creek (ID17060202SL023_03) did not meet 80% bank stability targets for the subbasin and required a sediment load reduction (Table 10). The SEI completed for Burnt Creek was completed on a 365-meter reach downstream of the 2018 BURP sample location. The SEI worksheets for these AUs are in Appendix C.

Table 10. Sediment loads from nonpoint sources within the Pahsimeroi River subbasin.

Stream Name	Assessment Unit Number	Year Sampled	% Bank Stability	Current Load ^a (tons)	Estimation Method	TMDL Required
Lawson Creek	ID17060202SL003_03	2018	96	2.9/year 0.008/day	Observed erosion rate calculated on target of 80% streambank stability	No
Burnt Creek	ID17060202SL023_03	2018	45	295/year 0.81/day		Yes

2.3.5 Idaho Department of Fish and Game Data

The IDFG's *Fisheries Management Plan 2019-2024* describes the species present, habitat conditions, and fisheries management practices applicable to the Pahsimeroi River subbasin (IDFG 2019):

The Pahsimeroi Valley lies between the Lemhi and Lost River mountain ranges. Water percolates through a broad, pervious alluvial fan in the upper valley and enters the Pahsimeroi River through ground water and springs lower in the valley. Therefore, productivity in the river is higher than most streams in the upper Salmon River basin. The drainage is approximately 845 square miles.

The US Geological Survey (USGS) measured stream flow in the Pahsimeroi River near its mouth at Ellis, Idaho, from 1985 to 2018. Annual mean discharge, ranged from 167 cfs in 2004 to 329 cfs in 1985 and averaged 230 cfs.

It is suspected that before agricultural development, the Pahsimeroi River seasonally flowed 49 miles from the confluence of the East and West Forks to the Salmon River at river mile 304. Now most of the bottom lands of the Pahsimeroi Valley are privately owned and heavily irrigated (particularly in the lower drainage) for hay and grazing. Flows in the Pahsimeroi River are interrupted at several locations on the valley floor due to irrigation withdrawal. During the irrigation season several river sections are inaccessible to fish for spawning and major tributaries are dewatered almost year-round.

An anadromous fish hatchery on the Pahsimeroi River, owned and funded by Idaho Power Company and operated by the Department, mitigates for lost anadromous production above the Hells Canyon dam complex. The main hatchery and weir are located within one mile of the mouth of the river. Summer Chinook Salmon are trapped and reared at the facility. The Pahsimeroi hatchery program includes a conservation component intended to increase the abundance of naturally spawning fish through an integrated supplementation effort. Starting in 2010 and guided by the recently developed Hatchery Genetic Management Plan, a portion of the production at Pahsimeroi Hatchery is integrated with Chinook of natural origin. Additionally, returning integrated hatchery-origin fish are released above the Pahsimeroi weir for natural spawning along with natural-origin returns. The minimum number of spawners is set at 300 fish. If that goal cannot be met with returning natural and integrates adults, segregated fish are released above the weir. Arun steelhead are also trapped at the weir, and bloodstock for upper Salmon River B-run steelhead may be collected in some years. However, the offspring are reared a fish hatcheries in the Hagerman Valley. Adult steelhead returning to the Pahsimeroi Hatchery contribute substantially to the steelhead fishery in the upper Salmon River.

Anadromous management actions in the Pahsimeroi River will emphasize maintaining existing natural spawning populations of Chinook and steelhead. Objectives for natural escapement are being developed. Populations will be monitored to assess their status relative to management objectives.

Native resident fish species include inland fluvial and resident Redband Trout, a remnant fluvial Bull Trout population in the main stem and resident populations primarily in tributaries, Mountain Whitefish, and Westslope Cutthroat Trout. Non-native Brook Trout are also present. The number of large fluvial Redband Trout migrating into the Pahsimeroi River is increasing.

2.3.6 Status of Beneficial Uses

The majority of current beneficial use support status determinations in the Pahsimeroi River subbasin shows a lack of beneficial use support, whether those uses are designated or existing. However, nearly 75% of AUs assessed from 2013 to 2020 received a passing BURP score. The BURP data in section 2.3.1 also show the number of surveys that could not be completed between 2013 and 2020 due to lack of access or dry stream conditions. Flow regime modification, temperature, and sedimentation/siltation are the major listed pollutants for the Pahsimeroi River subbasin.

2.3.7 Assessment Unit Summary

A summary of the data analysis, literature review, field investigations, and recommendations for changes to the AUs in Category 5 of the Integrated Report are provided below. This section includes changes that will be documented in the next Integrated Report once the TMDLs in this document have been approved by EPA. The proposed changes in this section are not considered official until reviewed and approved by EPA during the next Integrated Report submittal process. Field notes for these investigations are presented in Appendix D. 16 AUs were recently added to Category 5 for temperature in the 2024 Integrated Report. The temperature data was received after field work for this TMDL had already been completed and these 16 AUs will be assessed for temperature in a future TMDL.

2.3.7.1 Assessment Units Addressed in TMDLs

ID17060202SL004_03, North Fork Lawson Creek—source to mouth

- Listed for combined biota/habitat bioassessments.
- BURP assessment conducted in 2018 resulted in failing SMI and SHI scores. A SFI score was not calculated.
- Temperature logger data collected in 2021–2022 showed beneficial use criteria were exceeded. A new PNV temperature TMDL was completed for this AU.
- Move the AU to Category 4a in the next Integrated Report once the temperature TMDL is approved.

ID17060202SL023_03, Burnt Creek—Long Creek to mouth

- Listed for combined biota/habitat bioassessments.
- BURP data collected in 2018 showed 71% fines within the wetted width and an FSBI score of 10; the lowest FSBI score recorded in the Pahsimeroi River subbasin from 2013 to 2020.
- Move the AU to Category 4a in the next Integrated Report once the sediment TMDL is approved.

ID17060202SL024_02, Burnt Creek—source to Long Creek

- Listed for combined biota/habitat bioassessments.
- Temperature logger data collected in 2021 show beneficial use criteria were exceeded. A new PNV temperature TMDL was completed for this AU.
- Move the AU to Category 4a in the next Integrated Report once the temperature TMDL is approved.

ID17060202SL035_02, Patterson Creek—source to and including Inyo Creek

- Listed for combined biota/habitat bioassessments.
- Temperature logger data collected in 2021 show beneficial use criteria were exceeded. A new PNV temperature TMDL was completed for this AU.
- Move the AU to Category 4a in the next Integrated Report once the temperature TMDL is approved.

2.3.7.2 Assessment Units Proposed for Delisting

For purposes of the Integrated Report, DEQ refers to a delisting as any AU-cause combination that is removed from Category 4 (see section 4.3.5 for Category 4 delisting's) or Category 5. A delisting must be supported by a detailed rationale. The following Category 5 AUs are proposed for delisting in the next Integrated Report:

ID17060202SL003_03 Lawson Creek—confluence of North and South Fork Lawson Creek

- Listed for combined biota/habitat bioassessments.
- Added to the § 303(d) list in 2002 following failing BURP score in 1997.
- Lawson Creek flows from the confluence of the North and South Forks for approximately 0.2 miles before its flow is entirely diverted during the irrigation season from April 1 to October 31, as allowed by Idaho water right no. 73-79.
- The 2013 Pahsimeroi River subbasin TMDL recommended moving Lawson Creek source to mouth to Category 4c for flow regime modification as the stream is dewatered.
- Stream is impaired by pollution, not a pollutant.
- Delist for combined biota/habitat bioassessments. Include in Category 4c for flow regime modification (Appendix D).

ID17060202SL005_02, South Fork Lawson Creek—source to mouth

- Listed for combined biota/habitat bioassessments.
- Added to the § 303(d) list in 2002 following failing BURP score in 1997.
- Stream was dry each of the four times visited in 2021 and when visited in 2018.
- In 1997, several mayfly individuals were collected but only a single perennial-associated taxon (*Rhyacophila*) was present in the macroinvertebrate sample. However, *Rhyacophila* is a genus of caddisfly that regularly colonizes known intermittent streams in this region in Idaho.
- Satellite imagery and USGS maps show several springs that appear and then are lost to groundwater before reaching the confluence with North Fork Lawson Creek.

- The AU was listed based on an improper assessment of an intermittent spring system and does not qualify in a sampleable category for BURP assessment.
- Delist for combined biota/habitat bioassessments. Include in Category 3 due to insufficient data (Appendix D).

2.3.7.3 Assessment Units Requiring Further Investigation

ID17060202SL029_02, Donkey Creek—source to mouth

- Listed for combined biota/habitat bioassessments and temperature.
- Added to the § 303(d) list in 2002 following failing BURP score in 1997 due to a failing SMI and SHI score. No SFI score was calculated.
- Habitat data from the 1997 site shows no riffles in the monitored reach, which was dominated by runs and glides. The metrics selected for the macroinvertebrate index are based on species composition in riffle habitat. The original BURP site that led to listing the AU may have been in a nonrepresentative reach or in a location not suited for BURP protocols.
- In 2018, the AU received a passing SMI, SFI, and SHI score resulting a passing overall BURP score indicating full support of beneficial uses.
- BLM multiple indicator monitoring (MIM) data shows 95% bank stability and 1% fines in 2019 and 96% bank stability and 1.6% fines in 2016 suggesting that sediment targets are being met.
- Remain in Category 5 for combined biota/habitat bioassessment until further investigation into possible sedimentation and bacteria impairments is completed.
- Remain in Category 5 for temperature until assessment can be completed.

The following 16 AUs were newly listed in the 2024 Integrated Report for temperature and will require further investigation and TMDL development in a future TMDL document:

ID17060202SL007_04	ID17060202SL026_02	ID17060202SL036_02
ID17060202SL008_04	ID17060202SL028_03	ID17060202SL038_03
ID17060202SL010_03	ID17060202SL029_02	ID17060202SL039_02
ID17060202SL017_04	ID17060202SL030_02	ID17060202SL039_03
ID17060202SL019_03	ID17060202SL031_02	
ID17060202SL020_03	ID17060202SL034_03	

Note: ID17060202SL019_03 had a PNV analysis completed before the AU was added to the § 303(d) list for temperature. A solar load reduction of 0% was necessary for this AU, and no TMDL was developed. Further investigation into this temperature impairment is recommended for the next TMDL.

3 Pollutant Source Inventory

Pollutant sources fall into two broad classes: point sources and nonpoint sources. The CWA defines point sources as any discernable, confined, and discrete conveyance, including but not limited to pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operations, or vessel or other floating craft, from which pollutants are or may be discharged (CWA § 502(14)). Some examples of common point sources include discharges from municipal wastewater treatment facilities, mines, and industrial operations.

Nonpoint source is defined to mean any source of water pollution that does not meet the legal definition of point source as defined by the CWA. Nonpoint sources of pollution general result from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification. Nonpoint source pollution, unlike point sources, comes from many diffuse sources. Nonpoint source pollution can include excess fertilizers applied to agricultural or residential areas; sediment from constructions sites, crop and forested lands, and eroding streambanks; bacteria for livestock and pet waste; and atmospheric deposition (EPA 2024).

Pollution within the Pahsimeroi River subbasin is primarily from nonpoint temperature and sediment loading. Load allocations for sediment and bacteria were established in the original Pahsimeroi River subbasin TMDL (DEQ 2001).

3.1 Point Sources

The only known point source discharge in the Pahsimeroi River subbasin is the Idaho Power Company's Pahsimeroi River Rearing Ponds. The wasteload allocation for this facility was fully discussed in the original Pahsimeroi River subbasin TMDL (DEQ 2001). Based on that original analysis, no wasteload allocations are discussed here for the rearing ponds. Section 4.3.4 has additional updated information about the point source discharge from the Pahsimeroi River Rearing Ponds.

3.2 Nonpoint Sources

A detailed discussion of nonpoint sources is provided in the Pahsimeroi River subbasin TMDL (DEQ 2001). All pollutants causing impairments addressed in this TMDL are from nonpoint sources in this subbasin. Potential pollutants include sediment, bacteria, and temperature.

Potential sources of these pollutants could include streambank modification and erosion, flow regulation and irrigation return water, pasture treatment, and mine tailings. Recreational activities may cause nonpoint sources of pollution where streambanks are becoming degraded by high use. Livestock grazing in riparian areas, erosion from roads and cultivated fields are common sources of excess sediment delivery to the streams. Destabilized streambanks also contribute to reducing riparian vegetation that would provide shade, which leads to excess solar load and increased instream water temperatures.

3.3 Pollutant Transport

Pollutant transport refers to the pathway by which pollutants move from the pollutant source to cause a problem or water quality violation in the receiving water body.

Temperature pollutant transport often occurs due to exposure from solar radiation. Temperature often increases as a result from solar radiation when streamside vegetation is reduced or removed.

Sediment transportation is a function of particle size, shape, and composition (Sherman 2013). In general, smaller particles will have a higher transport distance and duration. Within fluvial systems, stream channel characteristics also affect sediment transportation. Channel characteristics such as gradient and width/depth ratio directly impact the velocity of streamflow. If channel characteristics are altered to increase stream velocity, this can cause an increase in scouring and deposition of particles over greater distances.

4 Summary of Five-Year Water Quality Monitoring and Pollution Control Efforts and Monitoring

In addition to developing new TMDLs for impaired streams withing the Pahsimeroi River subbasin, this document contains a 5-year review of previously developed Pahsimeroi River subbasin TMDLs to comply with Idaho Code § 39-3611(7) (Table 11). The 5-year review evaluates the current water quality status of the streams, for which TMDLs have already been developed and describes current water quality status and monitoring DEQ has completed. Pollution control efforts that have occurred since the last developed TMDL will also be discussed in this section.

Table 11. Validity of previous TMDLs written for the Pahsimeroi River subbasin.

TMDL Review Elements	2001 and 2013 Sediment TMDL	2001 and 2013 Temperature TMDL	2013 Bacteria TMDL
Are the TMDL targets appropriate?	Yes. The field data and methodology used to develop the TMDL targets were reasonable.	Yes. The field data and methodology used to develop the TMDL targets were reasonable.	Yes. The field data and methodology used to develop the TMDL targets were reasonable.
Are the pollutant allocations appropriate?	Yes. Sediment load allocations are appropriate and the reductions in the TMDL should eventually support the cold water aquatic life beneficial use.	Yes. Temperature load allocations are appropriate and the reductions in the TMDL should eventually support the cold water aquatic life beneficial use.	Yes. Bacteria load allocations are appropriate and the reductions in the TMDL should eventually support the cold water aquatic life beneficial use.
Are the assumptions and analysis appropriate?	Yes. All assumptions are reasonable, they can be tested and reproduced.	Yes. All assumptions are reasonable, they can be tested and reproduced.	Yes. All assumptions are reasonable, they can be tested and reproduced.
Do all the available data confirm and support data used in the existing TMDLs?	Yes. DEQ monitoring data supports the TMDL.	Yes. DEQ monitoring data supports the TMDL.	Yes. DEQ monitoring data supports the TMDL.

TMDL Review Elements	2001 and 2013 Sediment TMDL	2001 and 2013 Temperature TMDL	2013 Bacteria TMDL
Are the water quality criteria identified in the subbasin assessment/TMDL consistent with current water quality standards?	Yes. The TMDL identified sediment as the impairment. The criteria used in the TMDL is consistent with current water quality standards.	Yes. The TMDL identified temperature as an impairment. The criteria used in the TMDL is consistent with current water quality standards.	Yes. The TMDL identified Bacteria as the impairment. The criteria used in the TMDL is consistent with current water quality standards.

4.1 TMDL Review and Status

There are 20 existing EPA-approved TMDLs across 14 AUs in the Pahsimeroi River subbasin (Table 4). For detailed information regarding the development of these TMDLs:

- [Pahsimeroi River Subbasin Assessment and Total Maximum Daily Load](#) (DEQ 2001)
- [Pahsimeroi River Subbasin Assessment and Total Maximum Daily Load: 2013 Addendum and Five-Year Review](#) (DEQ 2013)

4.2 Beneficial Use Status

Assessed beneficial uses of the water bodies included in this 5-year review are provided in Table 12. Water quality criteria to support beneficial uses is found in section 2.2.3.

Table 12. Beneficial uses of water bodies addressed by this 5-year review.

Assessment Unit Name	Assessment Unit Number	Assessed Beneficial Uses	Type of Use
Pahsimeroi River – Patterson Creek to mouth	ID17060202SL001_05	COLD, SS, PCR	Designated
Pahsimeroi River – Meadow Creek to Patterson Creek	ID17060202SL002_02	COLD, SS, PCR	Designated
Pahsimeroi River – Meadow Creek to Patterson Creek	ID17060202SL002_04	COLD	Designated
Pahsimeroi River – Meadow Creek to Patterson Creek	ID17060202SL002_05	COLD, SS	Designated
North Fork Lawson Creek – source to mouth	ID17060202SL004_02	COLD, SS, SCR	Presumed, Existing
Pahsimeroi River - Furey Lane (T15S, R22E) to Meadow Creek	ID17060202SL007_04	COLD	Designated
Pahsimeroi River - Big Creek to Furey Lane (T15S, R22E)	ID17060202SL008_04	COLD	Designated
Pahsimeroi River - Goldburg Creek to Big Creek	ID17060202SL010_03	COLD, SS	Designated
Pahsimeroi River - Goldburg Creek to Big Creek	ID17060202SL010_04	COLD	Designated
Pahsimeroi River- Unnamed Trib (T12N, R23E, Sec. 22) to Goldburg Creek	ID17060202SL011_04	COLD	Designated
Pahsimeroi River-Burnt Creek to Unnamed Trib (T12N, R23E, Sec. 22)	ID17060202SL017_04	COLD, SS	Designated
Pahsimeroi River - Mahogany Creek to Burnt Creek	ID17060202SL018_04	COLD, SS, PCR	Designated
East Fork Pahsimeroi River – source to mouth	ID17060202SL022_03	COLD, SCR	Existing, Presumed
Short Creek - source to mouth	ID17060202SL026_02	COLD, SS, SCR	Existing, Presumed

a. Cold water aquatic life (COLD), salmonid spawning (SS), primary contact recreation (PCR), secondary contact recreation (SCR)

4.3 Summary and Analysis of Current Water Quality Data

The following section summarizes data collected in the Pahsimeroi River subbasin since the development of the original Pahsimeroi River TMDL (Figure 5). Current water quality data discussed in this section includes the following:

- Streambank erosion inventory
- McNeil sediment core data
- *E. coli* data
- Pollutant discharge for the Pahsimeroi Fish Hatchery
- Summaries for AUs included in Category 4a

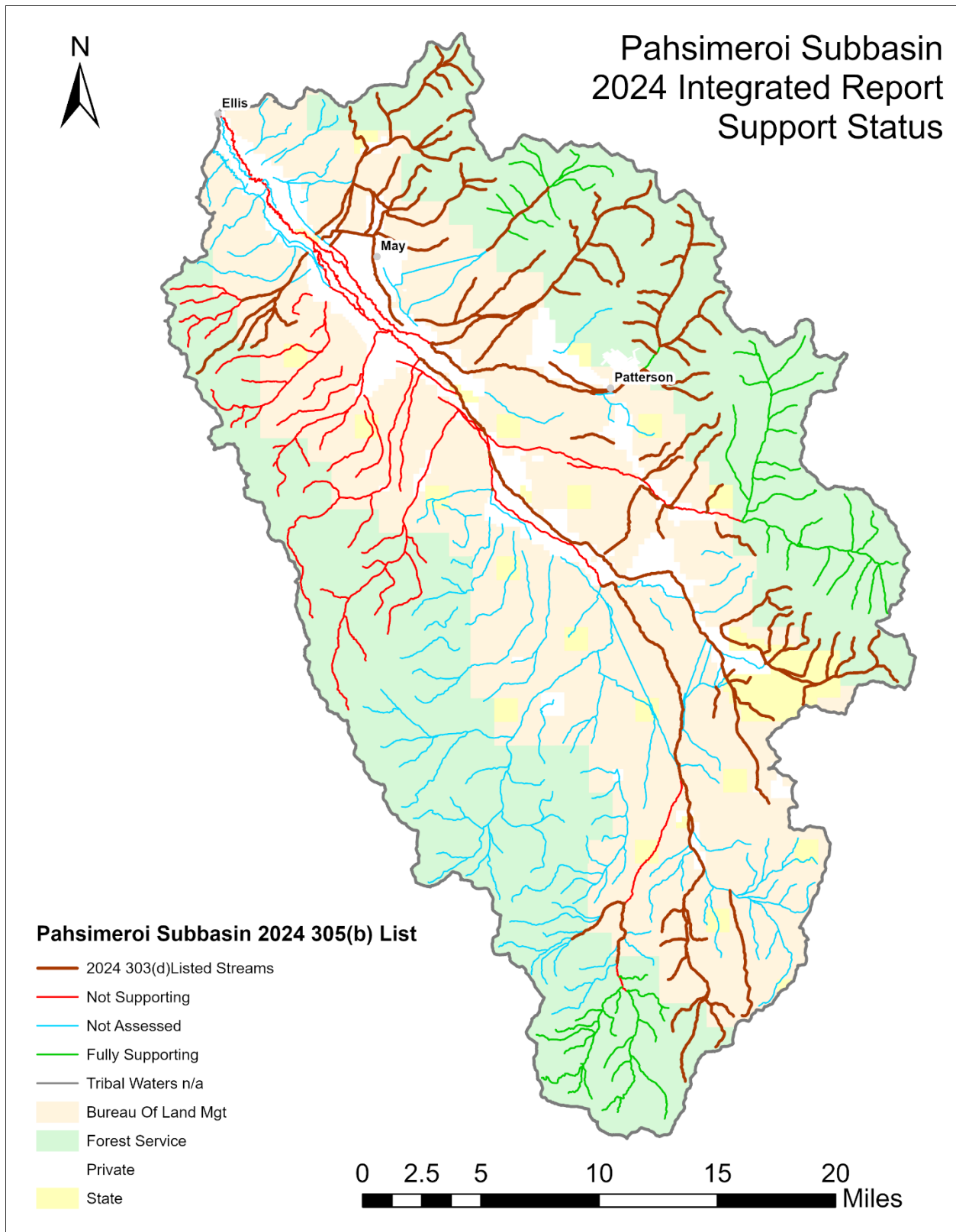


Figure 5. Streams listed in the 2024 Integrated Report (DEQ 2024).

4.3.1 Streambank Erosion Inventory Data

DEQ completed SEIs on six AUs listed in Category 4a for sedimentation/siltation impairments (DEQ 2020b, Table 13). Five of these AUs were along the main stem Pahsimeroi River. In the Pahsimeroi River subbasin TMDL (DEQ 2001), DEQ divided the Pahsimeroi River into 17 reaches to conduct SEI because AUs were not used at this time. SEIs have been repeated in four of these locations.

Table 13. Five-year review SEI surveys in the Pahsimeroi River subbasin.

Water Body	Assessment Unit Number	Year Completed	Upstream Location		Downstream Location	
			Latitude	Longitude	Latitude	Longitude
Sulphur Creek	ID17060202SL002_02	2018	44.51378	-113.93248	44.51443	-113.93243
Pahsimeroi River <i>Reach 9^a</i>	ID17060202SL007_04	2018	44.52969	-113.85238	44.53160	-113.85615
Pahsimeroi River <i>Reach 10^a</i>	ID17060202SL008_04	2018, 2021	44.52153	-113.84370	44.52535	-113.84719
Pahsimeroi River <i>Reach 12^a</i>	ID17060202SL010_04	2018	44.47880	-113.81598	44.48314	-113.81689
Pahsimeroi River <i>Downstream of Reach 17^a</i>	ID17060202SL017_04	2018	44.285156	-113.65350	44.28794	-113.65438
Pahsimeroi River <i>Reach 17^a</i>	ID17060202SL018_04	2018	44.271064	-113.65742	44.27295	-113.65603

a. Reach number from Pahsimeroi River subbasin TMDL (DEQ 2001).

Bank stability conditions appear to be improving along all the AUs surveyed in this 5-year review. In the most recent SEI, all the AUs except for Sulphur Creek (ID17060202SL002_02) are meeting 80% bank stability targets. The only AU previously meeting bank stability targets was the Pahsimeroi River – Goldburg Creek to Big Creek (ID17060202SL010_04) with a surveyed 80% bank stability in 2001. An SEI survey was conducted along the Pahsimeroi River - Big Creek to Furey Lane (ID17060202SL008_04) in both 2018 and 2021 because IDFG implemented a large restoration project within the SEI reach in 2020 that reduced bank erosion rates. The project introduced large wood to increase channel complexity and floodplain connectivity while reducing bank erosion rates (section 4.4.2, Appendix D). Additional monitoring and BURP assessments are needed to determine if beneficial uses are supported. Six AUs had updated SEIs completed for comparison to bank conditions at the time the original sediment TMDL was written. All six AUs show improving bank conditions (Table 14).

Table 14. Bank stability comparison based on SEI data.

Assessment Unit Name	Assessment Unit Number	Year Surveyed	Current Bank Stability (%)	2001/2013 TMDL Bank Stability (%)	Condition Trend
Sulphur Creek	ID17060202SL002_02	2018	75	45 (2013)	Improving
Pahsimeroi River <i>Reach 9^a</i>	ID17060202SL007_04	2018	85	0	Improving
Pahsimeroi River <i>Reach 10^a</i>	ID17060202SL008_04	2018	82	24	Improving
		2021	99		Improving
Pahsimeroi River <i>Reach 12^a</i>	ID17060202SL010_04	2018	96	80	Improving
Pahsimeroi River <i>Downstream of Reach 17^a</i>	ID17060202SL017_04	2018	99.5	—	Trend not available. Meeting targets
Pahsimeroi River <i>Reach 17^a</i>	ID17060202SL018_04	2018	91	21	Improving

4.3.2 McNeil Sediment Core Data

McNeil sediment core samples estimate subsurface fine sediment to a depth of 6 inches for anadromous fish species. Subsurface fine sediments are an important indicator of salmonid spawning beneficial use support, given the relationship to expected salmonid fry survival (McNeil and Ahnell 1964). Trout eggs can be deprived of oxygen by excess fine sediment deposited at this depth. McNeil sediment core data can be used to determine if sediment is likely to impair the SS beneficial use.

DEQ collected McNeil sediment cores in three AUs along the Pahsimeroi River to determine if sediment is likely to impair salmonid spawning in the Pahsimeroi River (Table 15). Sites were selected to represent the lower, middle, and upper reaches of the Pahsimeroi River. The downstream AU, ID1706020SL001_05, provides spawning habitat for Chinook and Steelhead Salmon. The middle AU, ID17060202SL008_04 is just upstream of known salmon spawning redds, and IDFG has found Chinook Salmon within this AU (IDFG, personal communication). Bull Trout and Cutthroat Trout use the upstream AU, ID17060202SL018_04, for spawning habitat. Table 15

Table 15. Five-year review McNeil sediment core collection in the Pahsimeroi River subbasin.

Water Body	Assessment Unit Number	Year Sampled	Latitude	Longitude
Pahsimeroi River	ID17060202SL001_05	2021	44.61831	-113.98013
Pahsimeroi River	ID17060202SL008_04	2021	44.52525	-113.84726
Pahsimeroi River	ID17060202SL018_04	2021	44.27070	-113.65743

DEQ determined the target of 28% for subsurface fines in the first subbasin TMDL (DEQ 2001), based on the research of salmonid spawning success as it relates to particle size of spawning bed materials (Hall 1986; McNeil and Ahnell 1964; Resier and White 1988). Depth fines do not meet targets in any of the AUs sampled, suggesting that SS beneficial uses are not being met.

The lowest value recorded was along the middle AU of the Pahsimeroi River (ID17060202SL008_04, Table 16) and the highest value recorded was along the upper AU of the Pahsimeroi River (ID17060202SL018_04, Table 16). The McNeil sediment core collected along ID17060202SL001_05 in 2021 resulted in depth fines at 35% compared to the 28% depth fines found in 2009, suggesting conditions may have deteriorated along this reach in the past decade (DEQ 2013).

Table 16. McNeil sediment core results in the Pahsimeroi River subbasin.

Water Body	Assessment Unit Number	Subsurface Fine Sediment Target (%)	Subsurface Fine Sediment ^a (%)	Meeting Targets?
Pahsimeroi River	ID17060202SL001_05	28	35 ± 3.2	No
Pahsimeroi River	ID17060202SL008_04		31 ± 6.3	No
Pahsimeroi River	ID17060202SL018_04		37 ± 3.8	No

a. Percentage of fine sediment (< 6.35 mm) as a total without 63 mm particles.

4.3.3 *E. coli* Data

Bacteria targets are set by Idaho's water quality standards (IDAPA 58.01.02.251.01). The numeric criterion for *E. coli* is not to exceed 126 colony forming units per 100 milliliters (cfu/100 mL) based on the geometric mean of five samples taken 3 to 7 days apart and collected at evenly spaced intervals over 30-day period. A geometric mean is applied to minimize random variability in data associated with surface waters prone to short-term episodic spikes in bacteria concentrations. This criterion applies to both primary and secondary recreation.

A geometric mean concentration was calculated from *E. coli* bacteria samples obtained from Sulphur Creek (ID17060202SL002_02), the only AU listed for *E. coli* within the Pahsimeroi River subbasin in the 2018/2020 Integrated Report (DEQ 2020b). The calculated geometric mean concentration from *E. coli* samples collected in Sulphur Creek in the 2021 field season did not exceed 126 cfu/100 mL, suggesting *E. coli* is no longer a source of impairment. *E. coli* monitoring results are shown in Table 17.

Table 17. Five-year review bacteria monitoring in the Pahsimeroi River subbasin.

Stream Name	Assessment Unit Number	Year Sampled	Latitude	Longitude	Water Quality Standard (cfu/100 mL)	Geometric Mean (cfu/100 mL)
Sulphur Creek	ID17060202SL002_02	2021	44.52923	-113.92434	126	40.85

4.3.4 Pahsimeroi Fish Hatchery

The Pahsimeroi Fish Hatchery is the sole Idaho Pollutant Discharge Elimination System (IPDES) permitted discharger within the Pahsimeroi River subbasin (IDG-131000). The hatchery is owned by Idaho Power Company and operated by IDFG. A waste load allocation to address total phosphorus and total suspended solids was developed in the Pahsimeroi River subbasin

TMDL (DEQ 2001) at the effluent limits then set in the discharge permit. The hatchery discharges into the Pahsimeroi River – Patterson Creek to mouth (ID17060202SL001_05) and is listed in Category 4a for sedimentation/siltation and temperature. The two National Pollutant Discharge Elimination System (NPDES) permits effective for the Pahsimeroi Fish Hatchery in 2001 (IDG-130039 and ID-0022527) set effluent limitations not to exceed a 5.0 milligrams per liter (mg/L) daily average with a daily maximum not to exceed 15 mg/L for suspended solids. The limitation for settleable solids was 0.1 mg/L daily average evaluated from samples collected once per month at the discharge of the rearing ponds (EPA 2019). The current NPDES (IDG-131000) permit limits are shown in Table 18.

Table 18. IPDES Permit IDG-131000 limits for the Pahsimeroi Fish Hatchery.

Parameter	Average Monthly Limit (mg/L)	Maximum Daily Limit (mg/L)
Net total phosphorous	0.10	0.16
Net total suspended solids	5	10

The current limitations for suspended solids are more restrictive than the waste load allocation developed in the Pahsimeroi River subbasin TMDL (DEQ 2001). The current IPDES permit sets effluent limitations for total phosphorous, which does not have a waste load allocation. Recent compliance inspections completed in 2021 and 2016 showed the site was meeting limitations and no violations or areas of concern were identified. A waste load allocation for the hatchery will not be discussed in this TMDL, as the facility is meeting effluent limits and the condition of the Pahsimeroi River – Patterson Creek to mouth has not changed.

4.3.5 Assessment Unit Summary

This section summarizes the data analysis, literature review, and field investigations and lists the conclusions for AUs included in Category 4a of the 2024 Integrated Report (DEQ 2024). Changes in AU status will be documented in the next Integrated Report once the TMDLs in this document have been approved by EPA. All AUs evaluated are summarized in Table 19. Sections 4.3.5.1 and 4.3.5.2 provide more detailed information.

Table 19. Summary of recommended changes for AUs evaluated in Category 4a of the 2024 Integrated Report.

Assessment Unit Name	Assessment Unit Number	Pollutant	Recommended Changes to Next Integrated Report	Justification
Pahsimeroi River – Patterson Creek to mouth	ID17060202SL001_05	Sedimentation/siltation Temperature	Retain in Category 4a for temperature, sedimentation/siltation	Results for McNeil sediment core show subsurface fines > 28%.
Pahsimeroi River – Meadow Creek to Patterson Creek	ID17060202SL002_02	Sedimentation/siltation Temperature <i>Escherichi coli</i>	Retain in Category 4a for temperature, sedimentation/siltation Delist for <i>Escherichia coli</i> .	Excess sediment loads from low bank stability still a cause of impairment 30-day geometric mean shows <i>E. coli</i> primary contact recreation criteria is being met.

Assessment Unit Name	Assessment Unit Number	Pollutant	Recommended Changes to Next Integrated Report	Justification
Pahsimeroi River - Furey Lane (T15S, R22E) to Meadow Creek	ID17060202SL007_04	Sedimentation/siltation Temperature	Retain in Category 4a for sedimentation/siltation Retain in Category 5 for temperature	Low flow alterations are primary cause for impairment; banks potentially erodible when water present.
Pahsimeroi River - Big Creek to Furey Lane (T15S, R22E)	ID17060202SL008_04	Sedimentation/siltation Temperature	Retain in Category 4a for sedimentation/siltation Retain in Category 5 for temperature	Excess sediment loads from low bank stability still a cause of impairment
Pahsimeroi River - Goldburg Creek to Big Creek	ID17060202SL010_04	Sedimentation/siltation	Retain in Category 4a for sedimentation/siltation	SEI did not show load reduction required. BURP assessment is needed to determine if beneficial uses are being supported.
Pahsimeroi River- Burnt Creek to Unnamed Trib (T12N, R23E, Sec. 22)	ID17060202SL017_04	Sedimentation/siltation Temperature	Delist for sedimentation/siltation Retain in Category 5 for temperature	SEI did not show load reduction required. BURP assessment in 2023 received a passing score (2.5). FSBI score and % fine sediment suggest no sedimentation/siltation impairments
Pahsimeroi River - Mahogany Creek to Burnt Creek	ID17060202SL018_04	Sedimentation/siltation Temperature	Retain in Category 4a for sedimentation/siltation, temperature	SEI did not show load reduction required. BURP assessment in 2018 received a failing BURP score (1.67). Cold water aquatic life use remains not supporting.
East Fork Pahsimeroi River – source to mouth	ID17060202SL022_03	Sedimentation/siltation Temperature	Delist for sedimentation/siltation. Retain in Category 4a for temperature	BURP assessment in 2021 received a passing BURP score (2.67). FSBI score and % fine sediment suggest no sedimentation/siltation impairments

4.3.5.1 Assessment Units in TMDLs—Still Impaired

ID17060202SL001_05, Pahsimeroi River—Patterson Creek to mouth

- Listed for sedimentation/siltation and temperature.
- Results from a McNeil sediment core collected in 2021 showed 35% depth fines. This exceeds the 28% depth fines target for the subbasin.

