Priest River Subbasin Assessment and Total Maximum Daily Load

2014 Addendum

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The cover photos were taken by Tyson Clyne (Idaho Department of Environmental Quality [DEQ]) during field validation of existing shade estimates of Lion and Indian Creeks.

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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)
ADB	assessment database
AU	assessment unit
AWS	agricultural water supply
BAG	basin advisory group
BLM	United States Bureau of Land Management
BMP	best management practice
BOD	biochemical oxygen demand
BOR	United States Bureau of Reclamation
Btu	British thermal unit
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
cm	centimeters
CWAL	cold water aquatic life
CWE	cumulative watershed effects
DEQ	Idaho Department of Environmental Quality
DO	dissolved oxygen
DOI	United States Department of the Interior
DWS	domestic water supply
EMAP	Environmental Monitoring and Assessment Program
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
F	Fahrenheit
FPA	Idaho Forest Practices Act
FWS	United States Fish and Wildlife Service
GIS	geographic information system
HUC	hydrologic unit code
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
km	kilometer
LA	load allocation
LC	load capacity
m	meter

mi	mile
MBI	Macroinvertebrate Biotic Index
MDAT	maximum daily average temperature
MDMT	maximum daily maximum temperature
mgd	million gallons per day
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
MOS	margin of safety
MWMT	maximum weekly maximum temperature
n/a	not applicable
NA	not assessed
NB	natural background
NFS	not fully supporting
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity unit
ORV	off-road vehicle
ORW	outstanding resource water
PCR	primary contact recreation
PFC	proper functioning condition
ppm	part(s) per million
QA	quality assurance
QC	quality control
RBP	rapid bioassessment protocol
RDI	DEQ's River Diatom Index
RFI	DEQ's River Fish Index
RHCA	riparian habitat conservation area
RMI	DEQ's River Macroinvertebrate Index
RPI	DEQ's River Physiochemical Index
SBA	subbasin assessment
SCR	secondary contact recreation
SFI	DEQ's Stream Fish Index
SHI	DEQ's Stream Habitat Index
SMI	DEQ's Stream Macroinvertebrate Index
SS	salmonid spawning
STATSGO	State Soil Geographic Database
T&E	threatened and/or endangered species
TMDL	total maximum daily load
US	United States
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USGS	United States Geological Survey
WAG	watershed advisory group

WBAG *Water Body Assessment Guidance*

WBID water body identification number

WLA wasteload allocation

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Executive Summary

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. States and tribes, pursuant to Section 303 of the CWA, 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. Section 303(d) of the CWA 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). States and tribes must periodically publish a priority list (a "§303(d) list") of impaired waters. Currently this list must be published every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards.

Elevated stream temperatures can be harmful to fish at all life stages, especially if they occur in combination with other habitat limitations such as low dissolved oxygen or poor food supply. Acceptable temperature ranges vary for different species of fish, with coldwater species being the least tolerant of high water temperatures. Elevated stream temperatures can also be harmful to aquatic invertebrates, amphibians, and mollusks, although less is known about these effects.

This document addresses all water bodies in the Priest River Subbasin that have been placed on Idaho's current §303(d) list as a result of exceedance(s) of the Idaho water quality standards for temperature. In 2000 and 2003, the U.S. Environmental Protection Agency approved TMDLs which addressed sediment and temperature impairments in the subbasin. The temperature-impaired streams have been reevaluated in this analysis because of new techniques in temperature TMDL development. The previous TMDLs relied on a mathematical equation to prescribe shade based on elevation to achieve a desired stream temperature. Due to the elevation of the watersheds analyzed, the shade requirements in most locations exceeded 100%. Complete stream shade is not achievable in a natural setting, so those streams addressed by the earlier TMDL have been reevaluated in this document using potential natural vegetation (PNV) methods (Shumar and de Varona 2009).

This TMDL analysis has been developed to comply with Idaho's TMDL requirements. The TMDL analysis quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition of meeting water quality standards.

Subbasin at a Glance

The Priest River subbasin (17010215) is located in the northwest corner of the Idaho panhandle adjacent to the State of Washington and the Canadian border (Figure A). Land ownership within the subbasin is mixed with majority of land owned and managed by the State of Idaho and the U.S. Forest Service. The majority of the lower portion of the watershed is privately-owned land. Other tracts of privately owned land occur near Nordman, Coolin and the lower reaches of Lamb Creek.

Twenty-seven assessment unit-pollutant combinations are included in category 5 of Idaho's 2010 Integrated Report (Figure A, Table A). The majority of assessment unit-pollutant combinations are associated with exceedances of Idaho water quality temperature criteria.

Other listed pollutants include combined biota/bioassessment, fishes bioassessment, Escherichia coli (*E. coli*), and fecal coliform.

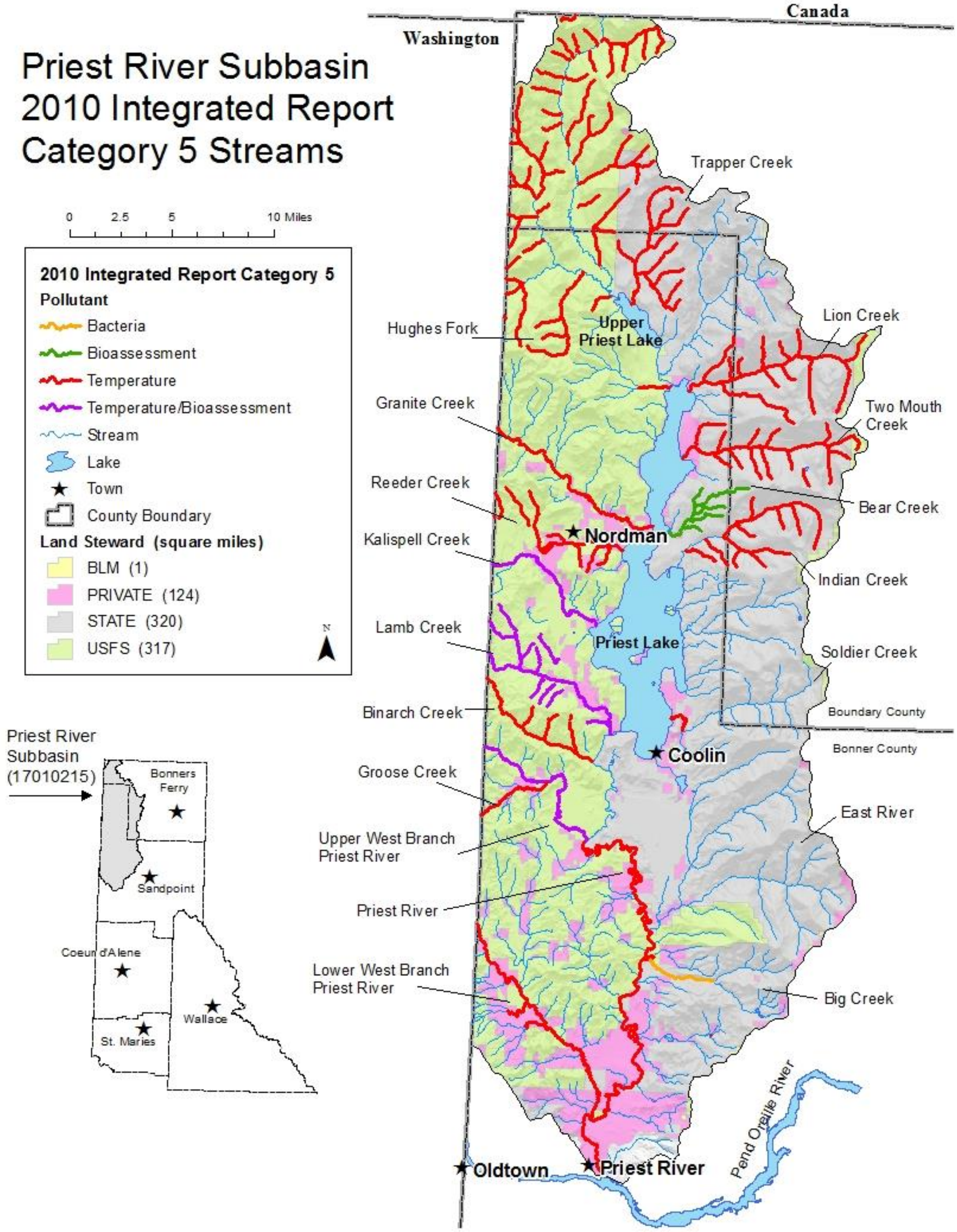

Figure A. Subbasin at a glance.

Table A. Priest River subbasin 2010 Integrated Report category 5 stream.

Stream	Assessment Unit	Pollutant
Lower Priest River: Upper West Branch Priest River to mouth	ID17010215PN001 _05	Temperature; combined biota/bioassessment
Big Creek: source to mouth	ID17010215PN002_03	*E. coli*
Soldier Creek: source to mouth	ID17010215PN008_03	Temperature
Indian Creek: source to mouth	ID17010215PN010_02	Temperature
Bear Creek: source to mouth	ID17010215PN011_02	Fishes bioassessment
Two Mouth Creek: source to mouth	ID17010215PN012_02	Temperature
Lion Creek: source to mouth	ID17010215PN013_02	Temperature
Trapper Creek: source to mouth	ID17010215PN017_02	Temperature
Trapper Creek: source to mouth	ID17010215PN017_03	Temperature
Upper Priest River: ID/Canadian border to mouth	ID17010215PN018_02	Temperature
Hughes Fork: source to mouth	ID17010215PN019_02	Temperature
Beaver Creek: source to mouth	ID17010215PN020_03	Temperature
Granite Creek: ID/WA border to mouth	ID17010215PN022_04	Temperature
Reeder Creek: source to mouth	ID17010215PN023_02	Temperature
Reeder Creek: source to mouth	ID17010215PN023_03	Temperature
Kalispell Creek: ID/WA border to mouth	ID17010215PN024_03	Temperature; combined biota/bioassessment
Lamb Creek: ID/WA border to mouth	ID17010215PN025_02	Temperature; combined biota/bioassessment
Binarch Creek: ID/WA border to mouth	ID17010215PN026_02	Temperature
Upper West Branch Priest River: ID/WA to Goose Creek	ID17010215PN027_03	Combined biota/bioassessment
Upper West Branch Priest River: ID/WA border to mouth	ID17010215PN027_04	Temperature; combined biota/bioassessment
Goose Creek: ID/WA border to mouth	ID17010215PN028_03	Fecal coliform
Lower West Branch Priest River: ID/WA border to mouth	ID17010215PN030_03	Temperature
Lower West Branch Priest River - ID/WA border to mouth	ID17010215PN030_04	Temperature

In 2001, the Idaho Department of Environmental Quality (DEQ) conducted a subbasin assessment and developed total maximum daily loads (TMDLs) to address excess sediment impairment Kalispell Creek and the lower West Branch Priest River (DEQ 2001). A TMDL addendum was developed by DEQ in 2003. The addendum addressed additional sediment-impaired waters, and temperature TMDLs were developed for the East River mainstem, Middle Fork East River, and North Fork East River (DEQ 2003). Twelve assessment units are addressed in the TMDL and the TMDL addendum that were approved by EPA in 2001 and 2003, respectively (Table B). Following EPA approval, the assessment unit pollutant combinations were placed in Category 4a of Idaho's Integrated Report (Figure B).

Table B. Assessment unit/pollutant combination addressed in the 2000 and 2003 EPA-approved TMDLs.

Stream	Assessment Unit	Pollutant
Lower Priest River	ID17010215PN001_05	Sediment
Middle Fork East River	ID17010215PN003_02	Temperature
Middle Fork East River	ID 1701021 5PN003_03	Temperature
East River mainstem	ID17010215PN003_04	Sediment and Temperature
North Fork East River	ID17010215PN004_02	Temperature
North Fork East River	ID17010215PN004_03	Temperature
Reeder Creek	ID17010215PN023_02	Sediment
Reeder Creek	ID17010215PN023_03	Sediment
Kalispell Creek	ID1 701021 5PN024_03	Sediment
Binarch Creek	ID1 701021 5PN026_02	Sediment
Lower West Branch Priest River	ID17010215PN030_03	Sediment
Lower West Branch Priest River	ID17010215PN030_04	Sediment

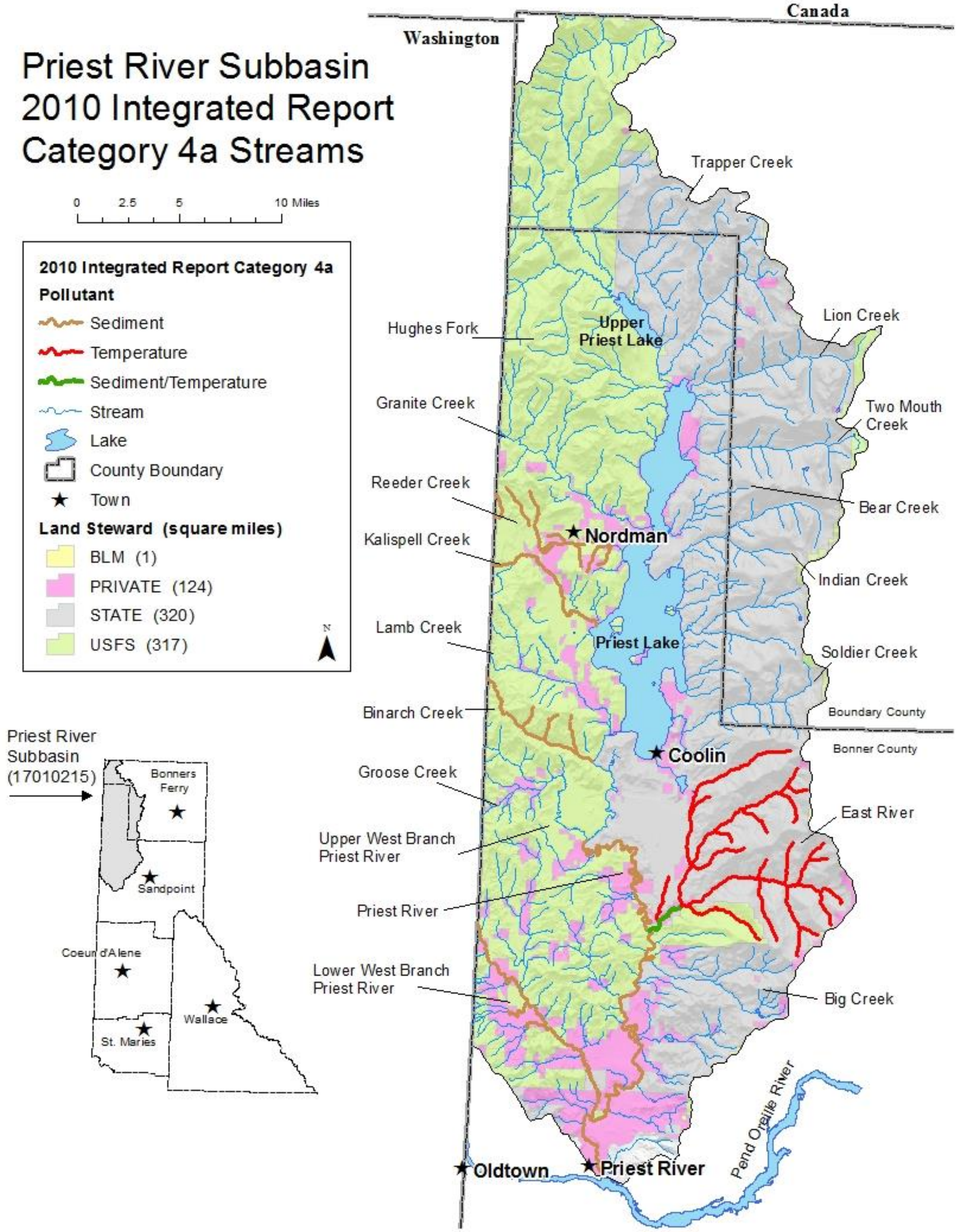

Figure B. Priest River Subbasin 2010 Integrated Report Category 4a streams.

Key Findings

The Idaho Department of Environmental Quality (DEQ) established effective shade targets for §303(d) waters and all tributary waters identified as having temperature impairment based on the concept of maximum shading under potential natural vegetation (PNV). Shade targets were derived from effective shade curves developed by DEQ and EPA for Idaho Panhandle vegetation types. DEQ estimated existing shade from aerial photo interpretation, and the accuracy of the aerial photo interpretations were field-verified with a Solar Pathfinder at ten sites scattered throughout the subbasin. Depending on the magnitude of error between measured shade and estimated shade, the estimated shade value was adjusted to reflect the measured shade value or remained unchanged.

Existing and PNV shade was converted to solar loads from data collected on flat-plate collectors at the Spokane, Washington National Renewable Energy Laboratory (NREL) weather stations. The difference between existing and target solar load, assuming existing load is higher, is the load reduction necessary to bring the stream back into compliance with water quality standards. PNV shade and associated target solar loads are assumed to be the natural condition; thus, stream temperatures under PNV conditions are assumed to be natural (so long as there are no point sources or any other anthropogenic sources of heat in the watershed) and are considered to be consistent with the Idaho water quality standards.

Most assessment units examined lack shade and have excess solar loads as a result. Some units have relatively low excess loads with needed reductions varying from 1-19%. Others have considerably larger excess loads. Target shade levels for individual reaches should be the goal managers strive for with future implementation plans. Managers should key in on the largest differences between existing and target shade as locations to prioritize implementation efforts.

As a result of this temperature TMDL assessment, recommendations for changes in Integrated Report category listings were made (Table C). Twenty-three assessment units are recommended to be moved to Category 4a of Idaho's 2014 Integrated Report.

Public Participation

Briefly discuss public input/meetings.

Table C. Summary of assessment outcomes.

Stream	Assessment Unit	Pollutant	TMDL(s) Completed	Recommended Changes to §303(d) List	Justification
Lower Priest River	ID17010215PN001_05	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Middle Fork East River	ID1 701021 5PN003_02 ID17010215PN003_03	Temperature	Yes	No change	Excess solar Load from lack of shade
East River	ID17010215PN003_04	Temperature	Yes	No change	Excess solar Load from lack of shade
North Fork East River	ID17010215PN004_02 ID17010215PN004_03	Temperature	Yes	No change	Excess solar Load from lack of shade
Soldier Creek	ID17010215PN008_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Hunt Creek	ID17010215PN009_03	Temperature	Yes	Move to 4a	Unlisted but Impaired
Indian Creek	ID17010215PN010_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of Shade
Indian Creek	ID17010215PN010_03	Temperature	Yes	Move to 4a	Unlisted but Impaired
Two Mouth Creek	ID17010215PN012_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Lion Creek	ID17010215PN013_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Trapper Creek	ID17010215PN017_02 ID17010215PN017_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Upper Priest River	ID17010215PN018_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Hughes Fork	ID17010215PN019_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Beaver Creek	ID17010215PN020_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade

Stream	Assessment Unit	Pollutant	TMDL(s) Completed	Recommended Changes to §303(d) List	Justification
Granite Creek	ID17010215PN022_04	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Reeder Creek	ID1 701021 5PN023_02 ID17010215PN023_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Kalispell Creek	ID17010215PN024_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of Shade
Lamb Creek	ID17010215PN025_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Binarch Creek	ID17010215PN026_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Upper West Branch Priest River	ID17010215PN027_04	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Goose Creek	ID17010215PN028_03	Temperature	Yes	Move to 4a	Unlisted but Impaired
Lower West Branch Priest River	ID1 701021 5PN030_03 ID17010215PN030_04	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Moores Creek	ID17010215PN031_03	Temperature	Yes	Move to 4a	Unlisted but Impaired

1 Subbasin Assessment Watershed—Characterization

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. States and tribes, pursuant to Section 303 of the CWA, 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. Section 303(d) of the CWA 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). States and tribes must periodically publish a priority list (a "§303(d) list") of impaired waters. Currently this list must be published every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards.

This document addresses the water bodies in the Priest River subbasin that have been placed on Idaho's current §303(d) list. The overall purpose of the subbasin assessment (SBA) and TMDL is to characterize and document pollutant loads within the Priest River subbasin. In 2001, the Idaho Department of Environmental Quality (DEQ) conducted a subbasin assessment and developed total maximum daily loads (TMDLs) to address excess sediment (DEQ 2001). A TMDL addendum was developed by DEQ in 2003 to address additional sediment-impaired waters and temperature TMDLs were developed for the East River mainstem, Middle Fork East River, and North Fork East River (DEQ 2003). This document will reevaluate the previously-developed temperature TMDLs and temperature-impaired water bodies assessed since completion of the 2003 TMDL addendum. The reevaluation is being completed because of new methodologies that better assess the sources causing increased stream temperatures.

The first portion of this document, the SBA, is partitioned into four major sections: watershed characterization, water quality concerns and status, pollutant source inventory, and a summary of past and present pollution-control efforts. This information will then be used to develop a TMDL for each pollutant of concern for the Priest River subbasin.

1.1 Introduction

In 1972, Congress passed the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Water Environment Federation 1987, p. 9). The act and the programs it has 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 insure "swimmable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality with more than just chemistry.

1.1.1 Background

The federal government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. The Department of Environmental Quality (DEQ) implements the CWA in Idaho, while the EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Section 303 of the CWA requires DEQ to adopt water quality standards and to review those standards every three years (EPA must approve Idaho's water quality standards). Additionally, DEQ must monitor waters to identify those not meeting water quality standards. For those waters not meeting standards, DEQ must establish a TMDL for each pollutant impairing the waters. Further, the agency must set appropriate controls to restore water quality and allow the water bodies to meet their designated uses.

These requirements result in a list of impaired waters, called the "§303(d) list." This list describes water bodies not meeting water quality standards. Waters identified on this list require further analysis. A SBA and TMDL provide a summary of the water quality status and allowable TMDL for water bodies on the §303(d) list. This addendum to the *Priest River Subbasin Assessment* and TMDL provides this summary for the currently-listed waters in the Priest River subbasin.

The SBA section of this document includes an evaluation and summary of the current water quality status, pollutant sources, and control actions in the Priest River subbasin to date. While this assessment is not a requirement of the TMDL, DEQ performs the assessment to ensure impairment listings are up to date and accurate. The TMDL is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet water quality standards (Water quality planning and management, 40 CFR Part 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.