- Temperature data collected by the USFS in 2016 shows exceedances to salmonid spawning, Idaho Bull Trout temperature criteria, and EPA Bull Trout temperature criteria.
- Retain in Category 4a for sedimentation/siltation and temperature.

ID17060202SL007_04, Pahsimeroi River—Furey Lane (T15S, R22E) to Meadow Creek

- Listed for sedimentation/siltation in Category 4a, for temperature in Category 5, and flow regime modification in Category 4c.
- SEI completed in 2018 showed 85% bank stability compared to the SEI completed in 2001, which showed 0% bank stability. The latest bank stability measurement shows the 80% bank stability measurement for the subbasin is being met. A BURP assessment is needed to determine if beneficial uses are being supported.
- Retain in Category 4a for sedimentation/siltation and Category 4c for flow regime modification.

ID17060202SL008_04, Pahsimeroi River—Big Creek to Furey Lane (T15S, R22E)

- Listed in Category 4a for sedimentation/siltation and in Category 5 for temperature.
- SEIs completed in 2021 and 2018 showed 99% and 82% bank stability, respectively suggesting bank stability has improved greatly since 2001 when a bank stability of 24% was observed. The 80% bank stability target for the subbasin is being met. Bank stability improvement from 2018 to 2021 is likely explained by a restoration project implemented by IFG in 2020, which focused on reducing bank erosion and increasing habitat complexity and floodplain connectivity. A BURP assessment is needed to determine if beneficial uses are being supported.
- Results from a McNeil sediment core collected in 2021 showed 31% depth fines. This exceeded the 28% depth fines sediment target for the subbasin.
- Retain in Category 4a for sedimentation/siltation.

ID17060202SL010_04, Pahsimeroi River—Goldburg Creek to Big Creek

- Listed for sedimentation/siltation in Category 4a and flow regime modification in Category 4c.
- SEI completed in 2018 showed 96% bank stability, an improvement from the 2001 measurement of 80% bank stability. The 80% bank stability target for the subbasin was met both years an SEI was completed. A BURP assessment is needed to determine if beneficial uses are being supported.

ID17060202SL018_04, Pahsimeroi River—Mahogany Creek to Burnt Creek

- Listed for sedimentation/siltation and temperature.
- Temperature data collected in 2021 showed salmonid spawning and Bull Trout spawning and rearing criteria were exceeded.
- SEI completed in 2018 showed 91% bank stability, an improvement from the surveyed 21% bank stability in 2001. The 2018 bank stability measurements meet 80% bank stability targets for the subbasin.

- McNeil sediment core collected in 2021 showed 37% depth fines, exceeding the 28% depth fines sediment target.
- AU received a failing BURP score of 1.67 in 2018.
- Retain in Category 4a for sedimentation/siltation and temperature.

4.3.5.2 Assessment Units in TMDLs—Proposed for Delisting

ID17060202SL002_02, Pahsimeroi River—Meadow Creek to Patterson Creek

- Listed for *E. coli*, sedimentation/siltation, and temperature in Category 4a.
- AU has been listed for *E. coli* since the 2002 Integrated Report (DEQ 2004).
- Original *E. coli* TMDL for this AU was established in the 2013 Pahsimeroi TMDL and 5-year review (DEQ 2013). Samples collected in 2009 yielded a geometric mean of 171 cfu/100 mL.
- Calculated geometric mean from *E. coli* samples collected in August and September is 40.85 cfu/100 mL, which is lower than the Idaho water quality standard of 126 cfu/100 mL.
- Numerous projects have been completed along Sulphur Creek in the past 10 years, including moving livestock feedlot that was previously located next to the stream, which removed a large source of *E. coli*. Additionally, projects include riparian fencing, installation of beaver dam analog structures, water savings project to reconnect Sulphur Creek to the Pahsimeroi River, fish passage barrier removal, and adjusting a center pivot that previous crossed the Sulphur Creek through its rotation.
- Delist for *E. coli*. Retain in Category 4a for temperature and sedimentation/siltation.

ID17060202SL017_04, Pahsimeroi River—Burnt Creek to Unnamed Trib (T12N, R23E, Sec. 22)

- Listed for sedimentation/siltation in Category 4a, flow regime modification in Category 4c and temperature in Category 5.
- SEI completed in 2018 showed a 99.5% bank stability, which meets the 80% bank stability target for the subbasin.
- BURP assessment completed in 2023 suggests there is no sedimentation/siltation impairment. BURP site 2023SIDFA018 received a passing score of 2.50 along with a relatively high Fine Sediment Biotic Index (FSBI) score of 110 (see section 2.3.4 for more information regarding FSBI). Additionally, fine sediment only made up 11.3% of the Wolman pebble count.
- Delist for sedimentation/siltation. Retain in Category 5 for temperature and in Category 4c for flow regime modification.

ID17060202SL022_03, East Fork Pahsimeroi River—source to mouth

- Listed for sedimentation/siltation, and temperature in Category 4a.
- AU was included in sediment load allocations/reductions for reach 17 of the 2001 Pahsimeroi River subbasin TMDL. Several AUs were combined to make up reach 17. None of the erosion inventories completed for TMDL development occurred in ID17060202SL022_03 (DEQ 2001).
- There is a lack of AU specific data provided for original TMDL listing.

- BURP data from 2021 (site 2021SIDFA030) suggests there is no sedimentation/siltation impairment. Fine sediment only made up 6.8% of the Wolman pebble count. BURP site 2021SIDFA030 also had a relatively high Fine Sediment Biotic Index (FSBI) score of 100 (see section 2.3.4 for more information regarding FSBI).
- Delist for sedimentation/siltation. Retain in Category 4a for temperature.

ID17060202SL034_04, Patterson Creek—Inyo Creek to mouth

- Listed for in Category 4c for flow regime modification.
- Closure of the PBSC-8 diversion as part of the P-9 Ditch closure removed a major diversion on Patterson Big Springs Creek that dewatered the creek. Additionally, the PBSC-9 diversion resulted in additional water savings. Both projects are detailed in the 2014 TMDL (DEQ 2014).
- Remove from Category 4c for flow regime modification and move to Category 3 until a BURP assessment can be completed.

4.4 Past and Present Pollution Control Efforts

In 2020, the Idaho Soil and Water Conservation Commission (ISWCC) with the assistance of the Custer Soil and Water Conservation District (CSWCD) completed the *Pahsimeroi River Subbasin Assessment and Total Maximum Daily Load Implementation Plan for Agriculture for the 2013 Addendum and Five-Year Review* (ISWCC 2020). ISWCC (2005) completed a previous agricultural implementation plan for the Pahsimeroi River subbasin TMDL (DEQ 2001). As shown in Table 20, numerous research and restoration activities have been completed or are currently being implemented. Further details and information regarding these activities can be acquired from the managing agency.

4.4.1 Responsible Parties

Various entities are involved in or responsible for implementing the TMDL (Table 20).

Table 20. Designated management agencies and their responsibility for implementing the Pahsimeroi River subbasin TMDLs.

Designated Management Agency	Resource Responsibility
Idaho Soil and Water Conservation Commission	Agriculture
Bureau of Land Management	BLM Land
Salmon-Challis National Forest	USFS Land
Idaho Department of Lands	State endowment lands, timber harvest, and mining
Idaho Department of Transportation	Roads
Idaho Department of Fish and Game	Pahsimeroi Fish Hatchery
County road departments: Custer and Lemhi Counties	County Roads

4.4.2 Activities Planned and Implemented

The following agencies provided information about projects accomplished in the Pahsimeroi River subbasin in the past 10 years: BLM, CSWCD, NRCS, IDFG, and Idaho Department of Lands (IDL). This is not a definitive list of projects accomplished within the Pahsimeroi River subbasin. Further details and information about the following projects can be acquired from the managing agency or responsible group.

4.4.2.1 Water Conservation Projects

Implementation of best management practices (BMP) are recommended to reduce sediment and temperature impairments where livestock grazing or field cultivation occurs. Depending on the BMP, water quality recovery times can vary greatly. For example, reductions in temperature and sediment loads can be realized by planting riparian vegetation along streambanks. The vegetation, when established, acts as an anchor for the sediment reducing erosion and providing shade to the stream. This process may take a decade to achieve; whereas, limiting livestock access to a stream while grazing can significantly decrease bacteria load to the water body and water quality improvements can be achieved almost immediately.

In the past 20 years, stakeholders within the Pahsimeroi Basin have completed many projects focused on increasing instream water quantity within the Pahsimeroi River and Patterson/Big Springs to increase spawning habitat for anadromous fish. The total water savings from these projects totaled 68.5 cfs (personal communication, CSWCD). In addition to water savings, many of these projects provided the opportunity to redesign diversion structures with fish screens to limit fish entrapment in irrigation canals. Figure 6 shows the locations of closed/consolidated ditches along the lower Pahsimeroi River.

4.4.2.2 Custer Soil and Water Conservation District

Table 21 lists BMP projects sponsored by the CSWCD since 2012. The project list was compiled through personal communication with the CSWCD, and projects listed in the 2020 agricultural implementation plan (ISWCC 2020).

Pahsimeroi River Water Savings Projects

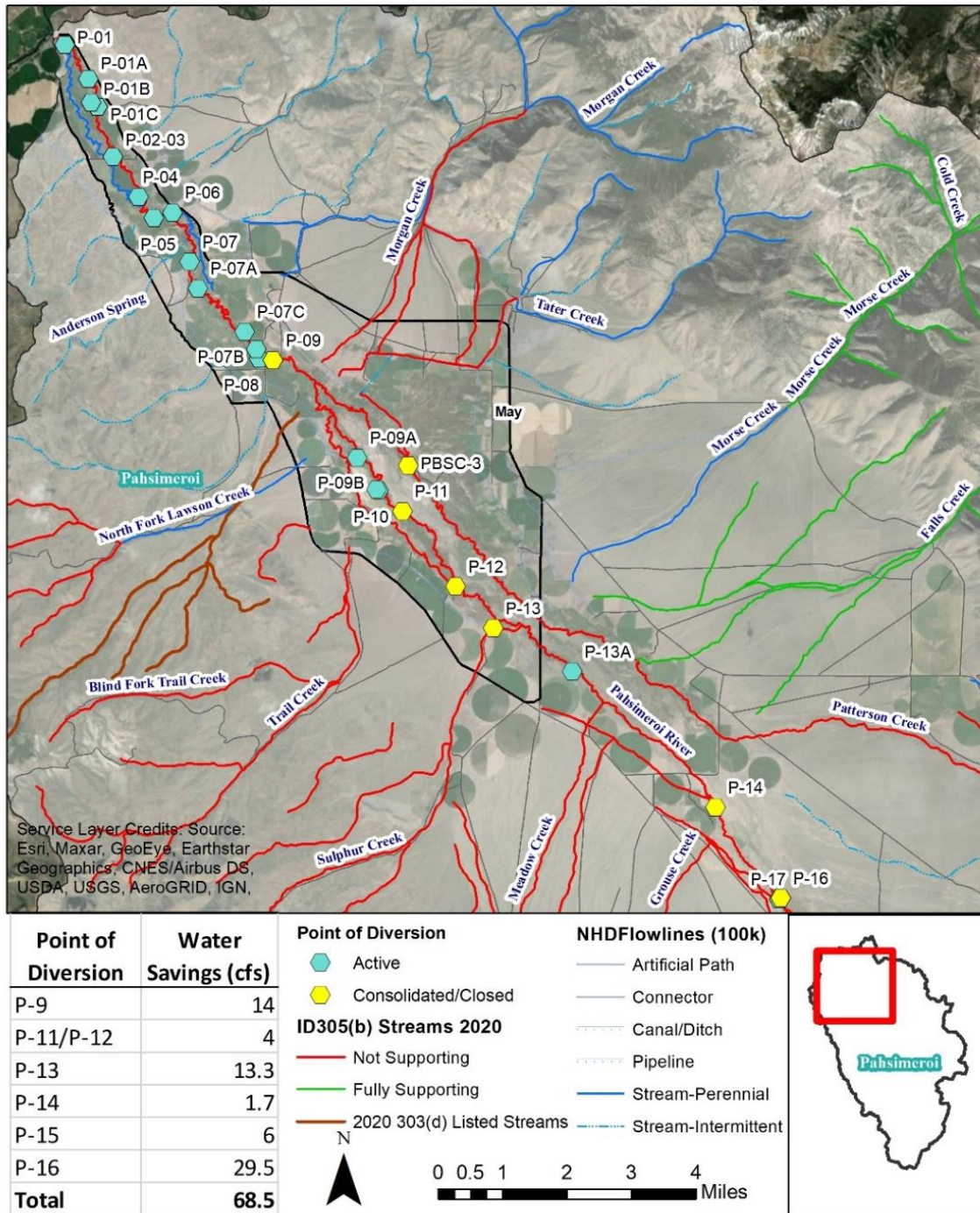


Figure 6. Map of ditch closure and consolidation along the lower Pahsimeroi River.

Table 21. Implementation activities sponsored by the CSWCD within the Pahsimeroi River subbasin.

Water Body	Pollutant	Project Description	Project Technical Lead	BMPs accomplished			Miles of Stream Impacted	Year
				Fish Passage Barriers Removed	New Fish Screen Installed	Water Savings (cfs)		
Pahsimeroi River (ID17060202SL001_05)	Sedimentation/Siltation and Temperature	P-8A fish passage barrier removal	NRCS, IDFG	1				2010
Pahsimeroi River, Muddy Springs, Duck Springs (ID17060202SL002_05)	Sedimentation/Siltation and Temperature	P-9 Ditch Consolidation	NRCS, IDFG	4	1	14	14.5	1998–2014
Pahsimeroi River and Muddy Spring (ID17060202SL002_05)	Sedimentation/Siltation and Temperature	Riparian Fencing	NRCS				13.37	1998–2014
Sulphur Creek (ID17060202SL002_02)	Sedimentation/Siltation, Temperature, and <i>E. coli</i>							
Pahsimeroi River, Muddy Springs (ID17060202SL002_05)	Sedimentation/Siltation and Temperature	P-11/P-12 Ditch Consolidation	NRCS, IDFG	3	1	4		2010
Pahsimeroi River (ID17060202SL002_04)	Sedimentation/Siltation	Fish passage barrier (culvert) removal and bridge installation	BOR	4				2011
Patterson/Big Springs Creek (ID17060202SL034_04)	Flow Regime Modification							
Morgan Creek (ID17060202SL039_02)	Not Assessed							
Mulvaney Ditch (ID17060202SL037_02)	Not Assessed							
Sulphur Creek (ID17060202SL002_02)	Sedimentation/Siltation, Temperature, and <i>E. coli</i>	Sulphur Creek Fish Passage Barrier Removal and Reconnection Project	BOR	3			3	2012–2014
Pahsimeroi River (ID17060202SL008_04)	Sedimentation/Siltation	Furey Lane (P-16) Push Up Dam Removal, Water	BOR, IDFG NRCS	3	1	29.5	2.5	2014–2015

Water Body	Pollutant	Project Description	Project Technical Lead	BMPs accomplished			Miles of Stream Impacted	Year
				Fish Passage Barriers Removed	New Fish Screen Installed	Water Savings (cfs)		
		Conservation Project and riparian plantings						
Pahsimeroi River (ID17060202SL008_04)	Sedimentation/Siltation	Riparian fencing and stock-water allotment P-16	BOR, NRCS				0.8	2014–2015
Sulphur Creek (ID17060202SL002_02)	Sedimentation/Siltation, Temperature, and <i>E. coli</i>	Fish passage barrier removal	BOR	1			4.5	2014
Pahsimeroi River (ID17060202SL010_04)	Sedimentation/Siltation, Flow Regime Modification	Feedlot Operation: Removed CAFO/ Riparian Protection; Fencing and Stock water	NRCS				0.5	2014–2015
Spring Creek McCoy Lane (ID17060202SL010_04)	Sedimentation/Siltation, Flow Regime Modification	Fish passage barrier (culvert) removal and bridge installation	BOR	1			2.5	2015
Goldburg Creek (ID17060202SL010_03)	Sedimentation/Siltation	Fish passage barrier (culvert) removal and bridge installation	BOR	1			2	2015
Pahsimeroi River (ID17060202SL002_05)	Sedimentation/Siltation and Temperature	P-13 ditch permanent closure	NRCS, IDFG	3	1	13.3	4.5	2014–2015
Pahsimeroi River (ID17060202SL008_04)	Sedimentation/Siltation	P-14 ditch permanent closure	NRCS	1		1.7	4.5	2014
Pahsimeroi River (ID17060202SL008_04)	Sedimentation/Siltation	P-15 ditch permanent closure	NRCS	1		6	1	2015
Pahsimeroi River (ID17060202SL002_05)	Sedimentation/Siltation and Temperature	Mulvaney Ditch: Installed water control structure	BOR	1			15	2015
Pahsimeroi River (ID17060202SL008_04)	Sedimentation/Siltation	Woody debris installation and floodplain reconnection, riparian plantings	IDFG				0.8	2016

Water Body	Pollutant	Project Description	Project Technical Lead	BMPs accomplished			Miles of Stream Impacted	Year
				Fish Passage Barriers Removed	New Fish Screen Installed	Water Savings (cfs)		
Pahsimeroi River (ID17060202SL007_04)		Woody debris and BDA installation and floodplain reconnection, riparian plantings	IDFG				2	2017 and 2021
Pahsimeroi River (ID17060202SL008_04)	Sedimentation/Siltation	Woody debris and BDA installation and floodplain reconnection, riparian plantings	IDFG				1	2018 and 2021
Sulphur Creek (ID17060202SL002_02)	Sedimentation/Siltation, Temperature and <i>E. coli</i>	BDA installation and riparian planting	IDFG				0.3	
Muddy Springs (ID17060202SL002_05)	Sedimentation/Siltation and Temperature	Habitat improvement project	IDFG					2021

Notes: Custer Soil & Water Conservation District (CSWCD); Idaho Fish and Game (IDFG), US Bureau of Reclamation (BOR), National Resource Conservation Service (NRCS)

4.4.2.3 National Resource Conservation Service

Table 22 summarizes BMPs accomplished through NRCS funding from 2004 through spring 2016 as reported in the 2020 Pahsimeroi River subbasin implementation plan (ISWCC 2020). The NRCS programs used to fund these projects include Environmental Quality Incentives Program, Wildlife Habitat Incentive Program, General Conservation Technical Assistance, and Grazing Lands Initiative Conservation Technical Assistance.

Table 22. Applied practices approved through NRCS funding from 2004 to spring 2016.

Practice Name	Amount Installed	Units
Comprehensive Nutrient Management Plan	7	
Waste Storage Facility	10	
Conservation Cover	12	acres
Fence	126,453.7	feet
Stream Habit Improvement and Management	72.5	acres
Irrigation Pipeline	9,236	feet
Sprinkler System	2,016.5	acres
Irrigation Water Management	2,025.1	acres
Access Control	379.3	acres
Obstruction Removal	474.9	acres
Forage and Biomass Planting	121.9	acres
Livestock Pipeline	11,455.3	feet
Prescribed Grazing	1,631.1	acres
Pumping Plant	11	
Structure for Water Control	2	
Upland Wildlife Habitat Management	35,040.6	acres
Structures for Wildlife	2	
Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic	35,564	feet

4.4.2.4 Idaho Fish and Game Habitat Improvement Projects

Sulphur Creek (ID17060202SL002_02) Habitat complexity and riparian planting (2013–2014)

Just over a mile of Sulphur Creek was improved on the Parkinson Ranch through the addition of woody debris structures and willow root wads into the channel to increase channel complexity and instream habitat. Riparian planting was completed in 2013 and 2014. Species consisted of black cottonwood and booth, geyer, coyote, bebb, and drummond willows. This project was part of a multiagency effort to reconnect Sulphur Creek to the Pahsimeroi River through a water savings project, removing a fish passage barrier and installing a fish screen.

Furey Lane Bridge Installation and Riparian Planting (2015)

In 2015, a bridge was set at Furey Lane over the Pahsimeroi River (ID17060202SL008_04) to replace two culverts that were partial barriers. Two root wad structures were placed upstream of the bridge for bank stabilization, and two root wad features were placed downstream for

habitat and flow deflection. This area was planted with riparian vegetation consisting of black cottonwood, willow (bebb, booth, coyote, geyer, and drummond), red osier dogwood, woods rose, and chokecherry. Plantings occurred in a 300-foot area on both sides of the river. A wildlife fence was installed in 2015 and removed in 2018.

Habitat Improvement below the P-16 Diversion (2016)

Large root wads and tops were placed instream and on the floodplain along 0.8 miles of the Pahsimeroi River (ID17060202SL008_04) downstream of the P-16 Ditch on BLM property. Riparian planting occurred on both sides of the river and included: black cottonwood, willow, woods rose, red osier dogwood, water birch, and golden current.

Big Creek Ranch Habitat Improvement Project (2017)

This project occurred in the Pahsimeroi River (ID17060202SL007_04) on Big Creek Ranch, downstream of Furey Lane. This project included floodplain grading, installing channel spanning riffles to inundate floodplains, developing lateral channels, remeandering a straightened section of the Pahsimeroi River, engineering log jams, adding habitat logs, and installing riparian planting on both sides of the river. Plantings included black cottonwood, willow, woods rose, red osier dogwood, water birch, and golden current and a native grass mix. This project was partially irrigated in 2018 to present. Fence structures were placed in 2021 to promote vegetation growth. Beaver dam analog (BDA) structures were placed in 2021 to further encourage floodplain reconnection and channel complexity.

IDL/O'Neal Habitat Restoration (2018)

This project was located on 1 mile of the Pahsimeroi River (ID17060202SL008_04), upstream of Furey Lane on the IDL property and downstream on private property. This project included a heavy wood treatment with channel spanning logjams to inundate floodplains, engineered logjams, habitat logs, side channel activation, partial channel spanning logjams, and riparian planting on both sides of the river. Both sides of the river were planted with willows, black cottonwood, woods rose, red osier dogwood, water birch, and golden current and seeded with a native grass mix. This project has been irrigated since 2019 to promote vegetation growth. In 2021, BDAs were installed on this project to enhance the existing habitat features.

Sulphur Creek (ID17060202SL002_02) BDA's (2019)

Approximately 30 BDAs were installed along 0.3 miles of Sulphur Creek on Sulphur Creek Ranch downstream of the Custer Road bridge along Sulphur Creek. These structures were channel spanning to slow the flow of the creek and allow lateral dispersal of energy. Riparian planting on both sides of the river included black cottonwood, willow varieties, and a native grass mix.

5 Total Maximum Daily Loads

A TMDL prescribes an upper limit (i.e., load capacity) on discharge of a pollutant from all sources to ensure water quality standards are met. It further allocates this load capacity among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a wasteload allocation, and nonpoint sources which receive load

allocations. Wasteload allocations may be composited for certain types of point sources, such as general permits, but typically each point source is given a wasteload allocation. Each nonpoint source load may receive a load allocation or the sources may be aggregated with a single load allocation for all nonpoint source loads. Natural background contributions, when present, are considered part of the load allocation but may be treated separately because they represent a part of the load not subject to control. Because of uncertainties about quantifying loads and the relation of specific loads to attaining water quality standards, the rules regarding TMDLs (40 CFR 130) require a margin of safety be included in the TMDL. Practically, the margin of safety and natural background are both reductions in the load capacity available for allocation to anthropogenic pollutant sources.

Load capacity can be summarized by the following equation:

$$LC = MOS + NB + LA + WLA = TMDL$$

Where:

LC = load capacity
MOS = margin of safety
NB = natural background
LA = load allocation
WLA = wasteload allocation

The equation is written in this order because it represents the logical order in which a load analysis is conducted. First, the load capacity is determined. Then the load capacity is broken down into its components. If the MOS is explicit (i.e., a specific amount or proportion of the load capacity) and the natural background is separated from other nonpoint sources, those loads are subtracted from the overall load capacity, and the remaining load is allocated among pollutant sources (i.e., the load allocation and WLA). When the breakdown and allocation are complete, the result is a TMDL, which must equal the load capacity.

The load capacity must be based on critical conditions—the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both load capacity and pollutant source loads vary, and not necessarily in concert, determining critical conditions can be more complicated than it may initially appear.

Another step in a load analysis is quantifying current pollutant loads by source. This step allows for the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility, and is necessary for pollutant trading to occur (DEQ 2016b). A load is fundamentally a quantity of pollutant discharged over some period of time and is the product of concentration and flow. Due to the diverse nature of various pollutants, and the difficulty of strictly dealing with loads, the federal rules allow for “other appropriate measures” to be used when necessary (40 CFR 130.2). These other measures must still be quantifiable and relate to water quality standards, but they allow flexibility to deal with pollutant loading in more practical and tangible ways. The rules also recognize the particular difficulty of quantifying nonpoint loads and allow “gross allotment” as a load allocation where

available data or appropriate predictive techniques limit more accurate estimates. For certain pollutants whose effects are long term, such as sediment and nutrients, EPA allows for seasonal or annual loads when consistent with applicable water quality standards.

5.1 Sediment TMDLs

5.1.1 Instream Water Quality Targets

TMDL water quality targets are a translation of the applicable numeric or narrative water quality standards for each pollutant. For pollutants with established numeric water quality standards, the numeric value(s) are used as the TMDL targets. For pollutants with narrative water quality standards, the targets provide a water body-specific interpretation of the narrative standard(s). Water quality targets are typically developed for multiple parameters that link directly to the impaired beneficial uses and applicable water quality standards. Therefore, the targets provide a benchmark by which to evaluate attainment of water quality standards. Furthermore, comparing existing stream conditions to target values allows for a better understanding of the extent and severity of the problem.

TMDL targets for sediment are established using streambank erosion inventories (SEI). The SEI process involves collecting streambank stability data and measurements to determine TMDL load allocations with the goal of full support of designated beneficial uses. When eroding streambanks are identified in the field during the SEI process, streambank height and length are measured, and six additional streambank characteristics are ranked. Corresponding erosion rates and target rates are then calculated using these parameters. DEQ collected data and measurements for six AUs in 2018 (Appendix C).

5.1.1.1 Critical Conditions, Seasonal Variation, and Other Design Conditions

Sediment erosion can vary seasonally and annually with climate and hydrology, resulting in a year-round critical period, with sediment transport and deposition largely occurring during wetter years. In the Pahsimeroi River subbasin, streambank erosion is most prevalent in the spring during bankfull conditions when runoff is at its peak. Based on flows from the USGS gage at Ellis, Idaho, the highest flows tend to occur from October to March (USGS 2021). Low flows occur from April to October with the lowest flows in July and August (USGS 2021).

5.1.1.2 Target Selection

Sediment targets selected for this TMDL are based on streambank stability equated to quantitative allocations of streambank erosion expressed in tons of sediment per year. Natural or background conditions for streambank sediment load is a $\geq 80\%$ stable streambank with $\leq 20\%$ eroding banks. The 80% stability level is identified in the *User's Guide to Fish Habitat: Descriptions that Represent Natural Conditions in the Salmon River Basin, Idaho* and is deemed protective of stream habitat (Overton et al. 1995). It is presumed that beneficial uses are supported at these load rates. Streambank erosion above 20% is considered detrimental to beneficial uses and would require a load reduction. The SEI is used to estimate long-term

streambank lateral recession rates. The inventory results in corresponding erosion rates and target erosion rates and consists of fieldwork, measurements, and calculations to estimate streambank and channel stability, length of eroding banks, and bank geometry. The SEI method is based on modified NRCS methods, Rosgen stream classification systems, and other applicable literature (Pfankuch 1975; Lohrey 1989; Rosgen 1996).

5.1.1.3 Water Quality Monitoring Points

DEQ conducted SEI monitoring along Burnt Creek – Long Creek to mouth (ID17060202SL023_03), which is currently listed in Category 5 of the 2024 Integrated Report (DEQ 2024) for combined biota/habitat bioassessments. This AU was suspected of having a sediment impairment based on metrics collected in a 2018 BURP assessment. Additional information about this assessment unit is found in Appendix D. Table 23 shows the location of the SEI conducted on Burnt Creek – Long Creek to mouth (ID17060202SL023_03) in 2018.

Table 23. Pahsimeroi River subbasin SEI monitoring locations.

Stream Name	Assessment Unit Number	Downstream Latitude	Downstream Longitude	Upstream Latitude	Upstream Longitude
Burnt Creek	ID17060202SL023_03	44.282310	-113.651500	44.279810	-113.649960

Burnt Creek should be surveyed in the future, as watershed improvement projects proceed to monitor progress towards meeting water beneficial use requirements and water quality targets. The SEI and sediment data are provided in Appendix C.

5.1.2 Load Capacity

The sediment load capacity is the sediment loading rate at which beneficial uses are supported, and reductions will be determined to meet those loads. Load capacity estimates are developed for SEI TMDLs using streambank cover and lateral recession rates that are equivalent to natural background conditions. Streambanks with 80% streambank cover or more are considered equivalent to natural conditions (Overton et al. 1995). The natural level of lateral recession is determined on a case-by-case basis and is specific to each AU where an SEI assessment is completed. After an SEI assessment is completed, the assessor calculates a Field Stability Score. Six factors go into the Field Stability Score, including bank erosion evidence; bank stability condition; bank cover and vegetation; lateral channel stability; channel bottom stability; and in-channel deposition. The Field Stability Score can range from 0 to 15 with a higher score representing higher lateral recession rates. Field Stability Scores between 0 and 4 are considered slight, 4 to 8 are moderate, and above 8 are severe. Once the Field Stability Score is estimated, the assessor uses details from the SEI field investigation and best professional judgement to determine Target Stability Score. The Target Stability Score and corresponding recession rate is assumed to represent erosion rates that normally occur in streams under natural conditions. The Target Stability Score is never greater than the Field Stability Score; however, if the Field Stability Score is low, the Target Stability Score may equal the Field Stability Score. The SEI method generates load capacity estimates using 80% streambank stability target lateral recession rate estimated by the Target Stability Score.

Since it is often not feasible to conduct SEI surveys for the entire length of an AU, a representative section of the AU is surveyed, and the results are applied to the entire AU. The average percent stability (i.e., area) and Field/Target Stability Scores (i.e., erosion rates) from the surveyed subsection are then extrapolated to create estimates of the AU's loading capacity and current load. The load capacity is calculated using the following equation:

$$\text{Load Capacity } \left(\frac{\text{tons}}{\text{day}} \right) = \frac{[\text{Eroding Area (sq ft)} * 80\% \text{ Bank Stability Factor}] * \text{Target Recession Rate } \left(\frac{\text{ft}}{\text{yr}} \right) * \text{bulk density} * 0.0005 \left(\frac{\text{tons}}{\text{lbs}} \right)}{\text{Total Surveyed Length (ft)}} \\ * \text{Total AU Length (ft)} * 0.0027 \left(\frac{\text{yr}}{\text{day}} \right)$$

Where:

Eroding area is measured from SEI survey.

80% stability factor is a conversion to estimate load at 80% stable streambank.

Target recession rate is estimated from Target Stability Score.

Bulk density is estimated from soil texture observed during survey.

This calculation for both the eroding and stable streambanks determines the load capacity at 80% streambank stability and the current load of the eroding areas. The load capacity is the natural, minimally erosive state one would expect of a covered, stable streambank. The current load is the tons of sediment per year calculated for the eroding streambanks at their current condition. The difference between the current load and the load capacity is the load reduction. Given that the sediment impaired streams in the Pahsimeroi River subbasin are impaired from nonpoint sources (i.e. streambank erosion) waste load allocations were not developed as part of this analysis. This TMDL will allocate sediment load reductions that are necessary to meet the load capacities on a seasonal basis. Allocating load reductions is useful in identifying the erosion magnitude and the timing needed to improve land management and apply BMPs.

5.1.3 Estimates of Existing Pollutant Loads

To the extent possible, background loads should be distinguished from human-caused increases in nonpoint loads. Federal regulations allow that loads "...may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading" (40 CFR 130.2(g)).

The volume of an eroding streambank at bankfull condition was calculated by measuring eroding bank height and length and evaluating the bank condition to estimate the lateral recession rate during periods of high discharge, taking erodibility of the soil type into consideration. The current loads estimated for Burnt Creek – Long Creek to mouth with a target of 80% streambank stability are 295.4 tons/year which is 0.81 tons/day. The later recession rate for this AU is 0.215 ft/year. Detailed results are discussed in section 5.1.4.1 and streambank erosion calculation worksheets are provided in Appendix B.

5.1.4 TMDL Allocations

Sediment impaired streams in the Pahsimeroi River subbasin are impaired from nonpoint sources (i.e., streambank erosion) and includes natural backgrounds. At higher flows, greater sediment loads can be expected. During low flow periods, significantly less erosion is expected. Point sources do not discharge sediment to the water bodies in this TMDL, so wasteload allocations are not necessary.

The load allocation is the portion of the load capacity that is allocated to nonpoint sources. Sediment load allocations are estimated targets to improve water quality so the beneficial uses will be fully supported. The load allocation includes natural background and reserves 10% of the load capacity for an explicit MOS, as shown by the below equation:

$$\text{Load Allocation} \left(\frac{\text{tons}}{\text{day}} \right) = \frac{[\text{Eroding Area (sq ft)} * 80\% \text{ Bank Stability Factor}] * \text{Target Recession Rate} \left(\frac{\text{ft}}{\text{yr}} \right) * \text{bulk density} * 0.0005 \left(\frac{\text{tons}}{\text{lbs}} \right)}{\text{Total Surveyed Length (ft)}} * \frac{\text{Total AU Length (ft)} * 0.0027 \left(\frac{\text{yr}}{\text{day}} \right) * 0.9}{1}$$

Where:

Eroding area is measured from SEI survey.

80% stability factor is a conversion to estimate load at 80% stable streambanks.

Target Recession Rate is estimated from Target Stability Score.

Bulk density is estimated from soil texture observed during survey, which was 80 lb/ft³.

0.9 is the 10% MOS.

The load capacity is the natural, minimally erosive state in a vegetated and stable streambank. The load capacity is the natural background condition, currently targeted to be 80% stable streambanks. The current load is the tons of sediment per year calculated for the eroding streambanks at their current condition based on field measurements. The difference between the current load and the load capacity is the necessary load reduction.

5.1.4.1 Load Allocations

The sediment-impaired stream in the Pahsimeroi River subbasin results from nonpoint sources (i.e., streambank erosion). At higher flows, greater sediment loads can be expected. During low flow periods, less erosion is expected.

Sediment load allocations are estimated targets in the process of improving water quality until beneficial uses of cold water aquatic life and salmonid spawning are fully supported. The load allocation includes natural background and reserves 10% of the load capacity for an explicit MOS. Table 24 lists the difference between the current sediment load (including a 10% MOS) and the load capacity of the impaired AU.

The load capacity is the natural, minimally erosive state in a vegetated and stable streambank. The load capacity is the natural background condition, currently targeted to be 80% stable streambanks. The current load is the tons of sediment per year calculated for the eroding

streambanks at their current condition based on field measurements. The difference between the current load and the load capacity is the necessary load reduction.

Because sediment in this AU is solely from nonpoint sources, the allocation required to meet load capacity will be based on the necessary load reduction, rather than the allocation of allowable load. This method better directs the implementation to times of greatest loads. Table 24 details the sediment reduction necessary to achieve the load capacity of Burnt Creek – Long Creek to mouth (ID17060202SL023_03).

Table 24. TMDL sediment allocation summary.

Assessment Unit Name	Assessment Unit Number	Current Load (tons)	Load Capacity (tons)	Margin of Safety ^a (tons)	Load Allocation (tons)	Necessary Load Reduction (tons)	Necessary Percent Reduction (%)
Burnt Creek – Long Creek to mouth	ID17060202SL023_03	295/year	25/year	2/year	23/year	273/year	92
		0.8/day	0.07/day	0.005/day	0.06/day	0.7/day	

a. Margin of safety numbers are rounded to the nearest ton.

Based on results from the field observations and calculations, Burnt Creek – Long Creek to mouth requires a load reduction. The sediment load in this AU is due to streambank erosion. A 92% sediment reduction is necessary to move from the current condition to the natural background load capacity of the system and restore beneficial uses.

5.1.4.1.1 Natural Background

Sediment load allocations are estimated targets to improve water quality to support cold water aquatic life and salmonid spawning beneficial uses. The load capacity is the natural, minimally eroded state in a vegetated and stable streambank. The load capacity is the natural background condition, currently targeted to be 80% stable streambanks, with the lateral recession rate of the respective stream. Sediment may be the causal factor for impairment, but until the stream meets the designated beneficial uses, typically determined by passing BURP scores, any implementation and load reduction cannot be deemed successful.

5.1.4.2 Margin of Safety

A 10% MOS is applied to ensure that beneficial uses will be restored. This MOS is applied by determining 10% of the load capacity. The load reduction is determined by subtracting the load capacity from the current load inclusive of the 10% MOS (Table 24).

5.2 Temperature TMDLs

5.2.1 Instream Water Quality Targets

Five AUs with potential temperature concerns had Potential Natural Vegetation (PNV) analyses completed. Idaho's water quality standards (IDAPA 58.01.02.200.09) include a provision that if natural conditions exceed numeric water quality criteria, exceedance of

the criteria is not considered a violation of water quality standards. In these situations, natural conditions essentially become the water quality standard, and for temperature TMDLS, the natural level of shade and channel width become the TMDL target. The instream temperature that results from attaining these conditions is consistent with the water quality standards, even if it exceeds numeric temperature criteria. Appendix B provides further discussion of water quality standards and natural background provisions. Four of the five AUs had shade deficiencies, and temperature TMDLs were developed for the following AUs:

North Fork Lawson Creek – source to mouth (ID17060202SL004_02) – 23%

North Fork Lawson Creek – source to mouth (ID17060202SL004_03)—16%

Burnt Creek – source to Long Creek (ID17060202SL024_02)—28%

Patterson Creek – source to and including Inyo Creek (ID17060202SL035_02)—23%

Mahogany Creek (ID17060202SL019_03) showed zero percent solar load reduction required and therefore will not have a TMDL developed and remain in Category 5 for further monitoring.

The PNV approach is described briefly below. The procedures and methodologies to develop PNV target shade levels and to estimate existing shade levels are described in detail in *The Potential Natural Vegetation (PNV) Temperature Total Maximum Daily Load (TMDL) Procedures Manual* (Shumar and De Varona 2009). The manual also provides a more complete discussion of shade and its effects on stream water temperature.

5.2.1.1 Factors Controlling Water Temperature in Streams

There are several important contributors of heat to a stream, including groundwater temperature, air temperature, and direct solar radiation (Poole and Berman 2001). Of these, direct solar radiation is the source of heat that is most controllable. The parameters that affect the amount of solar radiation hitting a stream throughout its length are shade and stream morphology. Shade is provided by the surrounding vegetation and other physical features such as hillsides, canyon walls, terraces, and high banks. Stream morphology (i.e., structure) affects riparian vegetation density and water storage in the alluvial aquifer. Riparian vegetation and channel morphology are the factors influencing shade that are most likely to have been influenced by anthropogenic activities and can be most readily corrected and addressed by a TMDL.

Riparian vegetation provides a substantial amount of shade on a stream by virtue of its proximity. However, depending on how much vertical elevation surrounds the stream, vegetation further away from the riparian corridor can also provide shade. The amount of shade that a stream receives can be measured in a number of ways. Effective shade (i.e., that shade provided by all objects that intercept the sun as it makes its way across the sky) can be measured in a given location with a Solar Pathfinder or with other optical equipment similar to a fish-eye lens on a camera. Effective shade can also be modeled using detailed information about riparian plants and their communities, topography, and stream aspect.

In addition to shade, canopy cover is a similar parameter that affects solar radiation. Canopy cover is the vegetation that hangs directly over the stream and can be measured using a densiometer or estimated visually either on-site or using aerial photography. All of these methods provide information about how much of the stream is covered and how much is exposed to direct solar radiation.

5.2.1.2 Potential Natural Vegetation for Temperature TMDLs

The PNV along a stream is the riparian plant community that could grow to an overall mature state, although some level of natural disturbance is usually included in the development and use of shade targets. Vegetation can be removed by disturbance either naturally (e.g., wildfire, disease/old age, wind damage, wildlife grazing) or anthropogenically (e.g., domestic livestock grazing, vegetation removal, erosion). The idea behind PNV as targets for temperature TMDLs is that PNV provides a natural level of solar loading to the stream without any anthropogenic removal of shade-producing vegetation. Vegetation levels less than PNV (with the exception of natural levels of disturbance and age distribution) result in the stream heating up from anthropogenically created additional solar inputs.

DEQ can estimate PNV (and therefore target shade) from models of plant community structure (shade curves for specific riparian plant communities), and we can measure or estimate existing canopy cover or shade. Comparing the two (target and existing shade) tells us how much excess solar load the stream is receiving and what potential exists to decrease solar gain. Streams disturbed by wildfire, flood, or some other natural disturbance will be at less than PNV and require time to recover. Streams that have been disturbed by human activity may require additional restoration above and beyond natural recovery.

Existing and PNV shade was converted to solar loads from data collected on flat-plate collectors at the nearest National Renewable Energy Laboratory (NREL) weather stations collecting these data. In this case, we used the average of the Helena, Montana, and Pocatello, Idaho, stations. The difference between existing and target solar loads, assuming existing load is higher, is the load reduction necessary to bring the stream back into compliance with water quality standards (Appendix B).

PNV shade and the associated solar loads are assumed to be the natural condition; thus, stream temperatures under PNV conditions are assumed to be natural (so long as no point sources or other anthropogenic sources of heat exist in the watershed) and are considered to be consistent with the Idaho water quality standards, even if they exceed numeric criteria by more than 0.3 °C.

5.2.1.2.1 Existing Shade Estimates

Existing shade was estimated for five AUs from visual interpretation of aerial photos and field observations. Estimates of existing shade based on plant type and density were marked out as stream segments on a 1:100,000 or 1:250,000 hydrography taking into account natural breaks in vegetation density. Stream segment length for each estimate of existing shade varies depending on the land use or landscape that has affected that shade level. Each segment was

assigned a single value representing the bottom of a 10% shade class (adapted from the cumulative watershed effects process, IDL 2000). For example, if shade for a particular stream segment was estimated somewhere between 50% and 59%, we assigned a 50% shade class to that segment. The estimate is based on a general intuitive observation about the kind of vegetation present, its density, and stream width. Streams where the banks and water are clearly visible are usually in low shade classes (10%, 20%, or 30%). Streams with dense forest or heavy brush where no portion of the stream is visible are usually in high shade classes (70%, 80%, or 90%). More open canopies where portions of the stream may be visible usually fall into moderate shade classes (40%, 50%, or 60%).

Visual estimates made from aerial photos are strongly influenced by canopy cover and do not always take into account topography or any shading that may occur from physical features other than vegetation. It is not always possible to visualize or anticipate shade characteristics resulting from topography and landform. However, research has shown that shade and canopy cover measurements are remarkably similar (OWEB 2001), reinforcing the idea that riparian vegetation and objects proximal to the stream provide the most shade. The visual estimates of shade in this TMDL were partially field verified with a Solar Pathfinder, which measures effective shade and takes into consideration other physical features that block the sun from hitting the stream surface (e.g., hillsides, canyon walls, terraces, and man-made structures).

5.2.1.2.2 Solar Pathfinder Field Verification

The accuracy of the aerial photo interpretations was field verified with a Solar Pathfinder. The Solar Pathfinder is a device that allows one to trace the outline of shade-producing objects on monthly solar path charts. The percentage of the sun's path covered by these objects is the effective shade on the stream at the location where the tracing is made. To adequately characterize the effective shade on a stream segment, 20 traces are taken at systematic or random intervals along the length of the stream in question.

At each sampling location, the Solar Pathfinder was placed in the middle of the stream at about the bankfull water level. Twenty traces were taken following the manufacturer's instructions (i.e., orient to south and level). Systematic sampling was used because it is easiest to accomplish without biasing the sampling location. For each sampled segment, the sampler started at a unique location, such as 25 to 50 meters (m) from a bridge or fence line, and proceeded upstream or downstream taking additional traces at fixed intervals (e.g., every 25 m, 25 paces, etc.). Alternatively, one can randomly locate points of measurement by generating random numbers to be used as interval distances.

When possible, the sampler also measured bankfull widths, took notes, and photographed the landscape of the stream at several unique locations while taking traces. Special attention was given to changes in riparian plant communities and what kinds of plant species (the large, dominant, shade-producing ones) were present. One can also take densiometer readings at the same location as Solar Pathfinder traces. These readings provide the potential to develop relationships between canopy cover and effective shade for a given stream.

In Table 25, the Solar Pathfinder data shows the aerial interpretations were reasonably accurate with a mean overestimation of -0.11 ± 0.57 (average $\pm$ 95% C.I.) for two TMDL sites in the Pahsimeroi River subbasin. These data were used to correct interpretations in those locations and to “calibrate our eyes” for further evaluation in other areas of the shade analysis.

Table 25. Solar Pathfinder results for TMDL sites in the Pahsimeroi River subbasin.

Site Name	Assessment Unit Number	Aerial Class	Pathfinder Measurement	Pathfinder Classification	Classification Difference
BURNT-01	ID17060202SL024_02	90	83	80	1
BURNT-02	ID17060202SL024_02	40	43	40	0
BURNT-03	ID17060202SL024_02	20	29	20	0
BURNT-04	ID17060202SL024_02	50	47	40	1
BURNT-05	ID17060202SL024_02	30	57	50	-2
BURNT-06	ID17060202SL024_02	10	19	10	0
EFPAT-01	ID17060202SL035_02	70	79	70	0
INYO-01	ID17060202SL035_02	70	78	70	0
PAT-01	ID17060202SL035_02	60	74	70	1
Mean					-0.11
Standard Deviation					0.87
Confidence Level (95%)					0.57

5.2.1.2.3 Target Shade Determination

The PNV targets were determined from an analysis of probable vegetation at the streams and comparing that to shade curves developed for similar vegetation communities in Idaho (Shumar and De Varona 2009). A shade curve shows the relationship between effective shade and stream width. As a stream gets wider, shade decreases as vegetation has less ability to shade the center of wide streams. As the vegetation gets taller, the more shade the plant community is able to provide at any given channel width.

5.2.1.2.4 Natural Bankfull Widths

Stream width must be known to calculate target shade since the width of a stream affects the amount of shade the stream receives. Bankfull width is used because it best approximates the width between the points on either side of the stream where riparian vegetation starts. Measures of current bankfull width may not reflect widths present under PNV (i.e., natural widths). As impacts to streams and riparian areas occur, width-to-depth ratios tend to increase such that streams become wider and shallower. Shade produced by vegetation covers a lower percentage of the water surface in wider streams, and widened streams can also have less vegetative cover if shoreline vegetation has eroded away.

Since existing bankfull width may not be discernible from aerial photo interpretation and may not reflect natural bankfull widths, this parameter must be estimated from available information. We used regional curves for the major basins in Idaho—developed from data

compiled by Diane Hopster of the Idaho Department of Lands—to estimate natural bankfull width (Figure 7).

For each stream evaluated in the load analysis, natural bankfull width was estimated based on the drainage area of the Upper Snake curve (Figure 7). Although estimates from other curves were examined (i.e., Salmon, Payette/Weiser), the Upper Snake curve was ultimately chosen because of its proximity to the Pahsimeroi watershed and because of similarity in climate and vegetation. Existing width data should also be evaluated and compared to these curve estimates if such data are available. However, for the Burnt Creek and Lawson Creek tributaries, only a few BURP sites exist, and bankfull width data from those sites represent only spot data (e.g., only three measured widths in a reach just several hundred meters long) that are not always representative of the stream as a whole.

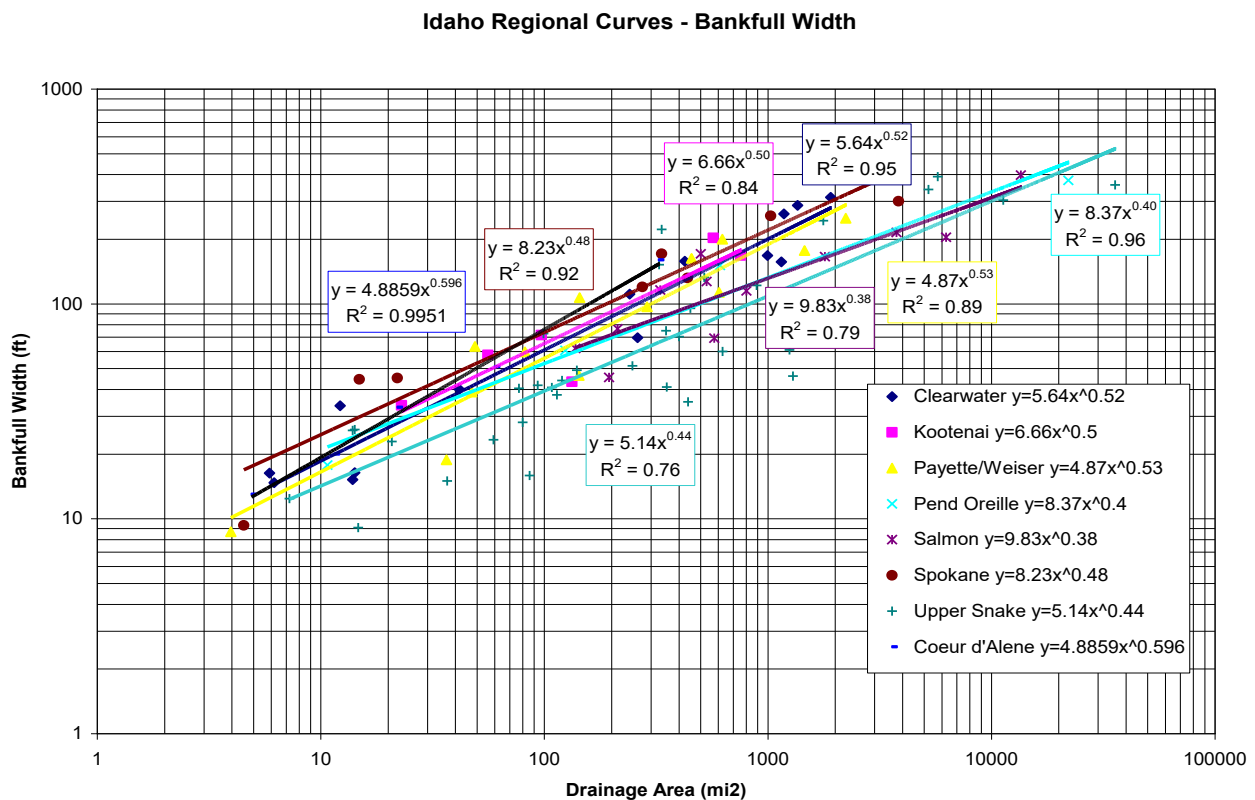


Figure 7. Bankfull width as a function of drainage area.

In general, BURP bankfull width data agreed with natural bankfull width estimates from the Upper Snake basin curve and DEQ did not make natural widths for Pahsimeroi River subbasin streams any smaller than Upper Snake basin estimates. Natural bankfull width estimates for each stream in this analysis are presented in Table 26. The load analysis tables contain a natural bankfull width and an existing bankfull width for every stream segment in the analysis based on the bankfull width results presented in Table 26.

Table 26. Bankfull width as a function of drainage area.

Assessment Unit Number	Location Description	Drainage Area (mi ²)	BURP Measured Width (m)	Natural Bankfull Width Estimate		
				Upper Snake (m)	Salmon (m)	Payette/Weiser (m)
ID17060202SL004_03	North Fork Lawson Creek at mouth	8.9	1	4	7	5
ID17060202SL 004_02	North Fork Lawson Creek above confluence with Middle Fork Lawson Creek	3.7	3	3	5	3
ID17060202SL004_02	Middle Fork Lawson Creek above confluence with North Fork Lawson Creek	4.1	2.4	3	5	3
ID17060202SL019_03	Mahogany Creek at 7680	7.0	3	4	6	4
ID17060202SL024_02	Burnt Creek at confluence with Pahsimeroi River	17.33	2.6	5	9	7
ID17060202SL024_02	Burnt Creek at 7440	13.48	3.7	5	8	6
ID17060202SL024_02	Burnt Creek at 7760	10.08	1.7	4	7	5
ID17060202SL024_02	Burnt Creek at confluence of East Fork and West Fork	4.21	2.3	3	5	3
ID17060202SL035_02	Inyo Creek at mouth	5.03	3	3	6	3
ID17060202SL035_02	Patterson Creek at confluence with East Fork Patterson Creek	14.96	5	5	8	6

5.2.1.3 Design Conditions

A detailed discussion of design conditions is provided in the 2013 Pahsimeroi River subbasin TMDL and 5-year review (DEQ 2013). In summary, the Pahsimeroi River valley is located within the Middle Rockies Level III Ecoregion. The valley floor adjacent to the river is within the Dry Intermontane Sagebrush Valleys Level IV Ecoregion—terrain characterized by stream terraces, floodplains, saline areas, and alluvial fans. Upslope from the valley bottom is the Dry Gneissic-Schistose-Volcanic Hills Level IV Ecoregion—a shrub and grass-covered landscape underlain by Quaternary and Tertiary volcanics more rugged and slightly moister than the valley bottom. Further upslope where the headwaters of Sulphur and Trail Creeks originate, the Barren Mountains Level IV Ecoregion contains quartzite and carbonate-rich rocks at elevations from 6,800 to 10,000 feet.

5.2.1.4 Shade Curve Selection

To determine PNV shade targets for tributaries to the Pahsimeroi River, effective shade curves from the southern Idaho nonforest group and the Salmon-Challis National Forest types were examined (Table 27) (Shumar and De Varona 2009). These curves were produced using vegetation community modeling of Idaho plant communities. Effective shade curves include percent shade on the vertical axis and stream width on the horizontal axis. For the Pahsimeroi River subbasin streams, curves for the most similar vegetation type were selected for shade target determinations.

Patterson and Burnt Creeks both flow through high-elevation forests represented by the Salmon-Challis Forest types. Burnt Creek then transitions to Drummond willow communities. The 3rd-order Mahogany Creek flows through Douglas Fir/Grassland foothills to Drummond willow/sedge communities. The 2nd-order tributaries to North Fork Lawson Creek flow through a combination of graminoid/sagebrush and Geyer willow populations.

Table 27. Shade target curves used in analysis.

Southern Idaho Nonforest Types	Salmon-Challis Forest Types
Graminoid	Dry Douglas-fir without ponderosa pine
Graminoid/Sagebrush	Subalpine Fir - Moist
Geyer willow/sedge	Douglas Fir/Grassland
Drummond willow/sedge	
Quaking Aspen	
Rock/Barren	

5.2.1.5 Water Quality Monitoring Points

Numeric monitoring in any of the temperature-impaired or shade-deficient AUs should be based on the statewide protocols. A robust riparian canopy aimed at preventing excess solar loads to streams is essential to the successful implementation of the PNV temperature TMDLs presented in this document. Effective shade monitoring can take place on any segment throughout the three AUs and be compared to existing shade. Those areas with the largest disparity between existing and target shade should be monitored with Solar Pathfinders to verify existing shade levels and determine progress toward meeting shade targets. DEQ's existing methods and quality assurance programs outline required elements for both the monitoring plans and beneficial use assessments

5.2.2 Load Capacity

The load capacity for a stream under PNV is essentially the solar loading allowed under the shade targets specified for the segments within that stream. These loads are determined by multiplying the solar load measured by a flat-plate collector (under full sun) for a given period of time by the fraction of the solar radiation that is not blocked by shade (i.e., the percent open or 100% minus percent shade). In other words, if a shade target is 60% (or 0.6), the solar load hitting the stream under that target is 40% of the load hitting the flat-plate collector under full sun.

DEQ obtained solar load data from flat-plate collectors at the NREL weather stations in Pocatello, Idaho, and Helena, Montana. The solar load data used in this TMDL analysis are spring/summer averages (i.e., an average load for the 6-month period from April through September). As such, load capacity calculations are also based on this 6-month period, which coincides with the time of year when stream temperatures are increasing, deciduous vegetation is in leaf, and fall spawning is occurring. During this period, temperatures may affect beneficial uses, and spring and fall salmonid spawning and cold water aquatic life criteria may be exceeded during summer months. Late July and early August typically represent the period of

highest stream temperatures. However, solar gains can begin early in the spring and affect not only the highest temperatures reached later in the summer but also salmonid spawning temperatures in spring and fall.

Table 28 (section 5.2.4) and Figure 8–Figure 10 summarize the PNV shade targets. The table also shows corresponding target summer loads (in kilowatt-hours per square meter per day [kWh/m²/day] and kWh/day) that serve as the load capacities for the streams.

The AU with the largest target load (i.e., load capacity) was Burnt Creek (ID17060202SL024_02) with 260,000 kWh/day (section 5.2.4, Table 28). The smallest target load was in the North Fork Lawson Creek AU (ID17060202SL004_03) with 33,000 kWh/day (section 5.2.4, Table 28).

5.2.3 Estimates of Existing Pollutant Loads

Regulations allow that loads “...may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading” (40 CFR 130.2(g)). The existing solar load for each segment identified is then summed to determine the existing solar load for the entire AU. The existing solar load can be summarized with the following equation:

$$\sum seg = seg_1 + seg_2 + seg_3 + \cdots + seg_n$$

Where:

$$seg = NREL \text{ Collector } kWh/m^2/day \times (1 - \text{Existing Shade Percentage})$$

Existing loads in this temperature TMDL come from estimates of existing shade as determined from aerial photo interpretations. There are currently no permitted point sources in the affected AUs. Like target shade, existing shade was converted to a solar load by multiplying the fraction of open stream by the solar radiation measured on a flat-plate collector at the NREL weather stations. Existing shade data are presented in Appendix C, Table C-3–Table C-7. Like load capacities (target loads), existing loads in these are presented on an area basis (kWh/m²/day) and as a total load (kWh/day). Existing and target loads in kWh/day can be summed for the entire stream or portion of stream examined in a single load analysis table. These total loads are shown at the bottom of their respective columns in each table. Because load calculations involve stream segment area calculations, the segments channel width which typically only has one or two significant figures dictates the level of significance of the corresponding loads. One significant figure in the resulting load can create rounding errors when existing and target loads are subtracted. The totals row of each load table represents total loads with two significant figures in an attempt to reduce apparent rounding errors.

The difference between target and existing load is also summed for the entire table. Should existing load exceed target load, this difference becomes the excess load (i.e., lack of shade) to be discussed next in the load allocation section and as depicted in the lack-of-shade figures (Figure 8–Figure 10).

The AU with the largest existing load was Burnt Creek (AU ID17060202SL024_02) with 370,000 kWh/day (section 5.2.4, Table 28). The smallest existing load was in the North Fork Lawson Creek AU (AU ID17060202SL004_03) with 37,000 kWh/day (Table 28).

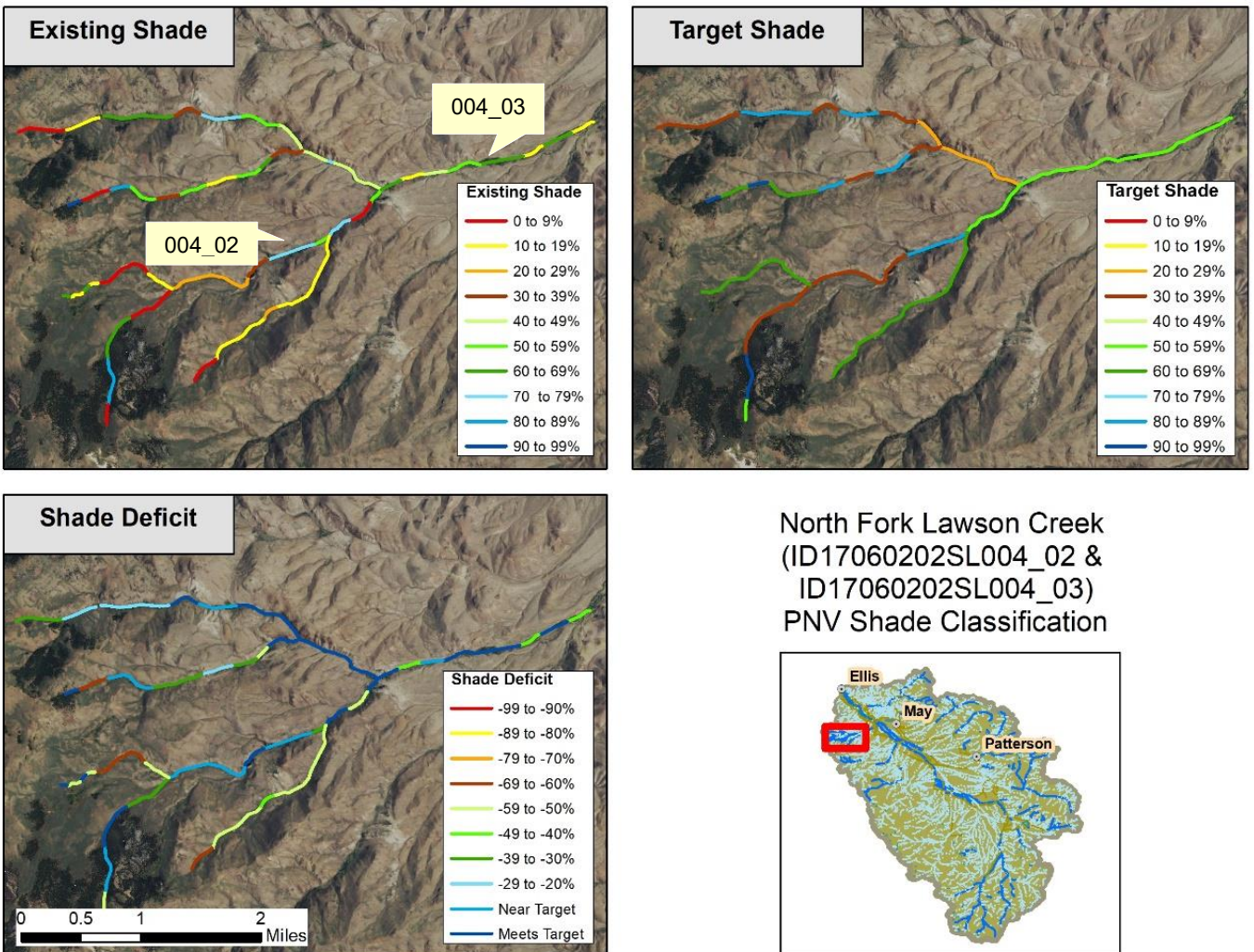


Figure 8. PNV shade classification for North Fork Lawson Creek (ID17060202SL004_02 and ID17060202SL004_03).

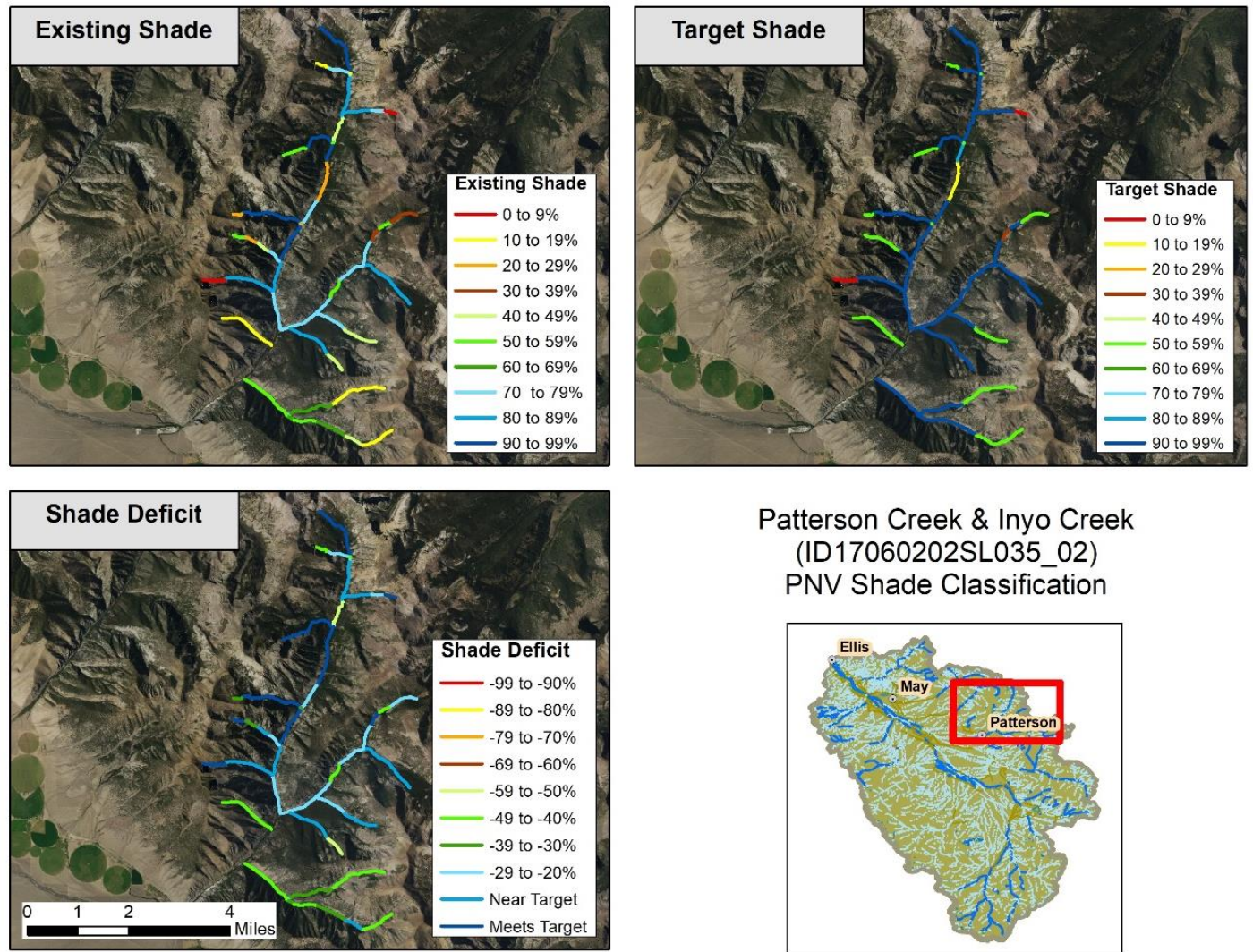


Figure 9. PNV shade classification for Patterson Creek (ID17060202SL035_02).

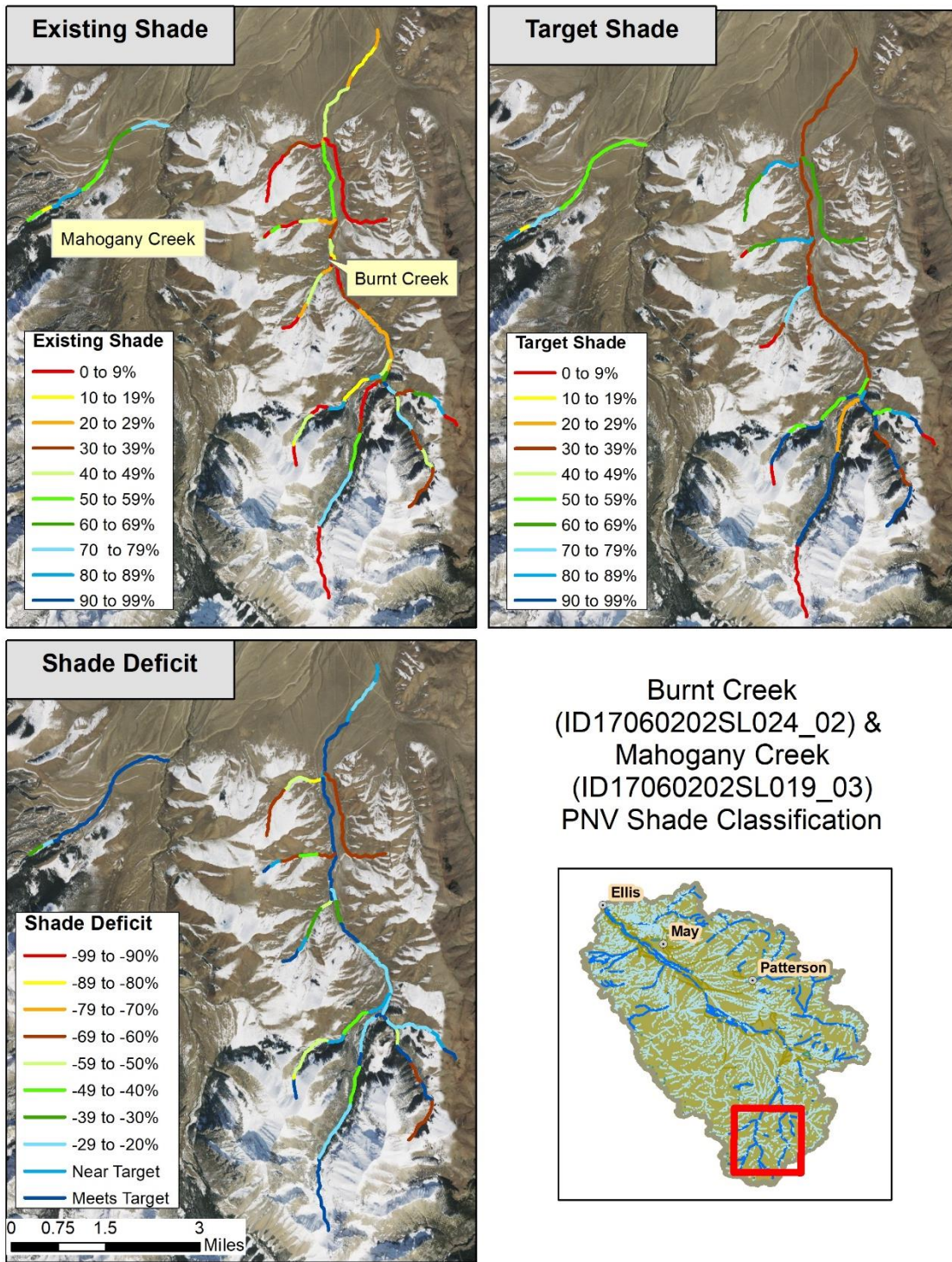


Figure 10. PNV shade classification for Burnt Creek (ID1706020SL024_02) and Mahogany Creek (ID17060202SL019_03).