Some conditions that impair water quality do not receive TMDLs. The EPA does consider certain unnatural conditions, such as flow alteration, human-caused lack of flow, or habitat alteration, that are not the result of the discharge of a specific pollutant as "pollution." However, TMDLs are not required for water bodies impaired by pollution, but not by specific pollutants. A TMDL is only required when a pollutant can be identified and in some way quantified.

1.1.2 Idaho's Role

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water, 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 state may assign or designate beneficial uses for particular Idaho water bodies to support. These beneficial uses are identified in the Idaho water quality standards and include the following:

- Aquatic life support–cold water, seasonal cold water, warm water, salmonid spawning, modified
- Contact recreation–primary (swimming), secondary (boating)
- Water supply–domestic, agricultural, industrial
- Wildlife habitats
- Aesthetics

The Idaho legislature designates uses for water bodies. Industrial water supply, wildlife habitats, and aesthetics are designated beneficial uses for all water bodies in the state. If a water body is unclassified, then cold water and primary contact recreation are used as additional default designated uses when water bodies are assessed.

A SBA entails analyzing and integrating multiple types of water body data, such as biological, physical/chemical, and landscape data to address several objectives:

- Determine the degree of designated beneficial use support of the water body (i.e., attaining or not attaining water quality standards).
- Determine the degree of achievement of biological integrity.
- Compile descriptive information about the water body, particularly the identity and location of pollutant sources.
- Determine the causes and extent of the impairment when water bodies are not attaining water quality standards.

1.2 Physical and Biological Characteristics

The Priest River subbasin is 981 square miles, primarily in the northwest corner of the Idaho Panhandle within Bonner and Boundary Counties. Headwaters of the Upper Priest River originate within the Nelson Mountain Range of British Columbia. Headwaters of major streams on the western side of the basin originate in northeast Washington. The subbasin is flanked on the east by the Selkirk Mountain range, and bordered on the west by the mountain crest separating the Kaniksu and Colville National Forests. Elevation within the subbasin ranges from 2,075 feet at the City of Priest River to more than 7,000 feet within the Selkirks.

Hydrologically, the subwatershed has four major complexes or divisions: 1) Upper Priest River and its tributaries, 2) Upper Priest Lake covering 1,338 acres and receiving Upper Priest River and other tributaries. Upper Priest Lake has a 2.7-mile outflow channel called “The Thoroughfare” which drains to Priest Lake, 3) Priest Lake which covers 23,300 acres and has numerous tributaries, and 4) Lower Priest River, the outflow from Priest Lake, which flows 45 river miles to its confluence with the Pend Oreille River at the city of Priest River. The Lower Priest River has several major tributaries.

Fisheries

Historically, four native salmonids have been reported in the Priest River subbasin: westslope cutthroat trout (*Onchorhynchus clarki*), bull trout (*Salvelinus confluentus*), mountain whitefish (*Prosopium williamsoni*), and pygmy whitefish (*Prosopium coulterii*).

In 1998, the US Fish and Wildlife Service (USFWS) listed bull trout as threatened under the federal Endangered Species Act. Westslope cutthroat trout is considered a Species of Special Concern by the State of Idaho, and as a “sensitive species” by Region 1 of the US Forest Service (USFWS). Cutthroat trout can be found in most tributaries in the basin, but the current range of bull trout is limited, primarily found in streams of the northern one-third of the basin and Upper Priest Lake.

The Upper Priest Lake and Priest River watersheds have been identified as key bull trout watersheds in the State of Idaho Bull Trout Conservation Plan (Batt 1996). The Environmental Protection Agency identified streams protected for bull trout spawning and rearing(Code of Federal Regulations, §131.33 Idaho) (section 2.4.2, Figure 3).

For more information on the physical and biological characteristics and fisheries of the Priest River subbasin, refer to the *Priest River Subbasin Assessment and Total Maximum Daily Load* and *Addendum Priest River Subbasin Assessment and Total Maximum Daily Load* (IDEQ, 2001 and 2003).

1.3 Cultural Characteristics

Land ownership within the Priest River subbasin is illustrated in Figures A and B. Over 85% of the subbasin in forested, administered by state, federal, and Canadian provincial agencies. The majority of the land on the west side of the subbasin is Idaho Panhandle National Forests administered through the USFS Priest Lake Ranger District. The majority of the land on the east side of the subbasin is Idaho State Endowment Trust lands administered through the Idaho Department of Lands. These public lands are managed primarily for timber production, but some lands are Special Management Areas (including experimental forests and recreation areas), Research Natural Areas, federal grazing allotments, and some land is leased for cabin and business development.

For more information on the cultural characteristics of the Priest River subbasin, refer to the *Priest River Subbasin Assessment and Total Maximum Daily Load* and *Addendum Priest River Subbasin Assessment and Total Maximum Daily Load* (IDEQ, 2001 and 2003).

2 Subbasin Assessment—Water Quality Concerns and Status

2.1 Water Quality Limited Assessment Units Occurring in the Subbasin

Section 303(d) of the Clean Water Act states that waters that are unable to support their beneficial uses and that do not meet water quality standards must be listed as water quality-limited waters. Subsequently, these waters are required to have TMDLs developed to bring them into compliance with water quality standards.

2.1.1 Assessment Units

AUs now define all the waters of the state of Idaho (Figure 1). These units and the methodology used to describe them can be found in the WBAGII (Grafe et al 2002).

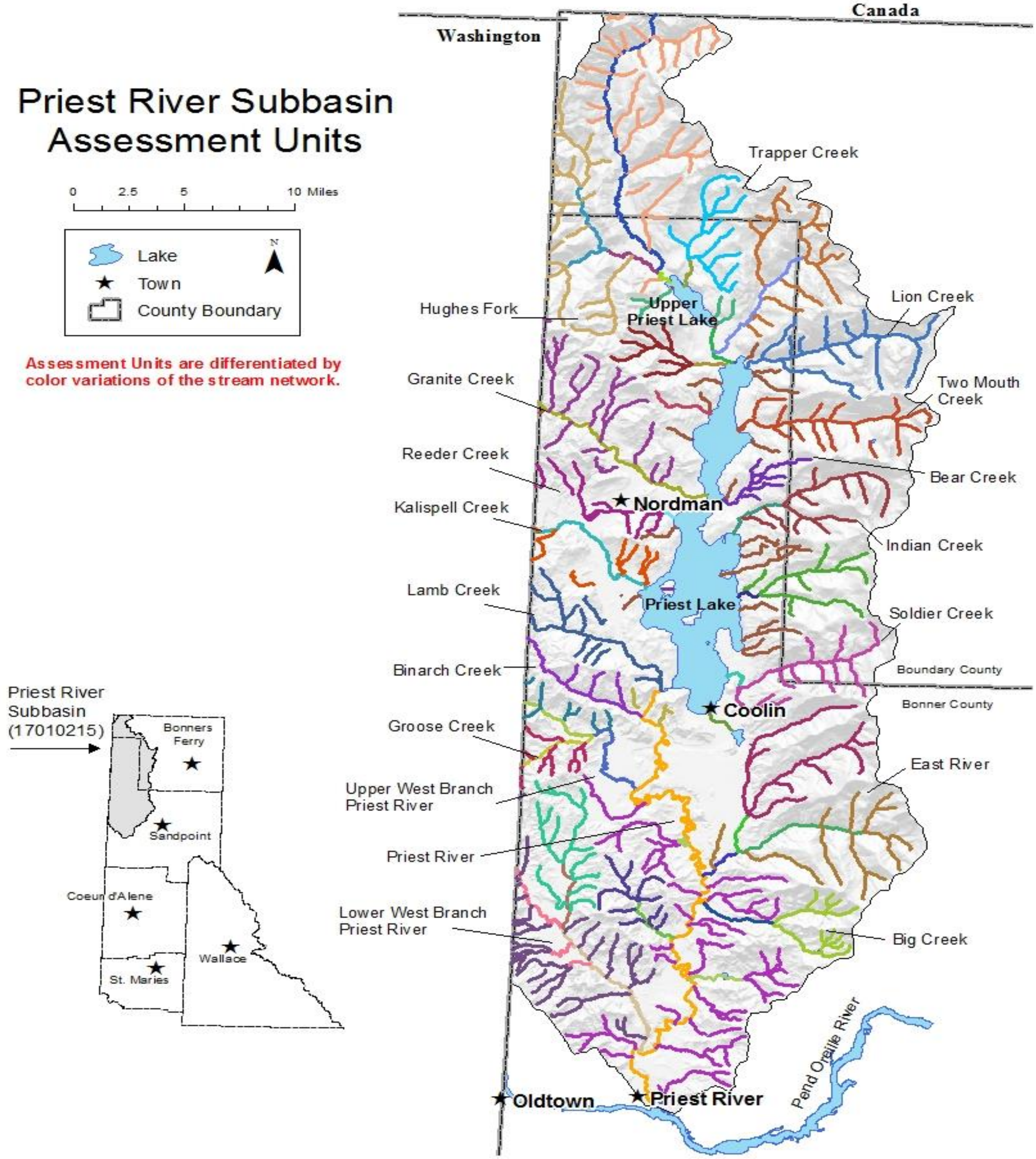

Figure 1. Priest River subbasin assessment units.

Assessment units (AUs) are groups of similar streams that have similar land use practices, ownership, or land management. Stream order, however, is the main basis for determining AUs—although ownership and land use can change significantly, the AU remains the same.

Using assessment units to describe water bodies offers many benefits, the primary benefit being that all the waters of the state are now defined consistently. In addition, using AUs fulfills he fundamental requirement of EPA's 305(b) report, a component of the Clean Water Act wherein states report on the condition of all the waters of the state. Because AUs are a subset of water body identification numbers, there is now a direct tie to the water quality standards for each AU, so that beneficial uses defined in the water quality standards are clearly tied to streams on the landscape.

However, the new framework of using AUs for reporting and communicating needs to be reconciled with the legacy of 303 (d) listed streams. Due to the nature of the court-ordered 1994 303(d) listings, and the subsequent 1998 303(d) list, all segments were added with boundaries from "headwater to mouth." In order to deal with the vague boundaries in the listings, and to complete TMDLs at a reasonable pace, DEQ set about writing TMDLs at the watershed scale (HUC), so that all the waters in the drainage are and have been considered for TMDL purposes since 1994.

The boundaries from the 1998 303(d) listed segments have been transferred to the new AU framework, using an approach quite similar to how DEQ has been writing SBAs and TMDLs. All AUs contained in the listed segment were carried forward to the 2002 303(d) listings in Section 5 of the Integrated Report. AUs not wholly contained within a previously listed segment, but partially contained (even minimally), were also included on the 303(d) list. This was necessary to maintain the integrity of the 1998 303(d) list and to maintain continuity with the TMDL program. These new AUs will lead to better assessment of water quality listing and de-listing.

When assessing new data that indicate full support, only the AU that the monitoring data represents will be removed (de-listed) from the 303(d) list (Section 5 of the Integrated Report.).

2.1.2 Listed Waters

Analyses of historical temperature data collected from streams within the Priest River subbasin indicates Idaho water quality standards for temperature were exceeded in 19 streams (25 assessment units) and their tributaries. All assessment units with data conclusive of exceedance(s) of temperature standards were subsequently placed on Idaho's §303(d) list in pursuit to meet the requirements of the Clean Water Act. Table 1 provides a summary of the listing history of temperature-impaired water bodies in the Priest River subbasin.

Table 1. Water quality listing history of temperature-impaired waterbodies in the Priest River subbasin.

Stream	Assessment Unit	1998	2002	2008	2010
Lower Priest River: Upper West Branch Priest River to mouth	ID17010215PN001_05		X	X	X
Middle Fork East River	ID17010215PN003_02		X	X	X
Middle Fork East River	ID17010215PN003_03		X	X	X
East River	ID17010215PN003_04		X	X	X
North Fork East River	ID17010215PN004_02				X
North Fork East River: source to mouth	ID17010215PN004_03	X	X	X	X
Soldier Creek: source to mouth	ID17010215PN008_03	X	X	X	X
Indian Creek: source to mouth	ID17010215PN010_02		X	X	X
Two Mouth Creek: source to mouth	ID17010215PN012_02	X	X	X	X
Lion Creek: source to mouth	ID17010215PN013_02	X	X	X	X
Trapper Creek: source to mouth	ID17010215PN017_02		X	X	X
Trapper Creek: source to mouth	ID17010215PN017_03		X	X	X
Upper Priest River: ID/Canadian border to mouth	ID17010215PN018_02		X	X	X
Hughes Fork: source to mouth	ID17010215PN019_02		X	X	X
Hughes Fork/Gold Creek	ID17010215PN019_03	X	X		
Beaver Creek: source to mouth	ID17010215PN020_03		X	X	X
Granite Creek: ID/WA border to mouth	ID17010215PN022_04	X	X	X	X
Reeder Creek: source to mouth	ID17010215PN023_02	X	X	X	X
Reeder Creek: source to mouth	ID17010215PN023_03	X	X	X	X
Kalispell Creek: ID/WA border to mouth	ID17010215PN024_03	X	X	X	X
Lamb Creek: ID/WA border to mouth	ID17010215PN025_02		X	X	X
Binarch Creek: ID/WA border to mouth	ID17010215PN026_02		X	X	X
Upper West Branch Priest River: ID/WA border to mouth	ID17010215PN027_04		X	X	X
Lower West Branch Priest River: ID/WA border to mouth	ID17010215PN030_03			X	X
Lower West Branch Priest River: ID/WA border to mouth	ID17010215PN030_04		X	X	X

Impaired water bodies that do not meet applicable water quality standards for one or more beneficial uses by one or more pollutants are placed in Category 5 of Idaho's Integrated Report. Waters can only be removed from Category 5 by having either an EPA-approved TMDL or EPA approval to remove based on good cause. Twenty-seven assessment unit-pollutant combinations are included in Category 5 of Idaho's 2010 Integrated Report (Table 2). The majority of assessment unit-pollutant combinations are associated with exceedances of

Idaho water quality temperature criteria. Other listed pollutants include combined biota/bioassessment, fishes bioassessment, Escherichia coli (*E. coli*), and fecal coliform.

Category 4a of Idaho's Integrated Report list waters with a TMDL completed and approved by the EPA. Twelve assessment unit-pollutant combinations are included in Category 4a of Idaho's 2010 Integrated Report (Table 3). These assessment units have existing TMDLs covered either in the *Priest River Subbasin Assessment and Total Maximum Daily Load* (IDEQ, 2001) or the *Addendum Priest River Subbasin Assessment and Total Maximum Daily Load* (IDEQ 2003).

Table 2. Priest River subbasin 2010 Integrated Report Category 5 streams.

Stream	Assessment Unit	Pollutant
Lower Priest River: Upper West Branch Priest River to mouth	ID17010215PN001_05	Temperature Combined biota/bioassessment
Big Creek: source to mouth	ID17010215PN002_03	*E. coli*
Soldier Creek: source to mouth	ID17010215PN008_03	Temperature
Indian Creek: source to mouth	ID17010215PN010_02	Temperature
Bear Creek: source to mouth	ID17010215PN011_02	Fishes bioassessment
Two Mouth Creek: source to mouth	ID17010215PN012_02	Temperature
Lion Creek: source to mouth	ID17010215PN013_02	Temperature
Trapper Creek: source to mouth	ID17010215PN017_02	Temperature
Trapper Creek: source to mouth	ID17010215PN017_03	Temperature
Upper Priest River: ID/Canadian border to mouth	ID17010215PN018_02	Temperature
Hughes Fork: source to mouth	ID17010215PN019_02	Temperature
Beaver Creek: source to mouth	ID17010215PN020_03	Temperature
Granite Creek: ID/WA border to mouth	ID17010215PN022_04	Temperature
Reeder Creek: source to mouth	ID17010215PN023_02	Temperature
Reeder Creek: source to mouth	ID17010215PN023_03	Temperature
Kalispell Creek: ID/WA border to mouth	ID17010215PN024_03	Temperature Combined biota/bioassessment
Lamb Creek: ID/WA border to mouth	ID17010215PN025_02	Temperature Combined biota/bioassessment
Binarch Creek: ID/WA border to mouth	ID17010215PN026_02	Temperature
Upper West Branch Priest River: ID/WA to Goose Creek	ID17010215PN027_03	Combined biota/bioassessment
Upper West Branch Priest River: ID/WA border to mouth	ID17010215PN027_04	Temperature Combined biota/bioassessment
Goose Creek: ID/WA border to mouth	ID17010215PN028_03	Fecal coliform
Lower West Branch Priest River: ID/WA border to mouth	ID17010215PN030_03	Temperature
Lower West Branch Priest River: ID/WA border to mouth	ID17010215PN030_04	Temperature

Table 3. Priest River subbasin 2010 Integrated Report Category 4a streams.

Stream	Assessment Unit	Pollutant
Lower Priest River: Upper West Branch Priest River to mouth	ID17010215PN001_05	Sediment
Middle Fork East River	ID 1701021 5PN003_02	Temperature
Middle Fork East River	ID 1701021 5PN003_03	Temperature
East River	ID 1701021 5PN003_04	Sediment and Temperature
North Fork East River	ID17010215PN004_02	Temperature
North Fork East River	ID17010215PN004_03	Temperature
Reeder Creek: source to mouth	ID17010215PN023_02	Sediment
Reeder Creek: source to mouth	ID17010215PN023_03	Sediment
Kalispell Creek: ID/WA border to mouth	ID17010215PN024_03	Sediment
Binarch Creek: ID/WA border to mouth	ID17010215PN026_02	Sediment
Lower West Branch Priest River: ID/WA border to mouth	ID17010215PN030_03	Sediment
Lower West Branch Priest River: ID/WA border to mouth	ID17010215PN030_04	Sediment

2.2 Applicable Water Quality Standards

A water quality standard defines the water quality goals for a water body or portion thereof, in part, by designating the use or uses to be made of the water. The designated beneficial use of a water body must consider its actual use, the ability of the water to support in the future a use that is not currently supported, and the basic goal of the Clean Water Act that all waters support aquatic life and recreation where attainable. Idaho must designate its uses accordingly

2.2.1 Beneficial Uses

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 briefly described in the following paragraphs. The *Water Body Assessment Guidance*, second edition (Grafe et al. 2002) gives a more detailed description of beneficial use identification for use assessment purposes.

2.2.2 Existing Uses

Existing uses under the CWA are “those uses actually attained in the waterbody on or after November 28, 1975, whether or not they are included in the water quality standards.” The existing in-stream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.050.02, .02.051.01, and .02.053). Existing uses include uses actually occurring, whether or not the level of quality to fully support the uses exists. A practical application of this concept would be to apply the existing use of salmonid spawning to a water that could support salmonid spawning, but salmonid spawning is not occurring due to other factors, such as dams blocking migration.

2.2.3 Designated Uses

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." 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. Water quality must be sufficiently maintained to meet the most sensitive use. 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 specifically listed for water bodies in Idaho in tables in the Idaho water quality standards (see IDAPA 58.01.02.003.27 and .02.1 09-.02.1 60 in addition to citations for existing uses). Table 4 lists the designated beneficial uses of water bodies in the Priest River subbasin.

Table 4. Priest River subbasin beneficial uses of §303(d) listed streams.

Water Body	Uses[a]	Type of Use
Lower Priest River: Upper West Branch Priest River to mouth	CW, PCR, DWS	Designated
Upper Priest River: ID/Canadian border to mouth	CW, SS, PCR, DWS	Designated

a. CW = cold water, SS = salmonid spawning, PCR= primary contact recreation, SCR = secondary contact recreation, AWS = agricultural water supply, DWS = domestic water supply

2.2.4 Presumed Uses

In Idaho, most water bodies listed in the tables of designated uses in the water quality standards do not yet have specific use designations. These undesignated uses are to be designated. In the interim, and absent information on existing uses, DEQ presumes that most waters in the state will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01 .02.1 01 .01). To protect these so-called "presumed uses," DEQ will apply the numeric cold water criteria and primary or secondary contact recreation criteria to undesignated waters. If in addition to these presumed uses, an additional existing use, (e.g., salmonid spawning) exists, because of the requirement to protect levels of water quality for existing uses, then the additional numeric criteria for salmonid spawning would additionally apply (e.g., intergravel dissolved oxygen, temperature). However, if for example, cold water aquatic life is not found to be an existing use, an use designation to that effect is needed before some other aquatic life criteria (such as seasonal cold) can be applied in lieu of cold water criteria (IDAPA 58.01.02.101.01).

2.2.5 Criteria to Support Beneficial Uses

Beneficial uses are protected by a set of criteria, which include narrative criteria for pollutants such as sediment and nutrients and *numeric* criteria for pollutants such as bacteria, dissolved oxygen, pH, ammonia, temperature, and turbidity (IDAPA 58.01.02.250).

DEQ's procedure to determine whether a water body fully supports designated and existing beneficial uses is outlined in IDAPA 58.01.02.053. The procedure relies heavily upon biological parameters and is presented in detail in the *Water Body Assessment Guidance* (Grafe et al. 2002).

This guidance requires the use of the most complete data available to make beneficial use support status determinations. Figure 2 provides an outline of the stream assessment process for determining support status of the beneficial uses of cold water aquatic life, salmonid spawning, and contact recreation.

Idaho water quality standards for temperature are specific numeric values not to be exceeded during the salmonid spawning and egg incubation period, which varies by species. The DEQ Coeur d'Alene Regional Office set the general spawning and incubation windows with assistance from the Idaho Department of Fish and Game to better reflect and protect salmonid spawning and incubation in north Idaho. Native salmonid species of the Priest River subbasin include westslope cutthroat trout, mountain whitefish, and bull trout. Westslope cutthroat trout are spring spawning salmonids; mountain whitefish and bull trout are both fall spawning salmonids. Idaho's salmonid spawning temperature criteria are summarized in Appendix A.

Bull trout (*Salvelinus confluentus*) is listed as a threatened species by the US Fish and Wildlife Service. To protect the species in Idaho, a recovery plan was developed by the State in which water temperature criteria were set to protect the threatened species (IDAPA 58.01 .02.250.02.g). The US Environmental Protection Agency (EPA) also promulgated bull trout water quality temperature criteria (40 CFR § 131.33). State and federal bull trout temperature criteria are summarized in Appendix A.