5.2.4 Load Allocations

Because this TMDL is based on PNV, which is equivalent to natural background load, the load allocation is essentially the desire to achieve natural background conditions. However, to reach that objective, load allocations are assigned to nonpoint source activities that have affected or may affect riparian vegetation and shade as a whole. Therefore, load allocations are stream segment specific and dependent upon the target load for a given segment. In Appendix C, Table C-3–Table C-7 show the target shade and corresponding target summer load. This target load (i.e., load capacity) is necessary to achieve natural background conditions. There is no opportunity to further remove shade from the stream by any activity without exceeding its load capacity.

Additionally, because this TMDL depends upon natural background conditions for achieving water quality standards, all tributaries to the waters examined here need to be in natural conditions to prevent excess heat loads to the system. Table 28 shows the total existing, target, and excess loads and the average lack of shade for each water body examined. The size of a stream influences the size of the excess load. Large streams have higher existing and target loads by virtue of their larger channel widths and thus greater surface area. However, 2nd-order AUs tend to be conglomerations of many individual 1st- and 2nd-order streams, making the total loads large as well. Although this TMDL analysis focuses on total solar loads, the differences between existing and target shade are key to successfully restoring these waters to achieving water quality standards. The shade deficit figures are provided in section 5.2.3, Figure 8–Figure 10.

Table 28. Existing and target solar loads for the Pahsimeroi River subbasin.

Water Body/Assessment Unit Number	TMDL Developed?	Total Existing Load	Total Target Load	Excess Load (% Reduction)	Average Lack of Shade (%)
		kWh/day			
North Fork Lawson Creek – source to mouth (ID17060202SL004_02)	Yes	110,000	82,000	32,000 (39)	-23
North Fork Lawson Creek – source to mouth (ID17060202SL004_03)	Yes	37,000	33,000	4,000 (12)	-16
Mahogany Creek – source to mouth (ID17060202SL019_03)	No	41,000	41,000	-1,000 (0)	-4
Burnt Creek – source to Long Creek (ID17060202SL024_02)	Yes	370,000	260,000	110,000 (38)	-28
Patterson Creek – source to and including Inyo Creek (ID17060202SL035_02)	Yes	200,000	94,000	110,000 (55)	-23

Note: Load data area rounded to two significant figures, which may present rounding errors.

5.2.4.1 Margin of Safety

The margin of safety in this TMDL is considered implicit in the design. Because the target is essentially background conditions, loads (shade levels) are allocated to lands adjacent to these streams at natural background levels. Because shade levels are established at natural

background or system potential levels, it is unrealistic to set shade targets at higher, or more conservative, levels. Additionally, existing shade levels are reduced to the next lower 10% shade class, which likely underestimates actual shade in the loading analysis. Although the loading analysis used in this TMDL involves gross estimations that are likely to have large variances, load allocations are applied to the stream and its riparian vegetation rather than specific nonpoint source activities and can be adjusted as more information is gathered from the stream environment.

A certain amount of excess load is potentially created by the existing shade/target shade difference inherent in the loading analysis. Because existing shade is reported as a 10% shade class and target shade a unique integer between 0 and 100%, there is usually a difference between the two. For example, say a particular stream segment has a target shade of 86% based on its vegetation type and natural bank-full width. If existing shade on that segment were at target level, it would be recorded as 80% in the loading analysis because it falls into the 80% existing shade class. There is an automatic difference of 6%, which could be attributed to the margin of safety.

5.3 Reserve for Growth

Given the undeveloped nature of the subbasin and the non-point source focus of the TMDLs, a reserve for growth has not been included as part of this analysis. DEQ will reevaluate the suitability of this approach in the next 5-year review. The entire load capacity has been allocated to the existing sources in the watershed. Any new sources will need to obtain an allocation from the existing load allocation. There is no nonpoint reserve for growth for sediment or temperature TMDLs. The allocations for temperature TMDLs are based on meeting natural background riparian canopy conditions. Allocations for sediment TMDLs are based on meeting nonpoint source sediment targets.

5.4 Implementation Strategies

DEQ recognizes that implementation strategies for TMDLs may need to be modified if monitoring shows that TMDL goals are not being met or significant progress is not being made toward achieving the goals. Reasonable assurance (section 5.4.5) for the TMDL to meet water quality standards is based on the implementation strategy.

Implementation strategies for TMDLs produced using PNV-based shade and solar loads should incorporate the load analysis tables presented in this TMDL (Appendix C, Table C-3–Table C-7). These tables need to be updated, first to field verify the remaining existing shade levels and second to monitor progress toward achieving reductions and TMDL goals. Using the Solar Pathfinder to measure existing shade levels in the field is important to achieving both objectives. It is likely that further field verification will find discrepancies with reported existing shade levels in the load analysis tables. Implementation strategies should include Solar Pathfinder monitoring to simultaneously field verify the TMDL and mark progress toward achieving desired load reductions.

There may be a variety of reasons that individual stream segments do not meet shade targets, including natural phenomena (e.g., beaver ponds, springs, wet meadows, and past natural disturbances) and/or historic land-use activities (e.g., logging, grazing, and mining). Existing shade for each stream segment should be field verified to determine if shade differences are real and result from activities that are controllable. The maps and load analysis tables in this TMDL should be used to guide and prioritize implementation investigations. The information in this TMDL may need further adjustment to reflect new information and conditions in the future.

Streambank restoration projects can be beneficial in eliminating multiple pollutants. Projects that have been implemented to improve temperature impairments have also improved sediment impairment. The establishment of riparian communities along a stream helps shade the stream and prevent excess solar load. As the riparian communities become established and anchor their roots into the soil, streambank stabilization also occurs. Excess sediment load into the stream can be reduced or eliminated, once the streambank stabilizes.

5.4.1 Time Frame

Implementing the temperature TMDL relies on riparian area management practices that will provide a mature canopy cover to shade the stream and prevent excess solar loading. Because implementation depends on mature riparian communities to substantially improve stream temperatures, DEQ believes 10–20 years may be a reasonable amount time for achieving water quality standards. Shade targets will not be achieved all at once. Given their smaller bankfull widths, smaller streams may reach targets sooner than larger streams.

Once BMPs are in place, DEQ believes that a time frame of 5–10 years is required to begin the process of streambank stabilization and initial identification of diminished volumes of fine sediment. Given their smaller bankfull widths, smaller streams may reach targets sooner than larger streams. It is estimated that without new sediment inputs, the removal of the fines on the substrate and redevelopment of the thalweg will take approximately 5 years.

The targets established for nonpoint sources in this TMDL may take decades to achieve. The Pahsimeroi River subbasin relies on a staged implementation strategy as referenced in EPA's phased TMDL clarification memo (EPA 2006). The staged implementation strategy for the Pahsimeroi River subbasin acknowledges that IPDES-permitted point sources will strive to achieve the TMDL as soon as possible, consistent with IDAPA 58.01.25 and 40 CFR 122.47.

This acknowledges that successfully achieving the TMDL target and allocations will depend in part on voluntary measures and be influenced by available funding, cost-sharing, willing partners, and opportunities for water quality trading.

5.4.2 Approach to Meeting Allocations

Full support of beneficial uses is the goal of any strategy implemented to increase shade on a stream or increase streambank stability. The same techniques described in this document that were used for temperature and streambank stability can be implemented at the same locations

to determine whether strategy implementation is successful or whether alternative strategies are necessary to achieve the goal of beneficial use attainment.

5.4.2.1 Wasteload Allocation

There are no new IPDES-permitted point sources in the affected watersheds and no new wasteload allocations. The Pahsimeroi Fish Hatchery is the sole IPDES-permitted discharger within the Pahsimeroi River subbasin (IDG-131000) (section 4.3.4).

5.4.2.2 Load Allocation

The *Pahsimeroi River Subbasin Total Maximum Daily Load Agricultural Implementation Plan* (ISWCC 2005) was developed several years following the Pahsimeroi River subbasin TMDL (DEQ 2001). The plan was developed to identify BMPs for implementation on agricultural lands. These BMPs were intended to help meet the requirements of the TMDL load allocations by reducing the amount of agricultural pollutants entering water bodies. Several projects were implemented in the Pahsimeroi River subbasin based on BMPs developed. Partners involved in various projects include CSWCD, NRCS, IDFG, Bonneville Power Authority, Pacific Coast Salmon Recovery Fund, The Nature Conservancy, United States Bureau of Reclamation, and Custer County. Section 4.4 includes examples of these projects.

Funding provided under CWA § 319 and other funds will be used to encourage voluntary projects to reduce nonpoint source pollution.

5.4.3 Responsible Parties

DEQ and the designated management agencies in Idaho have primary responsibility for overseeing implementation in cooperation with landowners and managers. In Idaho, these agencies, and their federal and state partners, are charged by the CWA to lend available technical assistance and other appropriate support to local efforts for water quality improvements. Designated state agencies are responsible for assisting with preparation of specific implementation plans, particularly for those resources for which they have regulatory authority or programmatic responsibilities:

- Idaho Department of Lands for timber harvest, oil and gas exploration and development, and mining
- Idaho Soil and Water Conservation Commission for grazing and agricultural activities
- Idaho Transportation Department for public road construction
- Idaho State Department of Agriculture for aquaculture
- DEQ for all other activities

In addition to the designated management agencies, the public—through the watershed advisory group and other equivalent organizations or processes—will have opportunities to be involved in developing the implementation plan to the maximum extent practical. Public participation will significantly affect public acceptance of the document and the proposed control actions. Stakeholders (e.g., landowners, local governing authorities, taxpayers, industries, and land managers) are the most educated regarding the pollutant sources and will

be called upon to help identify the most appropriate control actions for each area. Experience has shown that the best and most effective implementation plans are those developed with substantial public cooperation and involvement.

5.4.4 Implementation Monitoring Strategy

The objectives of a monitoring strategy are to track long-term recovery, better understand natural variability, track project and BMP implementation, and track the effectiveness of TMDL implementation. This monitoring and feedback mechanism is a major component of the reasonable assurance component of the TMDL implementation plan.

Monitoring will provide information on progress being made toward achieving TMDL allocations and water quality standards and will help in the interim evaluation of progress, including in the development of 5-year reviews and future TMDLs.

BURP monitoring, as prescribed in the *Water Body Assessment Guidance* (DEQ 2016a), is used to collect data on AUs and to determine the support status of an AU's beneficial uses. BURP monitoring, in conjunction with temperature, sediment, and bacteria monitoring, provide comprehensive tracking of the water quality in the Pahsimeroi River subbasin.

As described in section 5.2.1.5, effective shade monitoring can take place on any segment throughout the Pahsimeroi River subbasin and be compared to existing shade estimates. Many existing shade estimates have not been field verified, so they may require adjustment during the implementation process. Stream segment length for each estimate of existing shade varies depending on the land use or landscape that has affected that shade level. It is appropriate to monitor within a given existing shade segment to see if that segment has increased its existing shade toward target levels.

Sediment monitoring can either take place at the same location where a previous SEI identified a sediment impairment or a location representative of an AU where a sediment impairment has been confirmed. Results of this SEI monitoring can be compared to previous SEI monitoring to evaluate whether sedimentation problems are improving and if implementation measures have succeeded.

The implementation plan will be tracked by accounting for the numbers, types, and locations of projects, BMPs, educational activities, or other actions taken to improve or protect water quality. Implementation plan monitoring will include watershed monitoring and BMP monitoring.

5.4.5 Reasonable Assurance

When TMDLs are developed for water bodies that are impaired by point sources only, the issuance of an IPDES or NPDES permit(s) provided reasonable assurance that the WLA in the TMDL will be achieved. When a TMDL is developed for water bodies impaired by both point and nonpoint sources, the TMDL must provide reasonable assurance that the load allocation will be achieved through nonpoint source controls for the TMDL to be approvable. For water bodies

impaired only by nonpoint sources, a demonstration of reasonable assurance is not required (EPA 2002).

While a demonstration of reasonable assurance is not required in this TMDL, the State of Idaho relies on the *Idaho Nonpoint Source Management Plan*, TMDL implementation plans, § 319 grants, and agency partners to promote voluntary implementation of nonpoint source controls that may be needed to meet the reductions required by a TMDL's load allocations.

The CWA § 319 requires each state to develop and submit a nonpoint source management plan. The *Idaho Nonpoint Source Management Plan* was reviewed and revised in 2025 (DEQ 2025). The plan identifies programs to achieve implementation of nonpoint source BMPs, includes a schedule for program milestones, outlines key agencies and agency roles, is certified by the state attorney general to ensure that adequate authorities exist to implement the plan, and identifies available funding sources.

Idaho's nonpoint source management program describes many of the voluntary and regulatory approaches the state will take to abate nonpoint pollution sources. One of the prominent programs described in the plan is the provision for public involvement, which includes basin advisory groups.

The Idaho water quality standards refer to existing authorities to control nonpoint pollution sources in Idaho. Some of these authorities and responsible agencies are listed in Table 29.

Table 29. State of Idaho's regulatory authority for nonpoint pollution sources.

Authority	Water Quality Standard	Responsible Agency
Rules Pertaining to the Idaho Forest Practices Act (IDAPA 20.02.01)	58.01.02.350.03(a)	Idaho Department of Lands
Solid Waste Management Rules and Standards (IDAPA 58.01.06)	58.01.02.350.03(b)	Idaho Department of Environmental Quality
Individual/Subsurface Sewage Disposal Rules (IDAPA 58.01.03)	58.01.02.350.03(c)	Idaho Department of Environmental Quality
Stream channel Alteration Rules (IDAPA 37.03.07)	58.01.02.350.03(d)	Idaho Department of Water Resources
Rathdrum Prairie Sewage Disposal Regulations (Panhandle District Health Department)	58.01.02.350.03(e)	Idaho Department of Environmental Quality/Panhandle District Health Department
Rules Governing Exploration, Surface Mining and Closure of Cyanidation Facilities (IDAPA 20.03.02)	58.01.02.350.03(f)	Idaho Department of Lands
Dredge and Placer Mining Operations in Idaho (IDAPA 20.03.01)	58.01.02.350.03(g)	Idaho Department of Lands
Rules Governing Dairy Waste (IDAPA 02.04.14)	58.01.02.350.03(h)	Idaho State Department of Agriculture

Idaho uses a voluntary approach to address agricultural nonpoint sources; however, regulatory authority is found in the water quality standards (IDAPA 58.01.02.350.01–03). IDAPA 58.01.02.055.07 refers to the *Idaho Agricultural Pollution Abatement Plan* (Ag Plan) (ISWCC 2015), which provides direction to the agricultural community regarding approved BMPs. A

portion of the Ag Plan outlines responsible agencies or elected groups (soil conservation districts) that will take the lead if nonpoint source pollution problems need to be addressed. For agricultural activity, the Ag Plan assigns the local soil conservation districts to assist the landowner/operator with developing and implementing BMPs to abate nonpoint source pollution associated with the land use. If a voluntary approach does not succeed in abating the pollutant problem, the state may seek injunctive relief for those situations determined to be an imminent and substantial danger to public health or the environment (IDAPA 58.01.02.350.02(a)).

The Idaho water quality standards and wastewater treatment requirements specify that if water quality monitoring indicates that water quality standards are not being met, even with the use of BMPs or knowledgeable and reasonable practices, the state may request that the designated agency evaluate and/or modify the BMPs to protect beneficial uses. If necessary, the state may seek injunctive or other judicial relief against the operator of a nonpoint source activity in accordance with the DEQ director's authority provided in Idaho Code § 39-108 (IDAPA 58.01.02.350). The water quality standards list designated agencies responsible for reviewing and revising nonpoint source BMPs: the Idaho Department of Lands for timber harvest activities, oil and gas exploration and development, and mining activities; Idaho Soil and Water Conservation Commission for grazing and agricultural activities; Idaho Transportation Department for public road construction; Idaho State Department of Agriculture for aquaculture; and DEQ for all other activities (IDAPA 58.01.02.010.24).

6 Conclusions

DEQ used the most up-to-date water quality data to develop new TMDLs and track the status of known impairments in the Pahsimeroi River subbasin. This effort resulted in substantial assessment outcomes that will be reflected in the upcoming 2026 Integrated Report (Table 30). We presented evidence that several AUs currently impaired by flow alteration and do not require a TMDL. Ten AUs in the Pahsimeroi River subbasin are currently listed in Category 4c for flow alterations and are presented in Table 31. Shade targets were established for five AUs based on the concept of maximum shading under updated PNV techniques resulting in natural background temperature levels. Shade targets were derived from effective shade curves developed for similar vegetation types in Idaho. Existing shade was determined from aerial photo interpretation and partially field verified with Solar Pathfinder data. Target and existing shade levels were compared to determine the amount of shade needed to bring water bodies into compliance with temperature criteria in Idaho's "Water Quality Standards" (IDAPA 58.01.02). Four of the five AUs resulted in shade deficiencies, and temperature TMDLs were developed for the following AUs:

- North Fork Lawson Creek – source to mouth (ID17060202SL004_02)—23%
- North Fork Lawson Creek – source to mouth (ID17060202SL004_03)—16%
- Burnt Creek – source to Long Creek (ID17060202SL024_02)—28%
- Patterson Creek – source to and including Inyo Creek (ID17060202SL035_02)—23%

SEIs were conducted on 9 AUs between 2018-2021, two of which were in Category 5. One new sediment TMDL was created based on these updated SEIs: Burnt Creek - Long Creek to mouth (ID17060202SL023_03) exceeded streambank erosion targets, and a sediment TMDL was developed (Table 30. Summary of assessment outcomes. Table 30).

Results from the SEIs conducted between 2018-2021 identified four AUs currently in Category 4a for sedimentation/siltation are still failing to meet sediment targets and are recommended for retention in Category 4a for sediment/siltation (Table 30).

Five AUs are candidates for delisting:

- ID17060202SL002_02, Pahsimeroi River–Meadow Creek to Patterson Creek: Delist for *E. coli*. Retain in Category 4a for temperature and sedimentation/siltation.
- ID17060202SL003_03, Lawson Creek–confluence of North and South Fork Lawson Creek: AU is dewatered year-round at diversion structure. AU fails to meet water quality standards due to pollution. Delist for combined biota/habitat bioassessments; include in Category 4c for flow regime modification
- ID17060202SL005_02, South Fork Lawson Creek– source to mouth: Improper assessment of intermittent, dewatered, or ephemeral stream. Does not qualify in a sampleable category for BURP assessment. Include in Category 3.
- ID17060202SL017_04, Pahsimeroi River Pahsimeroi River–Burnt Creek to Unnamed Trib (T12N, R23E, Sec. 22): Currently in Category 4a for sedimentation/siltation, SEI and BURP assessment completed for this AU suggest no sedimentation/siltation impairment. Delist for sedimentation/siltation. Retain in Category 5 for temperature and in Category 4c for flow regime modification.
- ID17060202SL022_03, East Fork Pahsimeroi River– source to mouth: Recent BURP assessment suggests no sedimentation/siltation impairment. Lack of AU specific data provided for original TMDL listing. Delist for sedimentation/siltation. Retain in Category 4a for temperature.

Table 30. Summary of assessment outcomes.

Assessment Unit Name	Assessment Unit Number	Pollutant	New TMDL(s) Developed	Recommended Changes to Next Integrated Report	Justification
Pahsimeroi River – Patterson Creek to mouth	ID17060202SL001_05	Sedimentation/siltation Temperature	No	Retain in Category 4a for temperature, sedimentation/siltation	Results for McNeil sediment core show subsurface fines > 28%.
Pahsimeroi River – Meadow Creek to Patterson Creek	ID17060202SL002_02	Sedimentation/siltation Temperature Escherichia coli	No	Delist for Escherichia coli. Retain in Category 4a for temperature, sedimentation/siltation	Sediment TMDL developed based on SEI; excess sediment load from low percent bank stability. 30-day geometric mean shows <i>E. coli</i> primary contact recreation criteria is being met.

Assessment Unit Name	Assessment Unit Number	Pollutant	New TMDL(s) Developed	Recommended Changes to Next Integrated Report	Justification
Lawson Creek – confluence of North and South Fork Lawson Creek	ID17060202SL003_03	Combined Biota/Habitat Bioassessments	No	Delist for combined biota/habitat bioassessments; include in Category 4c for flow regime modification	AU is dewatered year-round at diversion structure. AU fails to meet water quality standards due to pollution.
North Fork Lawson Creek – source to mouth	ID17060202SL004_02	Sedimentation/siltation Temperature	Yes	Retain in Category 4a for sedimentation/siltation. Place in Category 4a for temperature	SEI TMDL targets set in 2013 TMDL are appropriate. Temperature exceeded criteria and PNV identified excess solar loads for TMDL development.
North Fork Lawson Creek – source to mouth	ID17060202SL004_03	Combined Biota/Habitat Bioassessments Temperature	Yes	Include in Category 4a for temperature; retain in Category 5 for combined biota/habitat bioassessments	Temperature TMDL completed based on PNV.
South Fork Lawson Creek – source to mouth	ID17060202SL005_02	Combined Biota/Habitat Bioassessments	No	Delist for combined biota/habitat bioassessments; include in Category 3	Improper assessment of intermittent, dewatered, or ephemeral stream. Does not qualify in a sampleable category for BURP assessment.
Pahsimeroi River – Furey Lane (T15S, R22E) to Meadow Creek	ID17060202SL007_04	Sedimentation/siltation Temperature Low flow alterations	No	Retain in Category 4a for sedimentation/siltation, in Category 5 for temperature and in Category 4c for flow regime modification.	Low flow alterations are primary cause for impairment; banks are potentially erodible when water present.
Pahsimeroi River – Big Creek to Furey Lane (T15S, R22E)	ID17060202SL008_04	Sedimentation/siltation Temperature	No	Retain in Category 4a for sedimentation/siltation and in Category 5 for temperature.	Sediment TMDL developed based on SEI.
Pahsimeroi River – Goldburg Creek to Big Creek	ID17060202SL010_04	Sedimentation/siltation Low flow alterations	No	Retain in Category 4a for sedimentation/siltation and in Category 4c for flow regime modification.	SEI did not show load reduction required. A BURP assessment is needed to determine if beneficial uses are being supported.
Pahsimeroi River – Unnamed Trib (T12N, R23E, Sec. 22) to	ID17060202SL011_04	Sedimentation/siltation Low flow alterations	No	Retain in Category 4a for sedimentation/siltation and in Category 4c for flow regime modification.	Low flow alterations are primary cause for impairment; banks potentially erodible when water present

Assessment Unit Name	Assessment Unit Number	Pollutant	New TMDL(s) Developed	Recommended Changes to Next Integrated Report	Justification
Goldburg Creek					
Pahsimeroi River – Burnt Creek to Unnamed Trib (T12N, R23E, Sec. 22)	ID17060202SL017_04	Sedimentation/siltation Temperature Low flow alterations	No	Delist for sedimentation /siltation. Retain in Category 5 for temperature and in Category 4c for flow regime modification	SEI did not show load reduction required. BURP assessment in 2023 received a passing score (2.5). FSBI score and % fine sediment suggest no sedimentation/siltation impairments
Pahsimeroi River – Mahogany Creek to Burnt Creek	ID17060202SL018_04	Sedimentation/siltation Temperature	No	Retain in Category 4a for sedimentation/ siltation, temperature	SEI did not show load reduction required. BURP assessment in 2018 received a failing BURP score (1.67). Cold water aquatic life use remains not supporting.
Mahogany Creek – source to mouth	ID17060202SL019_03	Temperature	No	Retain in Category 5 for temperature	PNV showed no excess solar load, no TMDL was developed.
East Fork Pahsimeroi River – source to mouth	ID17060202SL022_03	Sedimentation/siltation Temperature	No	Delist for sedimentation/ siltation. Retain in Category 4a for temperature	BURP assessment in 2021 received a passing BURP score (2.67). FSBI score and % fine sediment suggest no sedimentation/siltation impairments
Burnt Creek – Long Creek to mouth	ID17060202SL023_03	Combined Biota/Habitat Bioassessments Sedimentation/ Siltation	Yes	Include in Category 4a for sediment/ siltation; retain in Category 5 for combined biota/ habitat bioassessments	Sediment TMDL developed based on SEI.
Burnt Creek – source to Long Creek	ID17060202SL024_02	Combined Biota/Habitat Bioassessments Temperature	Yes	Include in Category 4a for temperature; retain in Category 5 for combined biota/habitat bioassessments	Temperature TMDL developed using PNV; excess solar load from a lack of existing shade.
Donkey Creek – source to mouth	ID17060202SL029_02	Combined Biota/Habitat Bioassessments Temperature	No	Retain in Category 5 for combined biota/habitat bioassessments; retain in Category 5 for temperature	2018 BURP assessment received a passing score. Improved habitat and biota score from 1997 assessment. Further investigation into sediment and bacteria

Assessment Unit Name	Assessment Unit Number	Pollutant	New TMDL(s) Developed	Recommended Changes to Next Integrated Report	Justification
					is needed before delisting.
Patterson Creek – source to and including Inyo Creek	ID17060202SL035_02	Combined Biota/Habitat Bioassessments	Yes	Include in Category 4a for temperature; retain in Category 5 for combined biota/habitat bioassessments	Temperature TMDL developed using PNV; excess solar load from a lack of existing shade.

ID17060202SL034_04, Patterson Creek—Inyo Creek to mouth will be removed from Category 4c and moved to Category 3 until a BURP assessment can be completed. Closure of the PBSC-8 diversion as part of the P-9 Ditch closure removed a major diversion on Patterson Big Springs Creek that dewatered the creek. Additionally, the PBSC-9 diversion resulted in additional water savings. Both projects are detailed in the 2014 TMDL (DEQ 2014).

Table 31. Pahsimeroi River subbasin assessment units reported in Category 4c of the 2024 Integrated Report.

Assessment Unit Name	Assessment Unit Number	Impaired Stream Miles	Listed Pollutants
Meadow Creek – source to mouth	ID17060202SL006_02	28.5	Flow regime modification
Pahsimeroi River – Furey Lane (T15S, R22E) to Meadow Creek	ID17060202SL007_04	1.56	Flow regime modification
Grouse Creek – source to mouth	ID17060202SL009_02	35.97	Flow regime modification
Pahsimeroi River – Goldburg Creek to Big Creek	ID17060202SL010_04	6.74	Flow regime modification
Pahsimeroi R-Unnamed Trib (T12N, R23E, Sec. 22) to Goldburg Creek	ID17060202SL011_04	2.54	Flow regime modification
Pahsimeroi River – Burnt Creek to unnamed tributary (T12N, R23E, Sec. 22)	ID17060202SL017_04	10.34	Flow regime modification
Big Creek – confluence of North and South Fork Big Creeks to mouth	ID17060202SL031_03	13.56	Flow regime modification
Patterson Creek – Inyo Creek to mouth	ID17060202SL034_03	13.61	Flow regime modification
	ID17060202SL034_04	9.65	
Morgan Creek – source to mouth	ID17060202SL039_03	14.07	Flow regime modification

This document was prepared with input from the public, as described in Appendix E.

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GIS Coverages

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Glossary

§ 303(d)

Refers to section 303 subsection “d” of the Clean Water Act. Section 303(d) requires states to develop a list of water bodies that do not meet water quality standards. This section also requires total maximum daily loads (TMDLs) be prepared for listed waters. Both the list and the TMDLs are subject to United States Environmental Protection Agency approval.

Assessment Unit (AU)

A group of similar streams that have similar land use practices, ownership, or land management. However, stream order is the main basis for determining AUs. All the waters of the state are defined using AUs, and because AUs are a subset of water body identification numbers, they tie directly to the water quality standards so that beneficial uses defined in the water quality standards are clearly tied to streams on the landscape.

Beneficial Use

Any of the various uses of water that are recognized in water quality standards, including, but not limited to, aquatic life, recreation, water supply, wildlife habitat, and aesthetics.

Beneficial Use Reconnaissance Program (BURP)

A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers.

Exceedance

A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.

Fully Supporting

In compliance with water quality standards and within the range of biological reference conditions for all designated and existing beneficial uses as determined through the *Water Body Assessment Guidance* (DEQ 2016a).

Load Allocation (LA)

A portion of a water body’s load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).

Load

The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Load is the product of flow (discharge) and concentration.

Load Capacity (LC)

How much pollutant a water body can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, a margin of safety, and natural background contributions, it becomes a total maximum daily load.

Margin of Safety (MOS)

An implicit or explicit portion of a water body’s load capacity set aside to allow for uncertainty about the relationship between the pollutant loads and the quality of the receiving water body. The margin of safety is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the

calculations and/or models). The margin of safety is not allocated to any sources of pollution.

Nonpoint Source

A dispersed source of pollutants generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and nonirrigated lands used for grazing, crop production, and silviculture; rural roads; log storage or rafting; and recreation sites.

Not Assessed (NA)

A concept and an assessment category describing water bodies that have been studied but are missing critical information needed to complete an assessment.

Not Fully Supporting

Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the *Water Body Assessment Guidance* (DEQ 2016a).

Point Source

A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable “point” of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater plants.

Pollutant

Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollution

A very broad concept that encompasses human-caused changes in the environment that alter the functioning of natural processes and produce undesirable environmental and health effects. Pollution includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Stream Order

Hierarchical ordering of streams based on the degree of branching. A 1st-order stream is an unforked or unbranched stream. Under Strahler’s (1957) system, higher-order streams result from the joining of two streams of the same order.

Total Maximum Daily Load (TMDL)

A TMDL is a water body’s load capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual basis. A TMDL is equal to the load capacity, such that load capacity = margin of safety + natural background + load allocation + wasteload allocation = TMDL. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.

Wasteload Allocation (WLA)

The portion of receiving water's load capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a water body.

Water Body

A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.

Water Quality Criteria

Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, aquatic habitat, or industrial processes.

Water Quality Standards

State-adopted and United States Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

Appendix A. Beneficial Uses

Idaho water quality standards (IDAPA 58.01.02) list beneficial uses and set water quality goals for waters of the state. Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as existing uses, designated uses, and presumed uses.

Existing Uses

Existing uses under the Clean Water Act are “those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards” (40 CFR 131.3). The existing instream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.051.01). Existing uses need to be protected, whether or not the level of water quality to fully support the uses currently exists. A practical application of this concept would be to apply the existing use of salmonid spawning to a water that supported salmonid spawning since November 28, 1975, but does not now due to other factors, such as blockage of migration, channelization, sedimentation, or excess heat.

Designated Uses

Designated uses under the Clean Water Act are “those uses specified in water quality standards for each water body or segment, whether or not they are being attained” (40 CFR 131.3). Designated uses are simply uses officially recognized by the state. In Idaho, these include uses such as aquatic life support, recreation in and on the water, domestic water supply, and agricultural uses. Multiple uses often apply to the same water; in this case, water quality must be sufficiently maintained to meet the most sensitive use (designated or existing). Designated uses may be added or removed using specific procedures provided for in state law, but the effect must not be to preclude protection of an existing higher quality use such as cold water aquatic life or salmonid spawning. Designated uses are described in the Idaho water quality standards (IDAPA 58.01.02.100) and specifically listed by water body in sections 110–160.

Undesignated Surface Waters and Presumed Use Protection

In Idaho, due to a change in scale of cataloging waters in 2000, most water bodies listed in the tables of designated uses in the water quality standards do not yet have specific use designations (IDAPA 58.01.02.110–160). The water quality standards have three sections that address nondesignated waters. Sections 101.02 and 101.03 specifically address nondesignated man-made waterways and private waters. Man-made waterways and private waters have no presumed use protections. Man-made waters are protected for the use for which they were constructed unless otherwise designated in the water quality standards. Private waters are not protected for any beneficial uses unless specifically designated in the water quality standards.

All other undesignated waters are addressed by section 101.01. Under this section, absent information on existing uses, DEQ presumes that most Idaho waters will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01.02.101.01). To

protect these so-called presumed uses, DEQ applies the numeric cold water and recreation criteria to undesignated waters. If in addition to presumed uses, an additional existing use (e.g., salmonid spawning) exists, then the additional numeric criteria for salmonid spawning would also apply (e.g., intergravel dissolved oxygen, temperature) because of the requirement to protect water quality for that existing use. However, if some other use that requires less stringent criteria for protection is found to be an existing use, then a use designation (rulemaking) is needed before that use can be applied in lieu of cold water criteria (IDAPA 58.01.02.101.01).

Appendix B. State and Site-Specific Water Quality Standards and Criteria

Table B-1. Selected numeric criteria supportive of designated beneficial uses in Idaho water quality standards.

Parameter	Primary Contact Recreation	Secondary Contact Recreation	Cold Water Aquatic Life	Salmonid Spawning ^a
Water Quality Standards: IDAPA 58.01.02.250–251				
Bacteria				
• Geometric mean	< 126 <i>E. coli</i> /100 mL ^b	< 126 <i>E. coli</i> /100 mL	—	—
• Single sample	≤ 406 <i>E. coli</i> /100 mL	≤ 576 <i>E. coli</i> /100 mL	—	—
pH	—	—	Between 6.5 and 9.0	Between 6.5 and 9.5
Dissolved oxygen (DO)	—	—	DO exceeds 6.0 milligrams/liter (mg/L)	Water Column DO: DO exceeds 6.0 mg/L in water column or 90% saturation, whichever is greater Intergravel DO: DO exceeds 5.0 mg/L for a 1-day minimum and exceeds 6.0 mg/L for a 7-day average
Temperature^c	—	—	22 °C or less daily maximum; 19 °C or less daily average	13 °C or less daily maximum; 9 °C or less daily average Bull Trout: Not to exceed 13 °C maximum weekly maximum temperature over warmest 7-day period, June–August; not to exceed 9 °C daily average in September and October
Turbidity	—	—	Turbidity shall not exceed background by more than 50 nephelometric turbidity units (NTU) instantaneously or more than 25 NTU for more than 10 consecutive days.	—
Ammonia	—	—	Ammonia not to exceed calculated concentration based on pH and temperature.	—
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR 131				
Temperature	—	—	—	7-day moving average of 10 °C or less maximum daily temperature for June–September

^a During spawning and incubation periods for inhabiting species

^b *Escherichia coli* per 100 milliliters

^c Temperature exemption: Exceeding the temperature criteria will not be considered a water quality standard violation when the air temperature exceeds the ninetieth percentile of the 7-day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather reporting station.