The cold water aquatic life criteria is not discussed in this section because where the cold water aquatic life beneficial use criteria apply, the salmonid spawning criteria also apply and are more protective (i.e., require a lower temperature) than the cold water aquatic life criteria. When temperature data exceed the more protective criteria (salmonid spawning), the water body is identified as impaired by temperature regardless of whether it fails the cold water aquatic life criteria also.

It is currently DEQ's policy to allow for minor exceedances of water quality temperature criteria when the exceedance occurs less than 10% of the critical time period and there is no other evidence of thermal inputs (Grafe et al. 2002). Exceptions are also made for water temperature exceedances that occur during periods when air temperatures exceed the 90th percentile of air temperatures recorded in the area (Grafe et al. 2002).

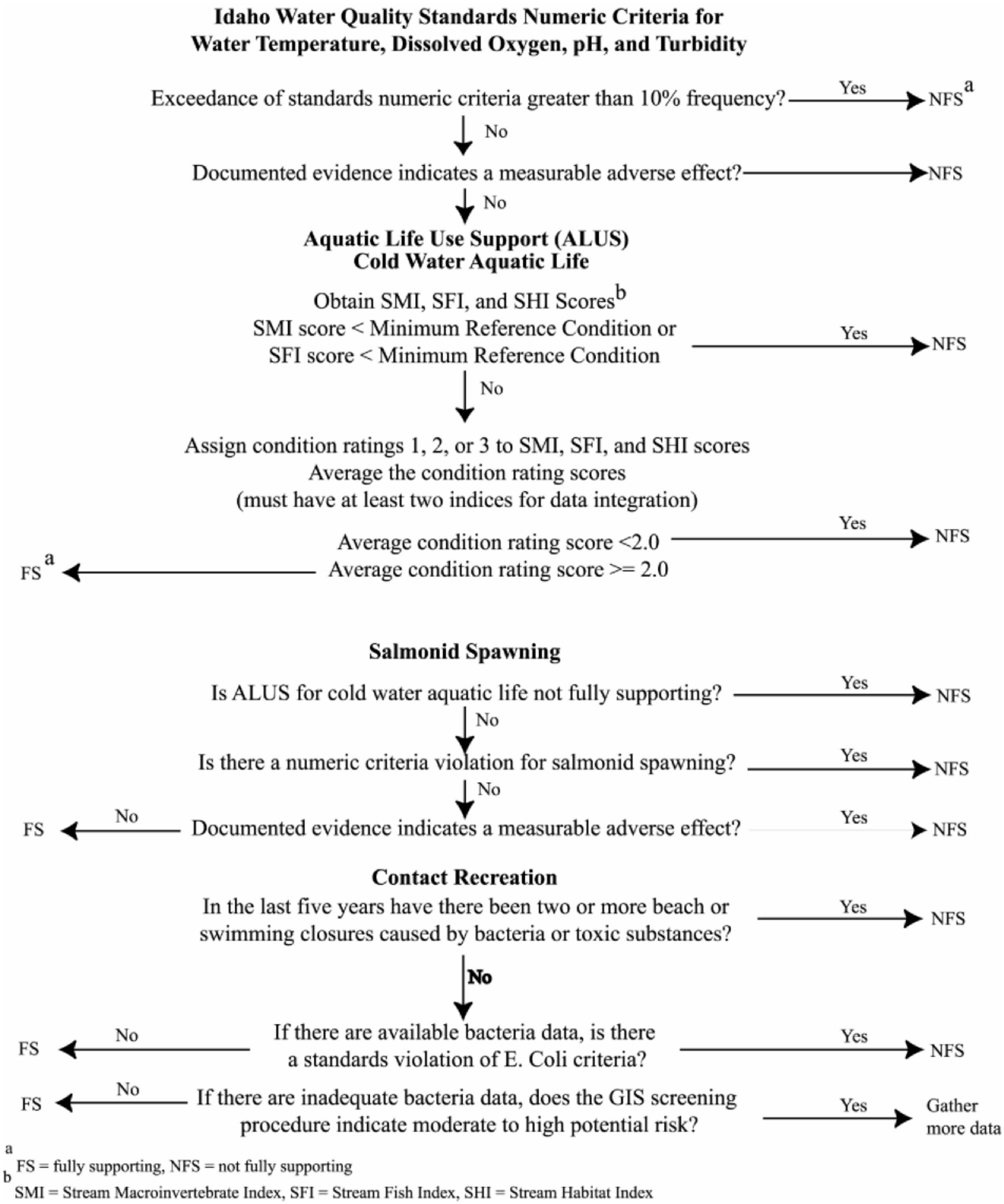

Figure 2. Determination steps and criteria for determining support status of beneficial uses in wadeable streams: Water Body Assessment Guidance, Second Addition (Grafe et al. 2002).

2.3 Pollutant/Beneficial Use Support Status Relationships

Most of the pollutants that impair beneficial uses in streams are naturally occurring stream characteristics that have been altered by humans. That is, streams naturally have sediment, nutrients, and the like, but when anthropogenic sources cause these to reach unnatural levels, they are considered “pollutants” and can impair the beneficial uses of a stream.

Temperature

Temperature is a water quality factor integral to the life cycle of fish and other aquatic species. Different temperature regimes also result in different aquatic community compositions. Water temperature dictates whether a warm, cool, or coldwater aquatic community is present. Many factors, natural and anthropogenic, affect stream temperatures. Natural factors include altitude, aspect, climate, weather, riparian vegetation (shade), and channel morphology (width and depth). Human influenced factors include heated discharges (such as those from point sources), riparian alteration, channel alteration, and flow alteration.

Elevated steam temperatures can be harmful to fish at all life stages, especially if they occur in combination with other habitat limitations such as low dissolved oxygen or poor food supply. Acceptable temperature ranges vary for different species of fish, with cold water species being the least tolerant of high water temperatures. Temperature as a chronic stressor to adult fish can result in reduced body weight, reduced oxygen exchange, increased susceptibility to disease, and reduced reproductive capacity. Acutely high temperatures can result in death if they persist for an extended length of time. Juvenile fish are even more sensitive to temperature variations than adult fish, and can experience negative impacts at a lower threshold value than the adults, manifesting in retarded growth rates. High temperatures also affect embryonic development of fish before they even emerge from the substrate. Similar kinds of affects may occur to aquatic invertebrates, amphibians and mollusks, although less is known about them.

2.4 Summary and Analysis of Existing Water Quality Data

2.4.1 Hydrological Characteristics

The Priest River subbasin has an abundance of tributaries with approximately 1,315 miles of perennial streams. Upper and Lower Priest River flow north to south, while the aspects of most other tributaries are from east to west. Tributaries on the northern and eastern sides of the basin originate in the Selkirk Mountains, and a large percentage of their stream channels are moderate to steep-gradient channels flowing through deep V-shaped mountainous valleys. On the western side of the subbasin, from Reeder Creek down to Lower West Branch Priest River, a large percentage of the stream lengths have gradual gradients (less than 1.5%) flowing through valley floodplains. Stream order and stream gradient maps for the subbasin are in Appendix B. For a more detailed description of the hydrological characteristics of the Priest River subbasin, refer to the *Priest River Subbasin Assessment and Total Maximum Daily Load* (DEQ 2001).

2.4.2 Water Quality Data

Temperature criteria for protection of cold water aquatic life and salmonid spawning beneficial uses were applied throughout the subbasin. Stream temperature data was collected and/or assessed following the completion of TMDLs in 2003. Stream temperature data loggers were deployed following the methodologies outlined by DEQ to ensure the data collected is representative of the location and to help eliminate sampling error (DEQ 2000c) (Figure 3). The elevation at which the data logger was deployed was taken into consideration when evaluating the salmonid spawning windows. Future efforts to monitor stream water temperature should follow the same protocols.

Data were evaluated against the cold water aquatic life, spring and fall salmonid spawning, and bull trout criteria. Assessments found widespread exceedances of Idaho numeric water temperature criteria, particularly for salmonid spawning (Table 5). Data recorded within the subbasin did not exceed the cold water aquatic life beneficial use criteria. However, as stated earlier, the salmonid spawning criteria are more protective (lower temperature) than the cold water aquatic life criteria. Therefore, when temperature data exceed the more protective criteria (salmonid spawning), the water body is assessed as impaired.

DEQ recently changed the water quality criteria by removal of the salmonid spawning 9 °C maximum daily average temperature. Regardless of this change, all AUs assessed in this document exceed the 13 °C maximum weekly maximum temperature and still require TMDL development (X). However, as a result of this rule change, Gold, Granite, Malcom, the North Fork Indian, Beaver, and Tango Creeks do not exceed the salmonid spawning criteria. All but the North Fork of Indian Creek still fail either the Idaho bull trout criteria or federal bull trout criteria or both.

It is currently DEQ's policy to allow for minor exceedances of water quality temperature criteria when the exceedance occurs less than 10% of the critical time period and there is no other evidence of thermal inputs (Grafe et al. 2002). Exceptions are also made for water temperature exceedances that occur during periods when air temperatures exceed the 90th percentile of air temperatures recorded in the area (Grafe et al. 2002). The data evaluated in Table 5 and Table 6, exceed the salmonid spawning criteria by more than 10%.

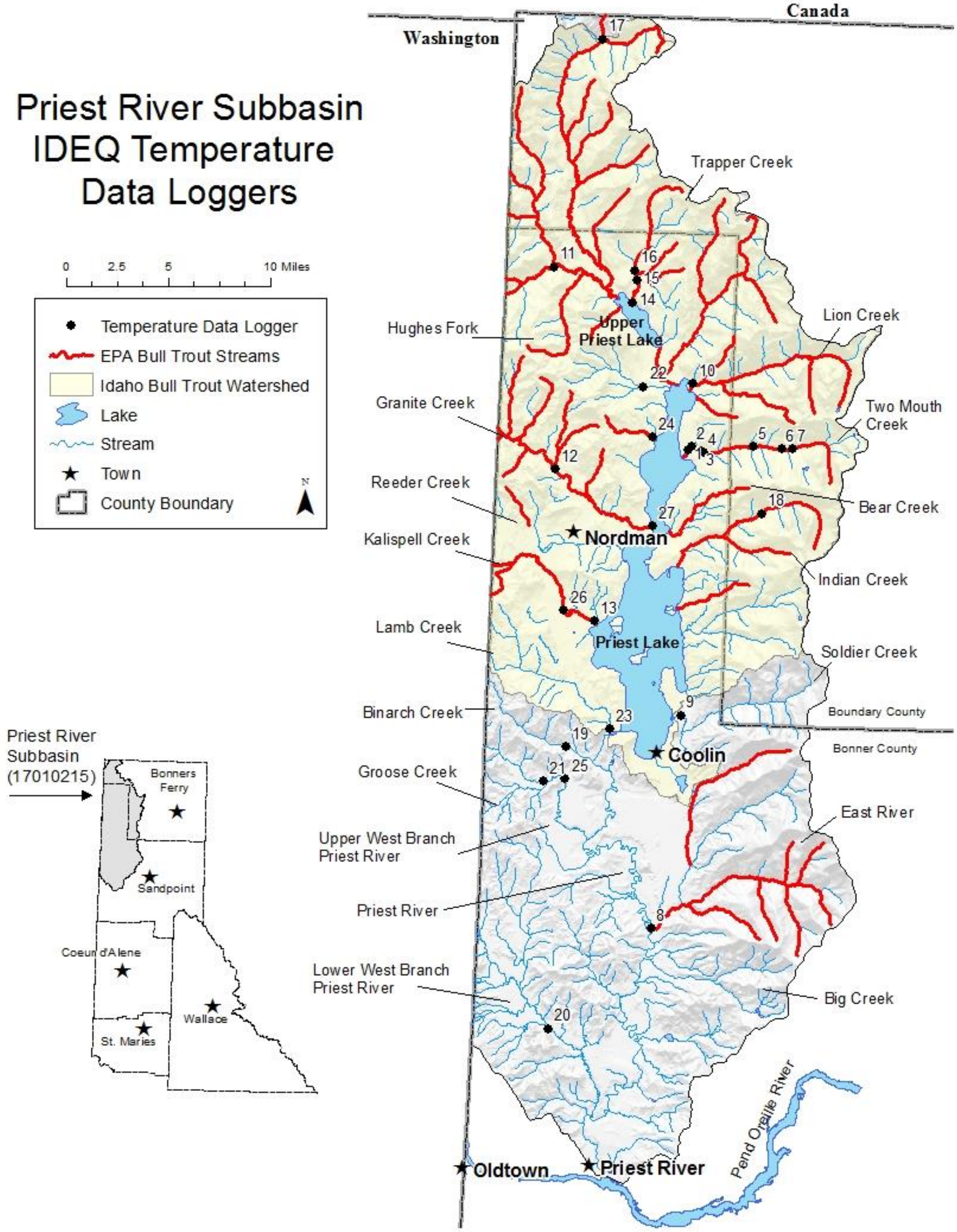

Figure 3. Priest River subbasin temperature data logger locations.

Table 5. Temperature data evaluated in the Priest River subbasin.

Stream Name	Assessment Unit	Map ID	Temperature Logger ID	Number of Spring Spawning Dates Evaluated	Percent Exceedance of Spring Spawning Dates (%)	Number of Fall Spawning Dates Evaluated	Percent Exceedance of Fall Spawning Dates (%)
					13 °C MWMT[a]		13 °C MWMT[a]
Two Mouth Creek 1	ID17010215PN012_02	1	1996SCDATL0005	0	0	61	39
Two Mouth Creek 2	ID17010215PN012_02	2	1996SCDATL0006	0	0	61	21
Two Mouth Creek 3	ID17010215PN012_02	3	1996SCDATL0007	0	0	61	26
Two Mouth Creek 4	ID17010215PN012_02	4	1996SCDATL0008	0	0	61	21
Two Mouth Creek 5	ID17010215PN012_02	5	1996SCDATL0009	0	0	61	16
Two Mouth Creek 6	ID17010215PN012_02	6	1996SCDATL0010	0	0	61	10
Two Mouth Creek 7	ID17010215PN012_02	7	1996SCDATL0011	13	69	61	2
East River	ID17010215PN003_04	8	1997SCDATL0009	0	0	69	57
Soldier Creek[b]	ID17010215PN008_03	9	1997SCDATL0010	0	0	69	49
Lion Creek	ID17010215PN013_02	10	1997SCDATL0011	0	0	69	35
Gold Creek	ID17010215PN019_03	11	1997SCDATL0012	0	0	69	3
Granite Creek	ID17010215PN022_04	12	1997SCDATL0013	0	0	69	4
Kalispell Creek	ID17010215PN024_03	13	1997SCDATL0014	0	0	69	26
Trapper Creek 1	ID17010215PN017_03	14	1998SCDATL0043	26	81	66	61

Stream Name	Assessment Unit	Map ID	Temperature Logger ID	Number of Spring Spawning Dates Evaluated	Percent Exceedance of Spring Spawning Dates (%)	Number of Fall Spawning Dates Evaluated	Percent Exceedance of Fall Spawning Dates (%)
					13 °C MWMT[a]		13 °C MWMT[a]
Trapper Creek 2	**ID17010215PN017_03**	**15**	**1998SCDATL0044**	**26**	**73**	**66**	**58**
Trapper Creek 3	ID17010215PN017_02	16	1998SCDATL0045	26	46	66	44
Malcom Creek	ID17010215PN018_02	17	1999SCDATL0053	0	0	54	4
North Fork Indian Creek	ID17010215PN010_02	18	1999SCDATL0054	0	0	51	2
Binarch Creek[b]	ID17010215PN026_02	19	2000SCDATL0002	8	100	76	58
Lower West Branch Priest River[b]	ID17010215PN030_04	20	2000SCDATL0019	8	100	63	46
Upper West Branch Priest River[b]	ID17010215PN027_03	21	2000SCDATL0031	8	100	63	60
Beaver Creek	ID17010215PN020_03	22	2001SCDATL0007	0	0	72	0
Lamb Creek	ID17010215PN025_02	23	2001SCDATL0014	0	0	72	33
Tango Creek	ID17010215PN021_02	24	2001SCDATL0020	0	0	72	0
Upper West Branch Priest River[b]	ID17010215PN027_04	25	2001SCDATL0021	0	0	72	64
Kalispell Creek	ID17010215PN024_03	26	2001SCDATL0024	0	0	72	49
Granite Creek	ID17010215PN022_04	27	2001SCDATL0030	0	0	72	42

a. MWMT = maximum weekly maximum temperature
b. Assessment unit not within state or federal bull trout watershed

Table 6. Bull Trout temperature criteria evaluation for temperature data loggers located in Bull Trout watersheds.

Stream Name	Assessment Unit	Map ID	Temp Logger ID	Idaho Criteria				Federal Criteria	
				Number of Rearing Days Evaluated	Percent Exceedance Rearing Days (%) 13 °C MWMT[a]	Number of Spawning Days Evaluated	Percent Exceedance of Fall Spawning Days (%) 9 °C MDAT[b]	Number of Days Evaluated	Percent Days Exceeding 10 °C MWMT[a] (%)
Two Mouth Creek 1	ID17010215PN012_02	1	1996SCDATL0005	31	84	30	43	68	74
Two Mouth Creek 2	ID17010215PN012_02	2	1996SCDATL0006	31	74	30	47	68	75
Two Mouth Creek 3	ID17010215PN012_02	3	1996SCDATL0007	31	77	30	50	68	75
Two Mouth Creek 4	ID17010215PN012_02	4	1996SCDATL0008	31	61	30	40	68	71
Two Mouth Creek 5	ID17010215PN012_02	5	1996SCDATL0009	31	42	30	37	68	60
Two Mouth Creek 6	ID17010215PN012_02	6	1996SCDATL0010	31	10	30	30	68	47
Two Mouth Creek 7	ID17010215PN012_02	7	1996SCDATL0011	31	6	30	13	68	34
East River	ID17010215PN003_04	8	1997SCDATL0009	n.a.	n.a.	n.a.	n.a.	48	90
Lion Creek	ID17010215PN013_02	10	1997SCDATL0011	18	89	53	42	48	71
Gold Creek	ID17010215PN019_03	11	1997SCDATL0012	18	0	53	30	48	60
Granite Creek	ID17010215PN022_04	12	1997SCDATL0013	18	0	53	28	48	58
Kalispell Creek	ID17010215PN024_03	13	1997SCDATL0014	18	78	53	51	48	65
Trapper Creek 1	ID17010215PN017_03	14	1998SCDATL0043	31	100	35	77	111	79
Trapper Creek 2	ID17010215PN017_03	15	1998SCDATL0044	31	100	35	91	111	79
Trapper Creek 3	ID17010215PN017_02	16	1998SCDATL0045	31	68	35	80	111	77
Malcom Creek	ID17010215PN018_02	17	1999SCDATL0053	31	0	23	0	63	49
North Fork Indian Creek	ID17010215PN010_02	18	1999SCDATL0054	31	0	20	0	60	2
Tango Creek	ID17010215PN021_02	24	2001SCDATL0020	31	0	41	29	75	43
Beaver Creek	ID17010215PN020_03	22	2001SCDATL0007	31	0	41	39	n.a.	n.a.
Lamb Creek	ID17010215PN025_02	23	2001SCDATL0014	31	74	41	46	n.a.	n.a.

Stream Name	Assessment Unit	Map ID	Temp Logger ID	Idaho Criteria				Federal Criteria	
				Number of Rearing Days Evaluated	Percent Exceedance Rearing Days (%) 13 °C MWMT[a]	Number of Spawning Days Evaluated	Percent Exceedance of Fall Spawning Days (%) 9 °C MDAT[b]	Number of Days Evaluated	Percent Days Exceeding 10 °C MWMT[a] (%)
Kalispell Creek	ID17010215PN024_03	26	2001SCDATL0024	31	100	41	68	75	95
Granite Creek	ID17010215PN022_04	27	2001SCDATL0030	31	100	41	68	75	83

a. MWMT = maximum weekly maximum temperature
b. MDAT = maximum daily average temperature

3 Total Maximum Daily Loads

A TMDL prescribes an upper limit on discharge of a pollutant from all sources so as to assure water quality standards are met. It further allocates this load capacity (LC) among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a wasteload allocation (WLA); and nonpoint sources, each of which receives a load allocation (LA). Natural background (NB), when present, is considered part of the LA, but is often broken out on its own because it represents a part of the load not subject to control. Because of uncertainties regarding quantification of loads and the relation of specific loads to attainment of water quality standards, the rules regarding TMDLs (Water quality planning and management, 40 CFR Part 130) require a margin of safety (MOS) be a part of the TMDL.

Practically, the margin of safety is a reduction in the load capacity that is available for allocation to pollutant sources. The natural background load is also effectively a reduction in the load capacity available for allocation to human-made pollutant sources. This can be summarized symbolically as the equation: LC = MOS + NB + LA + WLA = TMDL. The equation is written in this order because it represents the logical order in which a loading analysis is conducted. First the load capacity is determined. Then the load capacity is broken down into its components: the necessary margin of safety is determined and subtracted; then natural background, if relevant, is quantified and subtracted; and then the remainder is allocated among pollutant sources. When the breakdown and allocation are completed the result is a TMDL, which must equal the load capacity.

Another step in a loading analysis is the quantification of current pollutant loads by source. This allows the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility, and is necessary in order for pollutant trading to occur. 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, determination of critical conditions can be more complicated than it may appear on the surface.

A load is fundamentally a quantity of a 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. 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.

Temperature TMDLs will be developed for all assessment units (AU) exceeding Idaho water quality criteria. AUs addressed by the *Addendum Priest River Subbasin Assessment and Total Maximum Daily Load* are reevaluated in this analysis because of new techniques in temperature TMDL development (Table B). TMDLs developed in 2001 and 2003 relied on a mathematical equation to prescribe shade based on elevation to achieve a desired stream temperature. Due to the elevation of the watersheds analyzed, the shade requirements in most locations exceeded 100%. Complete stream shade is not achievable in a natural setting, so those streams addressed by the 2003 TMDLs were reevaluated in this document using potential natural vegetation (PNV) method developed by Shumar and de Varona (2009).

3.1 In-stream Water Quality Targets

For the Priest River subbasin temperature TMDLs, a potential natural vegetation (PNV) approach was used. The Idaho water quality standards include a provision (IDAPA 58.01.02.200.09) which establishes that if natural conditions exceed numeric water quality criteria, exceedance of the criteria is not considered to be a violation of water quality standards. In these situations, natural conditions essentially become the water quality standard, and the natural level of shade and channel width become the target of the TMDL. The instream temperature which results from attainment of these conditions is consistent with the water quality standards, even though it may exceed numeric temperature criteria. See Appendix A for further discussion of water quality standards and background provisions.

The PNV approach is described below. Additionally, the procedures and methodologies to develop PNV target shade levels and to estimate existing shade levels are described in Shumar and De Varona (2009). For a more complete discussion of shade and its effects on stream water temperature, the reader is referred to the *South Fork Clearwater Subbasin Assessment and TMDL* (IDEQ, 2004) and *The Potential Natural Vegetation (PNV) Temperature Total Maximum Daily Load (TMDL) Procedures Manual* (Shumar and De Varona, 2009).

3.1.1 Potential Natural Vegetation Approach to Temperature TMDLs

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 likely to be controlled. 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 the density of riparian vegetation and water storage in the alluvial aquifer. Streamside 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 may also provide shade to the stream. We can measure the amount of shade that a stream receives 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 other optical equipment that works 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.

PNV along a stream is that riparian plant community that has grown 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 solar inputs.

We can estimate PNV (and therefore target shade) from models of plant community structure (i.e., 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 there is to decrease solar gain. Streams disturbed by wildfire 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 shade was estimated for 21 AUs from visual interpretation of aerial photos. These estimates were partially field-verified by measuring shade with a Solar Pathfinder at systematically located points along the streams (see below for methodology). 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 the region. A shade curve shows the relationship between effective shade and stream width. As a stream gets wider, shade decreases because the vegetation has less ability to shade the center of wide streams. As vegetation gets taller, the plant community is able to provide more shade at any given channel width.

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. In this case, DEQ used the Spokane, Washington, station. The difference between existing and target solar load, assuming existing load is higher, is the load reduction necessary to bring the stream back into compliance with water quality standards. PNV shade and associated target solar loads are assumed to be the natural condition; thus, stream temperatures under PNV conditions are assumed to be natural (so long as there are no point sources or any other anthropogenic sources of heat 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.

3.1.1.1 Pathfinder Methodology

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 reach, ten traces are taken at systematic 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. Traces were taken following the manufacturer's instructions. Systematic sampling was used because it is easiest to accomplish without biasing the sampling location. For each sampled reach, the sampler started at a unique location (such as 50 to 100 meters from a bridge or fence line) and then proceeded upstream or downstream stopping to take additional traces at fixed intervals (e.g., every 50 meters, every 50 paces, etc.).

When possible, the sampler also measured bankfull widths, photographed the landscape, and took notes while taking Solar Pathfinder traces. This documentation helps show changes in riparian plant communities and what kinds of plant species (the large, dominant, shade-producing ones) are present.

3.1.1.2 Aerial Photo Interpretation

Existing stream shade levels were estimated using aerial photos and geographic information system (GIS) software. The software allowed the user to view high- resolution aerial photography on a computer screen along with other information such as streams, topography, monitoring locations, road networks, and other mapping information. Stream shade levels were estimated by viewing the aerial photo at its highest resolution and relying on best professional judgment developed while working in the field.

Estimates of shade were marked out on a 1:100,000 or 1:250,000 national hydrography dataset taking into account plant type and natural breaks in vegetation density. 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 we estimated shade for a particular stream segment at between 50% and 59%, a shade class of 50% would be assigned to that stream segment. The estimate is based on a general observation of the aerial photos and best professional judgment about the kind of vegetation present, its density, and stream width. The estimate is conservative in that it may overestimate the solar load to the stream. 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 shade estimates made from aerial photos are strongly influenced by canopy cover. It is not always possible when using this method to visualize or anticipate shade characteristics resulting from topography and landform. However, research has shown that canopy cover and shade are similar (OWEB 2001), reinforcing the idea that riparian vegetation and objects proximal to the stream provide the most shade.

3.1.1.3 Stream Morphology

Measures of current bankfull width or near-stream disturbance zone width may not reflect widths that were present under PNV. As impacts to streams and riparian areas occur, width-to-depth ratios tend to increase such that streams become wider and shallower. Shadow length 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 been eroded away.

This width factor (i.e., NSDZ or Bankfull Width) may not be discernible from the aerial photo work described previously. Accordingly, this parameter must be estimated from available information. We use regional curves for the major basins in Idaho, data which was compiled by Diane Hopster of Idaho Department of Lands (Figure 4), to estimate natural bankfull width.

For each stream evaluated in the loading analysis, natural bankfull width is estimated based on drainage area of the Pend Oreille curve from Figure 4. Although estimates from other curves were examined (i.e. Spokane, Kootenai, Clearwater), the Pend Oreille curve was ultimately chosen because of its proximity to the Priest River subbasin and its similar topography. Tables containing natural bankfull width estimates for each stream in each sub-watershed are presented in Appendix C.

Natural bankfull with curve estimates were partially field-verified by using Beneficial Use Reconnaissance (BURP) data collected by DEQ. However, for the Priest River subbasin, only a few BURP sites existed at the time of this evaluation. In general, we have found in other watersheds BURP bankfull width data to agree with the natural bankfull width estimates from the Pend Oreille basin curve. Existing widths, where available, are presented in loading tables in Appendix C. Existing widths values in the table are either based on actual data, or in some instances, it was appropriate to provide crude measurements of stream width as seen on aerial photographs. Where such data/measurements are not attainable, existing width in the table matches estimated natural width.

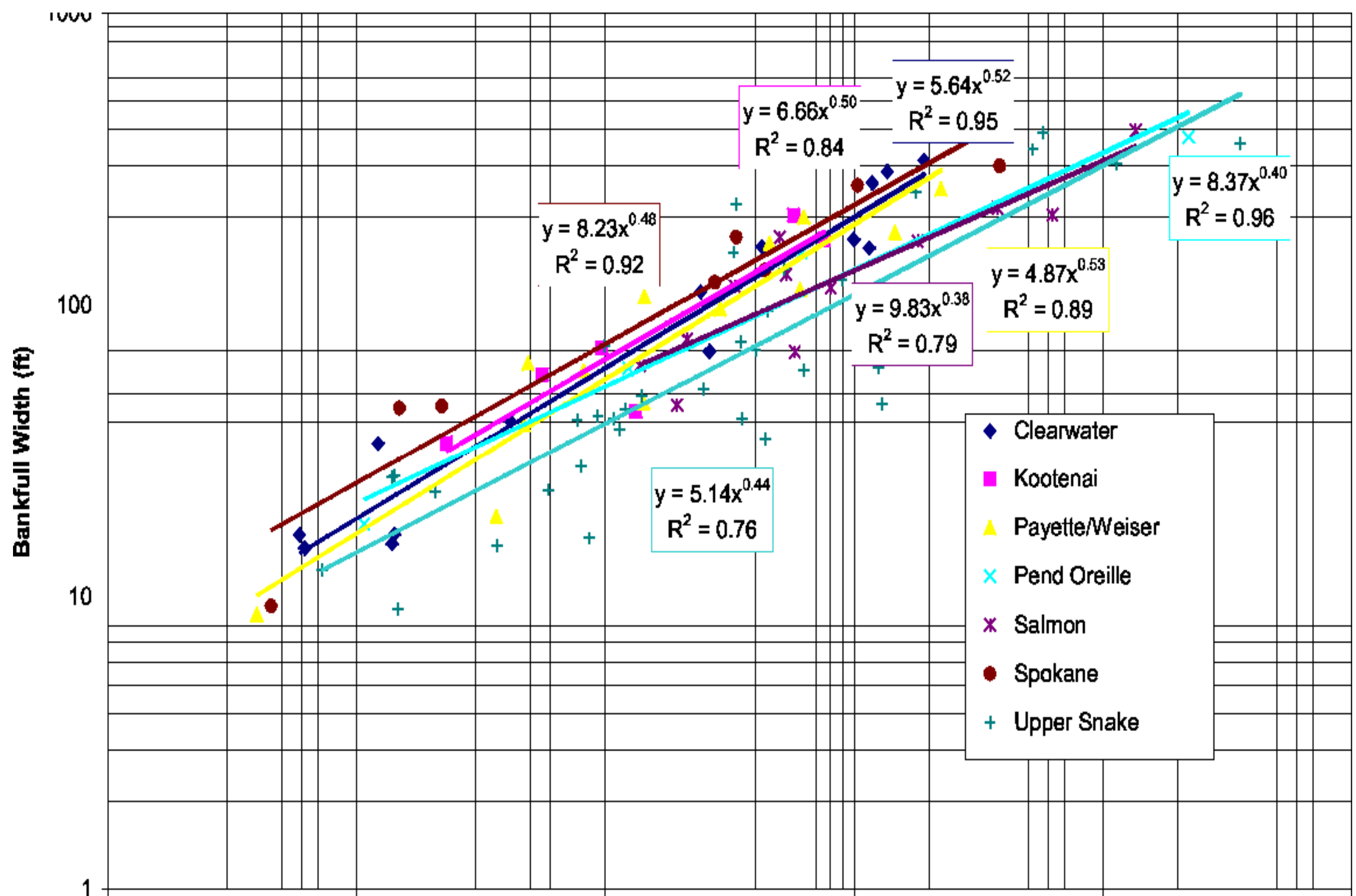

Figure 4. Bankfull width as a function of drainage area.

3.1.2 Design Conditions

Streams examined in this document are found in two sub-ecoregions in the Northern Rockies Level III Ecoregion defined by McGrath et al. (2001). The Priest River subbasin is located in the Northern Rockies Level 3 Ecoregion of McGrath et al. (2001). The higher elevations surrounding the Lake are in the Selkirk Mountains Level 4 Ecoregion, an area known for its mixed coniferous forests of Pacific species (grand fir, western redcedar and western hemlock) and Rocky Mountain species (western larch, western white pine and lodgepole pine). A combination of weather patterns, high relief and very narrow valleys results in more summer precipitation, fog, and relative humidity at low to mid elevations than elsewhere in northern Idaho. Boreal influence is stronger here resulting in lower subalpine fir-spruce zones and more extensive whitebark pine than in the rest of the Northern Rockies Ecoregion. North-facing valleys have extensive peat lands and avalanche chutes are common.

The lower elevations around the major river valleys are in the Inland Maritime Foothills and Valleys Level 4 Ecoregion (McGrath et al., 2001). Here western hemlock, western redcedar, grand fir, Douglas fir, Ponderosa pine, lodgepole pine, and western larch are common. Birch, alder and aspen are common on floodplains and as seral stands on uplands.

The Panhandle National Forest has grouped this wide variety of forests into habitat types, which form the basis for 11 vegetation response units (VRUs) that can be grouped into four basic forest types (AD) based on temperature and moisture (Table 7). VRUs are further explained in the procedures manual for PNV temperature TMDLs (Shumar and De Varona 2009). These VRUs were used as the basis for developing shade curves used to set target shade levels for the streams in this analysis.

Most streams examined are in the moderately warm and moderately cool/moist assemblage of forests of Group B (VRUs 4, 5, and 6). Other forest types include Groups A and C as well as stunted forests at high elevation rocky sites. In addition to these forest types, Shumar and De Varona (2009) include shade curves developed for two lower-elevation hardwood- conifer mix forests that occur at lower elevation, wider floodplains. The labels for these groups, although identified as Nonforest Group 1 and 2, are perhaps a misnomer because they are a mix of both coniferous and hardwood species and have a substantial tree component.

Table 7. Panhandle National Forests basic forest types and vegetation response units.

Forest Type	Vegetation Response Units	Forest Description
Group A	1, 2, and 3	This group contains the warmer and drier habitat types. These areas include warm, dry grasslands to moderately cool and dry upland sites. The dry, lower-elevation open ridges are composed of Douglas-fir and ponderosa pine in well-stocked and fairly open-growing conditions. Moderately moist upland areas and dense draws also include larch and lodgepole pine, with lesser amounts of ponderosa pine. While the growing season is fairly long, high solar inputs and moderately shallow soils often result in soils that dry out early in the growing season, which results in low to moderate site productivity.
Group B	4, 5, and 6	This group occupies most of the moist sites along benches and stream bottoms. The moderating effects of the inland maritime climate ecologically influence this group. This group is widespread throughout the forest and has the most biological productivity. Douglas and grand fir, lodgepole and ponderosa pine, western larch, western redcedar, and quaking aspen commonly occur within the vegetation group.
Group C	7 and 8	This group contains the moist, lower subalpine forest setting and is common on the northwest- to east-facing slopes, riparian and poorly drained subalpine sites, and moist forest pockets. Vegetation productivity is moderate to high as a result of the high moisture-holding capacity and nutrient productivity of loess deposits, adequate precipitation, and a good growing season.
Group D	9, 10, and 11	This group is typified by cool and moderately dry conditions with moderate solar input. The local climate is characterized by a short growing season with early summer frosts. Due to generally shallow soils, slope position, and aspect, soil moisture is often limited during late summer months. This group is generally found on rolling ridges and upper reaches of convex mountain slopes. Subalpine fir, lodgepole pine, and Engelmann spruce are dominant tree species within this vegetation group.

3.1.3 Target Shade Selection

To determine potential natural vegetation shade targets for the Priest River subbasin, effective shade curves for the Kaniksu National Forest groups A, B. C, and were examined (see Figures D1 to D3, Appendix D). Effective shade curves include percent shade on the vertical axis and stream width on the horizontal axis. As a stream becomes wider, a given vegetation type loses its ability to shade wider and wider streams (Figure 5). Shumar and De Varona (2009) provide an explanation of how shade curves were developed for the Panhandle region of Idaho.

The effective shade calculations are based on a 6-month period from April through September. This period coincides with the critical time when temperatures could negatively affect cold water aquatic life and salmonid spawning beneficial uses. Late July and early August typically represent the period of highest stream temperatures.

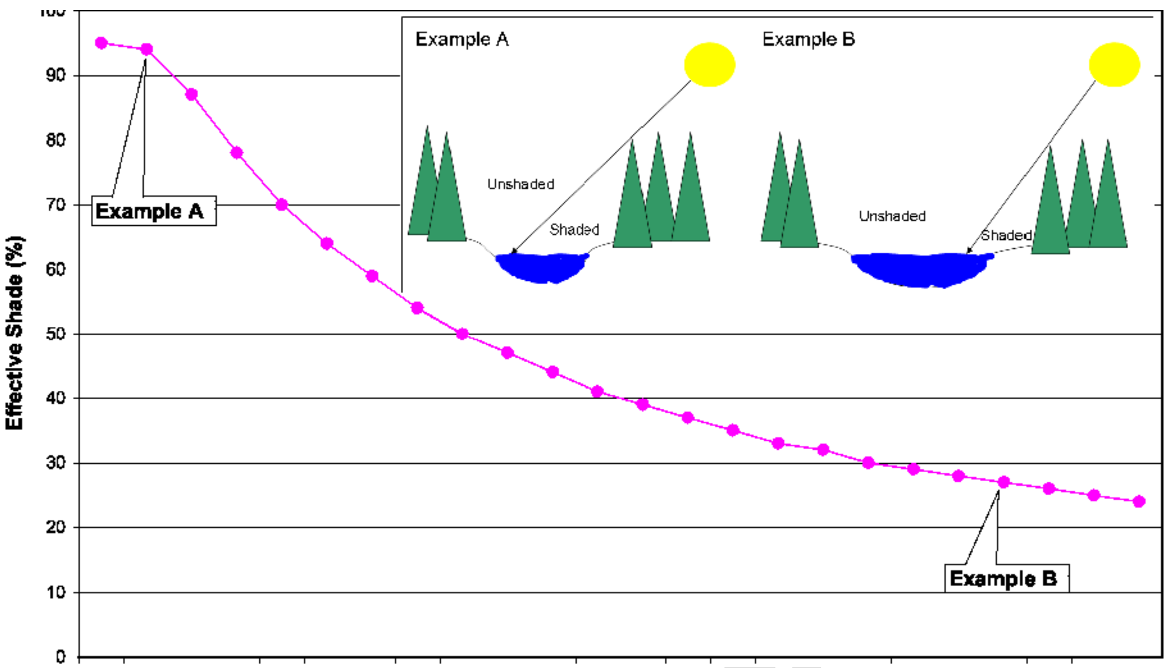

Figure 5. Example relationship between stream width and shade.

The use of the various shade curves described below is based on an aquatic response unit (ARU) filter, which is a USFS method used to differentiate between forest and nonforest riparian vegetation (see Shumar and De Varona 2009). If the stream order is between 1st and 4th and the gradient is ≥3%, then one of the Forest Group shade curves is used for that section of stream. Stream order and stream gradients are presented in Appendix B. Which Forest Group shade curve is used for a particular section of stream depends on the predominant forest type (i.e., VRU) surrounding the stream in that section. For example,Group B tends to be the dominant shade curve utilized in this TMDL. Shade target percentages in Group B are determined from averaging three aspect-based shade curves, one for each cardinal direction (N-S and E-W) and one for the 45 degree angles (Figure D2, Appendix D).

If stream orders are between 1st and 4th, but the gradient is <3%, then the stream falls into the Nonforest Group 1 category from the ARU filter (Shumar and De Varona 2009). Generally, the lower portions of most streams fall into the <3% slope class. Shade curves developed for this group include a variety of coniferous and deciduous vegetation (see Shumar and De Varona 2009). Shade curves were developed for even-numbered channel widths only (i.e., 2 meters, 4 meters, etc.). Targets for odd-numbered widths are extrapolated by averaging the higher and lower even-numbered width targets (Table 8). When stream orders increase to the 5th and 6th level, streams and their associated floodplains become wider and a second group of non-coniferous forest vegetation is needed for describing shade targets (Table 9). Refer to Shumar and De Varona (2009) for more explanation in determining shade targets.

Table 8. Shade targets for Nonforest Group 1 vegetation type at various stream widths.

Non-Forest	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m	21m	22m	23m	24m	25m
Group 1 - Hardw oods - 0/180		93		75		61		53		47		42		38		35		32		30		28		26	
45/135/225/315		93		77		64		55		49		43		39		35		32		30		27		25	
90/270		95		82		69		57		47		39		34		30		27		25		23		21	
Target (%)	**97**	**94**	**86**	**78**	**72**	**65**	**60**	**55**	**52**	**48**	**45**	**41**	**39**	**37**	**35**	**33**	**32**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**24**

Non-Forest	26m	27m	28m	29m	30m	31m	32m	33m	34m	35m	36m	37m	38m	39m	40m	41m	42m	43m	44m	45m	46m	47m	48m	49m	50m
Group 1 - Hardw oods - 0/180	24		23		22		20		19		18		17		17		16		15		15		14		14
45/135/225/315	24		22		21		19		18		17		17		16		15		14		14		13		13
90/270	20		19		17		16		16		15		14		13		13		12		12		11		11
Target (%)	**23**	**22**	**21**	**21**	**20**	**19**	**18**	**18**	**18**	**18**	**17**	**17**	**16**	**16**	**15**	**15**	**15**	**15**	**14**	**14**	**14**	**14**	**13**	**13**	**13**

Table 9. Shade targets for Nonforest Group 2 vegetation type at various stream widths.

Non-Forest	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m	21m	22m	23m	24m	25m
Group 2 - Hardw oods - 0/180		86		67		54		47		41		37		34		31		29		26		25		23	
45/135/225/315		88		69		57		49		43		39		35		32		29		27		25		23	
90/270		90		74		62		53		44		37		32		28		25		23		21		20	
Target (%)	**94**	**88**	**79**	**70**	**64**	**58**	**54**	**50**	**47**	**43**	**41**	**38**	**36**	**34**	**32**	**30**	**29**	**28**	**27**	**25**	**25**	**24**	**23**	**22**	**21**

Non-Forest	26m	27m	28m	29m	30m	31m	32m	33m	34m	35m	36m	37m	38m	39m	40m	41m	42m	43m	44m	45m	46m	47m	48m	49m	50m
Group 2 - Hardw oods - 0/18	22		20		19		18		17		17		16		15		14		14		13		13		12
45/135/225/315	21		20		19		18		17		16		15		14		14		13		13		12		12
90/270	18		17		16		15		14		14		13		12		12		11		11		10		10
Target (%)	**20**	**20**	**19**	**19**	**18**	**18**	**17**	**17**	**16**	**16**	**16**	**16**	**15**	**15**	**14**	**14**	**13**	**13**	**13**	**13**	**12**	**12**	**12**	**12**	**11**

The east-side drainages such as Trapper Creek, Lion Creek, Two Mouth Creek, Indian Creek, and East River originate high on the Selkirk Crest above Priest Lake. This high elevation rocky terrain is subject to heavy snows and wind that result in reduced vegetation stature. While not completely Krummholz in nature, the forests in this region are often reduced in height and cover compared to lower elevation forests. We have produced a specific shade curve for these Rocky/High Elevation areas (Figure D5, Appendix D) from forest data collected by LiDAR images of four undisturbed headwaters locations (Keokee Creek, Devils Creek and Uleda Creek). Average canopy cover (65%) and average height (32 ft.) data from LiDAR results were used to calculate shade targets.

Additionally, there are stream locations scattered throughout low elevation areas around the lake where the riparian community is dominated by thinleaf alder meadows. In those locations (Trapper, Lion, Two Mouth, East, Snow, Soldier, Lamb, Reeder, Floss), we have used an alder shade curve (Figure D6, Appendix D) from Shumar and De Varona (2009) for shade targets.

In a few instances, rock outcrop or avalanche paths have directly influenced the streamside vegetation. A forest or hardwood shade curve would not be appropriate for targets in these areas as the vegetation is unlikely to attain target levels. In such locations we have set the existing shade level as interpreted through aerial photos as the target shade level. Hence, if we estimate existing shade in an avalanche path to be 50%, then the target shade associated with that stream segment is likewise set at 50%.