Table B-2. Applicable spawning and incubation periods for inhabiting species of the Pahsimeroi River subbasin (Miller et al. 2014).

Fish Species	Initiation of Spawning Period	End of Incubation/Emergence
Spring/Summer Chinook	July 22-August 15	June 1-June 30
Fall Chinook	October 15	May 7-June 30
Bull Trout	September 1	May 31
Mountain Whitefish	October 1	April 30
Brook Trout	September 1	May 31
Summer Steelhead	February 1	July 15 to August 15
Rainbow Trout	March 15	July 15
Cutthroat Trout	March 15	July 1-Oct 31

Appendix C. Data Sources

Table C-1. Data sources for Pahsimeroi River subbasin assessment.

Water Body/Area	Data Source	Type of Data	Collection Date
Pahsimeroi River subbasin	DEQ Idaho Falls Regional office	PNV analyses	August 2021
		Solar Pathfinder effective shade and stream width	August 2018, August 2021
		Streambank erosion inventories	August 2018, August 2021
		Instream temperature loggers	July–October 2021
Pahsimeroi River – Patterson Creek to mouth	US Forest service Rocky mountain Research Station	Instream temperature loggers	2018–2022
Various locations in the Pahsimeroi River subbasin	Challis BLM	Instream temperature loggers	2018–2021
Sulphur Creek	DEQ Idaho Falls Regional Office	<i>E. coli</i> sampling	August–September 2021
Pahsimeroi River	Idaho Department of Fish and Game	Fish data and management information	2019
N. Fork Little Morgan Creek, Pahsimeroi River, Patterson Creek, W. Fork Pahsimeroi River	Salmon Challis National Forest Service	Fish populations	August 2021
Pahsimeroi River near its mouth at Ellis, Idaho	USGS website—Stream gages	Streamflow (cfs)	September 2021
May, Idaho	NOAA online weather data	Historical temperatures in the Pahsimeroi River subbasin	January 2022

E. Coli Data

Table C-2. Results from 2021 *E. coli* bacteria samples collected in Sulphur Creek (ID17060202SL002_02)

Sample Date	Result (cfu/100mL)	Geometric Mean
8/24/2021	38.30	
8/29/2021	55.4	
9/1/2021	30.90	
9/8/2021	63.80	
9/14/2021	27.20	
		40.85

IDEQ McNeil Core Field Form

Stream:	Pahsimeroi River - Patterson Creek to mouth (ID17060202SL001_05)		
Date (mm/dd/yyyy):	9/1/2021		
Site Description:	Upstream of Downton Ln bridge		
Lat/Lon:	44.61831 / -113.98013		
Lat/Lon accuracy:	meters		
Datum:	WGS84		
Sampling Event ID	2021 TMDL		
Personnel:	D. Shore, D. Locke, C. Sandow, A. Laib, M. Barnes, QAO - G. Lehotsky		
Rosgen Channel:			
Habitat Unit			
Reach Gradient (%):			
Geology (Q, G, V, or S):	Q		
Target Species:	native fish		
Flow (cfs):			
Surrounding Land Use:	IFG Sportsmans Access		

Sample number	1	2	3		
Ocular est. % surface fines					
Sieve size	(mL)	(mL)	(mL)		
63 mm (2.5")	0	0	0		
25 mm (1.0")	560	940	1340		
12.5 mm (0.5")	1750	1680	1810		
6.34 mm (0.25")	1450	1150	1100		
1.0 - 0.25" Subtotal	3760	3770	4250		
4.75 mm (0.187")	200	34	280		
2.36 mm (0.0937")	450	760	560		
850 µm (0.0331")	450	200	410		
212 µm (0.0083")	1145	900	600		
106 µm (0.0041")					
75 µm (0.0029")					
53 µm (0.0021")	152	150	65		
Bottom pan (< 53 µm)					
< 0.25" Subtotal	2397	2044	1915		
Sample total w/o 2.5" particles	6157	5814	6165	Mean	STDDEV
% fines w/o 2.5" particles	0.389312977	0.351565187	0.310624493	0.350501	0.032133
Sample total w/ 2.5" particles	6157	5814	6165	Mean	STDDEV
% fines w/ 2.5" particles	0.389312977	0.351565187	0.310624493	0.350501	0.032133

ID17060202SL001_05

11/1/2021

IDEQ McNeil Core Field Form

Stream:	Pahsimeroi River - Big Creek to Furey Lane (ID17060202SL008_04)				
Date (mm/dd/yyyy):	8/31/2021				
Site Description:					
Lat/Lon:	44.52525 / -113.84756				
Lat/Lon accuracy:	meters				
Datum:	WGS84				
Sampling Event ID	2021 TMDL				
Personnel:	D. Shore, D. Locke, M. Barnes				
Rosgen Channel:					
Habitat Unit					
Reach Gradient (%):					
Geology (Q, G, V, or S):					
Target Species:					
Flow (cfs):					
Surrounding Land Use:	Recent grazing exclosure & stream-restoration				

Sample number	1	2	3		
Ocular est. % surface fines					
Sieve size	(mL)	(mL)	(mL)		
63 mm (2.5")	0	1550	600		
25 mm (1.0")	860	1320	1250		
12.5 mm (0.5")	960	910	750		
6.34 mm (0.25")	720	580	440		
1.0 - 0.25" Subtotal	2540	2810	2440		
4.75 mm (0.187")	74	140	85		
2.36 mm (0.0937")	210	380	360		
850 µm (0.0331")	190	350	340		
212 µm (0.0083")	210	470	560		
106 µm (0.0041")					
75 µm (0.0029")					
53 µm (0.0021")	42	130	60		
Bottom pan (< 53 µm)					
< 0.25" Subtotal	726	1470	1405		
Sample total w/o 2.5" particles	3266	4280	3845	Mean	STDDEV
% fines w/o 2.5" particles	0.222290263	0.343457944	0.365409623	0.310386	0.062934
Sample total w/ 2.5" particles	3266	5830	4445	Mean	STDDEV
% fines w/ 2.5" particles	0.222290263	0.252144082	0.316085489	0.263507	0.039126

ID17060202SL008_04

11/1/2021

IDEQ McNeil Core Field Form

Stream:	Pahsimeroi River - Mahogany Creek to Burnt Creek (17060202SL018_04)				
Date (mm/dd/yyyy):	8/30/2021				
Site Description:					
Lat/Lon:	44.27070 -113.65743				
Lat/Lon accuracy:	meters				
Datum:	WGS 84				
Sampling Event ID	2021 TMDL				
Personnel:	D. Shore, A. Laib, C. Sandow, M. Barnes, D. Locke				
Rosgen Channel:	C				
Habitat Unit					
Reach Gradient (%):					
Geology (Q, G, V, or S):					
Target Species:	Native Fish				
Flow (cfs):					
Surrounding Land Use:	Rangeland/Grazing				
Sample number	1	2	3		
Ocular est. % surface fines					
Sieve size	(mL)	(mL)	(mL)		
63 mm (2.5")	860	240	590		
25 mm (1.0")	840	1100	1820		
12.5 mm (0.5")	560	850	880		
6.34 mm (0.25")	150	640	540		
1.0 - 0.25" Subtotal	1550	2590	3240		
4.75 mm (0.187")	125	280	170		
2.36 mm (0.0937")	320	560	480		
850 µm (0.0331")	455	670	690		
212 µm (0.0083")	77	175	150		
106 µm (0.0041")					
75 µm (0.0029")					
53 µm (0.0021")	50	60	30		
Bottom pan (< 53 µm)					
< 0.25" Subtotal	1027	1745	1520		
Sample total w/o 2.5" particles	2577	4335	4760	Mean	STDDEV
% fines w/o 2.5" particles	0.398525417	0.402537486	0.319327731	0.373464	0.038315
Sample total w/ 2.5" particles	3437	4575	5350	Mean	STDDEV
% fines w/ 2.5" particles	0.298807099	0.381420765	0.28411215	0.321447	0.04283

ID17060202SL018_04

11/1/2021

Streambank Erosion Inventory Data Sheets

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET					
Stream: Pahsimeroi River - Meadow Creek to Patterson		Stream Segment Location (DD)			
Assessment Unit: 17060202SL002_02		Upstream N	44.513783°		
Segment Inventoried: Sulfur Creek		W	-113.932483°		
Total Reach:		Downstream N	44.514433°		
Date Collected: 2-Aug-18		W	-113.932433°		
Field Crew: A Laib, G Freeman, G Lehotsky		Notes: Maxed out field datasheet in ~300ft distance; short inventory length			
Data Reduced By: A Laib					
Current Load Streambank Erosion Calculations		Unit	Area Applied		
Right, left or both bank measurements	2	Both Banks	Inventoried Segment		
Inventory/Thalweg Length (LBB) (stream flow path distance)	300.00	ft	Inventoried Segment		
TMDL Margin of Safety	10	%	Total Reach		
Bulk Density (BD)	95	lb/ft^3	Total Reach		
Length of Similar Stream	130000	ft	Total Reach		
Estimated Distance inventoried	600.00	ft	"		
Total Erosive Bank Length	151.69	ft	"		
Percent Erosive Bank	25.3	%	"		
Eroding Area (AE)	107.60	ft^2	"		
Lateral Recession Rate (RLR)	0.0575		"		
Bank Erosion (E)	0.29	tons/year	"		
Total Bank Erosion Rate (ER)	5.17	tons/mile/year	Reach and Segment		
Total Bank Erosion	127.35	tons/year	"		
Recession Rate Calculations					
Factor	Field Stability Score	Erosion Severity Reduction			
Bank Erosion Evidence (0 to 3)	1	1			
Bank Stability Condition (0 to 3)	1	0.75			
Bank Cover/Vegetation(0 to 3)	1	0.75			
Lateral Channel Stability (0 to 3)	1.25	1			
Channel Bottom Stability (0 to 2)	0.25	0.25			
In-Channel Deposition (-1 to 1)	0.25	0			
Total = Slight (0-4); Moderate (4-8); Severe (>8)	4.75	3.75			
Lateral Recession Rate (RLR) (ft/yr)	0.0575	0.0475			
Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied		
Eroding Area at Load Capacity (AE)	85.12	ft^2	Inventoried Segment		
Bank Erosion at Load Capacity (E)	0.19	tons/year	"		
Total Bank Erosion Rate at Load Capacity (ER)	3.38	tons/mile/year	Reach and Segment		
Total Bank Erosion at Load Capacity for Reach	83.22	tons/year	Total Reach		
Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
5.2	127.3	3.4	83.2	YES	8
Percent Erosion Reduction (%)					39
Total Erosion Reduction (tons/yr)					52



STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET			
Stream:	Law son Creek - confluence of North and South		Stream Segment Location (DD)
Assessment Unit:	ID17060202SL003_03		Upstream N
Segment Inventoried:	Law son Creek		W
Total Reach:			Downstream N
Date Collected:	29-Aug-18		W
Field Crew:	A Laib, G Freeman, G Lehotsky		Notes:
Data Reduced By:	A Laib		Intermittent stream; diversion structure downstream from SEI reach

Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)	1100.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	95	lb/ft ³	Total Reach
Length of Similar Stream	7900	ft	Total Reach
Estimated Distance inventoried	2200.00	ft	"
Total Erosive Bank Length	82.01	ft	"
Percent Erosive Bank	3.7	%	"
Eroding Area (AE)	152.94	ft ²	"
Lateral Recession Rate (RLR)	0.055		"
Bank Erosion (E)	0.40	tons/year	"
Total Bank Erosion Rate (ER)	1.92	tons/mile/year	Reach and Segment
Total Bank Erosion	2.87	tons/year	"

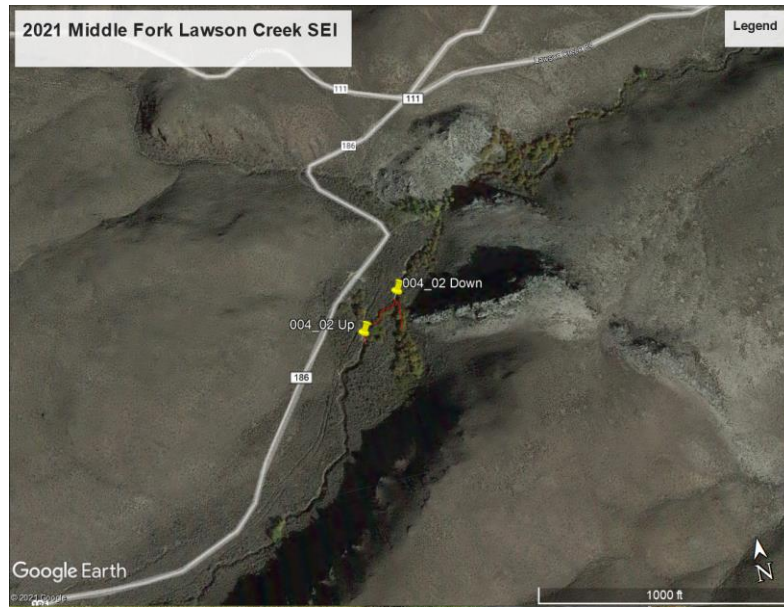
Recession Rate Calculations		
Factor	Field Stability Score	Erosion Severity Reduction
Bank Erosion Evidence (0 to 3)	1.25	0.5
Bank Stability Condition (0 to 3)	0.75	0.5
Bank Cover/Vegetation(0 to 3)	1	0.5
Lateral Channel Stability (0 to 3)	1	0.25
Channel Bottom Stability (0 to 2)	0.5	0.25
In-Channel Deposition (-1 to 1)	0	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	4.5	2
Lateral Recession Rate (RLR) (ft/yr)	0.055	0.03

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	820.54	ft ²	Inventoried Segment
Bank Erosion at Load Capacity (E)	1.17	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	5.61	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	8.40	tons/year	Total Reach

Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
1.9	2.9	5.6	8.4	No	1

Percent Erosion Reduction (%)	-126
Total Erosion Reduction (tons/yr)	-5

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET			
Stream: Middle Fork Law son Creek		Stream Segment Location (DD)	
Assessment Unit: ID17060202SL004_02		Upstream N	44.576040
Segment Inventoried:		W	-114.029500
Total Reach:		Downstream N	44.576450
Date Collected: 31-Aug-21		W	-114.028850
Field Crew: D. Shore, D. Locke, A. Laib, C. Sandow, A. Bell		Notes:	
Data Reduced By: D. Shore			
Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements		2	Both Banks
Inventory/Thalweg Length (LBB) (stream flow path distance)		415.00	ft
TMDL Margin of Safety		10	%
Bulk Density (BD)		105	lb/ft^3
Length of Similar Stream		8025	ft
Estimated Distance inventoried		830.00	ft
Total Erosive Bank Length		27.23	ft
Percent Erosive Bank		3.3	%
Eroding Area (AE)		891.25	ft^2
Lateral Recession Rate (RLR)		0.1575	
Bank Erosion (E)		7.37	tons/year
Total Bank Erosion Rate (ER)		93.76	tons/mile/year
Total Bank Erosion		142.51	tons/year
Recession Rate Calculations			
Factor	Field Stability Score	Erosion Severity Reduction	
Bank Erosion Evidence (0 to 3)	2.5	0.25	
Bank Stability Condition (0 to 3)	1	0	
Bank Cover/Vegetation(0 to 3)	2	0	
Lateral Channel Stability (0 to 3)	1	0.25	
Channel Bottom Stability (0 to 2)	2	0.25	
In-Channel Deposition (-1 to 1)	0.25	0	
Total = Slight (0-4); Moderate (4-8); Severe (>8)	8.75	0.75	
Lateral Recession Rate (RLR) (ft/yr)	0.1575	0.0175	
Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)		5433.07	ft^2
Bank Erosion at Load Capacity (E)		4.99	tons/year
Total Bank Erosion Rate at Load Capacity (ER)		63.51	tons/mile/year
Total Bank Erosion at Load Capacity for Reach		96.52	tons/year
Summary of Loads			
Current Load		Load Capacity	
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)
93.8	142.5	63.5	96.5
		Load Reduction Required?	Margin of Safety (tons/yr)
		YES	10
Percent Erosion Reduction (%)			37
Total Erosion Reduction (tons/yr)			56



STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET			
Stream:	Pahsimeroi River - Furey Lane (T15S, R22E) to		Stream Segment Location (DD)
Assessment Unit:	ID17060202SL007_04		Upstream N
Segment Inventoried:	Pahsimeroi River		W
Total Reach:			Downstream N
Date Collected:	30-Aug-18		W
Field Crew:	A Laib, G Freeman, G Lehotsky, T Saffle		Notes:
Data Reduced By:	A Laib		

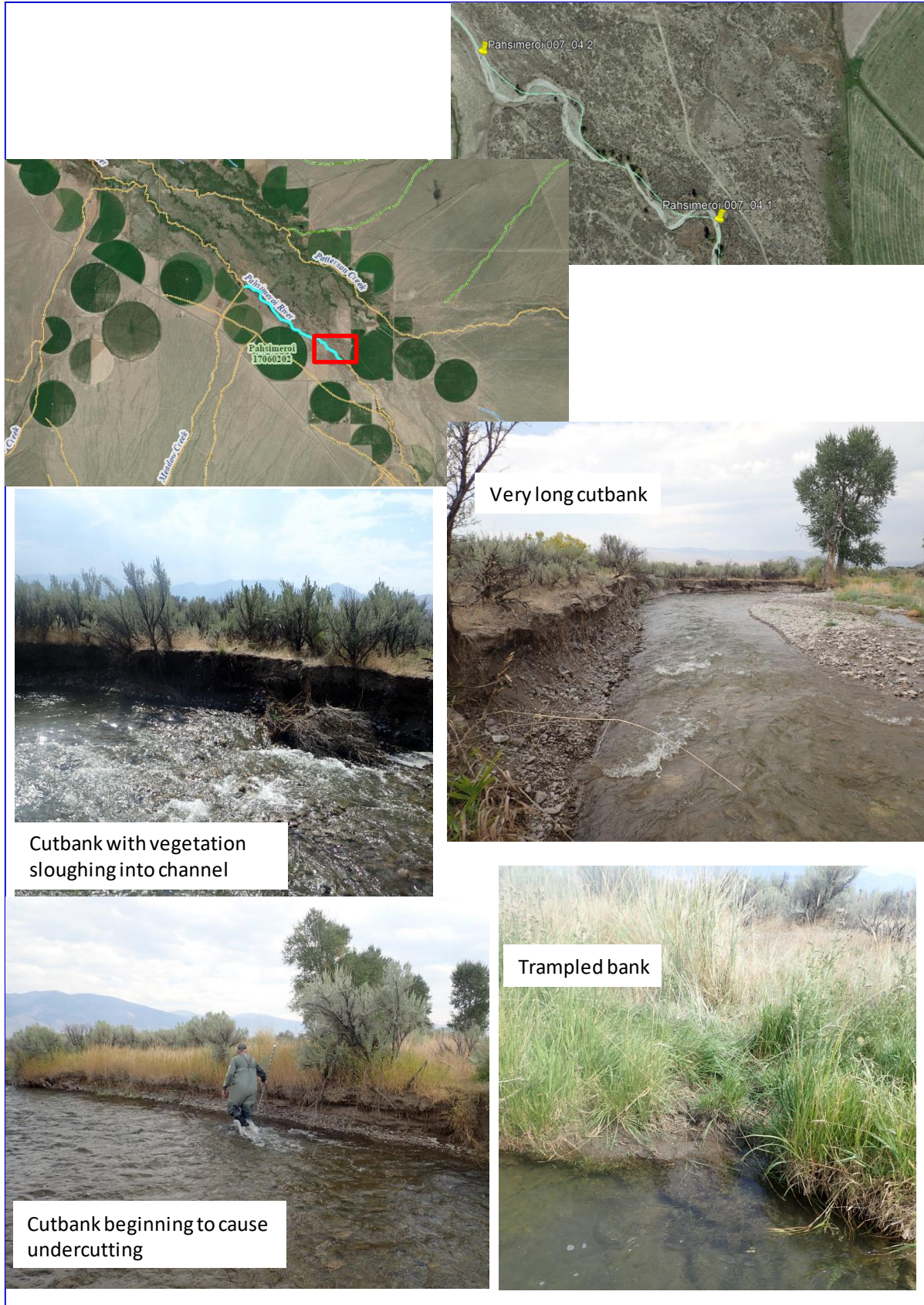
Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)	1500.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	95	lb/ft ³	Total Reach
Length of Similar Stream	6500	ft	Total Reach
Estimated Distance inventoried	3000.00	ft	"
Total Erosive Bank Length	442.58	ft	"
Percent Erosive Bank	14.8	%	"
Eroding Area (AE)	1429.10	ft ²	"
Lateral Recession Rate (RLR)	0.2975		"
Bank Erosion (E)	20.20	tons/year	"
Total Bank Erosion Rate (ER)	71.09	tons/mile/year	Reach and Segment
Total Bank Erosion	87.51	tons/year	"

Recession Rate Calculations		
Factor	Field Stability Score	Erosion Severity Reduction
Bank Erosion Evidence (0 to 3)	2.25	0.75
Bank Stability Condition (0 to 3)	2.75	0.75
Bank Cover/Vegetation(0 to 3)	2	0.75
Lateral Channel Stability (0 to 3)	1.25	1
Channel Bottom Stability (0 to 2)	1.5	0.5
In-Channel Deposition (-1 to 1)	0.5	0.5
Total = Slight (0-4); Moderate (4-8); Severe (>8)	10.25	4.25
Lateral Recession Rate (RLR) (ft/yr)	0.2975	0.0525

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	1937.42	ft ²	Inventoried Segment
Bank Erosion at Load Capacity (E)	4.83	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	17.01	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	20.94	tons/year	Total Reach

Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
71.1	87.5	17.0	20.9	YES	2

Percent Erosion Reduction (%)	77
Total Erosion Reduction (tons/yr)	69



STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET					
Stream: Pahsimeroi River - Big Creek to Furey Lane (T15S,		Stream Segment Location (DD)			
Assessment Unit: ID17060202SL008_04		Upstream N		44.522440°	
Segment Inventoried: Pahsimeroi River		W		-113.844380°	
Total Reach:		Downstream N		44.525030°	
Date Collected: 29-Aug-18		W		-113.846860°	
Field Crew: A Laib, G Freeman, G Lehotsky, T Saffle		Notes:			
Data Reduced By: A Laib					
Current Load Streambank Erosion Calculations				Unit	Area Applied
Right, left or both bank measurements		2	Both Banks	Inventoried Segment	
Inventory/Thalweg Length (LBB) (stream flow path distance)		1300.00	ft	Inventoried Segment	
TMDL Margin of Safety		10	%	Total Reach	
Bulk Density (BD)		95	lb/ft^3	Total Reach	
Length of Similar Stream		16800	ft	Total Reach	
Estimated Distance inventoried		2600.00	ft	"	
Total Erosive Bank Length		476.22	ft	"	
Percent Erosive Bank		18.3	%	"	
Eroding Area (AE)		2264.89	ft^2	"	
Lateral Recession Rate (RLR)		0.38		"	
Bank Erosion (E)		40.88	tons/year	"	
Total Bank Erosion Rate (ER)		166.04	tons/mile/year	Reach and Segment	
Total Bank Erosion		528.31	tons/year	"	
Recession Rate Calculations					
Factor	Field Stability Score		Erosion Severity Reduction		
Bank Erosion Evidence (0 to 3)	3		0.75		
Bank Stability Condition (0 to 3)	2.25		0.75		
Bank Cover/Vegetation(0 to 3)	2.25		0.75		
Lateral Channel Stability (0 to 3)	1		1		
Channel Bottom Stability (0 to 2)	1.5		0.5		
In-Channel Deposition (-1 to 1)	1		0.5		
Total = Slight (0-4); Moderate (4-8); Severe (>8)	11		4.25		
Lateral Recession Rate (RLR) (ft/yr)	0.38		0.0525		
Load Capacity Streambank Erosion Calculations for Total Reach				Unit	Area Applied
Eroding Area at Load Capacity (AE)		2473.10	ft^2	Inventoried Segment	
Bank Erosion at Load Capacity (E)		6.17	tons/year	"	
Total Bank Erosion Rate at Load Capacity (ER)		25.05	tons/mile/year	Reach and Segment	
Total Bank Erosion at Load Capacity for Reach		79.70	tons/year	Total Reach	
Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
166.0	528.3	25.0	79.7	YES	8
Percent Erosion Reduction (%)					85
Total Erosion Reduction (tons/yr)					457

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET			
Stream:	Pahsimeroi River		Stream Segment Location (DD)
Assessment Unit:	ID17060202SL008_04		Upstream N
Segment Inventoried:			W
Total Reach:			Downstream N
Date Collected:	31-Aug-21		W
Field Crew:	D. Shore, D. Locke, M. Barnes		Notes: Restoration project aimed at improving channel complexity and floodplain connectivity and reducing bank erosion completed 2018/2019
Data Reduced By:	D. Shore		

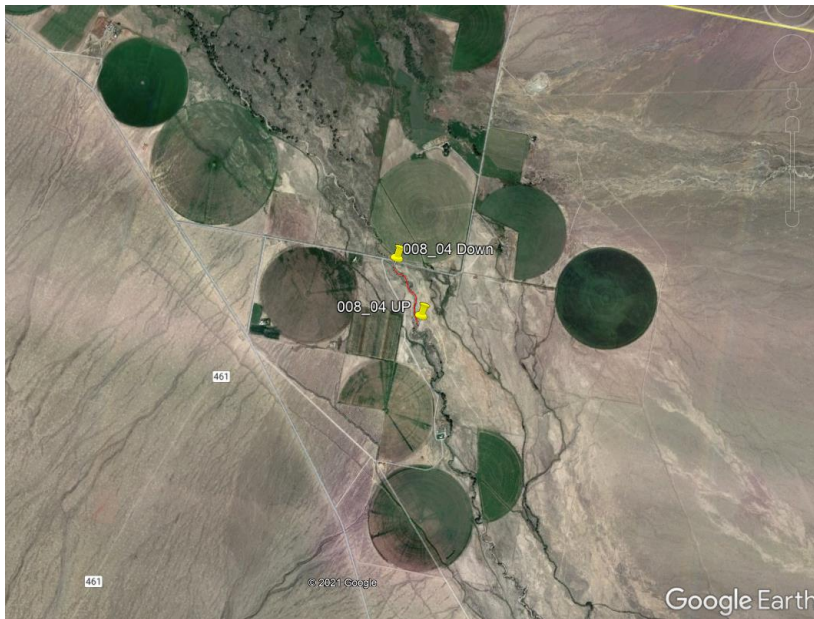
Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)	1896.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	105	lb/ft^3	Total Reach
Length of Similar Stream	8976	ft	Total Reach
Estimated Distance inventoried	3792.00	ft	"
Total Erosive Bank Length	3.61	ft	"
Percent Erosive Bank	0.1	%	"
Eroding Area (AE)	37.67	ft^2	"
Lateral Recession Rate (RLR)	0.0125		"
Bank Erosion (E)	0.02	tons/year	"
Total Bank Erosion Rate (ER)	0.07	tons/mile/year	Reach and Segment
Total Bank Erosion	0.12	tons/year	"

Recession Rate Calculations		
Factor	Field Stability Score	Erosion Severity Reduction
Bank Erosion Evidence (0 to 3)	0	0
Bank Stability Condition (0 to 3)	0.25	0.25
Bank Cover/Vegetation(0 to 3)	0	0
Lateral Channel Stability (0 to 3)	0	0
Channel Bottom Stability (0 to 2)	0	0
In-Channel Deposition (-1 to 1)	0	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	0.25	0.25
Lateral Recession Rate (RLR) (ft/yr)	0.0125	0.0125

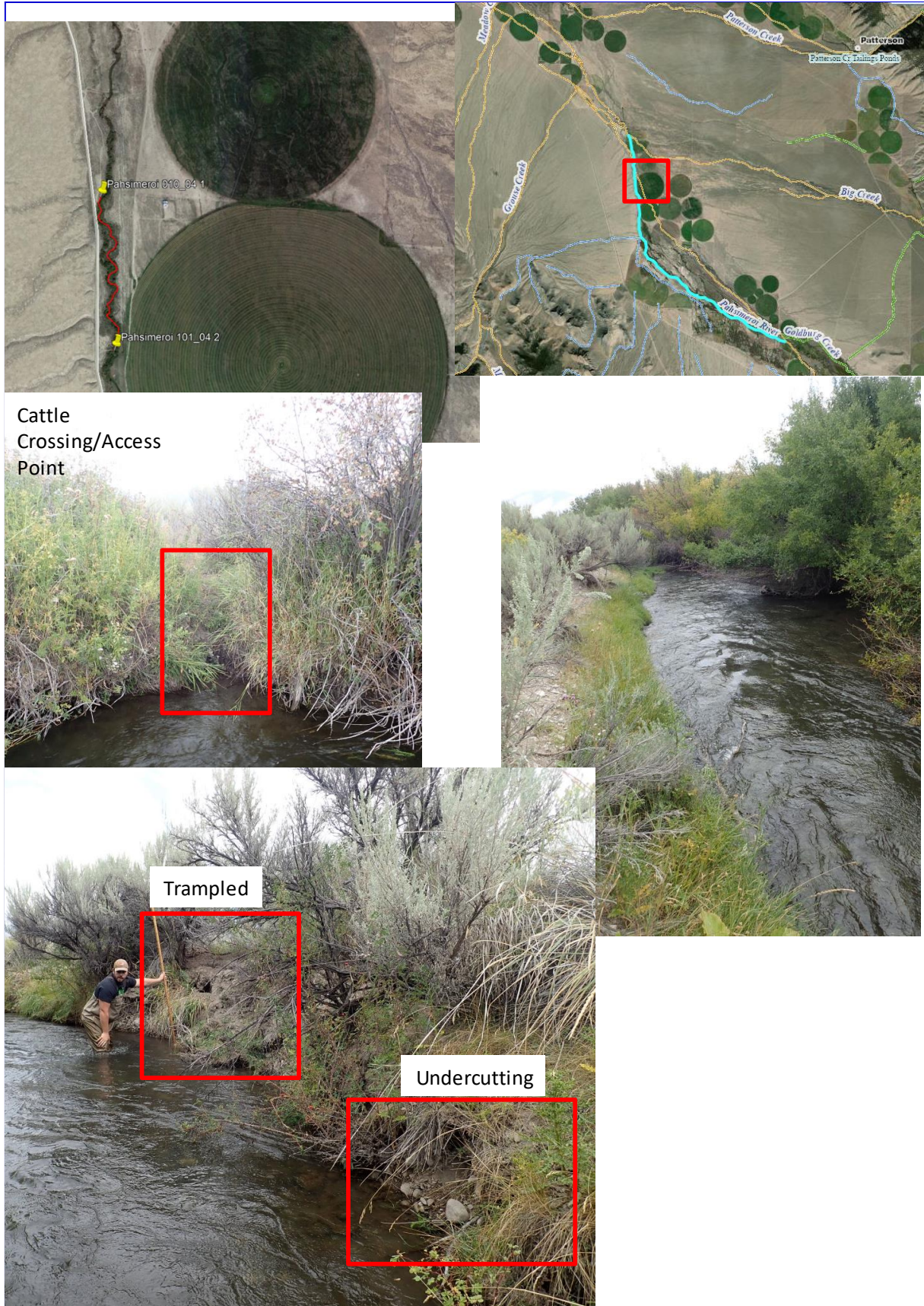
Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	7916.97	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	5.20	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	14.47	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	24.60	tons/year	Total Reach

Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
0.1	0.1	14.5	24.6	No	2

Percent Erosion Reduction (%)	-855
Total Erosion Reduction (tons/yr)	-22



STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET					
Stream: Pahsimeroi River - Goldberg Creek to Big Creek		Stream Segment Location (DD)			
Assessment Unit: ID17060202SL010_04		Upstream N		44.478800	
Segment Inventoried: Pahsimeroi River		W		-113.815980	
Total Reach:		Downstream N		44.483140	
Date Collected: 30-Aug-18		W		-113.816886	
Field Crew: A Laib, G Freeman, T Saffle		Notes:			
Data Reduced By: A Laib					
Current Load Streambank Erosion Calculations				Unit	Area Applied
Right, left or both bank measurements		2	Both Banks		Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)		2000.00	ft		Inventoried Segment
TMDL Margin of Safety		10	%		Total Reach
Bulk Density (BD)		85	lb/ft ³		Total Reach
Length of Similar Stream		30000	ft		Total Reach
Estimated Distance inventoried		4000.00	ft		"
Total Erosive Bank Length		230.32	ft		"
Percent Erosive Bank		5.8	%		"
Eroding Area (AE)		443.12	ft ²		"
Lateral Recession Rate (RLR)		0.0975			"
Bank Erosion (E)		1.84	tons/year		"
Total Bank Erosion Rate (ER)		4.85	tons/mile/year		Reach and Segment
Total Bank Erosion		27.54	tons/year		"
Recession Rate Calculations					
Factor	Field Stability Score		Erosion Severity Reduction		
Bank Erosion Evidence (0 to 3)	1.5		0.75		
Bank Stability Condition (0 to 3)	1		0.75		
Bank Cover/Vegetation(0 to 3)	1.25		0.75		
Lateral Channel Stability (0 to 3)	1		0.75		
Channel Bottom Stability (0 to 2)	0.75		0.5		
In-Channel Deposition (-1 to 1)	0.75		0.5		
Total = Slight (0-4); Moderate (4-8); Severe (>8)	6.25		4		
Lateral Recession Rate (RLR) (ft/yr)	0.0975		0.05		
Load Capacity Streambank Erosion Calculations for Total Reach				Unit	Area Applied
Eroding Area at Load Capacity (AE)		1539.15	ft ²		Inventoried Segment
Bank Erosion at Load Capacity (E)		3.27	tons/year		"
Total Bank Erosion Rate at Load Capacity (ER)		8.63	tons/mile/year		Reach and Segment
Total Bank Erosion at Load Capacity for Reach		49.06	tons/year		Total Reach
Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
4.8	27.5	8.6	49.1	No	5
Percent Erosion Reduction (%)					-51
Total Erosion Reduction (tons/yr)					-17



STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET			
Stream:	Pahsimeroi River - Burnt Creek to Unnamed Trib		Stream Segment Location (DD)
Assessment Unit:	ID17060202SL017_04		Upstream N
Segment Inventoried:	Pahsimeroi River		W
Total Reach:			Downstream N
Date Collected:	29-Aug-18		W
Field Crew:	A Laib, G Freeman, G Lehotsky		Notes:
Data Reduced By:	A Laib		One large, exposed, but stable over bank; two trampled livestock access/crossings; mostly stable, well armored banks

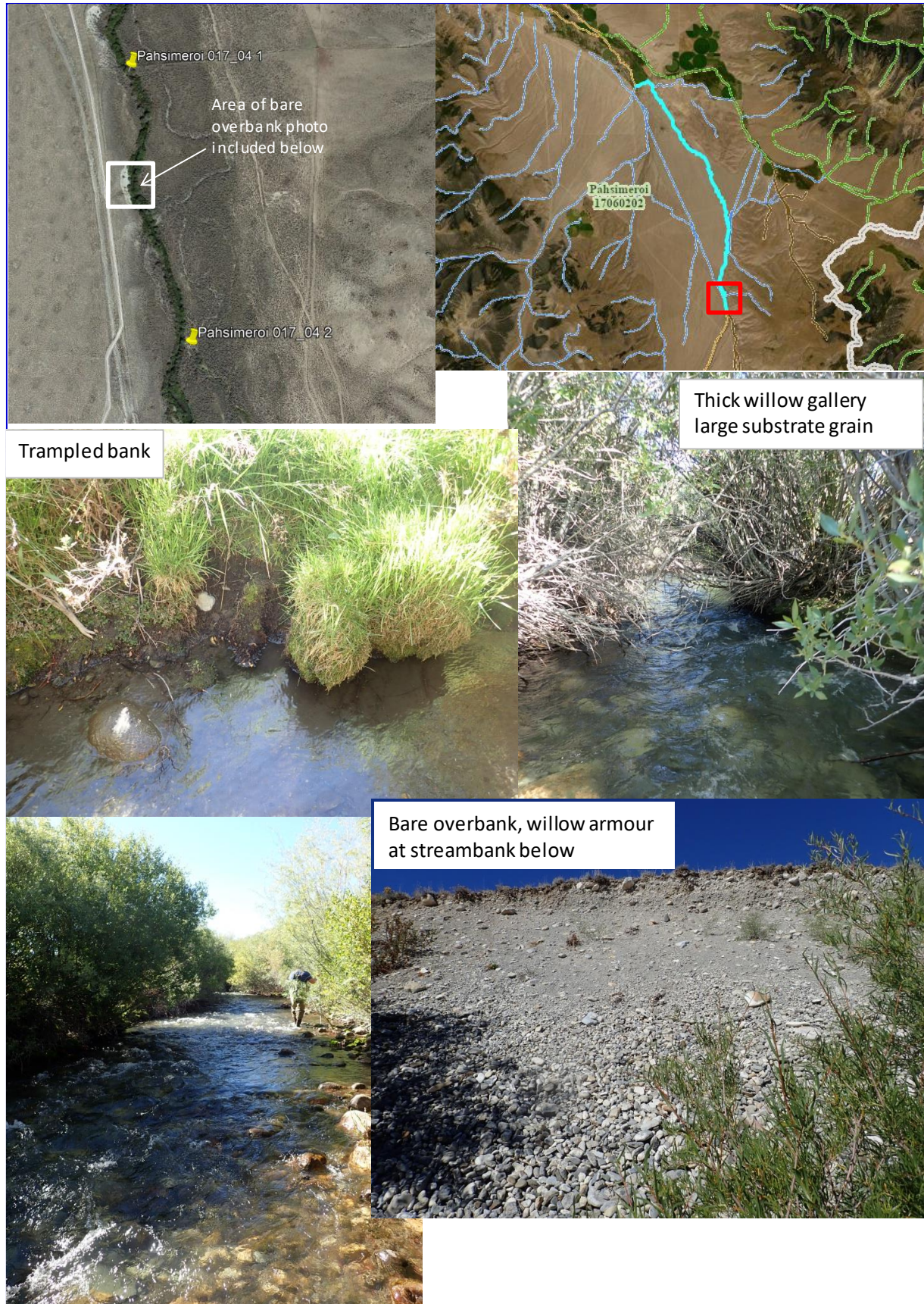
Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)	1200.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	85	lb/ft ³	Total Reach
Length of Similar Stream	26400	ft	Total Reach
Estimated Distance inventoried	2400.00	ft	"
Total Erosive Bank Length	11.48	ft	"
Percent Erosive Bank	0.5	%	"
Eroding Area (AE)	33.27	ft ²	"
Lateral Recession Rate (RLR)	0.035		"
Bank Erosion (E)	0.05	tons/year	"
Total Bank Erosion Rate (ER)	0.22	tons/mile/year	Reach and Segment
Total Bank Erosion	1.09	tons/year	"

Recession Rate Calculations		
Factor	Field Stability Score	Erosion Severity Reduction
Bank Erosion Evidence (0 to 3)	0.25	0.25
Bank Stability Condition (0 to 3)	0.25	0.25
Bank Cover/Vegetation(0 to 3)	0.25	0.25
Lateral Channel Stability (0 to 3)	1	1
Channel Bottom Stability (0 to 2)	0.75	0.75
In-Channel Deposition (-1 to 1)	0	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	2.5	2.5
Lateral Recession Rate (RLR) (ft/yr)	0.035	0.035

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	1391.12	ft ²	Inventoried Segment
Bank Erosion at Load Capacity (E)	2.07	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	9.10	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	45.52	tons/year	Total Reach

Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
0.2	1.1	9.1	45.5	No	5

Percent Erosion Reduction (%)	-707
Total Erosion Reduction (tons/yr)	-40



STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET			
Stream:	Pahsimeroi River - Mahogany Creek to Burnt Creek		Stream Segment Location (DD)
Assessment Unit:	ID17060202SL018_04		Upstream N
Segment Inventoried:	Pahsimeroi River		W
Total Reach:			Downstream N
Date Collected:	27-Aug-18		W
Field Crew:	A Laib, G Freeman, G Lehotsky		Notes:
Data Reduced By:	A Laib		Principal bank stability problem is immediately downstream of culvert

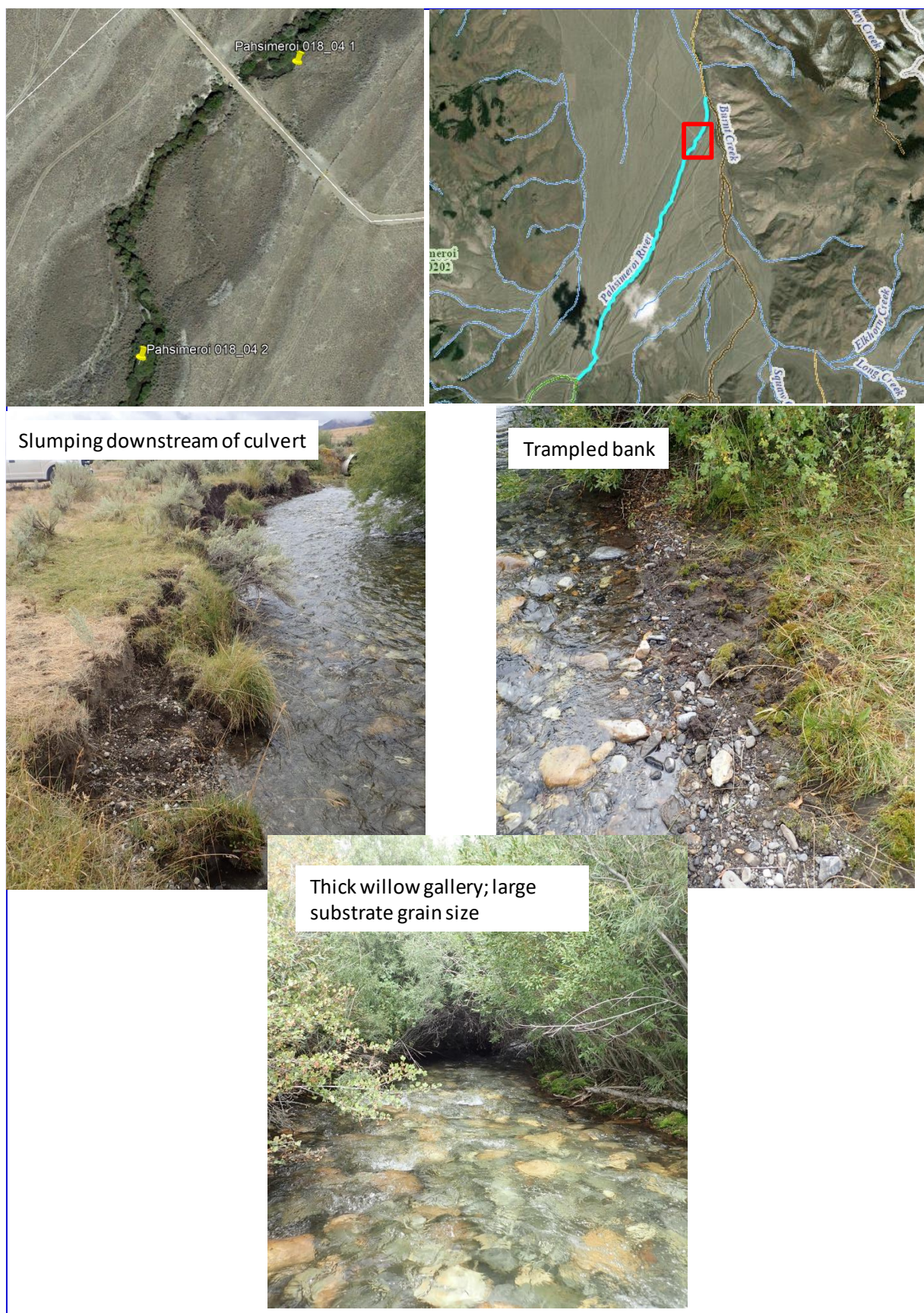
Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)	1000.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	95	lb/ft ³	Total Reach
Length of Similar Stream	30000	ft	Total Reach
Estimated Distance inventoried	2000.00	ft	"
Total Erosive Bank Length	172.44	ft	"
Percent Erosive Bank	8.6	%	"
Eroding Area (AE)	281.38	ft ²	"
Lateral Recession Rate (RLR)	0.04		"
Bank Erosion (E)	0.53	tons/year	"
Total Bank Erosion Rate (ER)	2.82	tons/mile/year	Reach and Segment
Total Bank Erosion	16.04	tons/year	"

Recession Rate Calculations		
Factor	Field Stability Score	Erosion Severity Reduction
Bank Erosion Evidence (0 to 3)	1	0.25
Bank Stability Condition (0 to 3)	0.5	0.25
Bank Cover/Vegetation(0 to 3)	0.25	0.25
Lateral Channel Stability (0 to 3)	0.5	1
Channel Bottom Stability (0 to 2)	0.75	0.75
In-Channel Deposition (-1 to 1)	0	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	3	2.5
Lateral Recession Rate (RLR) (ft/yr)	0.04	0.035

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	652.71	ft ²	Inventoried Segment
Bank Erosion at Load Capacity (E)	1.09	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	5.73	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	32.55	tons/year	Total Reach

Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
2.8	16.0	5.7	32.6	No	3

Percent Erosion Reduction (%)	-69
Total Erosion Reduction (tons/yr)	-13



STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET					
Stream:		Burnt Creek - Long Creek to mouth		Stream Segment Location (DD)	
Assessment Unit:		ID17060202SL023_03		Upstream N	44.279810°
Segment Inventoried:		Burnt Creeek		W	-113.649960°
Total Reach:				Downstream N	44.282310°
Date Collected:		28-Aug-18		W	-113.651500°
Field Crew:		A Laib, G Freeman, G Lehotsky		Notes:	
Data Reduced By:		A Laib			

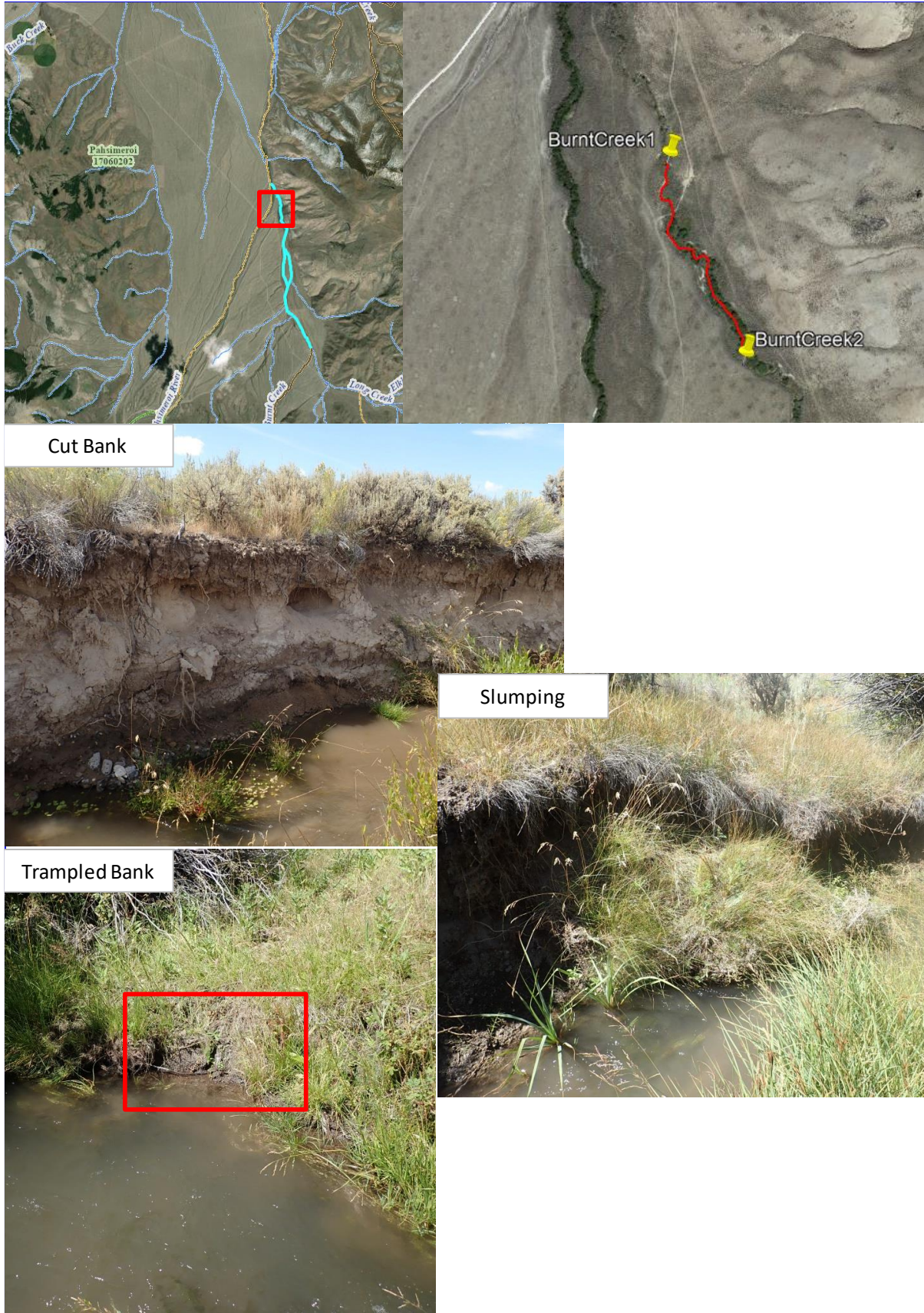
Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)	1200.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	95	lb/ft^3	Total Reach
Length of Similar Stream	26300	ft	Total Reach
Estimated Distance inventoried	2400.00	ft	"
Total Erosive Bank Length	1320.00	ft	"
Percent Erosive Bank	55.0	%	"
Eroding Area (AE)	1320.00	ft^2	"
Lateral Recession Rate (RLR)	0.215		"
Bank Erosion (E)	13.48	tons/year	"
Total Bank Erosion Rate (ER)	59.31	tons/mile/year	Reach and Segment
Total Bank Erosion	295.45	tons/year	"

Recession Rate Calculations		
Factor	Field Stability Score	Erosion Severity Reduction
Bank Erosion Evidence (0 to 3)	2.5	1.25
Bank Stability Condition (0 to 3)	2	0.5
Bank Cover/Vegetation(0 to 3)	2	0.75
Lateral Channel Stability (0 to 3)	1.5	1
Channel Bottom Stability (0 to 2)	0.5	0.25
In-Channel Deposition (-1 to 1)	1	0.25
Total = Slight (0-4); Moderate (4-8); Severe (>8)	9.5	4
Lateral Recession Rate (RLR) (ft/yr)	0.215	0.05

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	480.00	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	1.14	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	5.02	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	24.99	tons/year	Total Reach

Summary of Loads					
Current Load		Load Capacity		Load Reduction Required?	Margin of Safety (tons/yr)
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)		
59.3	295.4	5.0	25.0	YES	2

Percent Erosion Reduction (%)	92
Total Erosion Reduction (tons/yr)	273



Temperature Data Plots

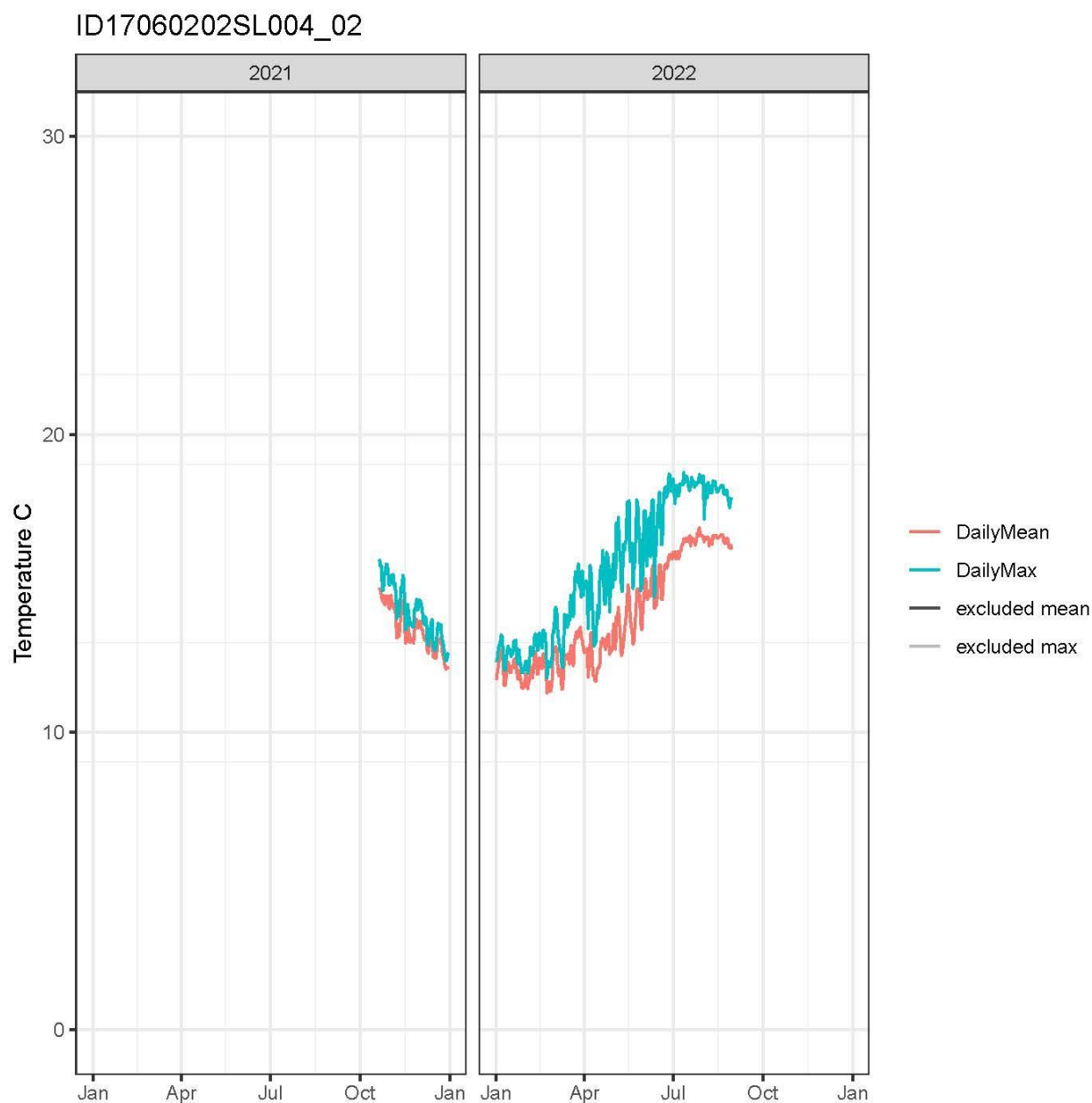


Figure C-1. Temperature data collected in 2021 and 2022 for ID17060202SL004_02, North Fork Lawson Creek – source to mouth. Salmonid spawning and Bull Trout spawning and rearing criteria were exceeded.

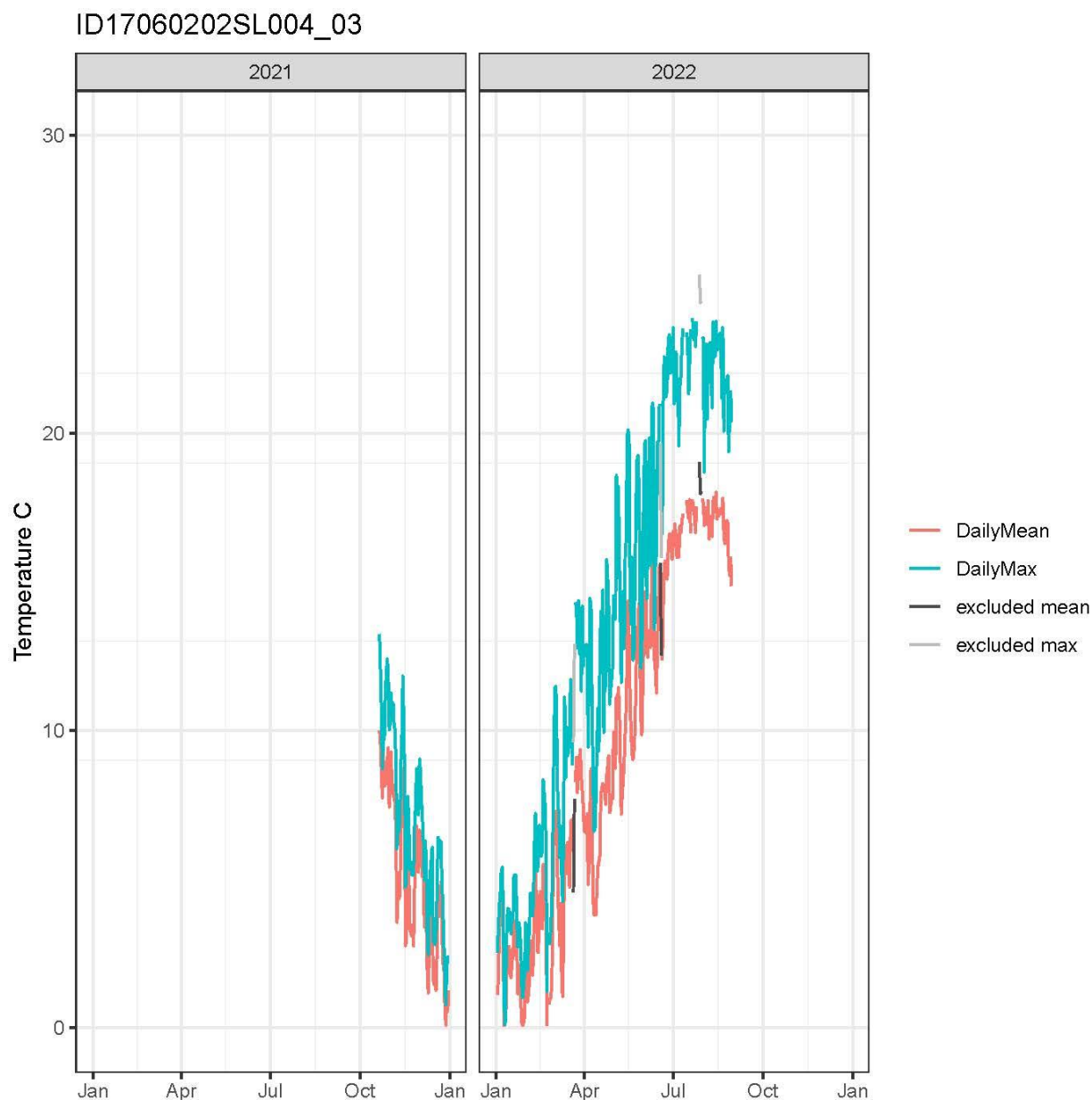


Figure C-2. Temperature data collected in 2021 and 2022 for ID17060202SL004_03, North Fork Lawson Creek – source to mouth. Cold water aquatic life, salmonid spawning, and Bull Trout spawning and rearing criteria were exceeded.

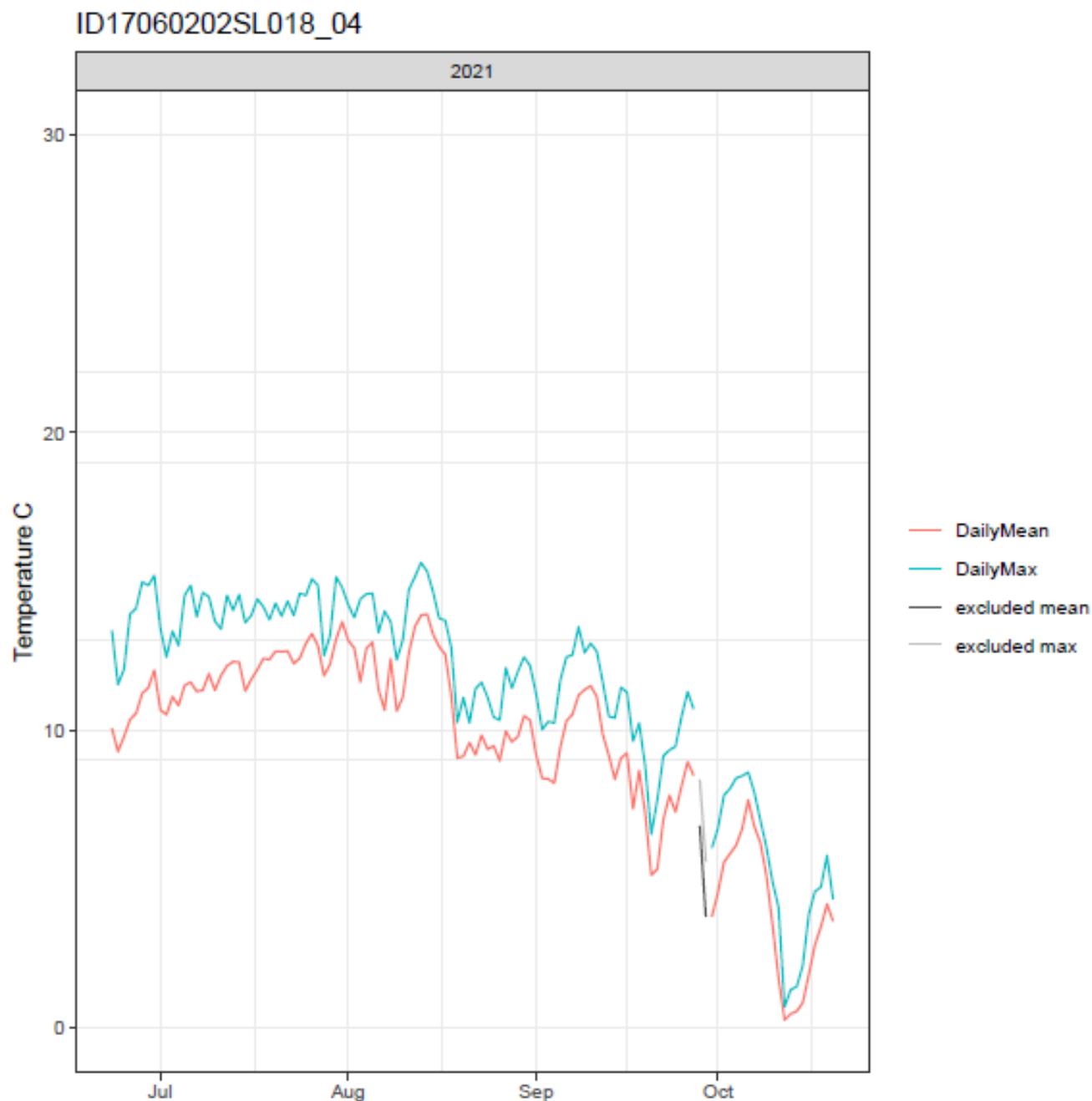


Figure C-3. Temperature data collected in 2021 for ID17060202SL018_04, Pahsimeroi River - Mahogany Creek to Burnt Creek. Salmonid spawning and Bull Trout spawning and rearing criteria were exceeded.

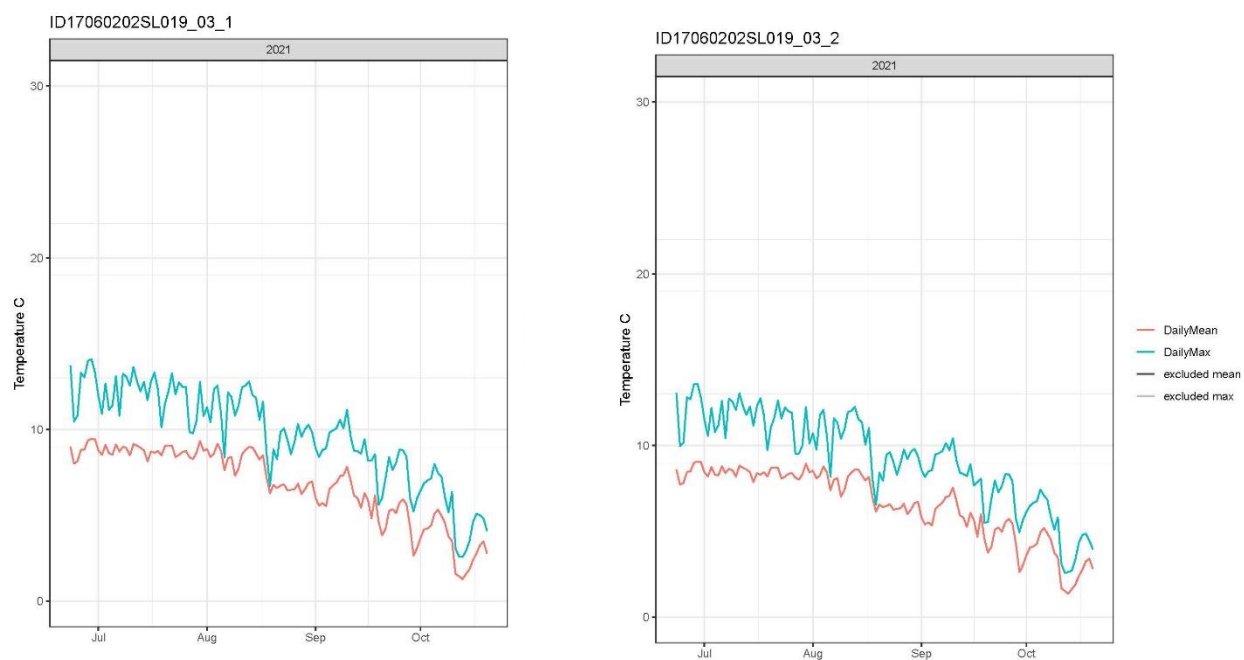


Figure C-4. Temperature data collected in 2021 for ID17060202SL019_03, Mahogany Creek – source to mouth. Salmonid spawning and Bull Trout spawning and rearing criteria were exceeded.

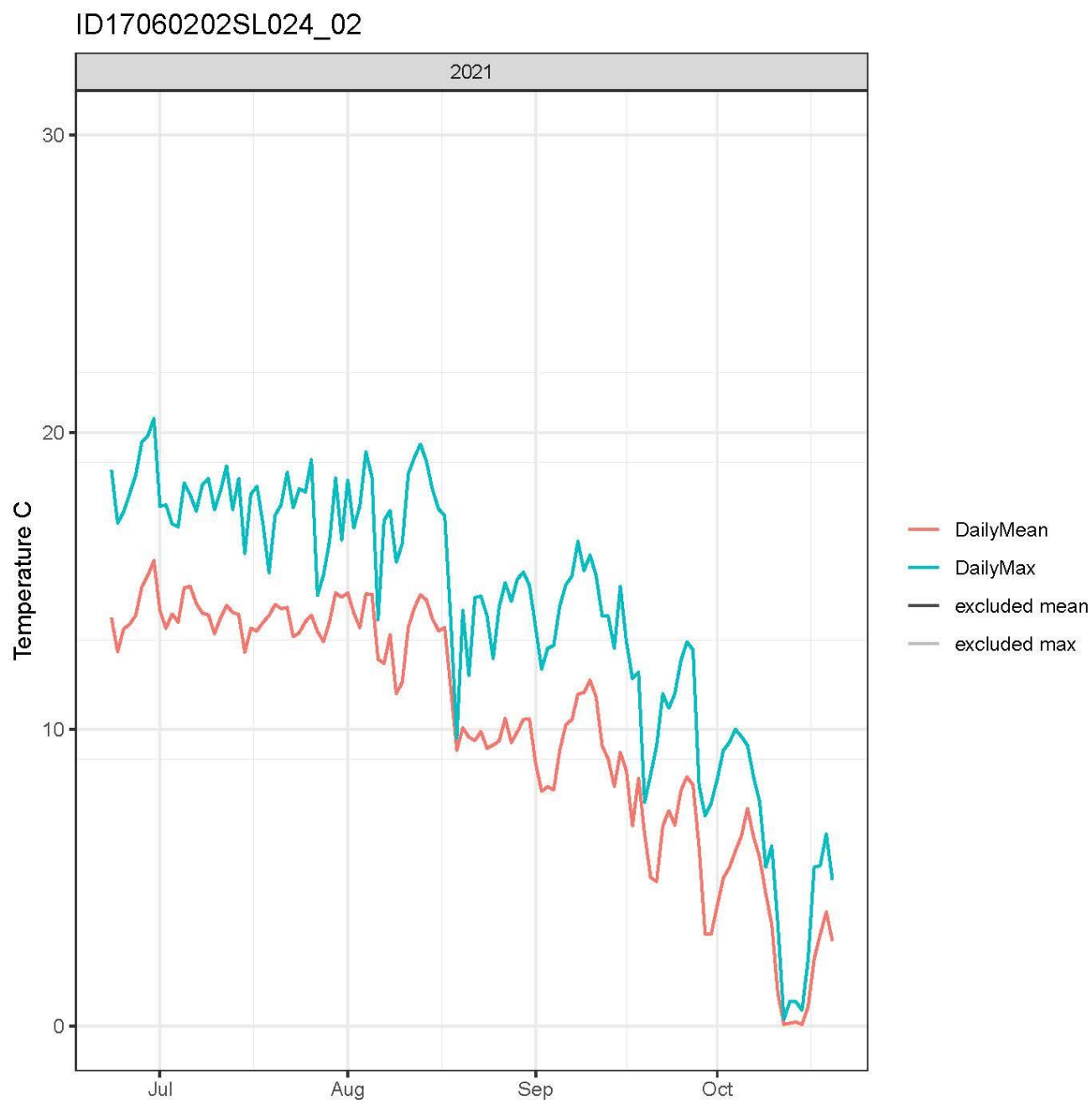


Figure C-5. Temperature data collected in 2021 for ID17060202SL024_02, Burnt Creek – source to Long Creek. Salmonid spawning and Bull Trout spawning and rearing criteria were exceeded.