3.1.4 Monitoring Points

The accuracy of the aerial photo interpretations were field-verified with a Solar Pathfinder at ten sites scattered throughout the subbasin. Five of these sites were collected by DEQ regional office personnel and five were from Forest Practices Water Quality Audit sites visited in 2008. These data, although limited in scope, were used to calibrate our eyes when we re-examined the original aerial photo interpretation of existing shade. The existing shade presented in this document represents corrected shade values for the ten sites.

Effective shade monitoring can take place on any reach throughout the Priest River subbasin and compared to estimates of existing shade. Those areas with the largest disparity between existing shade estimates and shade targets should be monitored with Solar Pathfinders to verify the existing shade levels and to determine progress towards meeting shade targets. It is important to note that many existing shade estimates have not been field-verified, and may require adjustment during the implementation process. Stream segments for each change in existing shade vary in length depending on 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 towards target levels. Ten equally spaced Solar Pathfinder measurements within that segment averaged together should suffice to determine new shade levels in the future.

3.2 Load Capacity

The load capacity for a stream under PNV is essentially the solar loading allowed under the shade targets specified for the reaches within that stream. These loads are determined by multiplying the solar load received 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%, then the solar load hitting the stream under that target is 40% of the load hitting the flat-plate collector under full sun.

We obtained solar load data from flat-plate collectors at the NREL weather station in Spokane, Washington. The solar loads used in this TMDL are spring/summer averages (i.e., an average load for the 6-month period from April through September). These months coincide with the time of year when stream temperatures are increasing, deciduous vegetation is in leaf, and spring and fall salmonid spawning is occurring. These months are when cold water aquatic life criteria are more likely to be exceeded. Late July and early August typically represent the period of highest stream temperatures.

Figures 6, 9, 12, 16, 18, 21, and 24 and Tables D1 through D38(Appendix D) show the PNV shade targets (identified as target shade) and their 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. 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.

3.3 Estimates of Existing Pollutant Loads

Regulations allow that loadings "...may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading," (Water quality planning and management, 40 CFR § 130.2(I)). An estimate must be made for each point source. Nonpoint sources are typically estimated based on the type of sources (land use) and area (such as a watershed), but may be aggregated by type of source or land area. To the extent possible, background loads should be distinguished from human-caused increases in nonpoint loads.

Existing loads in this temperature TMDL come from estimates of existing shade as determined from aerial photo interpretations. 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 Figures, 7, 10, 13, 16, 19, 22, and 25 and Tables D1 through D38in Appendix D. Like loading capacities (potential loads), existing loads in the tables of Appendix D are presented on an area basis (kWh/m2/day) and as a total load (kWh/day).

Existing and potential loads in kWh/day can be summed for the entire stream or portion of stream examined in a single loading table. These total loads are shown at the bottom of their respective columns in each table. The difference between potential load and existing load is also summed for the entire table. Should existing load exceed potential load, this difference becomes the excess load discussed in Section 3.4 “Load Allocation” and depicted in Figures 8, 11, 14, 17, 20, 23, and 26.

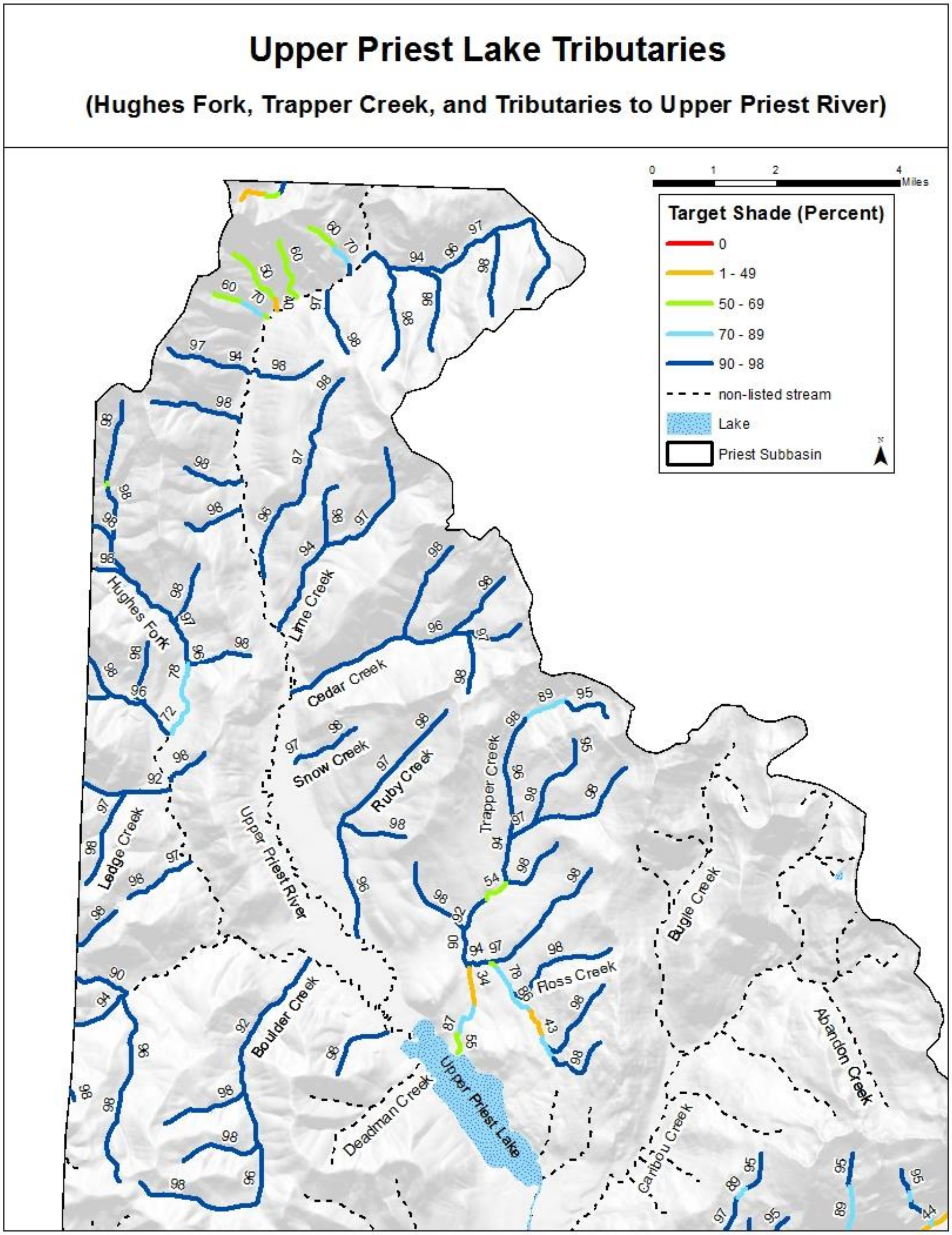

Figure 6. Target shade for Upper Priest River region.

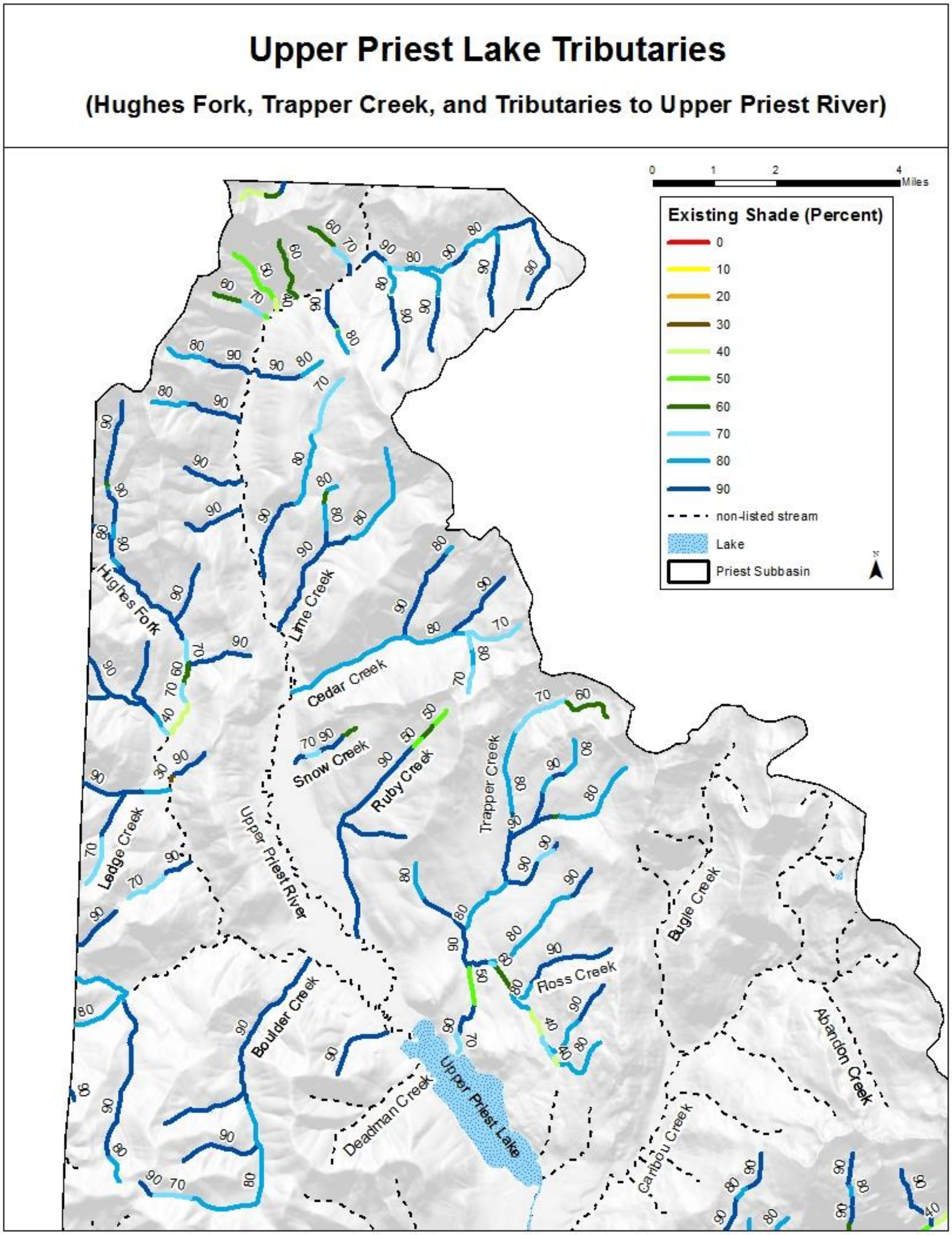

Figure 7. Existing shade estimated for Upper Priest River region.

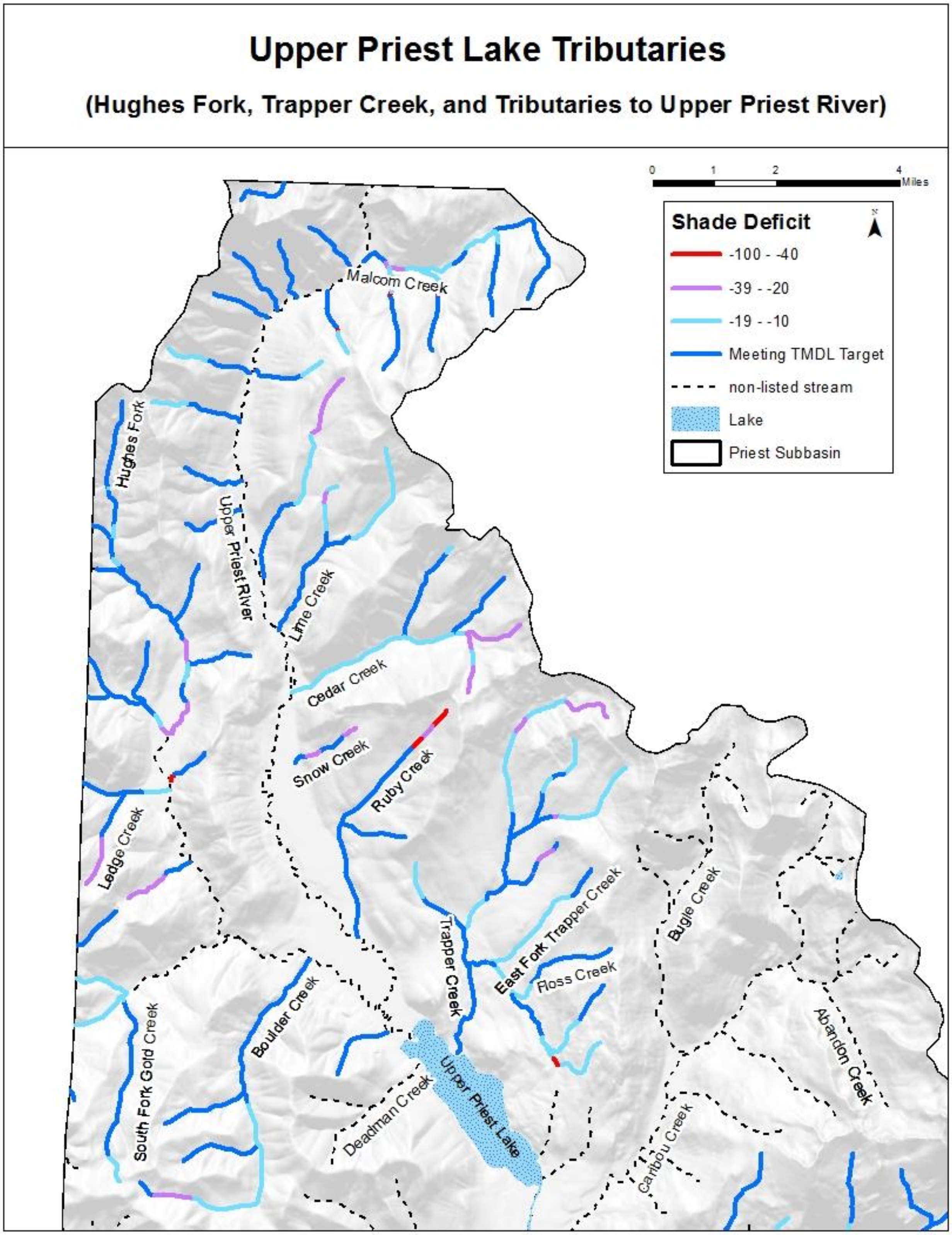

Figure 8. Shade deficit for the Upper Priest River region.

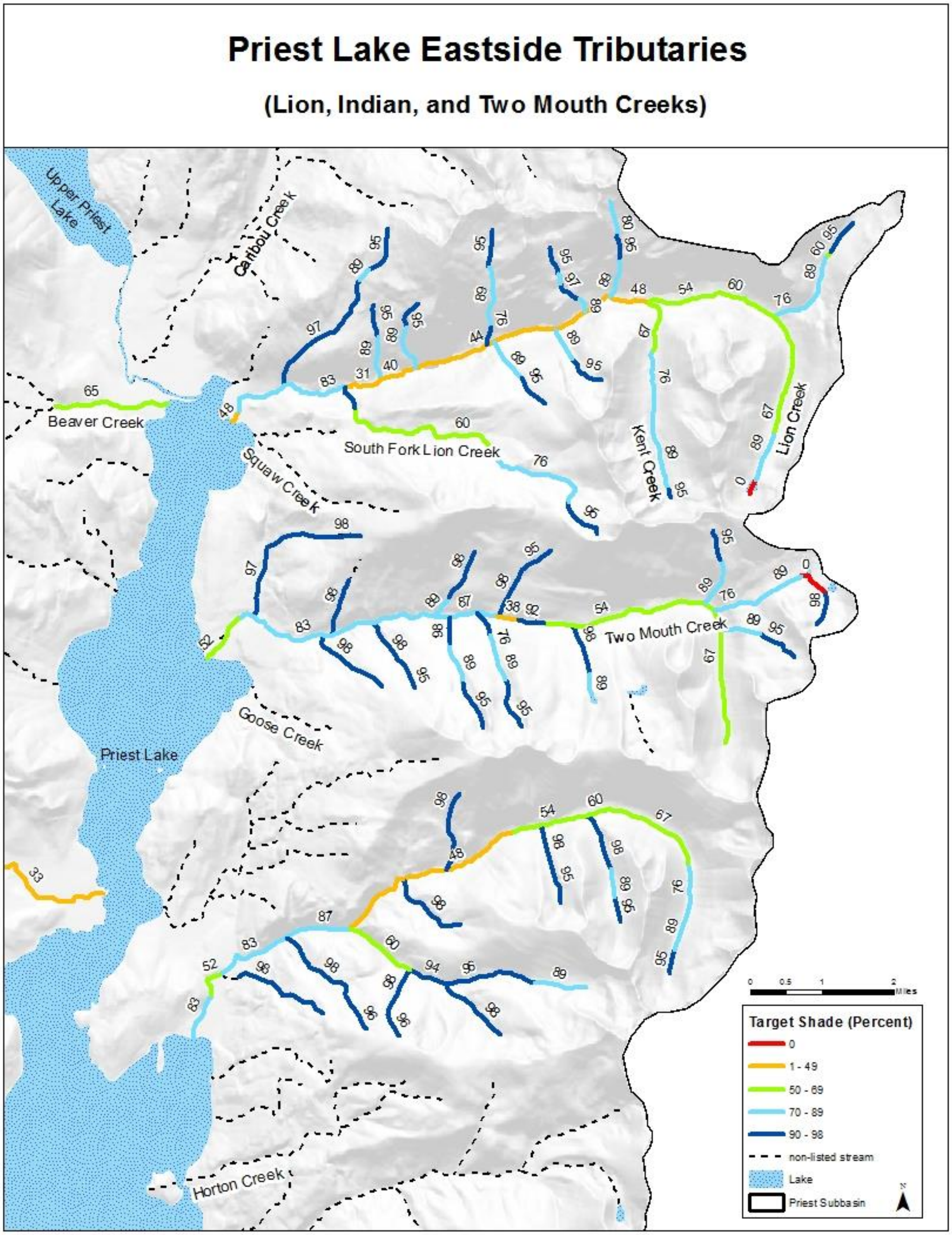

Figure 9. Target shade for Priest Lake Eastside region.

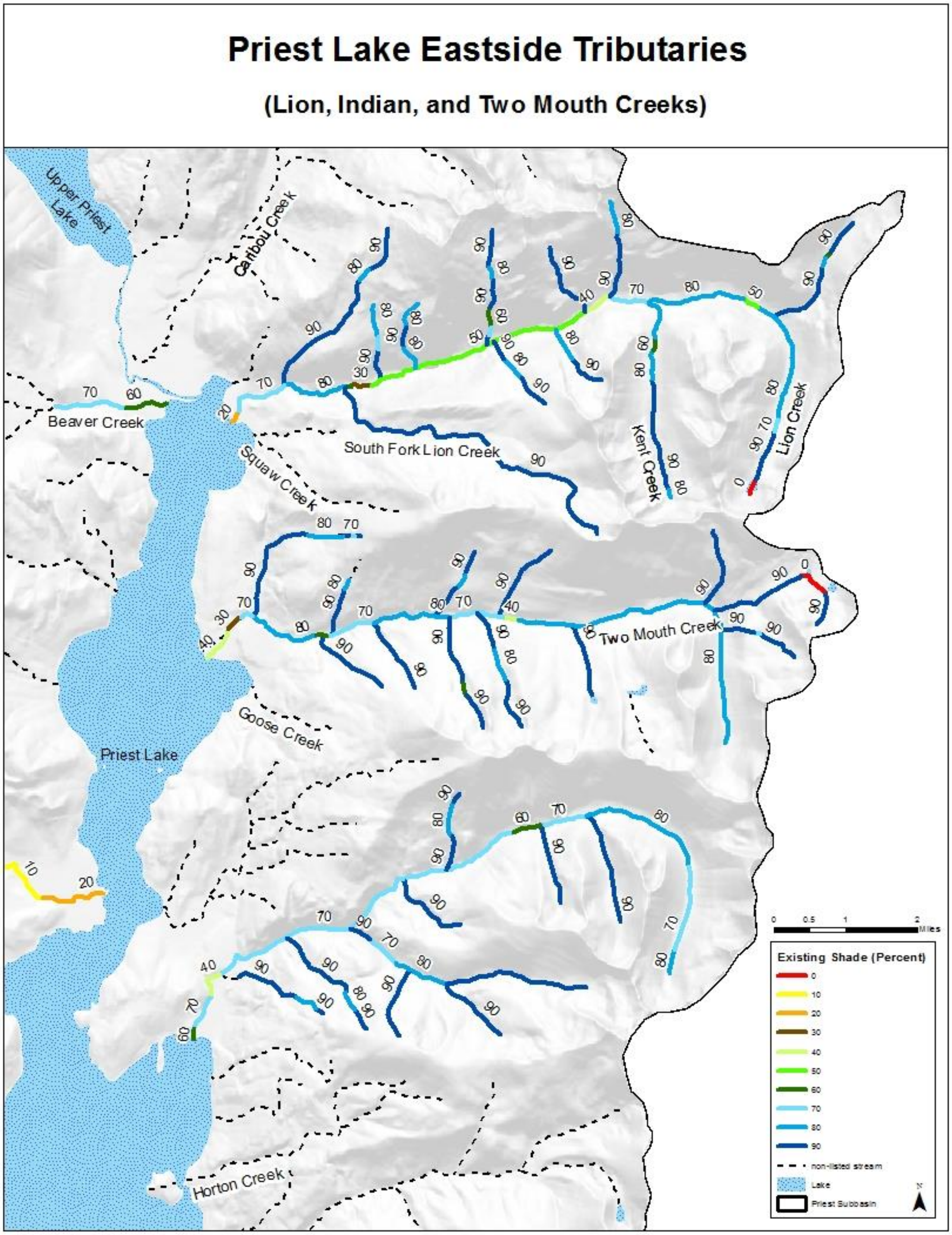

Figure 10. Existing shade estimated for Priest Lake eastside region.

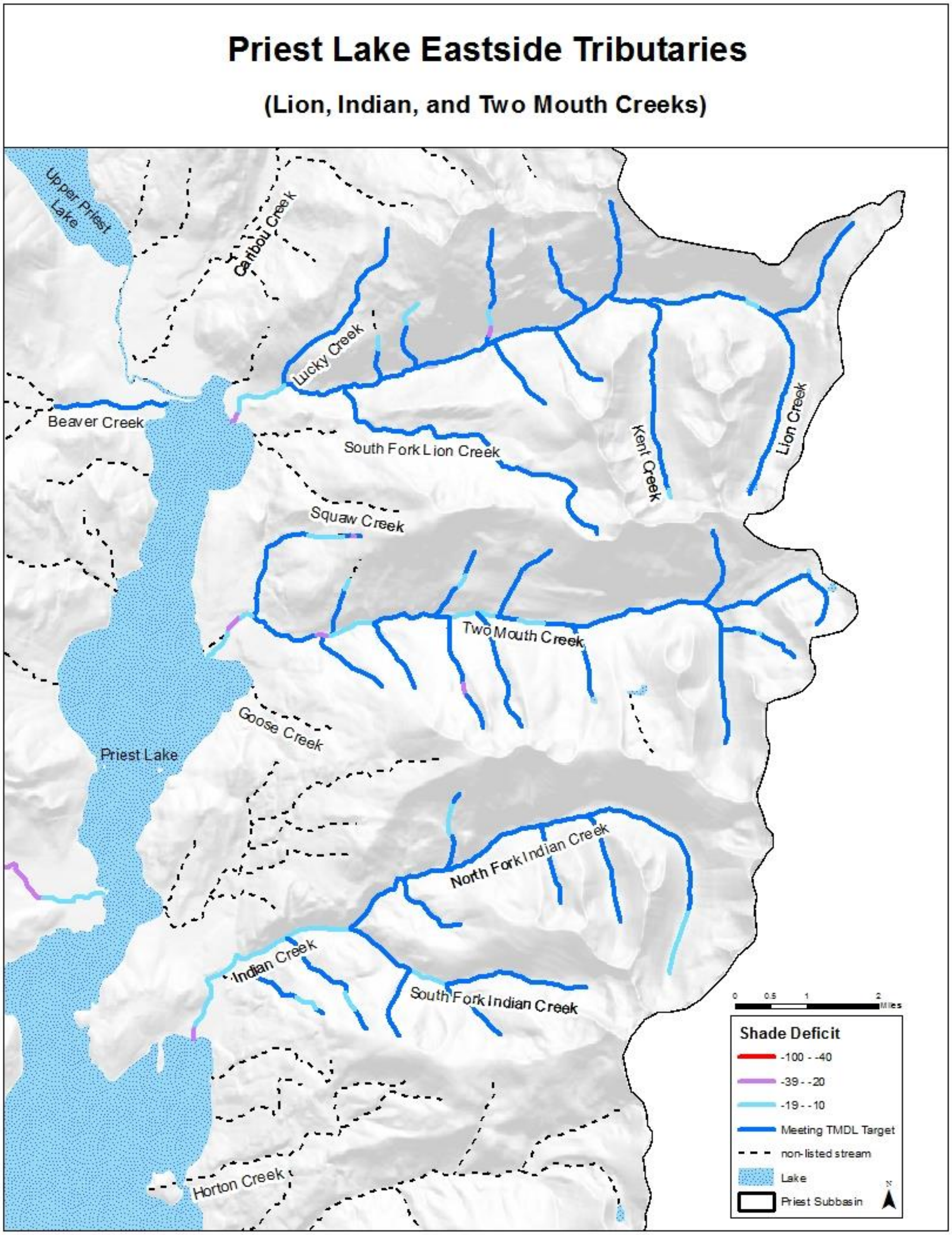

Figure 11. Shade deficit for the Priest Lake eastside region.

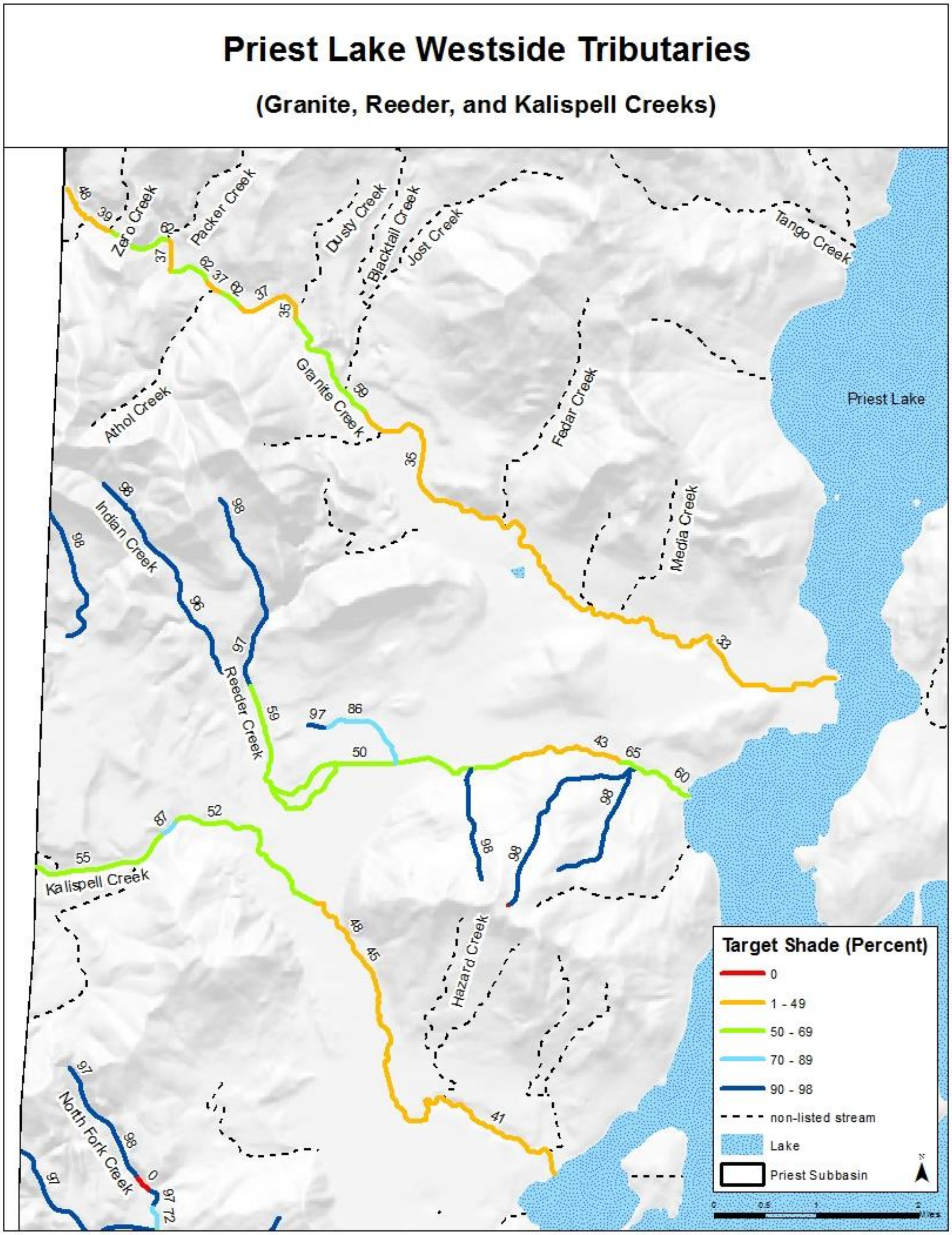

Figure 12. Target shade for Priest Lake westside region.

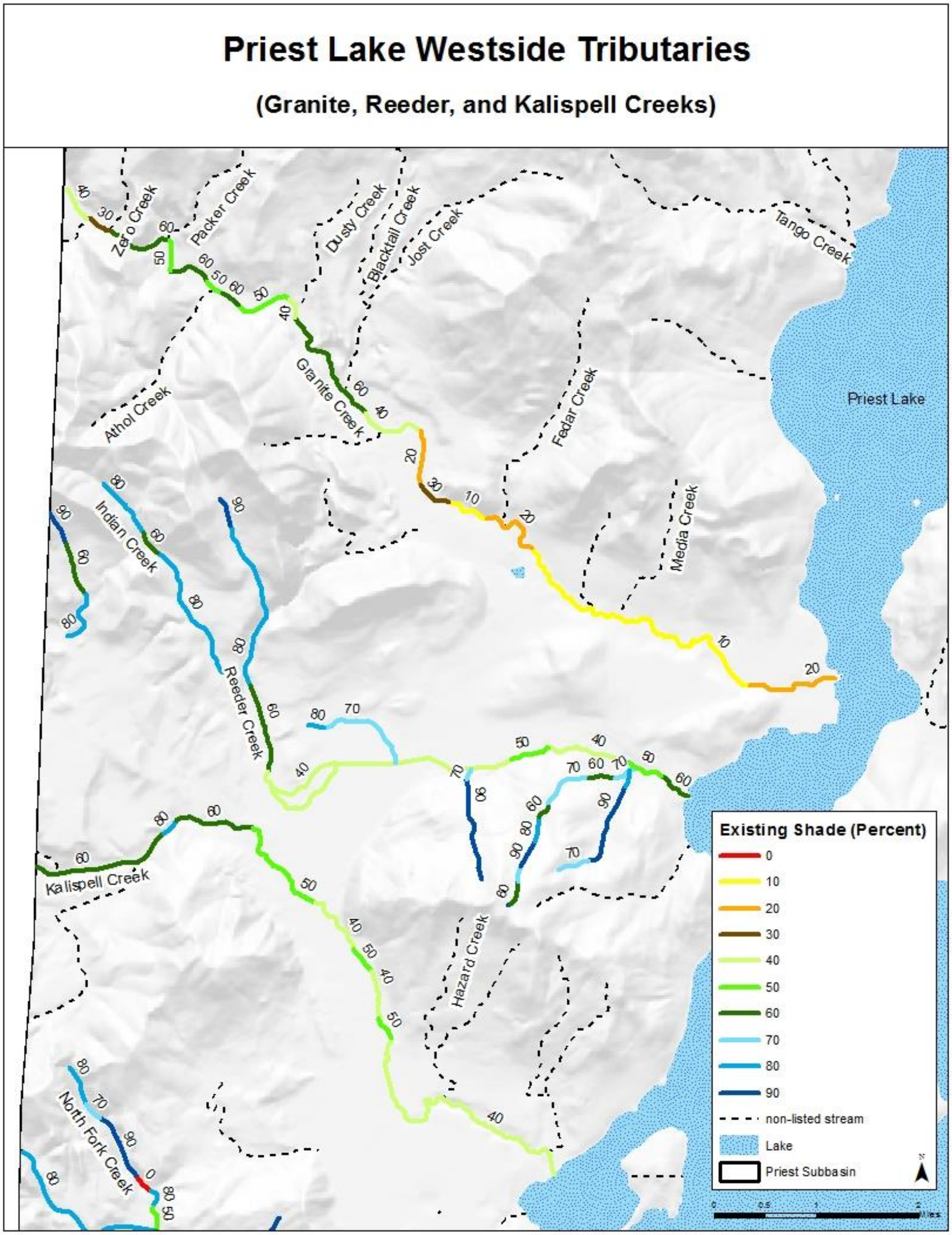

Figure 13. Existing shade estimated for Priest Lake westside region.

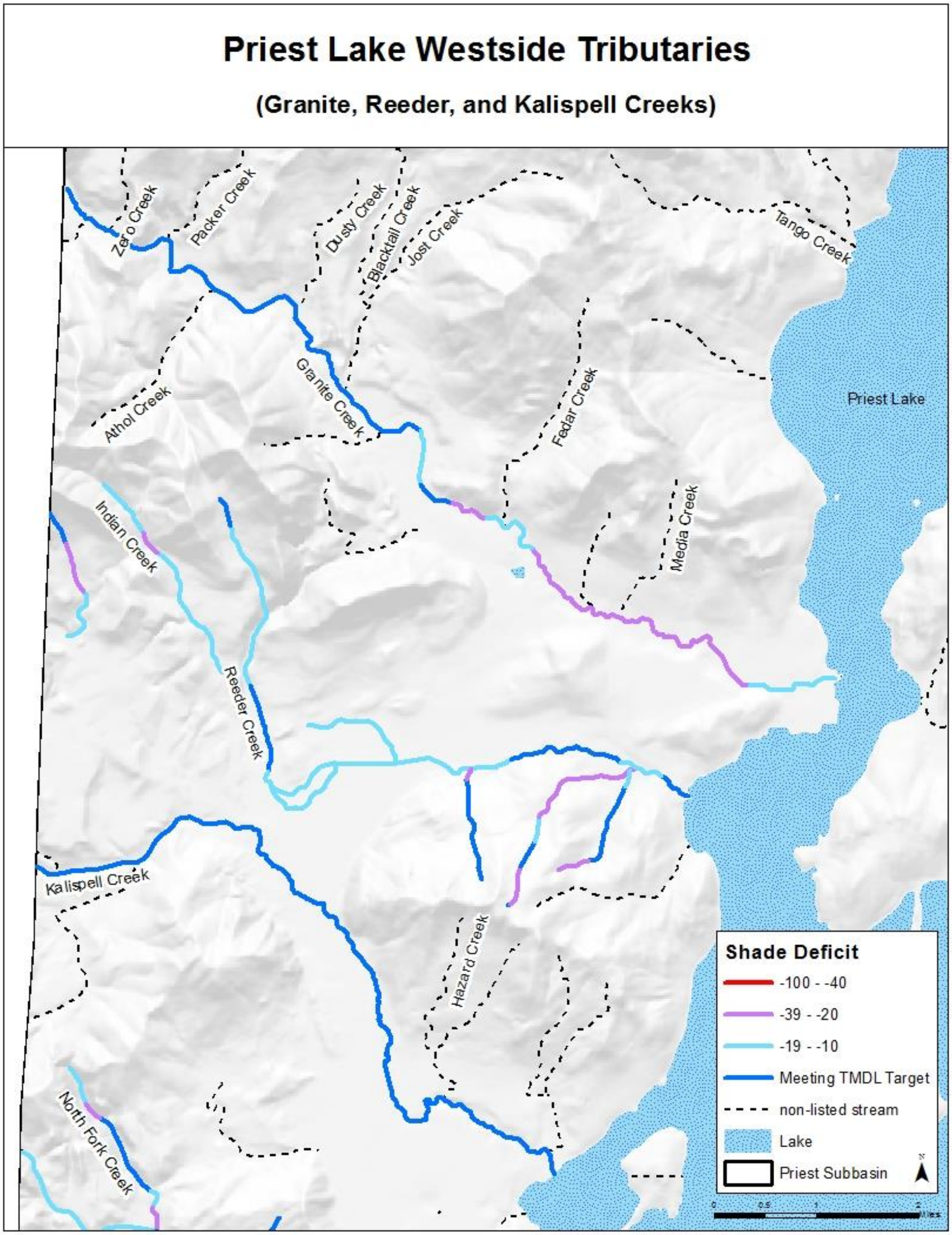

Figure 14. Shade deficit for the Priest Lake westside region.

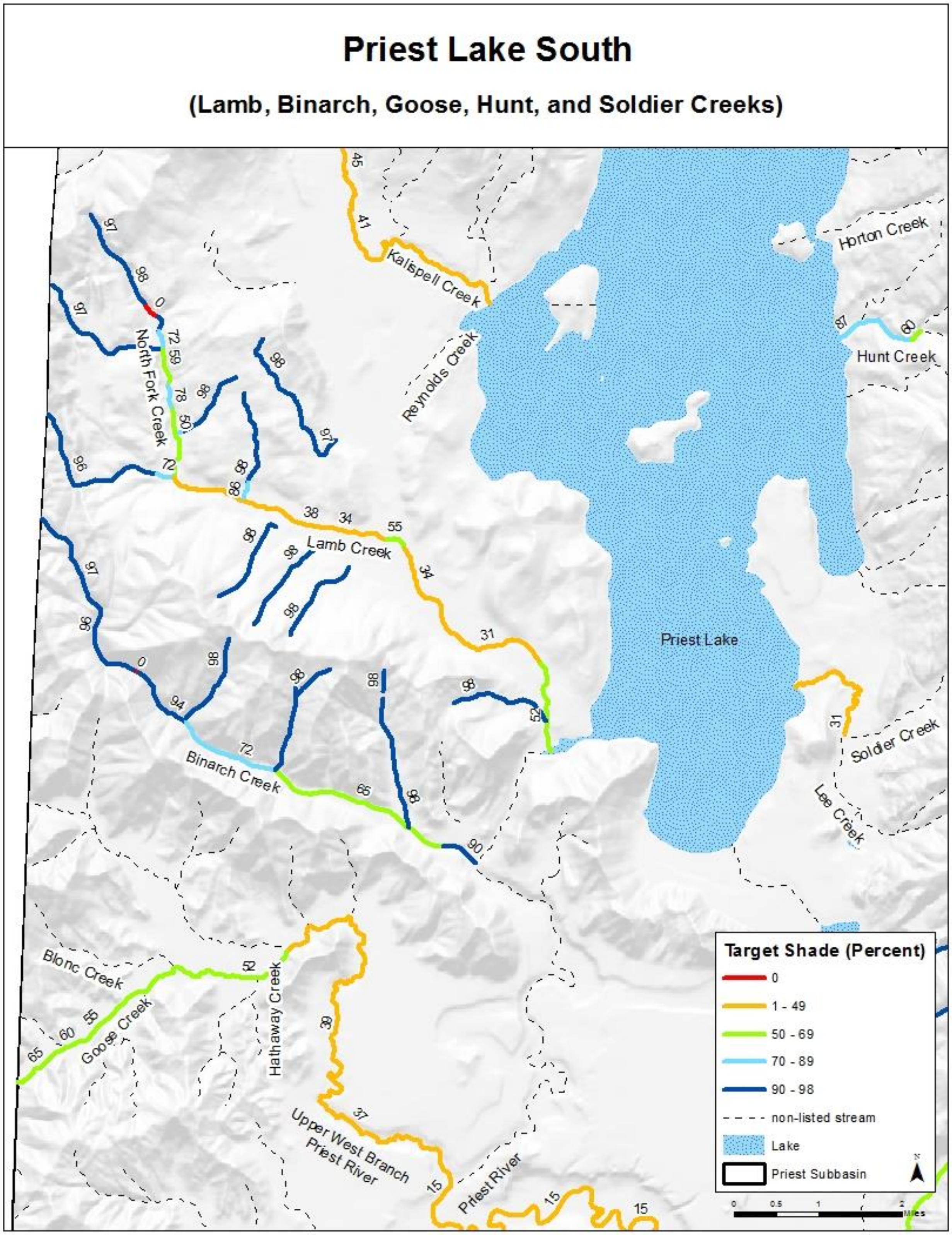

Figure 15. Target shade for Priest Lake south.

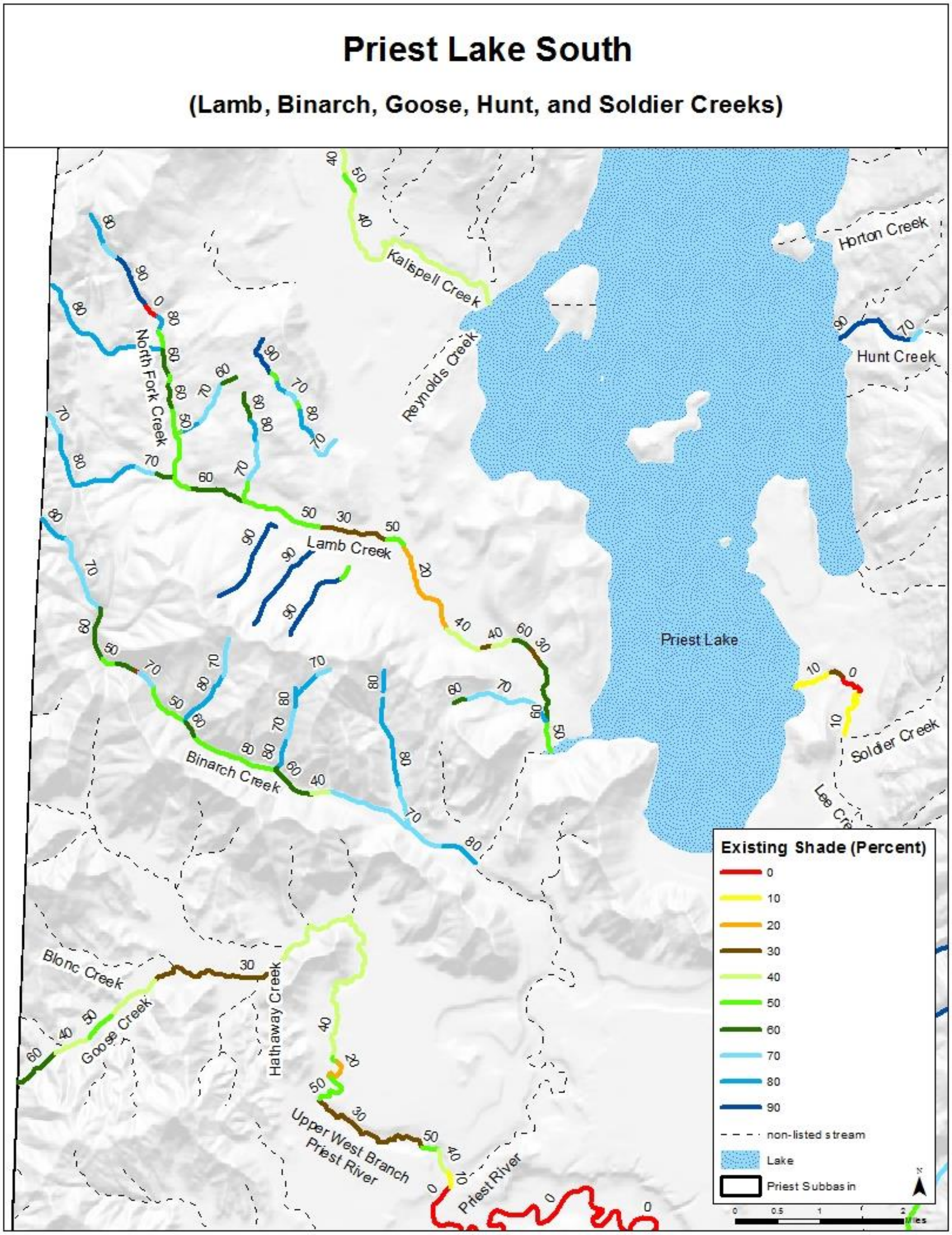

Figure 16. Existing shade estimated for Priest Lake south.