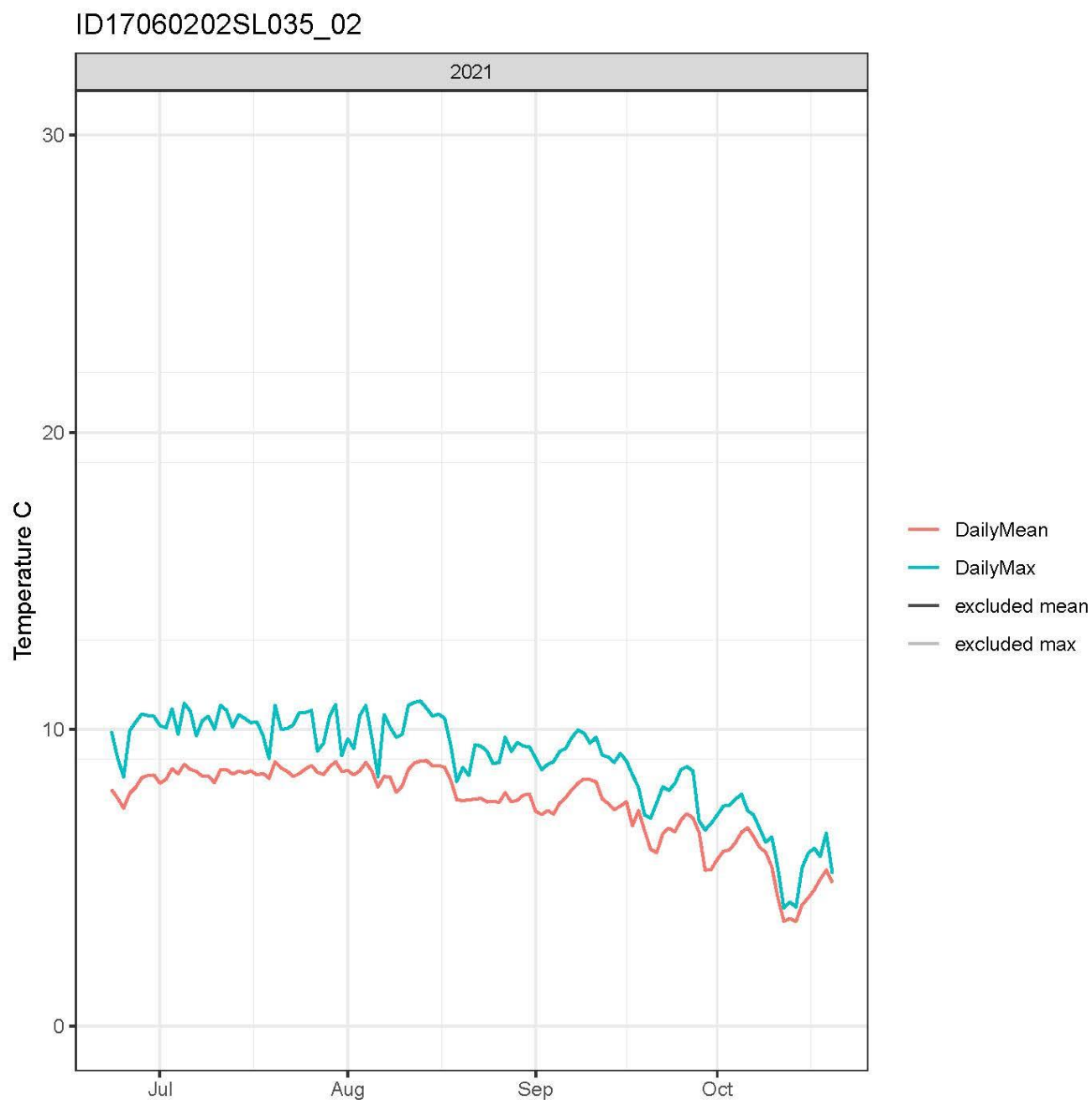


Figure C-6. Temperature data collected in 2021 for ID17060202SL035_02, Patterson Creek – source to and including Inyo Creek. Bull Trout spawning and rearing criteria were exceeded.

Table C-3. Existing and target solar loads for North Fork Lawson Creek (ID17060202SL004_03).

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
004_03	NF Lawson Creek	1	285	geyer willow/segde	53%	2.79	4	1,000	3,000	80%	2.37	4	1,000	2,000	(1,000)	7%
004_03	NF Lawson Creek	2	349	geyer willow/segde	53%	2.79	4	1,000	3,000	10%	5.34	4	1,000	5,000	2,000	-43%
004_03	NF Lawson Creek	3	238	geyer willow/segde	53%	2.79	4	1,000	3,000	40%	3.56	4	1,000	4,000	1,000	-13%
004_03	NF Lawson Creek	4	485	geyer willow/segde	53%	2.79	4	2,000	6,000	50%	2.97	4	2,000	6,000	0	-3%
004_03	NF Lawson Creek	5	590	geyer willow/segde	53%	2.79	4	2,000	6,000	60%	2.37	4	2,000	5,000	(1,000)	7%
004_03	NF Lawson Creek	6	293	geyer willow/segde	53%	2.79	4	1,000	3,000	10%	5.34	4	1,000	5,000	2,000	-43%
004_03	NF Lawson Creek	7	428	geyer willow/segde	53%	2.79	4	2,000	6,000	60%	2.37	4	2,000	5,000	(1,000)	7%
004_03	NF Lawson Creek	8	339	geyer willow/segde	53%	2.79	4	1,000	3,000	10%	5.34	4	1,000	5,000	2,000	-43%
Totals									33,000					37,000	4,000	

Table C-4. Existing and target solar loads for North Fork Lawson Creek (ID17060202SL004_02).

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
004_02	North Fork Lawson Creek	1	720	Graminoid/Sagebrush	39%	3.62	2	1,000	4,000	0%	5.93	2	1,000	6,000	2,000	-39%
004_02	North Fork Lawson Creek	2	466	Graminoid/Sagebrush	39%	3.62	2	900	3,000	10%	5.34	2	900	5,000	2,000	-29%
004_02	North Fork Lawson Creek	3	921	geyer willow/segde	82%	1.07	2	2,000	2,000	60%	2.37	2	2,000	5,000	3,000	-22%
004_02	North Fork Lawson Creek	4	424	Graminoid/Sagebrush	39%	3.62	2	800	3,000	30%	4.15	2	800	3,000	0	-9%
004_02	North Fork Lawson Creek	5	540	geyer willow/segde	82%	1.07	2	1,000	1,000	70%	1.78	2	1,000	2,000	1,000	-12%
004_02	North Fork Lawson Creek	6	547	Graminoid/Sagebrush	39%	3.62	2	1,000	4,000	50%	2.97	2	1,000	3,000	(1,000)	11%
004_02	North Fork Lawson Creek	7	490	Graminoid/Sagebrush	27%	4.33	3	1,000	4,000	40%	3.56	3	1,000	4,000	0	13%
004_02	North Fork Lawson Creek	8	346	Graminoid/Sagebrush	27%	4.33	3	1,000	4,000	40%	3.56	3	1,000	4,000	0	13%
004_02	North Fork Lawson Creek	9	85	Graminoid/Sagebrush	27%	4.33	3	300	1,000	70%	1.78	3	300	500	(500)	43%
004_02	North Fork Lawson Creek	10	784	Graminoid/Sagebrush	27%	4.33	3	2,000	9,000	40%	3.56	3	2,000	7,000	(2,000)	13%
004_02	UNT to NF Lawson	11	174	Dry DF w/o Ppne	94%	0.36	1	200	70	90%	0.59	1	200	100	30	-4%
004_02	UNT to NF Lawson	12	436	Graminoid/Sagebrush	66%	2.02	1	400	800	0%	5.93	1	400	2,000	1,000	-66%
004_02	UNT to NF Lawson	13	244	geyer willow/segde	92%	0.47	1	200	90	80%	1.19	1	200	200	100	-12%
004_02	UNT to NF Lawson	14	411	Graminoid/Sagebrush	66%	2.02	1	400	800	50%	2.97	1	400	1,000	200	-16%
004_02	UNT to NF Lawson	15	321	Graminoid/Sagebrush	66%	2.02	1	300	600	30%	4.15	1	300	1,000	400	-36%
004_02	UNT to NF Lawson	16	379	geyer willow/segde	82%	1.07	2	800	900	50%	2.97	2	800	2,000	1,000	-32%
004_02	UNT to NF Lawson	17	420	Graminoid/Sagebrush	39%	3.62	2	800	3,000	10%	5.34	2	800	4,000	1,000	-29%
004_02	UNT to NF Lawson	18	350	geyer willow/segde	82%	1.07	2	700	700	50%	2.97	2	700	2,000	1,000	-32%
004_02	UNT to NF Lawson	19	479	geyer willow/segde	82%	1.07	2	1,000	1,000	30%	4.15	2	1,000	4,000	3,000	-52%
004_02	UNT to NF Lawson	20	204	Graminoid/Sagebrush	39%	3.62	2	400	1,000	60%	2.37	2	400	900	(100)	21%
004_02	Middle Fork Lawson Creek	21	261	Graminoid	55%	2.67	1	300	800	0%	5.93	1	300	2,000	1,000	-55%
004_02	Middle Fork Lawson Creek	22	669	Dry DF w/o Ppne	94%	0.36	1	700	200	80%	1.19	1	700	800	600	-14%
004_02	Middle Fork Lawson Creek	23	636	Graminoid/Sagebrush	39%	3.62	2	1,000	4,000	60%	2.37	2	1,000	2,000	(2,000)	21%
004_02	Middle Fork Lawson Creek	24	713	Graminoid/Sagebrush	39%	3.62	2	1,000	4,000	0%	5.93	2	1,000	6,000	2,000	-39%
004_02	Middle Fork Lawson Creek	25	1200	Graminoid/Sagebrush	39%	3.62	2	2,000	7,000	20%	4.74	2	2,000	9,000	2,000	-19%
004_02	Middle Fork Lawson Creek	26	352	Graminoid/Sagebrush	39%	3.62	2	700	3,000	30%	4.15	2	700	3,000	0	-9%
004_02	Middle Fork Lawson Creek	27	652	geyer willow/segde	82%	1.07	2	1,000	1,000	70%	1.78	2	1,000	2,000	1,000	-12%
004_02	Middle Fork Lawson Creek	28	236	geyer willow/segde	82%	1.07	2	500	500	50%	2.97	2	500	1,000	500	-32%
004_02	Middle Fork Lawson Creek	29	401	geyer willow/segde	53%	2.79	3	1,000	3,000	70%	1.78	3	1,000	2,000	(1,000)	17%
004_02	Middle Fork Lawson Creek	30	347	geyer willow/segde	53%	2.79	3	1,000	3,000	0%	5.93	3	1,000	6,000	3,000	-53%
004_02	Middle Fork Lawson Creek	31	229	geyer willow/segde	53%	2.79	3	700	2,000	50%	2.97	3	700	2,000	0	-3%
004_02	UNT1 to MF Lawson	32	86	Graminoid/Sagebrush	66%	2.02	1	90	200	60%	2.37	1	90	200	0	-6%
004_02	UNT1 to MF Lawson	33	198	Graminoid/Sagebrush	66%	2.02	1	200	400	10%	5.34	1	200	1,000	600	-56%
004_02	UNT1 to MF Lawson	34	121	Graminoid/Sagebrush	66%	2.02	1	100	200	60%	2.37	1	100	200	0	-6%
004_02	UNT1 to MF Lawson	35	137	Graminoid/Sagebrush	66%	2.02	1	100	200	10%	5.34	1	100	500	300	-56%
004_02	UNT1 to MF Lawson	36	813	Graminoid/Sagebrush	66%	2.02	1	800	2,000	0%	5.93	1	800	5,000	3,000	-66%
004_02	UNT1 to MF Lawson	37	377	Graminoid/Sagebrush	66%	2.02	1	400	800	10%	5.34	1	400	2,000	1,000	-56%
004_02	UNT2 to MF Lawson	38	410	Graminoid/Sagebrush	66%	2.02	1	400	800	0%	5.93	1	400	2,000	1,000	-66%
004_02	UNT2 to MF Lawson	39	905	Graminoid/Sagebrush	66%	2.02	1	900	2,000	10%	5.34	1	900	5,000	3,000	-56%
004_02	UNT2 to MF Lawson	40	1326	Graminoid/Sagebrush	66%	2.02	1	1,000	2,000	20%	4.74	1	1,000	5,000	3,000	-46%
004_02	UNT2 to MF Lawson	41	218	Graminoid/Sagebrush	66%	2.02	1	200	400	10%	5.34	1	200	1,000	600	-56%
Totals									81,000					110,000	32,000	-23%

Table C-5. Existing and target solar loads for Mahogany Creek (ID17060202SL019_03).

Segment Details					Target					Existing					Summary		
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade	
019_03	Mahogany Creek	1	387	Douglas Fir/Grassland	88%	0.71	3	1,000	700	50%	2.97	3	1,000	3,000	2,000	-38%	
019_03	Mahogany Creek	2	282	Graminoid	16%	4.98	4	1,000	600	10%	5.34	4	900	2,000	1,000	-29%	
019_03	Mahogany Creek	3	994	Douglas Fir/Grassland	79%	1.25	4	4,000	5,000	80%	1.19	4	4,000	5,000	0	1%	
019_03	Mahogany Creek	4	995	Drummond Willow/Sedge	51%	2.91	5	5,000	10,000	50%	2.97	5	5,000	10,000	0	-1%	
019_03	Mahogany Creek	5	639	Drummond Willow/Sedge	51%	2.91	5	3,000	9,000	60%	2.37	5	3,000	7,000	(2,000)	9%	
019_03	Mahogany Creek	6	402	Drummond Willow/Sedge	51%	2.91	5	2,000	6,000	60%	2.37	5	2,000	5,000	(1,000)	9%	
019_03	Mahogany Creek	7	1061	Drummond Willow/Sedge	51%	2.91	5	5,000	10,000	70%	1.78	5	5,000	9,000	(1,000)	19%	
Totals					41,000					41,000					-1,000		-4%

Table C-6. Existing and target solar load for Burnt Creek (ID17060202SL024_02).

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
024_02	WF Burnt Creek	1	1980	Rock/Barren	0%	5.93	1	2,000	10,000	0%	5.93	1	2,000	10,000	0	0%
024_02	WF Burnt Creek	2	1806	Subalpine Fir-Moist	96%	0.24	2	3,000	700	70%	1.78	2	3,000	5,000	4,000	-29%
024_02	WF Burnt Creek	3	1008	Subalpine Fir-Moist	96%	0.24	2	2,000	500	50%	2.97	2	2,000	8,000	6,000	-46%
024_02	WF Burnt Creek	4	369	Graminoid	21%	4.68	3	1,000	5,000	30%	4.15	3	1,000	4,000	(1,000)	9%
024_02	WF Burnt Creek	5	1136	Graminoid	21%	4.68	3	3,000	10,000	0%	5.93	3	3,000	20,000	10,000	-21%
024_02	WF Burnt Creek	6	185	Graminoid	21%	4.68	3	600	3,000	30%	4.15	3	600	2,000	(1,000)	9%
024_02	Burnt Creek	7	222	Dry DF w/o Ppne	84%	0.95	4	900	900	60%	2.37	4	900	2,000	1,000	-24%
024_02	Burnt Creek	8	2091	Drummond Willow/Sedge	45%	3.26	4	8,000	30,000	20%	4.74	4	8,000	40,000	10,000	-25%
024_02	Burnt Creek	9	665	Drummond Willow/Sedge	38%	3.68	5	3,000	10,000	30%	4.15	5	3,000	10,000	0	-8%
024_02	Burnt Creek	10	607	Drummond Willow/Sedge	38%	3.68	5	3,000	10,000	0%	5.93	5	3,000	20,000	10,000	-38%
024_02	Burnt Creek	11	356	Drummond Willow/Sedge	38%	3.68	5	2,000	7,000	10%	5.34	5	2,000	10,000	3,000	-28%
024_02	Burnt Creek	12	441	Drummond Willow/Sedge	38%	3.68	5	2,000	7,000	40%	3.66	5	2,000	7,000	0	2%
024_02	Burnt Creek	13	584	Drummond Willow/Sedge	38%	3.68	5	3,000	10,000	30%	4.15	5	3,000	10,000	0	-8%
024_02	Burnt Creek	14	2134	Drummond Willow/Sedge	38%	3.68	5	10,000	40,000	50%	2.97	5	10,000	30,000	(10,000)	12%
024_02	Burnt Creek	15	1656	Drummond Willow/Sedge	38%	3.68	5	8,000	30,000	40%	3.66	5	8,000	30,000	0	2%
024_02	Burnt Creek	16	304	Drummond Willow/Sedge	38%	3.68	5	2,000	7,000	20%	4.74	5	2,000	9,000	2,000	-18%
024_02	Burnt Creek	17	963	Drummond Willow/Sedge	38%	3.68	5	5,000	20,000	10%	5.34	5	5,000	30,000	10,000	-28%
024_02	Burnt Creek	18	578	Drummond Willow/Sedge	38%	3.68	5	3,000	10,000	20%	4.74	5	3,000	10,000	0	-18%
024_02	EF Burnt Creek	19	1202	Douglas Fir/Grassland	96%	0.24	1	1,000	200	30%	4.15	1	1,000	4,000	4,000	-66%
024_02	EF Burnt Creek	20	627	Graminoid	31%	4.09	2	1,000	4,000	40%	3.66	2	1,000	4,000	0	9%
024_02	EF Burnt Creek	21	595	Graminoid	31%	4.09	2	1,000	4,000	70%	1.78	2	1,000	2,000	(2,000)	39%
024_02	EF Burnt Creek	22	527	Dry DF w/o Ppne	94%	0.36	2	1,000	400	30%	4.15	2	1,000	4,000	4,000	-64%
024_02	EF Burnt Creek	23	469	Douglas Fir/Grassland	93%	0.42	2	900	400	40%	3.66	2	900	3,000	3,000	-53%
024_02	EF Burnt Creek	24	367	Dry DF w/o Ppne	94%	0.36	2	700	200	70%	1.78	2	700	1,000	800	-24%
024_02	EF Burnt Creek	25	159	Dry DF w/o Ppne	94%	0.36	2	300	100	90%	0.59	2	300	200	100	-4%
024_02	UNT to EF Burnt	26	407	Rock/Barren	0%	5.93	1	400	2,000	0%	5.93	1	400	2,000	0	0%
024_02	UNT to EF Burnt	27	631	Douglas Fir/Grassland	96%	0.24	1	600	100	80%	1.19	1	600	700	600	-16%
024_02	UNT to EF Burnt	28	543	Drummond Willow/Sedge	87%	0.77	1	500	400	60%	2.37	1	500	1,000	600	-27%
024_02	UNT to EF Burnt	29	463	Graminoid	55%	2.67	1	500	1,000	30%	4.15	1	500	2,000	1,000	-25%
024_02	Unnamed 1	30	784	Rock/Barren	0%	5.93	1	800	5,000	0%	5.93	2	2,000	10,000	5,000	0%
024_02	Unnamed 1	31	45	Subalpine Fir-Moist	96%	0.24	1	50	10	10%	5.34	2	90	500	500	-86%
024_02	Unnamed 1	32	866	Subalpine Fir-Moist	96%	0.24	1	900	200	40%	3.66	2	2,000	7,000	7,000	-56%
024_02	Unnamed 1	33	542	Graminoid	55%	2.67	1	500	1,000	0%	5.93	1	500	3,000	2,000	-55%
024_02	Unnamed 1	34	514	Dry DF w/o Ppne	94%	0.36	1	500	200	80%	1.19	1	500	600	400	-14%
024_02	Unnamed 1	35	900	Graminoid	55%	2.67	1	900	2,000	10%	5.34	1	900	5,000	3,000	-45%
024_02	Unnamed 1	36	313	Subalpine Fir-Moist	96%	0.24	2	600	100	80%	1.19	1	300	400	300	-16%
024_02	Unnamed 1	37	505	Graminoid	55%	2.67	2	1,000	3,000	40%	3.66	1	500	2,000	(1,000)	-15%
024_02	Unnamed 2	38	552	Rock/Barren	0%	5.93	1	600	4,000	0%	5.93	2	1,000	6,000	2,000	0%
024_02	Unnamed 2	39	342	Graminoid/Sagebrush	39%	3.62	1	300	1,000	20%	4.74	2	700	3,000	2,000	-19%
024_02	Unnamed 2	40	873	Drummond Willow/Sedge	76%	1.42	2	2,000	3,000	40%	3.66	2	2,000	7,000	4,000	-36%
024_02	Unnamed 2	41	383	Drummond Willow/Sedge	76%	1.42	2	800	1,000	20%	4.74	2	800	4,000	3,000	-56%
024_02	Unnamed 3	42	225	Rock/Barren	0%	5.93	1	200	1,000	0%	5.93	1	200	1,000	0	0%
024_02	Unnamed 3	43	245	Graminoid/Sagebrush	66%	2.02	1	200	400	50%	2.97	1	200	600	200	-16%
024_02	Unnamed 3	44	561	Graminoid/Sagebrush	66%	2.02	1	600	1,000	0%	5.93	1	600	4,000	3,000	-66%
024_02	Unnamed 3	45	440	Drummond Willow/Sedge	87%	0.77	1	400	300	40%	3.66	1	400	1,000	700	-47%
024_02	Unnamed 3	46	521	Drummond Willow/Sedge	87%	0.77	1	500	400	20%	4.74	1	500	2,000	2,000	-67%
024_02	Unnamed 4	47	982	Graminoid/Sagebrush	66%	2.02	1	1,000	2,000	0%	5.93	1	1,000	6,000	4,000	-66%
024_02	Unnamed 4	48	332	Graminoid/Sagebrush	66%	2.02	1	300	600	0%	5.93	1	300	2,000	1,000	-66%
024_02	Unnamed 4	49	785	Drummond Willow/Sedge	87%	0.77	1	800	600	30%	4.15	1	800	3,000	2,000	-57%
024_02	Unnamed 4	50	393	Drummond Willow/Sedge	87%	0.77	1	400	300	0%	5.93	1	400	2,000	2,000	-87%
024_02	Unnamed 5	51	3376	Graminoid/Sagebrush	66%	2.02	1	3,000	6,000	0%	5.93	1	3,000	20,000	10,000	-66%
Totals									260,000					370,000	110,000	-28%

Table C-7. Existing and target solar loads for Patterson Creek (ID17060202SL035_02).

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m ² /day)	Segment Width (m)	Segment Area (m ²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
035_02	Patterson Creek	1	892	Subalpine Fir-Moist	96%	0.24	1	900	200	90%	0.59	1	900	500	300	-6%
035_02	Patterson Creek	2	1031	Dry DF w/o Ppine	94%	0.36	2	2,000	700	90%	0.59	2	2,000	1,000	300	-4%
035_02	Patterson Creek	3	1288	Dry DF w/o Ppine	93%	0.42	3	4,000	2,000	80%	1.19	3	4,000	5,000	3,000	-13%
035_02	Patterson Creek	4	952	Aspen	96%	0.24	4	4,000	900	40%	3.56	4	4,000	10,000	9,000	-56%
035_02	Patterson Creek	5	543	Dry DF w/o Ppine	84%	0.95	4	2,000	2,000	90%	0.59	4	2,000	1,000	(1,000)	6%
035_02	Patterson Creek	6	1397	Graminoid	16%	4.98	4	6,000	30,000	20%	4.74	4	6,000	30,000	0	4%
035_02	Patterson Creek	7	871	Subalpine Fir-Moist	93%	0.42	4	3,000	1,000	70%	1.78	4	3,000	5,000	4,000	-23%
035_02	Patterson Creek	8	1409	Subalpine Fir-Moist	93%	0.42	4	6,000	2,000	90%	0.59	4	6,000	4,000	2,000	-3%
035_02	Patterson Creek	9	870	Aspen	93%	0.42	5	4,000	2,000	80%	1.19	5	4,000	5,000	3,000	-13%
035_02	Patterson Creek	10	1237	Aspen	93%	0.42	5	6,000	2,000	70%	1.78	5	6,000	10,000	8,000	-23%
035_02	Unnamed 1	11	405	Graminoid	55%	2.67	1	400	1,000	10%	5.34	1	400	2,000	1,000	-45%
035_02	Unnamed 1	12	822	Subalpine Fir-Moist	96%	0.24	1	800	200	70%	1.78	1	800	1,000	800	-26%
035_02	Unnamed 2	13	358	Rock/Barren	0%	5.93	1	400	2,000	0%	5.93	1	400	2,000	0	0%
035_02	Unnamed 2	14	417	Aspen	93%	0.42	1	400	200	70%	1.78	1	400	700	500	-23%
035_02	Unnamed 2	15	1019	Aspen	93%	0.42	2	2,000	800	80%	1.19	1	1,000	1,000	200	-13%
035_02	Unnamed 3	16	777	Graminoid	55%	2.67	1	800	2,000	50%	2.97	1	800	2,000	0	-5%
035_02	Unnamed 3	17	1179	Subalpine Fir-Moist	96%	0.24	2	2,000	500	90%	0.59	1	1,000	600	100	-6%
035_02	Unnamed 4	18	300	Graminoid	55%	2.67	1	300	800	20%	4.74	1	300	1,000	200	-35%
035_02	Unnamed 4	19	2074	Subalpine Fir-Moist	96%	0.24	2	4,000	900	90%	0.59	1	2,000	1,000	100	-6%
035_02	Unnamed 5	20	415	Graminoid	55%	2.67	1	400	1,000	50%	2.97	1	400	1,000	0	-5%
035_02	Unnamed 5	21	361	Graminoid	55%	2.67	1	400	1,000	20%	4.74	1	400	2,000	1,000	-35%
035_02	Unnamed 5	22	527	Graminoid	55%	2.67	1	500	1,000	40%	3.56	1	500	2,000	1,000	-15%
035_02	Unnamed 5	23	454	Dry DF w/o Ppine	94%	0.36	1	500	200	70%	1.78	1	500	900	700	-24%
035_02	Unnamed 6	24	734	Rock/Barren	0%	5.93	1	700	4,000	0%	5.93	1	700	4,000	0	0%
035_02	Unnamed 6	25	1790	Subalpine Fir-Moist	96%	0.24	1	2,000	500	80%	1.19	1	2,000	2,000	2,000	-16%
035_02	Unnamed 7	26	1927	Graminoid	55%	2.67	1	2,000	5,000	10%	5.34	1	2,000	10,000	5,000	-45%
035_02	EF Patterson Cre	27	896	Graminoid	55%	2.67	1	900	2,000	30%	4.15	1	900	4,000	2,000	-25%
035_02	EF Patterson Cre	28	426	Subalpine Fir-Moist	96%	0.24	1	400	90	50%	2.97	1	400	1,000	900	-46%
035_02	EF Patterson Cre	29	463	Graminoid	31%	4.09	2	900	4,000	30%	4.15	2	900	4,000	0	-1%
035_02	EF Patterson Cre	30	857	Subalpine Fir-Moist	96%	0.24	2	2,000	500	70%	1.78	2	2,000	4,000	4,000	-26%
035_02	EF Patterson Cre	31	975	Subalpine Fir-Moist	96%	0.30	3	3,000	900	70%	1.78	3	3,000	5,000	4,000	-25%
035_02	EF Patterson Cre	32	613	Subalpine Fir-Moist	96%	0.30	3	2,000	600	50%	2.97	3	2,000	6,000	5,000	-45%
035_02	EF Patterson Cre	33	688	Subalpine Fir-Moist	95%	0.30	3	2,000	600	70%	1.78	3	2,000	4,000	3,000	-25%
035_02	EF Patterson Cre	34	995	Aspen	96%	0.24	4	4,000	900	70%	1.78	4	4,000	7,000	6,000	-26%
035_02	EF Patterson Cr	35	278	Aspen	96%	0.24	4	1,000	200	70%	1.78	4	1,000	2,000	2,000	-26%
035_02	UNT 1 to EF Patt	36	2029	Dry DF w/o Ppine	94%	0.36	2	4,000	1,000	80%	1.19	2	4,000	5,000	4,000	-14%
035_02	UNT 2 to EF Patt	37	1217	Graminoid	55%	2.67	1	1,000	3,000	40%	3.56	1	1,000	4,000	1,000	-15%
035_02	UNT 2 to EF Patt	38	973	Dry DF w/o Ppine	94%	0.36	1	1,000	400	70%	1.78	1	1,000	2,000	2,000	-24%
035_02	UNT 3 to EF Patt	39	767	Subalpine Fir-Moist	96%	0.24	1	800	200	40%	3.56	1	800	3,000	3,000	-56%
035_02	UNT 3 to EF Patt	40	1456	Dry DF w/o Ppine	94%	0.36	2	3,000	1,000	80%	1.19	2	3,000	4,000	3,000	-14%
035_02	Inyo Creek	41	1156	Graminoid	55%	2.67	1	1,000	3,000	10%	5.34	1	1,000	5,000	2,000	-45%
035_02	Inyo Creek	42	551	Graminoid	55%	2.67	1	600	2,000	40%	3.56	1	600	2,000	0	-15%
035_02	Inyo Creek	43	1018	Dry DF w/o Ppine	94%	0.36	1	1,000	400	60%	2.37	1	1,000	2,000	2,000	-34%
035_02	Inyo Creek	44	756	Dry DF w/o Ppine	94%	0.36	2	2,000	700	50%	2.97	2	2,000	6,000	5,000	-44%
035_02	Inyo Creek	45	299	Dry DF w/o Ppine	94%	0.36	2	600	200	60%	2.37	2	600	1,000	800	-34%
035_02	Inyo Creek	46	1768	Dry DF w/o Ppine	92%	0.47	3	5,000	2,000	50%	2.97	3	5,000	10,000	8,000	-42%
035_02	UNT to Inyo Cree	47	1892	Graminoid	55%	2.67	1	2,000	5,000	10%	5.34	1	2,000	10,000	5,000	-45%
035_02	UNT to Inyo Cree	48	146	Dry DF w/o Ppine	94%	0.36	2	300	100	70%	1.78	2	300	500	400	-24%
035_02	UNT to Inyo Cree	49	1384	Dry DF w/o Ppine	94%	0.36	2	3,000	1,000	60%	2.37	2	3,000	7,000	6,000	-34%
Totals								94,000						200,000	110,000	

Note: All assessment unit (AU) numbers start with ID17060202SL in all load tables (Tables C-3–C-7). Significant figures are controlled by the lowest level in the calculation, typically that of the channel width. Some rounding errors may result.

BLM Multiple Indicator Monitoring (MIM) Data

Table C-8. BLM MIM streambank and sediment data.

Assessment Unit Number	Allotment	Designated Monitoring Area			Streambanks			Substrate		
		DMA ID	Stream	Year	Streambank Alteration (%)	Streambank Stability (%)	Streambank Cover (%)	Percent Fines (%)	D16 Particle Size (mm)	D50 Particle Size (mm)
ID17060202SL002_02	Grouse Creek	SULP-KA-01	Sulphur Creek	2014	11	94	92	5.9	14	23.7
ID17060202SL002_02	Grouse Creek	SULP-KA-01	Sulphur Creek	2017	10	99	96	7.1	13	26.8
ID17060202SL002_02	Grouse Creek	SULP-KA-01	Sulphur Creek	2020	29	93	86	1.3	31	13.2
ID17060202SL002_02	Grouse Creek	SULP-KA-02	Sulphur Creek	2014	0	99	95	16.5	1	29.7
ID17060202SL002_02	Grouse Creek	SULP-KA-02	Sulphur Creek	2018	0	99	98	13.4	3	30.3
ID17060202SL002_02	Trail Creek	TRAIL-KA-01	Trail Creek	2015	7	98	95	0.5	73	1.5
ID17060202SL004_03	Lawson	LAW-KA-01	North Fork Lawson Creek	2015	8	100	100	0.9	38	10.0
ID17060202SL008_04	County Line	PAR-KA-01	Pahsimeroi River	2016	0	69	57	3.4	19	17.8
ID17060202SL010_03	Lower Goldberg	GOLD-KA-02	Goldberg Creek	2014	6	99	85	7.8	8	29.6
ID17060202SL010_03	Lower Goldberg	GOLD-KA-02	Goldberg Creek	2017	0	100	92	12.0	3	24.3
ID17060202SL010_03	Lower Goldberg	GOLD-KA-02	Goldberg Creek	2020	32	65	51	1.7	21	18.9
ID17060202SL010_04	Grouse Creek	PAR-KA-02	Pahsimeroi River	2016	0	93	91	2.8	22	15.5
ID17060202SL010_04	Grouse Creek	PAR-KA-02	Pahsimeroi River	2019	0	94	99	1.3	26	16.2
ID17060202SL017_04	Donkey Hills	PAH-KA-01	Pahsimeroi River	2016	2	99	94	11.3	9	28.9

Assessment Unit Number	Allotment	Designated Monitoring Area			Streambanks			Substrate		
		DMA ID	Stream	Year	Streambank Alteration (%)	Streambank Stability (%)	Streambank Cover (%)	Percent Fines (%)	D16 Particle Size (mm)	D50 Particle Size (mm)
ID17060202SL017_04	Donkey Hills	PAH-KA-01	Pahsimeroi River	2020	0	96	99	15.2	10	34.3
ID17060202SL018_04	Upper Pahsimeroi	PAH-KA-03	Pahsimeroi River	2015	0	99	77	4.3	17	39.5
ID17060202SL018_04	Upper Pahsimeroi	PAH-KA-03	Pahsimeroi River	2020	0	100	100	14.1	12	44.2
ID17060202SL019_03	Upper Pahsimeroi	MGY-KA-01	Mahogany Creek	2015	2	100	100	4.5	17	12.4
ID17060202SL019_03	Upper Pahsimeroi	MGY-KA-01	Mahogany Creek	2020	0	100	100	5.4	13	12.0
ID17060202SL020_03	Rock Creek	PAH-KA-04	Pahsimeroi River	2016	4	99	99	18.6	5	69.0
ID17060202SL020_03	Rock Creek	PAH-KA-04	Pahsimeroi River	2019	4	96	100	31.6	0	62.7
ID17060202SL023_03	Pines-Elkhorn	BRN-KA-05	Burnt Creek	2016	0	93	94	0.6	56	1.9
ID17060202SL023_03	Pines-Elkhorn	BRN-KA-05	Burnt Creek	2019	0	93	94	9.5	4	14.9
ID17060202SL024_02	Upper Pahsimeroi	BRN-KA-01	Burnt Creek	2015	0	99	96	0.6	62	1.9
ID17060202SL026_02	Dry Creek	SHC-KA-02	Short Creek	2015	6	96	95	3.1	24	11.2
ID17060202SL028_03	Upper Pahsimeroi	GOLD-KA-01	Goldberg Creek	2015	11	97	98	1.9	22	16.5
ID17060202SL029_02	Donkey Hills	DKY-KA-01	Donkey Creek	2016	4	96	100	1.6	25	16.6
ID17060202SL029_02	Donkey Hills	DKY-KA-01	Donkey Creek	2019	3	95	100	1.0	34	17.0
ID17060202SL036_02	Mahogany Creek	FC-KA-01	Falls Creek	2020	0	100	75	16.7	0	46.7

Table C-9. BLM MIM habitat data.