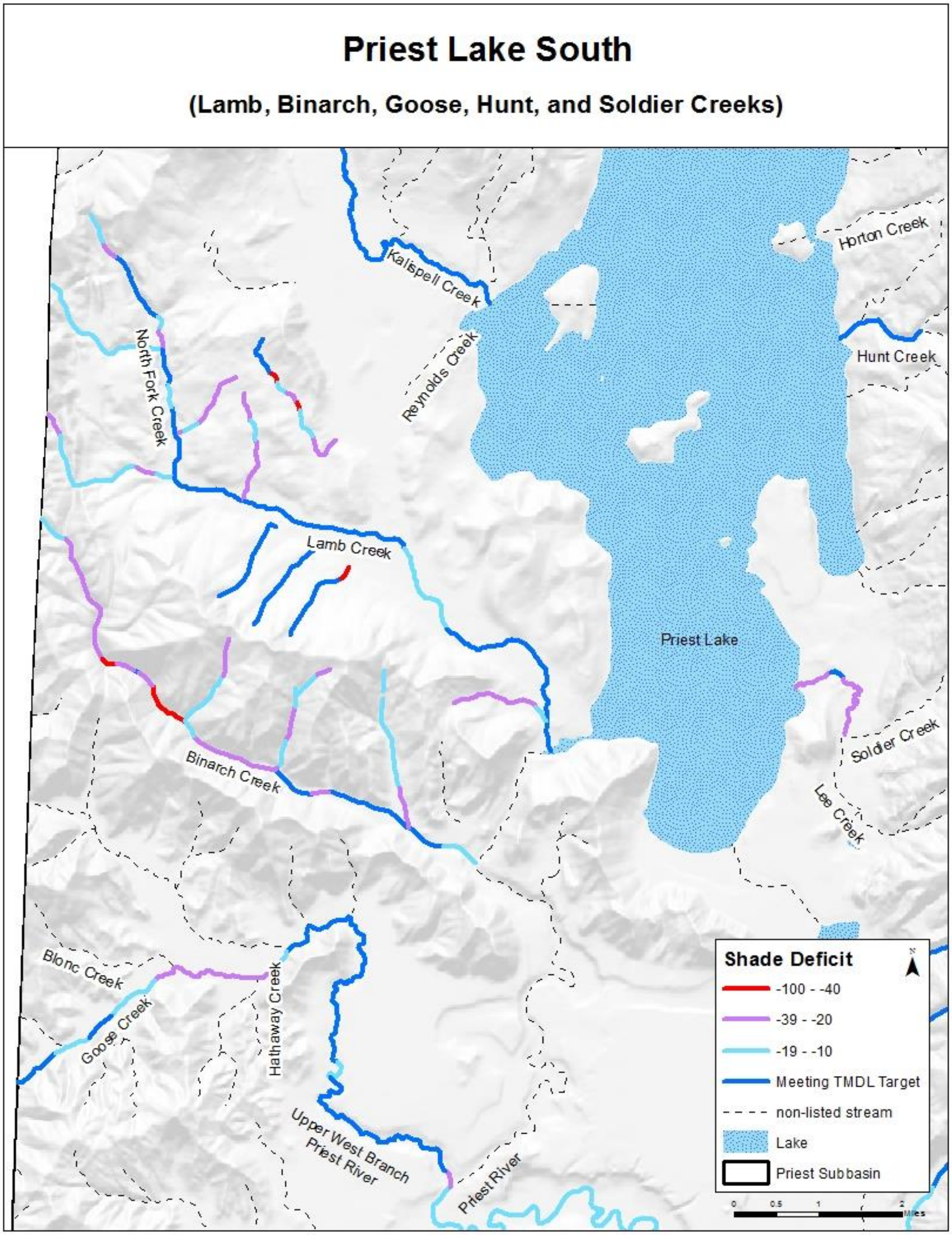

Figure 17. Shade deficit for Priest Lake south.

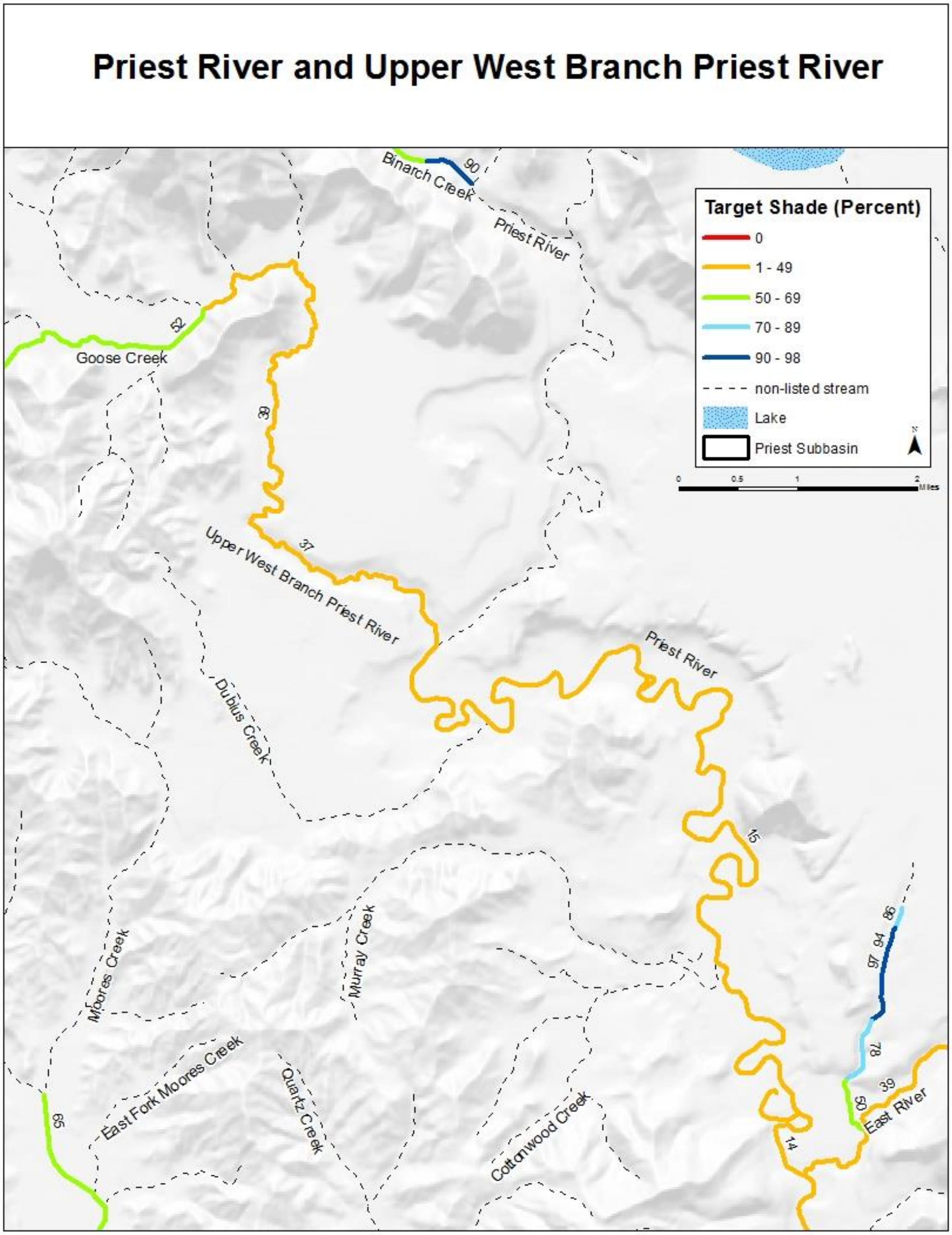

Figure 18. Target Shade for Upper West Branch Priest River.

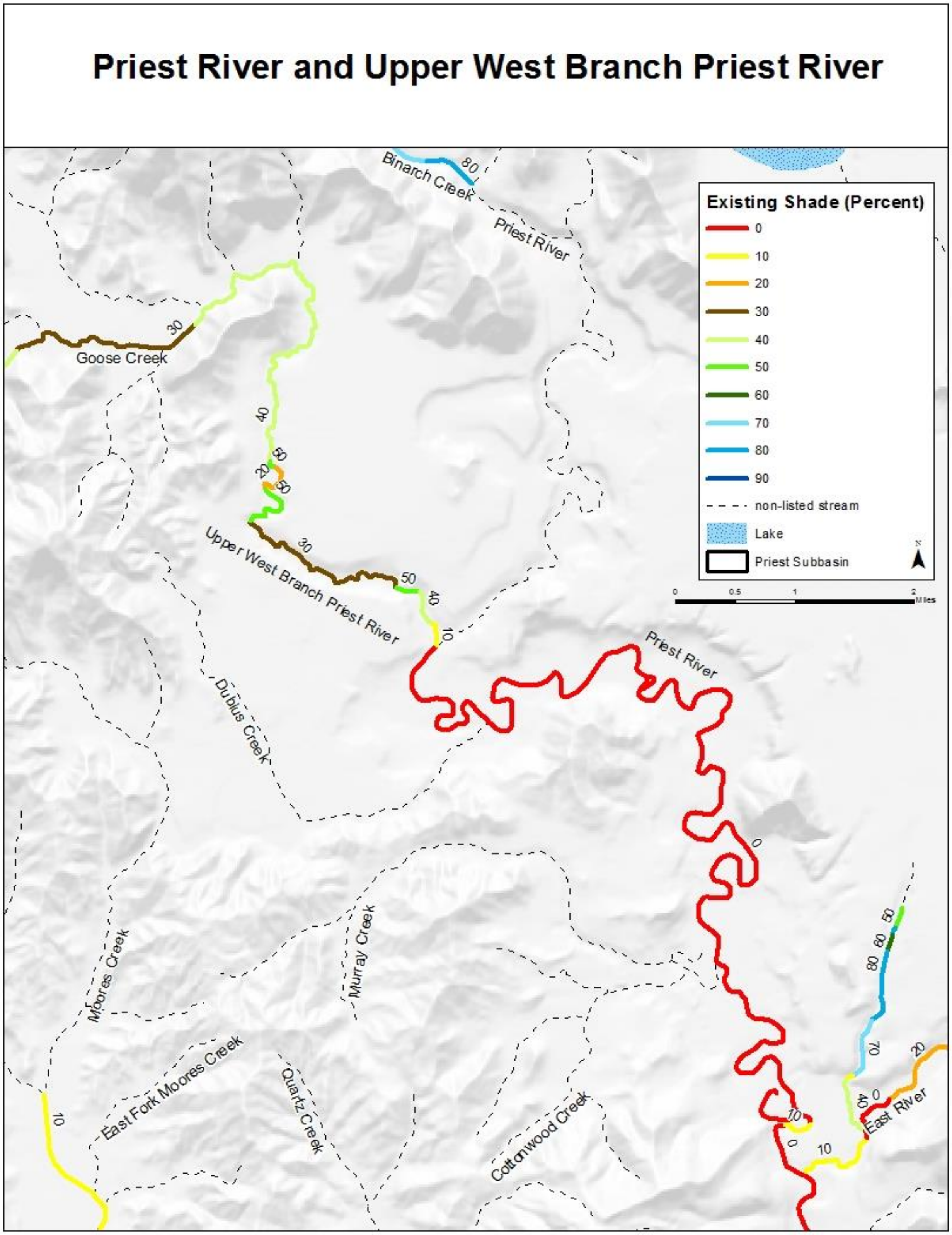

Figure 19. Existing shade estimated for Upper West Branch Priest River.

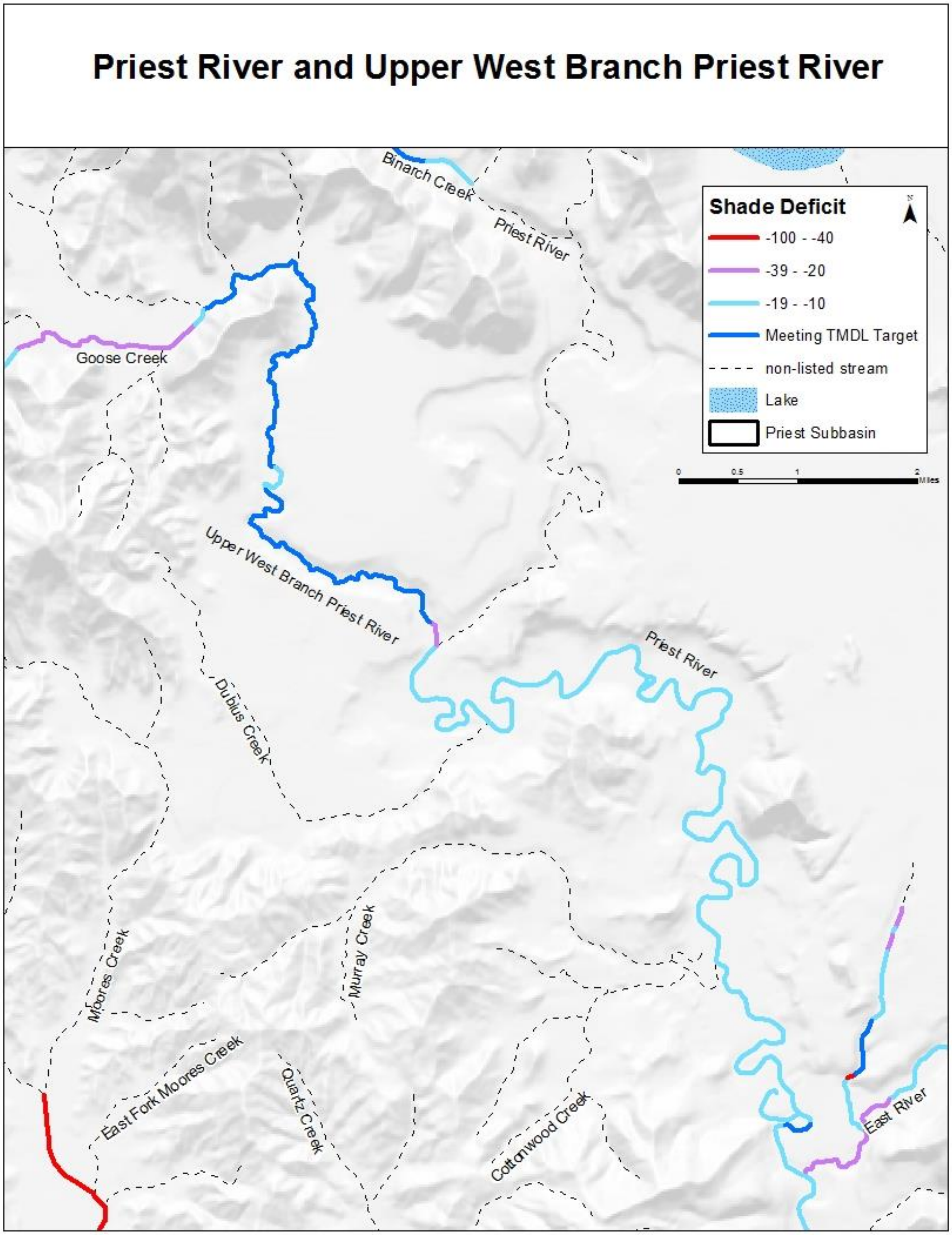

Figure 20. Shade deficit for the Upper West Branch Priest River.

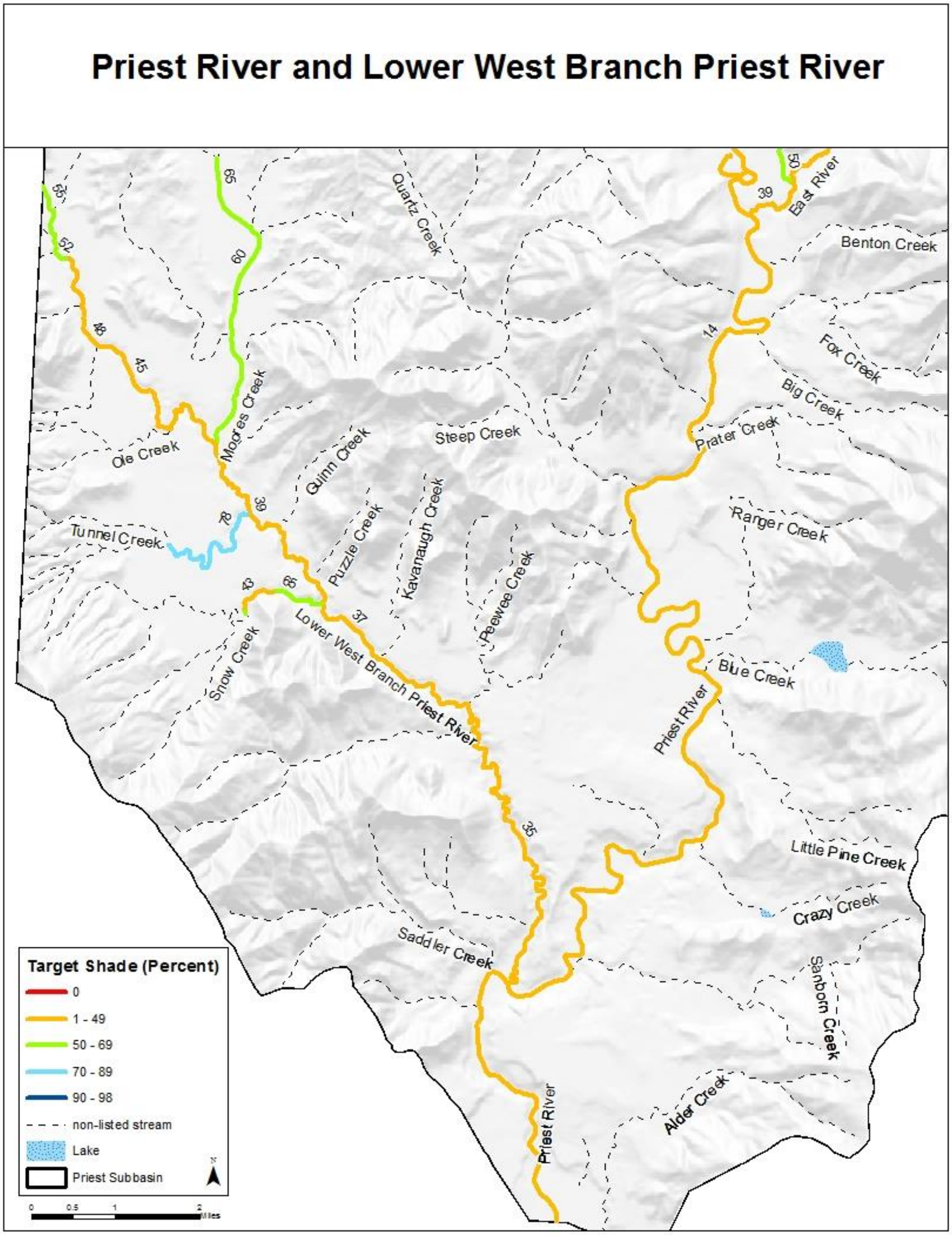

Figure 21. Target shade for the Lower West Branch and Priest River.

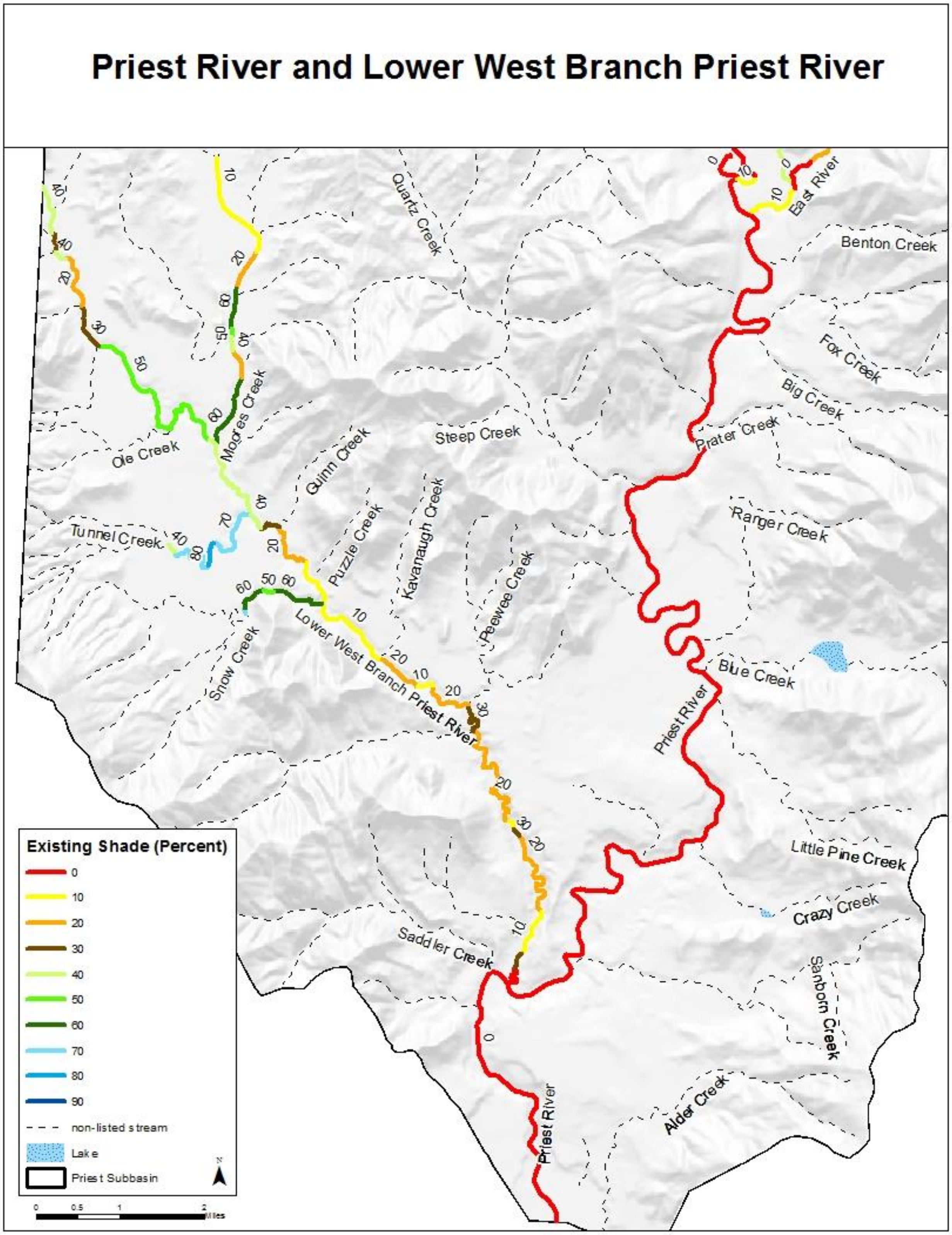

Figure 22. Existing shade for the Lower West Branch and Priest River.