Assessment Unit Number	Allotment	Designated Monitoring Area			Vegetation Ratings			Width and Shade			Pools	
		DMA ID	Stream	Year	Greenline Ecological Status Rating	Site Wetland Rating	Winward Greenline Stability Rating	Greenline to Greenline Width (m)	Average Woody Plant Height (m)	Shade Index	Pool Frequency (#/mile)	Mean Residual Depth (m)
ID17060202SL002_02	Grouse Creek	SULP-KA-01	Sulphur Creek	2014	22	42		1.2	1.2	0.2		
ID17060202SL002_02	Grouse Creek	SULP-KA-01	Sulphur Creek	2017	31	51		1.3	0.6	0.1		
ID17060202SL002_02	Grouse Creek	SULP-KA-01	Sulphur Creek	2020	20	48	3.508559	1.3	0.8	0.4		
ID17060202SL002_02	Grouse Creek	SULP-KA-02	Sulphur Creek	2014	12	47		3.0	1.5	0.1		
ID17060202SL002_02	Grouse Creek	SULP-KA-02	Sulphur Creek	2018	12	36		2.7	1.4	0.1		
ID17060202SL002_02	Trail Creek	TRAIL-KA-01	Trail Creek	2015	38	67		2.2	2.4	0.2		
ID17060202SL004_03	Lawson	LAW-KA-01	North Fork Lawson Creek	2015	32	60		1.7	0.7	0.1	165.202	0.6
ID17060202SL008_04	County Line	PAR-KA-01	Pahsimeroi River	2016	25	35		6.0	2.8	0.1	73.936	0.3
ID17060202SL010_03	Lower Goldberg	GOLD-KA-02	Goldberg Creek	2014	41	57		5.3	4.3	0.2	101.089	0.1
ID17060202SL010_03	Lower Goldberg	GOLD-KA-02	Goldberg Creek	2017	43	55		5.2	5.4	0.2	90.975	0.1
ID17060202SL010_03	Lower Goldberg	GOLD-KA-02	Goldberg Creek	2020	68	71	5.711574	6.4	4.3	0.3		
ID17060202SL010_04	Grouse Creek	PAR-KA-02	Pahsimeroi River	2016	46	65		4.6	3.6	0.3	76.910	0.4
ID17060202SL010_04	Grouse Creek	PAR-KA-02	Pahsimeroi River	2019	58	77		4.7	1.5	0.1		
ID17060202SL017_04	Donkey Hills	PAH-KA-01	Pahsimeroi River	2016	44	66		5.8	2.8	0.3	51.144	0.2
ID17060202SL017_04	Donkey Hills	PAH-KA-01	Pahsimeroi River	2020	46	69	5.950603	5.8	2.0	0.3		
ID17060202SL018_04	Upper Pahsimeroi	PAH-KA-03	Pahsimeroi River	2015	88	73		4.9	1.9	0.3	77.652	0.3

Assessment Unit Number	Allotment	Designated Monitoring Area			Vegetation Ratings			Width and Shade			Pools	
		DMA ID	Stream	Year	Greenline Ecological Status Rating	Site Wetland Rating	Winward Greenline Stability Rating	Greenline to Greenline Width (m)	Average Woody Plant Height (m)	Shade Index	Pool Frequency (#/mile)	Mean Residual Depth (m)
ID17060202SL018_04	Upper Pahsimeroi	PAH-KA-03	Pahsimeroi River	2020	100	84	8.648043	4.4	2.3	0.5		
ID17060202SL019_03	Upper Pahsimeroi	MGY-KA-01	Mahogany Creek	2015	85	67		2.2	2.7	0.3	56.867	0.3
ID17060202SL019_03	Upper Pahsimeroi	MGY-KA-01	Mahogany Creek	2020		72	6.822104	2.1	2.1	0.6		
ID17060202SL020_03	Rock Creek	PAH-KA-04	Pahsimeroi River	2016	56	65		7.3	2.8	0.1	58.310	0.3
ID17060202SL020_03	Rock Creek	PAH-KA-04	Pahsimeroi River	2019	63	75		7.4	1.6	0.1		
ID17060202SL023_03	Pines-Elkhorn	BRN-KA-05	Burnt Creek	2016	15	47		1.1	0.7	0.0		
ID17060202SL023_03	Pines-Elkhorn	BRN-KA-05	Burnt Creek	2019	28	52		1.3	0.7	0.0		
ID17060202SL024_02	Upper Pahsimeroi	BRN-KA-01	Burnt Creek	2015	89	69		1.9	1.5	0.3	157.423	0.2
ID17060202SL026_02	Dry Creek	SHC-KA-02	Short Creek	2015	71	70		1.3	2.7	0.4		
ID17060202SL028_03	Upper Pahsimeroi	GOLD-KA-01	Goldberg Creek	2015	54	73		3.7	1.4	0.2	177.436	0.2
ID17060202SL029_02	Donkey Hills	DKY-KA-01	Donkey Creek	2016	81	81		0.7	1.4	0.1		
ID17060202SL029_02	Donkey Hills	DKY-KA-01	Donkey Creek	2019	69	80		0.8	1.1	0.0		
ID17060202SL036_02	Mahogany Creek	FC-KA-01	Falls Creek	2020	70	61	6.280552	2.4	3.2	0.9		

Bankfull Width Estimates

North Fork Lawson Creek – source to mouth

ID17060202SL004_02

Location	Area (sq mi)	Upper Snake (m)	BURP (m)
North Fork Lawson Creek @ confluence with UNT	2.1	2	
UNT to North Fork Lawson Creek	1.3	2	
NF Lawson @ MF Lawson	3.7	3	3
MF Lawson Creek @ UNT 1	1.19	2	
MF Lawson Creek UNT 1 @ mouth	0.5	1	
MF Lawson Creek @ UNT 2	2.91	3	
MF Lawson Creek UNT 2 @ mouth	0.8	1	
MF Lawson Creek @ NF Lawson	4.1	3	2.4

North Fork Lawson Creek – source to mouth

ID17060202SL004_02

Location	Area (sq mi)	Upper Snake (m)	BURP (m)
North Fork Lawson @ Middle Fork Lawson	7.7	4	
North Fork @ South Fork	8.9	4	1

Mahogany Creek – source to mouth

ID17060202SL019_03

Location	Area (sq mi)	Upper Snake (m)	BURP (m)
@ top of AU	5.8	5	
Mahogany Creek @7680	7.0	4	3
Mahogany Creek @ mouth	12.1	3	

Burnt Creek – source to Long Creek

ID17060202SL024_02

Location	Area (sq mi)	Upper Snake (m)	BURP (m)
EF Burnt Creek @ Burnt Creek	2.4	2	
EF Burnt Creek UNT 1 @ mouth	1.0	2	
WF Burnt Creek @ 9000 ft	2.83	2	
WF Burnt Creek @ EF Burnt Creek	4.21	3	2.3
Burnt Creek @ EF and WF confluence	6.64	4	
UNT 1 @ mouth	1.0	2	
Burnt Creek @ 7760 ft	10.08	4	1.7
Burnt Creek @ UNT 2	11.28	5	
UNT 2 @ mouth	1.76	2	
Burnt Creek @ Trib 3	13.48	5	
UNT 3 @ mouth	0.71	1	
Burnt Creek @ 7440 ft	14.54	5	3.7

Burnt Creek @ Trib 4	14.87	5	
UNT 4 @ mouth	0.75	1	
UNT 5 @ mouth	1.03	2	
Burnt Creek @ Pahsimeroi River	17.33	5	2.6

Patterson Creek – source to and including Inyo Creek
ID17060202SL035_02

Location	Area (sq mi)	Upper Snake (m)	BURP (m)
Inyo Creek @ UNT	1.34	2	
UNT to Inyo Creek	2.62	2	
Inyo Creek @ mouth	5.03	3	3
Patterson Creek @ UNT 1	1.58	2	
UNT 1 @ mouth	0.35	1	
Patterson @ UNT 2	3.1	3	
UNT 2 @ mouth	0.96	2	
Patterson @ UNT 3	4.51	3	
UNT 3 @ mouth	1.71	2	
Patterson @ UNT 4	9.66	4	
UNT 4 @ mouth	1.21	2	
Patterson @ UNT 5	11.69	5	
UNT 5 @ mouth	0.86	1	
Patterson @ UNT 6	13.21	5	
UNT 6 @ mouth	0.77	1	
UNT 7 @ mouth	0.51	1	
Patterson Creek @ EF Patterson	14.96	5	5
EF Patterson @ 8800 ft	0.9	1	
EF Patterson @ UNT 1	1.42	2	
UNT 1 to EF Patterson @ mouth	1.5	2	
EF Patterson @ UNT 2	5.25	3	
UNT 2 to EF Patterson @ mouth	0.78	1	
EF Patterson @ UNT 3	6.44	4	
UNT 3 to EF Patterson @ mouth	1.46	2	
EF Patterson @ mouth	7.94	4	

Appendix D. Assessment Unit Notes

Category 5 Assessment Units

Lawson Creek—confluence of North and South Fork Lawson Creek (ID17060202SL003_03)

Lawson Creek flows for approximately 0.2 miles before its flow is entirely diverted at 44.58750, -113.98913 during the irrigation season from April 1 to October 31 as allowed by Idaho water right no. 73-79 (Figures D-1, D-2, and D-3). When flow is returned to its natural channel at the end of the irrigation season, it is lost to groundwater before reaching the Pahsimeroi River (Figure D-4). Site visits before and after irrigation season and ample evidence of bank disturbance show that heavy machinery excavate a new flow path at the beginning and end of the irrigation season to move flow into or away from the diversion structure. Figure D-5 shows how a large pile of fine sediment was used to divert flow away from headgate back into the natural channel through an anthropogenic berm created to deliver water to the headgate. Figure D-6 shows the bank headcut caused as Lawson Creek flows through the berm and the downstream overwidening once flow returns to the natural channel. Upstream of the headgate, there is ample evidence of bank trampling by livestock and large cutbanks supplying ample fine sediment to Lawson Creek (Figures D-7 and D-8).

DEQ has attempted to conduct a BURP assessment within the AU twice since the 2013 AU was written. In 2016, crews visited a site downstream of the diversion structure, and the stream was dry so no score was calculated. In 2018, Lawson Creek received a failing BURP score of 1 aggregated from a SMI score of 1 and an SHI score of 1. No fish data was collected to calculate a SFI score. Lawson Creek flows mainly through BLM land with USFS managing portions of the South, Middle and North Forks. There is a small portion of private land before the Lawson Creek confluence with the Pahsimeroi River.

Recommendation: Remove from Category 5 for combined biota/habitat bioassessment and place in Category 4c for flow regime modification, as the stream is completely dewatered during the irrigation season. Replacing the current diversion structure with one that eliminates the need to manipulate the channel twice a year to deliver water to the headgate would increase the ability of Lawson Creek to meet its beneficial uses.

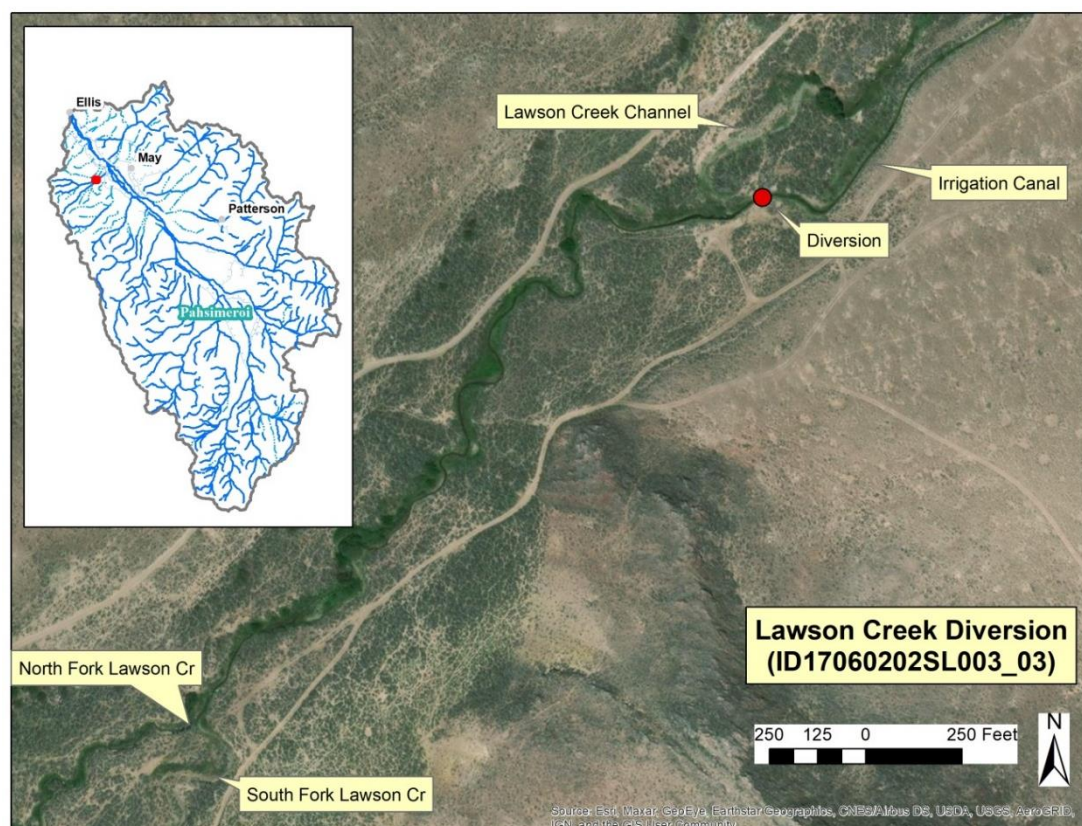


Figure D-1. Map of Lawson Creek diversion.



Figure D-2. Flow from Lawson Creek diverted through a headgate per Idaho water right 73-79.



Figure D-3. Alternative view of the headgate along Lawson Creek. There is no flow path for water when the headgate is closed. The natural channel is to the left of the photo. There is ample evidence of soil disturbance suggesting heavy machinery is often used to manipulate the stream channel.



Figure D-4. By the time Lawson Creek crosses under Custer Road, all flow is lost to groundwater even when no flow is diverted outside of irrigation season.



Figure D-5. Piles of sediment adjusting the path of streamflow suggesting the stream channel is manipulated with heavy machinery to divert flow into or away from the point of diversion at the start and end of the irrigation season.



Figure D-6. Headcut caused by moving Lawson Creek in and out of the natural channel to deliver water to the headgate and downstream overwidening.



Figure D-7. Evidence of bank trampling and fine sediment deposition in Lawson Creek.



Figure D-8. Bank trampling and large cutbank along Lawson Creek.

South Fork Lawson Creek—source to mouth (ID17060202SL005_02)

Lawson Creek was originally listed on the 2002 § 303(d) list for cause unknown following a failing BURP score in 1997. This impairment has been updated and South Fork Lawson Creek is currently listed in Category 5 of the 2024 Integrated Report for combined biota/habitat bioassessment (DEQ 2024). DEQ has attempted to assess beneficial uses in 2021, 2018, and 2013, but the stream was dry both times, so BURP surveys could not be done. The original BURP assessment was done in 1997, which was an exceptionally wet year in southeastern Idaho. Streamflows during the 1997 BURP assessment were 1.1 cfs, which is just above the optimum streamflow of ≥ 1 cfs to assess aquatic life beneficial uses. The USGS NHD identifies South Fork Lawson Creek as an intermittent stream.

The South Fork Lawson Creek was dry each time it was visited in the summer of 2021 (Figure D-9). The channel was bordered by sagebrush, and upland plant. Figure D-10 shows cottonwoods growing in a dry channel with flood-mobilized wood caught on the upstream side suggesting water does flow down the channel intermittently either during spring run-off or precipitation-drive run-off events. Figure D-11 shows the confluence of the North and South Forks Lawson Creek. South Fork Lawson Creek is dry while the North Fork contributes all of the flow to Lawson Creek.

Recommendation: Remove from Category 5 for combined biota/habitat bioassessment and move into Category 3, as the BURP monitoring protocols are not developed for intermittent streams



Figure D-9. Dry South Fork Lawson Creek with sagebrush, a facultative upland plant, growing adjacent to the stream channel.



Figure D-10. Flood-mobilized wood caught on cottonwoods adjacent to the dry South Fork Lawson Creek channel.



Figure D-11. Confluence of South Fork Lawson Creek (left) and North Fork Lawson Creek (right).

Burnt Creek—Long Creek to mouth (ID17060202SL023_03)

Burnt Creek – Long Creek was first placed on the 2002 § 303(d) following a failing BURP score in 1998. DEQ has attempted to conduct BURP monitoring four times in 1998, 2006, 2013 and 2018. In 2006 and 2013, Burnt Creek was dry, so scores were not calculated. The AU received failing BURP scores in 1998 and 2018. Despite the fact that Burnt Creek drains from the high peaks of the Little Lost River, most of its flow through this AU is lost to groundwater once it exits the mountain front and flows over the thick alluvium of the valley bottom (Williams et al. 2006). In dry years with below-average snowpack, this section of Burnt Creek will run dry due to and combination of natural groundwater losses and irrigation diversion (Figure D-12). There is only one water right (73-164) along Burnt Creek with a maximum diversion rate of 3.2 cfs. The point of diversion for this water right is at the upstream extent of this AU at the confluence with Long Creek.

BURP monitoring in 2018 resulted in a Fine Sediment Biological Index (FSBI) of 10, the lowest recorded in the PaHSimeroi River subbasin, and 71% fines. BURP monitoring found 100% bank stability; the SEI survey also completed in 2018 found 45% bank stability. This difference is likely because the SEI was done in an incised reach with large cutbanks while the BURP assessment was done at a site with better floodplain connection (Figures D-13, 14, and 15). BURP data and bank stability measurements from the 2018 SEI suggest that sediment is the true cause of impairment.

Recommendation: Move to Category 4a for sedimentation/siltation upon sediment TMDL approval.



Figure D-12. Burnt Creek was dry on 06/22/2021.



Figure D-13. Photo from 2018 BURP site - 2018SIDFA037.

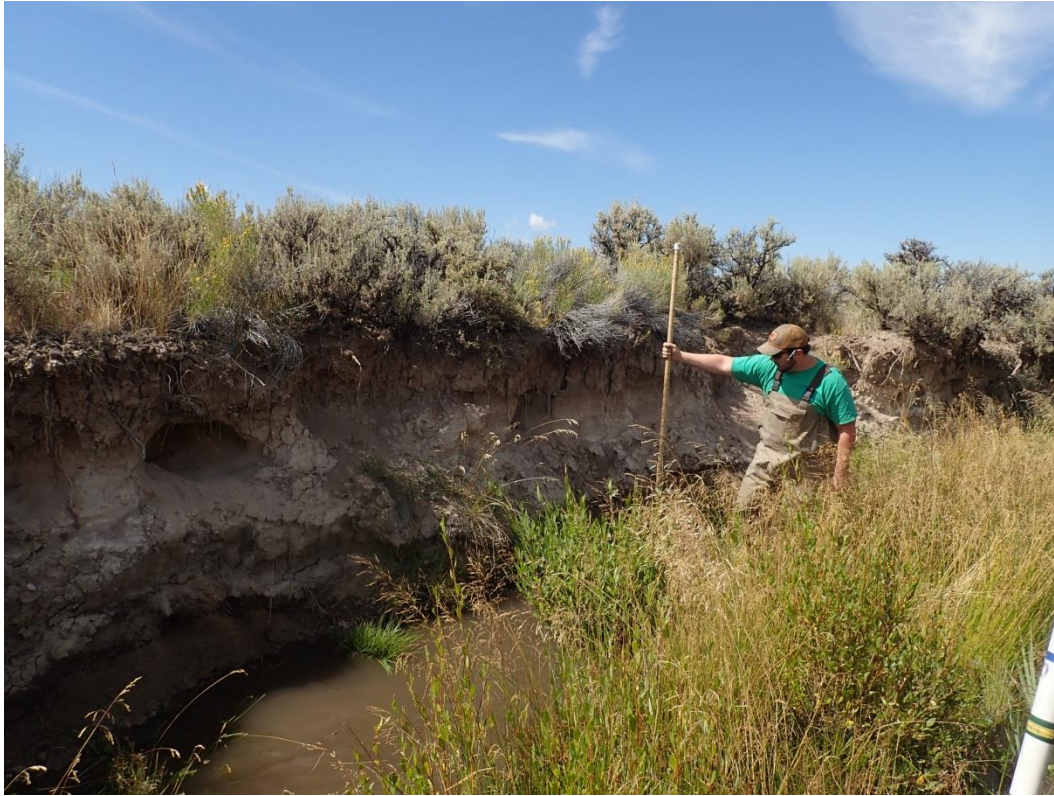


Figure D-14. Large cutbank and wetted channel during 2018 SEI.



Figure D-15. Bank collapse and high-turbidity water along Burnt Creek.

Burnt Creek—mouth to Long Creek (ID17060202SL024_02).

Burnt Creek – mouth to Long Creek was added to the 2018/2020 § 303(d) list following a failing BURP score in 2016. This AU was on the 2002 § 303(d) list for cause unknown after receiving two failing BURP scores in 1997 but had not been included on the § 303(d) list since its removal in 2004. Based on continuous instream temperature data collected in 2021, salmonid spawning, Idaho Bull Trout rearing and spawning, and EPA Bull Trout criteria were exceeded.

In 2001, there were several perennial-associated taxa collected in Burnt Creek (see 2001SIDFA117); in contrast, there were only two individual invertebrates in the 2016 sample that are considered perennial indicators (*Parapsyche elsis*, *Rhyacophila* sp.; Nadeau 2015).

The macroinvertebrate index score was far lower in 2016 (SMI2=43) compared to 2001 (SMI2=67); these data, along with the apparent change in perennial-associated taxa, indicate significant impairment of the macroinvertebrate community since the sample collection in 2001. Generally, the metrics that are indicative of sedimentation worsened from 2001 to 2016 (Figure D-16). Fine sediment in the wetted width increased substantially (1.5% to 35.4%), FSBI decreased from 45 to 15, estimated bank stability moderately decreased from 93% to 82.5%, and the embeddedness score decreased by a single point.

Conversely, cold water-associated metrics have seemingly improved. In 2001, the macroinvertebrate sample contained only 1.61% empirically derived coldwater taxa (ENCW) and literature derived coldwater taxa (LDCW) were completely absent; in 2016, the sample contained 6.39% EDCW and 1.29% LDCW. The BURP crew also collected several Bull Trout from various age classes in 2016 (no Bull Trout were sampled in 2001). Although Disruptive Pressures and Zone of Influence scores were both higher in 2016, riparian canopy cover was nearly nonexistent (canopy score=0) (Figures D-17 and D-18).

Overall, these data suggest sedimentation may be the main driver of impairment in this AU.

Recommendation: Move to Category 4a for temperature following TMDL approval.

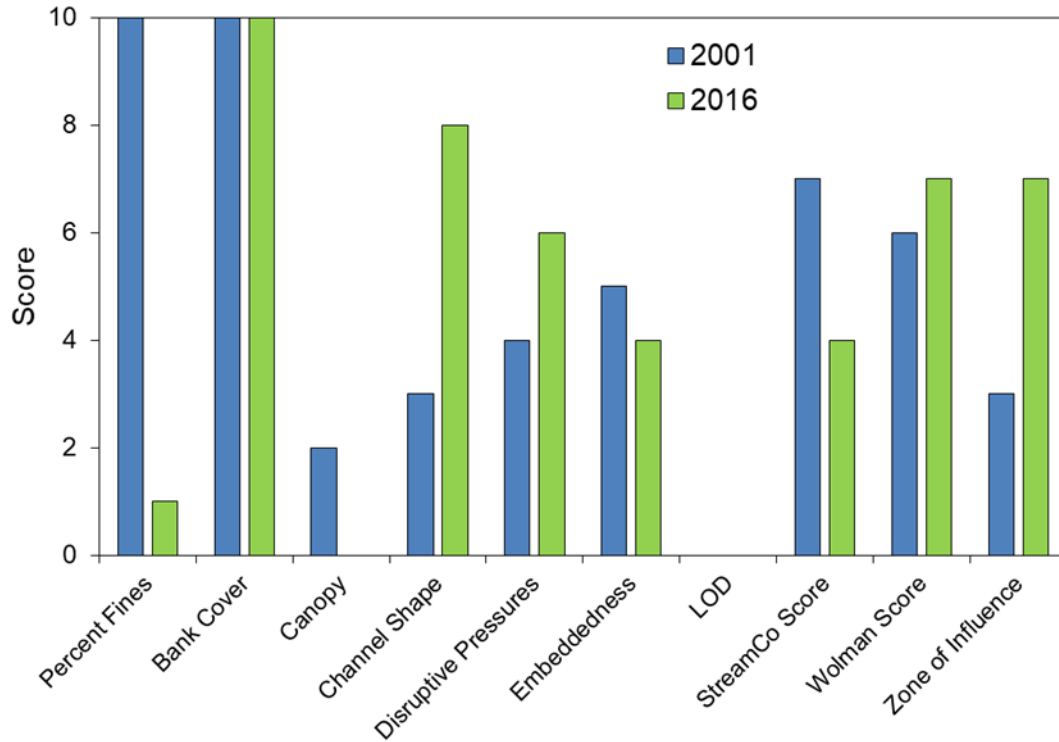


Figure D-16. Habitat metrics used to calculate SHI2 for Burnt Creek (ID17060202SL024_02) from BURP sites 2001SIDFA117 (blue bars) and 2016SIDFA022 (green bars).



Figure D-17. Willow community along upper Burnt Creek.



Figure D-18. Burnt Creek near its confluence with Long Creek.

Donkey Creek—source to mouth (ID17060202SL029_02)

Donkey Creek was originally placed on the § 303(d) list in 2002 following a failing BURP score in 1997. Donkey Creek received a passing BURP score of 2.33 in 2018 suggesting cold water aquatic life and salmonid spawning beneficial uses are being met. Habitat data from the 1997 site show that there were no riffles in the monitored reach and that it was dominated by runs and glides. The metrics selected for the macroinvertebrate index are based on species composition in riffle habitat. In this way, the original BURP site that led to this AU being listed may have been located in a nonrepresentative reach or at least in a location that is not ideally suited for BURP protocols.

Donkey Creek is dewatered before it reaches Goldburg Creek where Ditch Creek intercepts the flow from Donkey Creek per Idaho water right 73-178. The diversion rate for this water right is 4.8 cfs, which likely exceeds the average annual discharge of Donkey Creek (Figure D-19). For reference, the measured discharge at BURP site 2018SIDFA035 was 0.26 cfs (Figure D-20). Downstream of the Ditch Creek crossing, there is no stream channel discernable on satellite imagery.

Recommendation: Remain in Category 5 for combined biota and temperature until further investigation can be completed.



Figure D-19. Donkey Creek dewatered north of Ditch Creek diversion.



Figure D-20. Donkey Creek near BURP site 2018SIDFA035.

Patterson Creek—source to including Inyo Creek (ID17060202SL035_02)

Patterson Creek – source to and including Inyo Creek was added to the § 303(d) list in the 2018/2020 Integrated Report (DEQ 2020b) because salmonids less than 100 millimeters were not found during a BURP assessment in 2016 at BURP site 2016SIDFA034, indicating salmonid spawning is not being met. A site condition rating of 2.67 at BURP site indicates full support of cold water aquatic life.

Temperature data collected in 2021 by the DEQ showed that water temperature met Idaho salmonid spawning and Bull Trout temperature criteria but exceeded EPA Bull Trout criteria. Summer 2021 was marked by extreme drought brought on by high temperatures and low snowpack. Stream temperatures should be monitored in the future to determine to EPA Bull Trout criteria are exceeded under average weather conditions.

Recommendation: Move to Category 4a for temperature following temperature TMDL approval. Additional BURP sampling should be done to continue assessing salmonid spawning beneficial uses, as site condition ratings indicated full cold water aquatic life support.

Category 4a Assessment Units

Pahsimeroi River—Patterson Creek to mouth (ID17060202SL001_05)

A McNeil sediment core collected in 2021 resulted in 35% subsurface fines without particles > 2.5 inches (Figure D-21). The banks through this section of the Pahsimeroi River were vegetated with dense willow populations (Figure D-22).

Recommendation: Retain in Category 4a for sedimentation/siltation and temperature.



Figure D-21. McNeil sediment core collection along the Pahsimeroi River (ID17060202SL001_05).



Figure D-22. Willow communities along the Pahsimeroi River (ID17060202SL001_05).

Pahsimeroi River—Meadow Creek to Patterson Creek (ID17060202SL002_02)

This 2nd-order AU is comprised of Trail Creek and Sulphur Creek. Sulphur Creek is perennial while Trail Creek is intermittent. Both are spring-fed creeks. Warm springs raise water temperatures through Sulphur Creek. Flow from Sulphur Creek reaches the Pahsimeroi River, but Trail Creek naturally dewateres as it flows over thick alluvium before reaching the Pahsimeroi River.

Local stakeholders have worked to reconnect Sulphur Creek to the Pahsimeroi River through irrigation management by shifting irrigated fields and source locations for water withdrawal. Prior to this action, Sulphur Creek flowed through a field irrigated by a center pivot. Additionally, a feedlot adjacent to the stream was removed.

E. coli samples collected this summer resulted in a geometric mean of 41 cfu/100 mL, below the 126 cfu/100 mL numeric criterion for *E. coli* (IDAPA 58.01.02.251.01). The SEI completed in 2018 showed 75% bank stability, which is below the 80% bank stability target.

Recommendation: Remove from Category 4a for *E. coli*. Retain in Category 4a for temperature and sediment. Future BURP assessments along this AU should be completed on Sulphur Creek as it is perennial.

North Fork Lawson Creek—source to mouth (ID17060202SL004_02)

The North Fork Lawson Creek is dry upstream of the confluence with the Middle Fork (Figure D-23). The Middle Fork Lawson Creek is a perennial stream fed by the numerous springs along the

channel (Figure D-24). The channel bottom is covered predominantly in fine sediment that is likely due in combination to grazing impacts and the consistent flows of a spring-fed system. The stream is an entrenched stream boarded by bare, unstable cutbanks. A temperature logger was placed in Middle Fork Lawson Creek near the bottom of the AU (Figure D-25). Temperature exceeded salmonid spawning and Bull Trout criteria, subsequently a PNV analysis was completed. The PNV analysis suggests an average 23% shade deficit for this AU and a TMDL was developed (section 5.2.3).

Recommendation: Retain in Category 4a for sedimentation/siltation. Place in Category 4a for temperature in the 2026 Integrated Report.



Figure D-23. North Fork Lawson Creek upstream of the confluence with the Middle Fork.



Figure D-24. Confluence of the Middle Fork and North Fork Lawson Creek. There is surface water flow in the Middle Fork, but not in the South Fork.

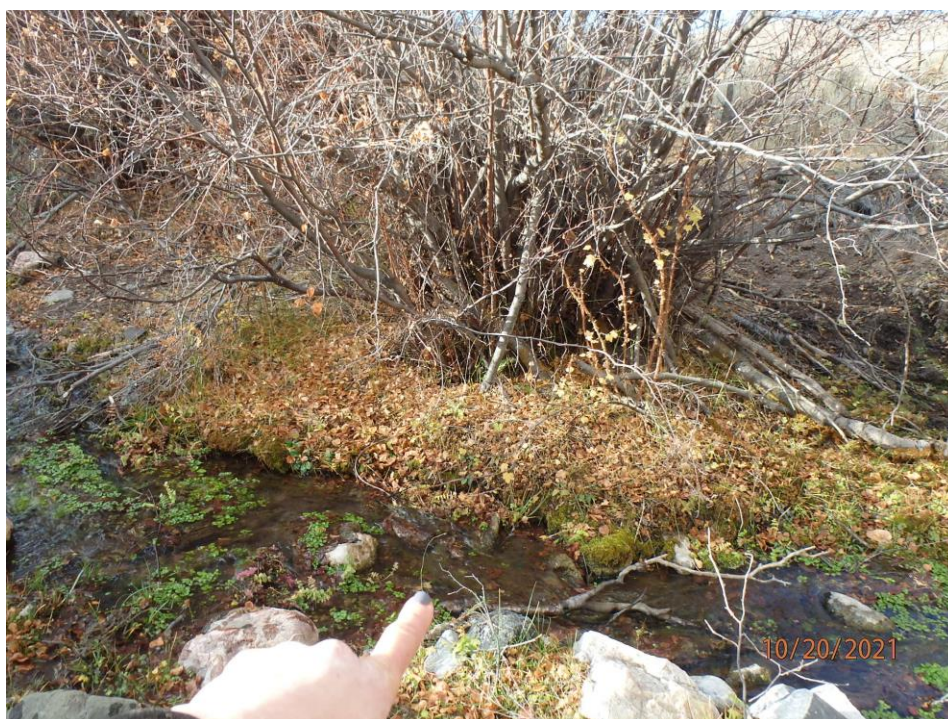


Figure D-25. Location of temperature logger in Middle Fork Lawson Creek.

Appendix E. Public Participation and Public Comments

This TMDL was developed with participation from the Salmon Basin Advisory Group. There were no public comments submitted during the comment period.

Salmon Basin Advisory Group and their interest represented

Bruce Mulkey (Agriculture)

Theresa Hughes (At-large Position)

Betsy Rieffenberger (Environmental)

Will Nailon (Mining)

Ryan Stebbins (Non-Municipal IPDES)

Stephen Pfeiffer (Recreation)

Hunter Osborne (Tribal)