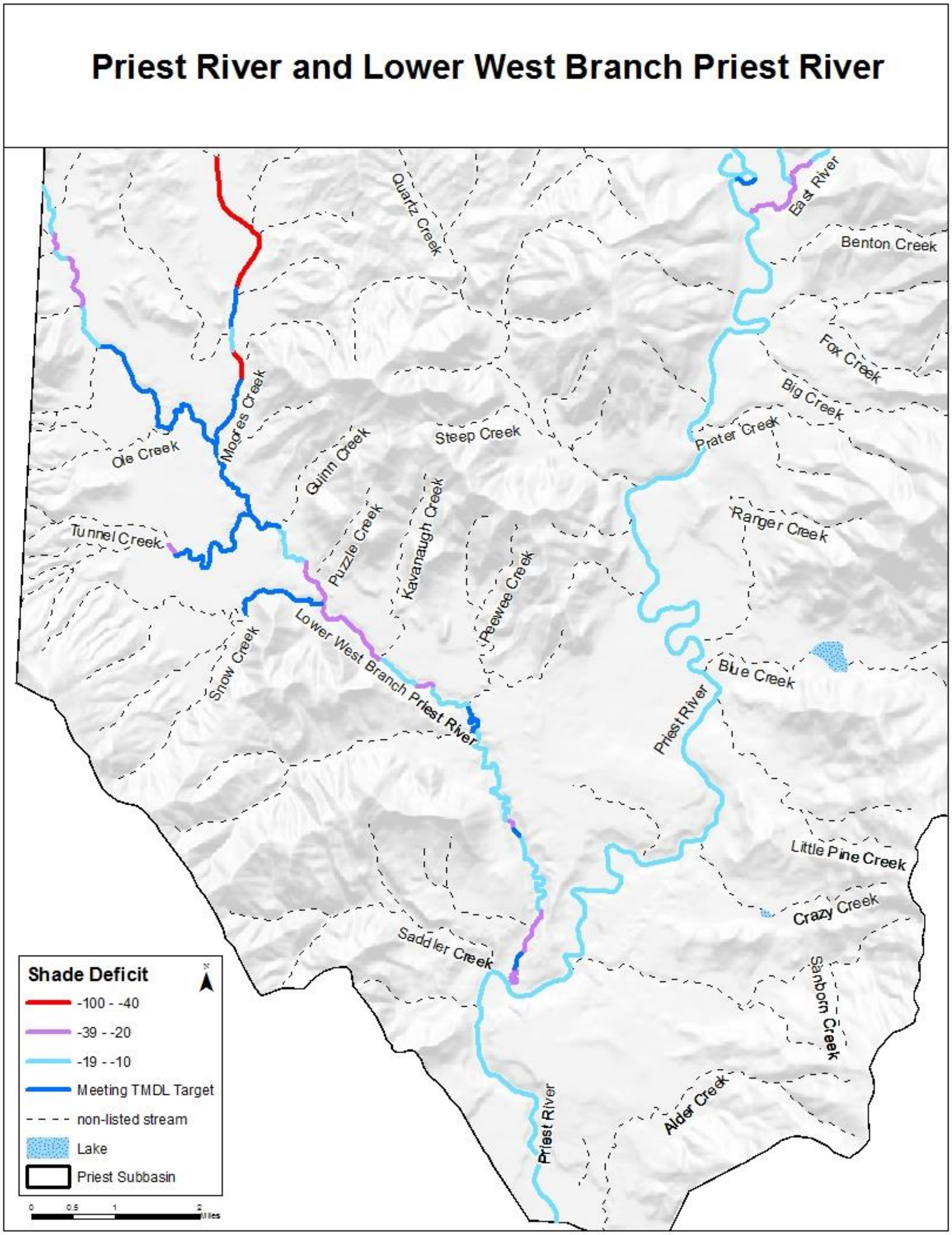

Figure 23. Shade deficit for the Lower West Branch and Priest River.

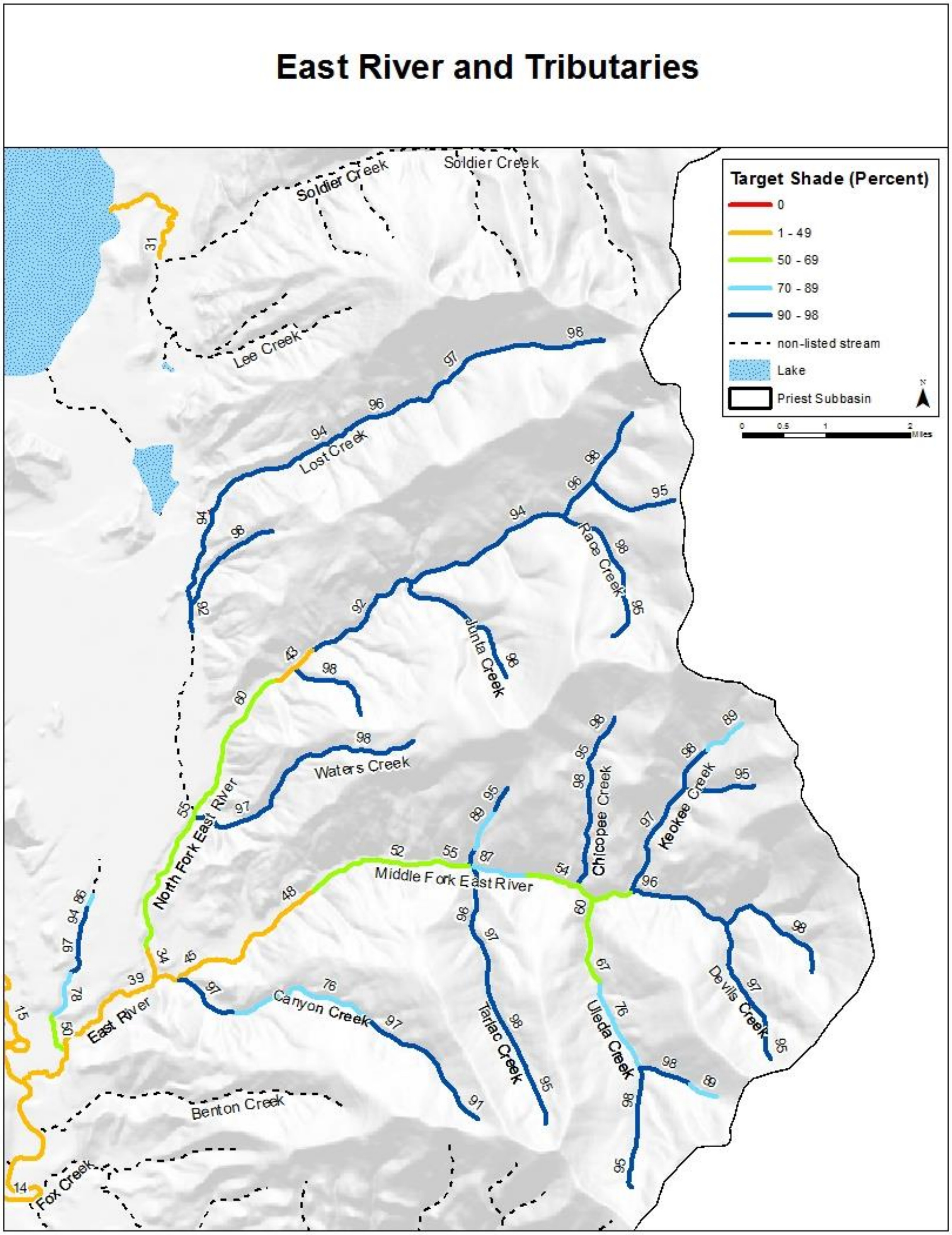

Figure 24. Middle Fork, North Fork and Mainstem East River target shade.

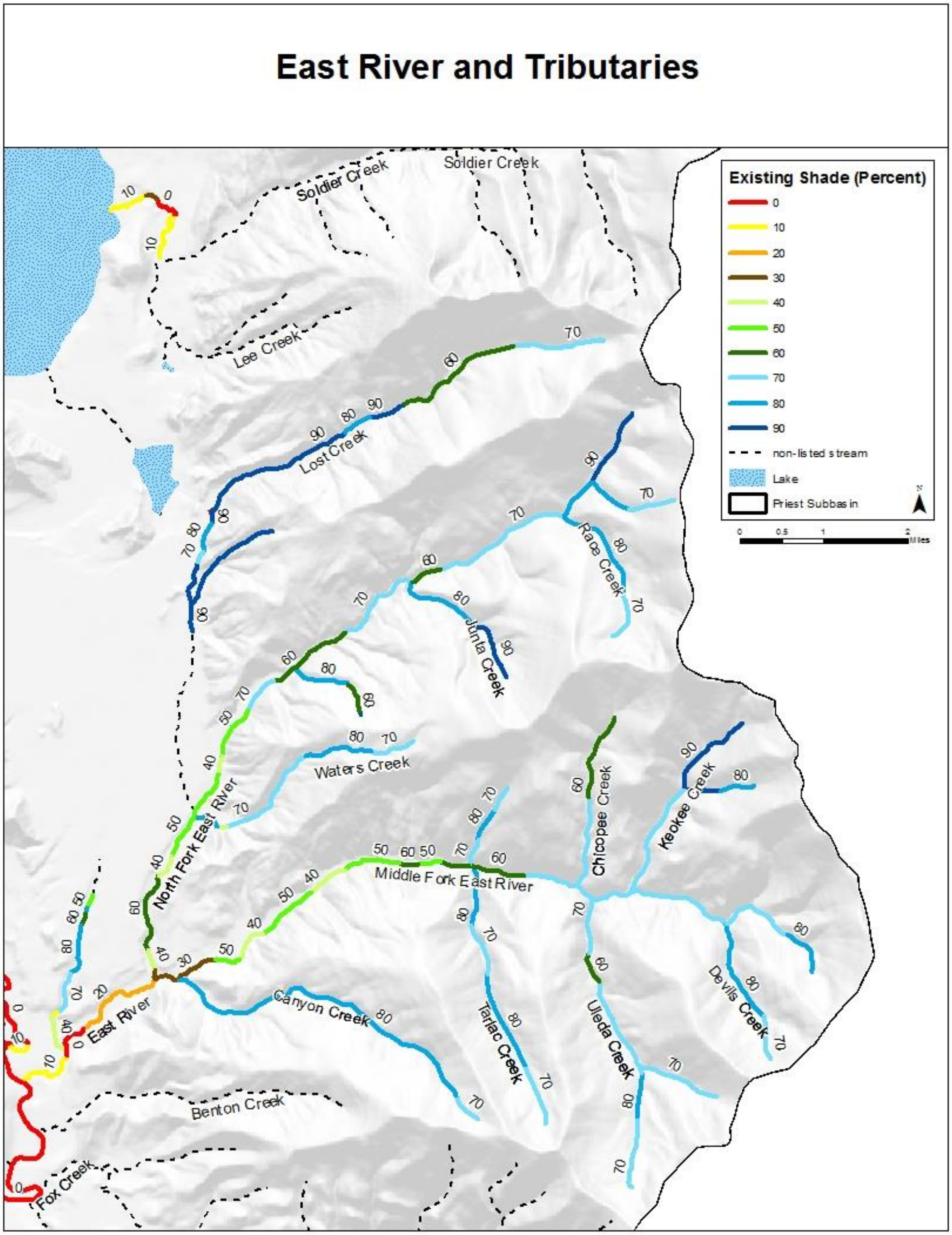

Figure 25. Middle Fork, North Fork and Mainstem East River existing shade.

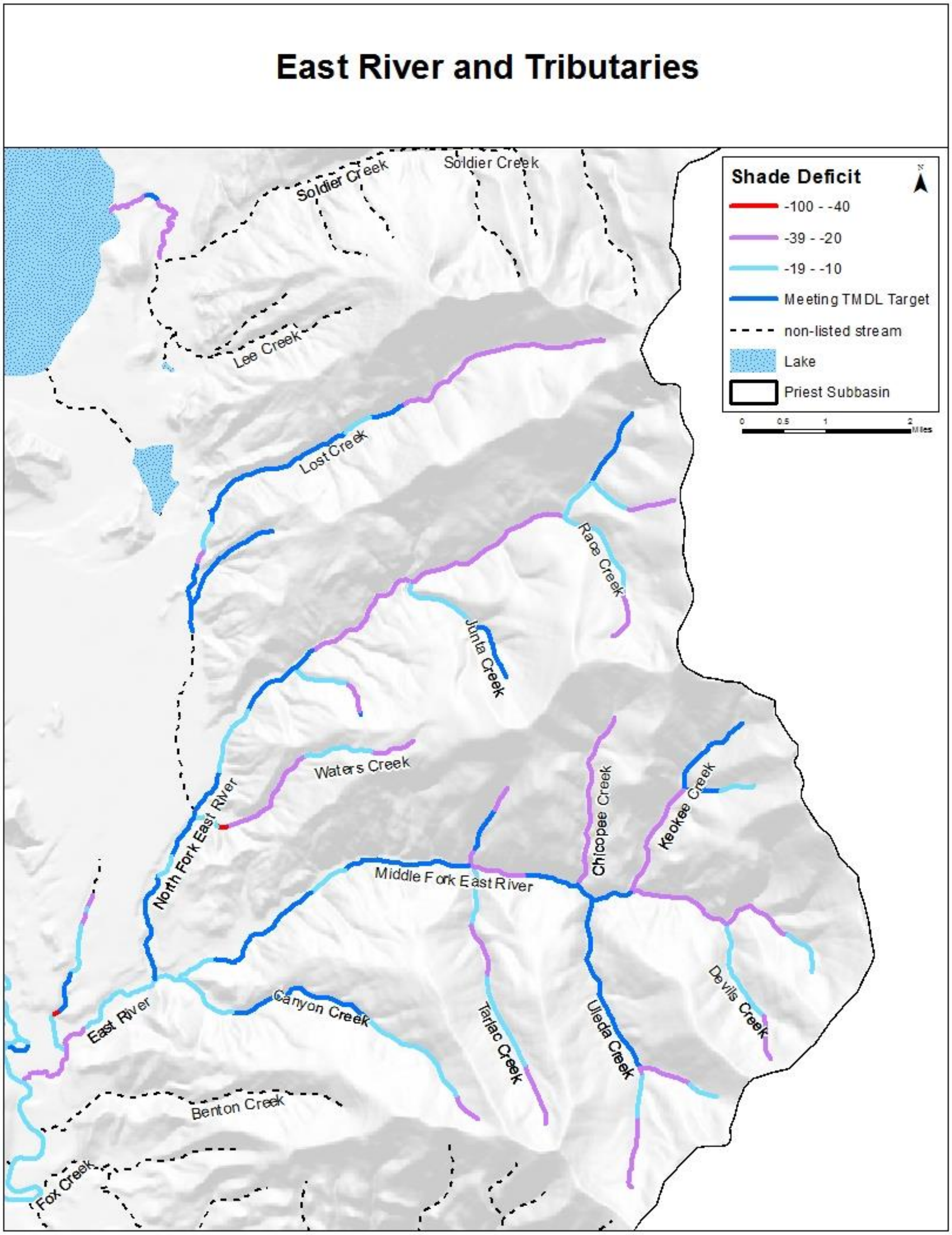

Figure 26. Middle Fork, North Fork and Mainstem East River shade deficit.

3.4 Load Allocation

This TMDL is based on PNV, which is equivalent to solar loads at background conditions. As such, 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. Load allocations are stream-reach specific and are dependent upon the target load for a given reach. Tables D1 through D38in Appendix D show the target shade, which is converted to a target summer load by multiplying the inverse fraction (1 minus shade fraction) by the average loading measured by a flat-plate collector for the months of April through September. This calculation provides the load capacity of the stream and the solar load necessary to achieve background conditions. At this level of solar loading, there is no opportunity to further remove shade from the stream by any activity without exceeding its load capacity. Because this TMDL is dependent upon background conditions for achieving water quality standards, all tributaries to the waters examined also need to be in natural conditions in order to prevent excess heat loads to the system.

Table 10 through Table 13 show the total existing, target, and excess heat load (kWh/day) for each AU examined and the percent reduction for each AU. 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. Large streams have higher existing and target loads by virtue of their larger channel widths.

Although the following analysis dwells on total heat loads for streams in this TMDL, it is important to note that differences between existing shade and target shade, depicted as lack of shade in Figures 8, 11, 14, 17, 20, 23, and 26, are the key to successfully restoring these waters to achieving water quality standards. Target shade levels for individual reaches should be the goal managers strive for with future implementation plans. Managers should key in on the largest differences between existing and target shade as locations to prioritize implementation efforts. Each loading table contains a final column that lists the lack of shade on the stream. It is derived from subtracting the target shade from the existing shade for each segment. Thus, stream segments with the largest lack of shade are in the worst shape.

Table 10. Total solar loads and average lack of shade for the Upper Priest River region.

Stream	AU	Total Existing Load in kWh/day	Total Target Load in kWh/day	Excess Load in kWh/day	Percent Reduction
Tributaries to Upper Priest	17010215PN018_02	180,000	64,000	120,000	67%
Hughes Fork	17010215PN019_02	164,000	56,000	110,000	67%
Trapper Creek	17010215PN017_02	120,000	64,000	52,000	43%
	17010215PN017_03	34,000	47,000	0	0%

Table 11. Total solar loads and average lack of shade for the Priest Lake Eastside region.

Stream	AU	Total Existing Load in kWh/day	Total Target Load in kWh/day	Excess Load in kWh/day	Percent Reduction
Lion Creek	17010215PN013_02	870,000	900,000	0	0%
Two Mouth Creek	17010215PN012_02	620,000	530,000	77,000	12%
NF and SF Indian Creek	17010215PN010_02	190,000	170,000	27,000	14%
Indian Creek	17010215PN010_03	120,000	57,000	55,000	46%
Hunt Creek	17010215PN009_03	9,000	12,000	0	0%
Soldier Creek	17010215PN008_03	140,000	100,000	40,000	29%

Table 12. Total Solar loads and average lack of shade for the Priest Lake Westside region.

Water Body	AU	Total Existing Load in kWh/day	Total Target Load in kWh/day	Excess Load in kWh/day	Percent Reduction
Beaver Creek	17010215PN020_03	30,000	30,000	0	0%
Granite Creek	17010215PN022_04	990,000	850,000	140,000	14%
Reeder Creek	1701021 5PN023_02 1701021 5PN023_03	200,000 18,000	150,000 16,000	54,000 2,000	27% 11%
Kalispell Creek	17010215PN024_03	440,000	420,000	17,000	4%
Lamb Creek	17010215PN025_02	420,000	390,000	24,000	6%

Table 13. Total solar loads and average lack of shade for the Lower Priest River region.

Water Body	AU	Total Existing Load in kWh/day	Total Target Load in kWh/day	Excess Load in kWh/day	Percent Reduction
Binarch Creek	17010215PN026_02	140,000	71,000	73,000	43%
Goose Creek	17010215PN028_03	160,000	100,000	52,000	33%
Upper West Branch Priest River	17010215PN027_04	530,000	520,000	10,000	2%
NF East River	17010215PN004_02 17010215PN004_03	200,000 68,000	100,000 110,000	100,000 0	50% 0%
MF East River	17010215PN003_02 17010215PN003_03	120,000 250,000	46,000 240,000	77,000 10,000	64% 4%
East River	17010215PN003_04	000	000	000	00

Moores Creek	17010215PN031_03	140,000	76,000	63,000	45%
Lower West Branch Priest River	17010215PN030_03 17010215PN030_04	340,000 1,100,000	300,000 900,000	40,000 230,000	12% 21%
Priest River	17010215PN001_05	13,000,000	11,000,000	1,900,000	15%

Most AUs appear to lack shade and generally have average lack of shade values greater than 10%. However, Lion, Indian and Lamb Creeks appear to be very close to target levels. Lack of shade figures (Figures 8, 11, 14, 17, 20, 23, and 26) demonstrate where problem areas are on each stream. In the Upper Priest River region (

Table 10**), excess loads to AUs vary from 35% of their total existing loads to 65%, thus needed load reductions are 35-69%. These AUs lack an average of 13-14% shade. In the Priest Lake eastside region (Table 11) two AUs (Soldier and Two Mouth Creeks) have large relative excess loads with reductions needed at 62% and 25%, and two AUs (Lion and Two Mouth Creeks) where percent reductions are closer to 0%. Average shade deficits vary from 4-19%. Over on the westside region (**

Table 12) AUs have needed reductions that are 43% or less. In fact, Granite Creek and Kalispell Creek AUs have percent reductions at 14% and 16%, respectively; and Lamb Creek has only 1% reduction needed. Assessment units in the Lower Priest River region (Table 13) also have needed reductions at 52% or less. The Upper West Branch appears to be the least impacted AU in this region with only 10% reduction needed. Large rivers such as the Lower Priest River have very large target and existing loads because of their large width and shade does not affect them as much. In such circumstances a lack of near shore shade does not create proportionally large excess loads.

Average lack of shade values in Tables D1 through D38are good indicators of condition. These numbers reflect how much stream segments lack shade. Many stream systems show average lack of shade in excess of 20% meaning that on average existing shade is less than 20% of its target. Stream systems with average lack of shade values less than 20% tend to have major portions of their streams meeting target shade levels or within 9% of target levels.

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% class level and target shade is a unique integer, there is usually a difference between them. For example, say a particular stretch of stream has a target shade of 86% based on its vegetation type and natural bankfull width. If existing shade on that stretch of stream were at target level, it would be recorded as 80% existing shade in the loading analysis because it falls into that existing shade class. There is an automatic difference of 6% which could be attributed to the margin of safety.

3.4.1 Wasteload Allocation

There are no known NPDES permitted point sources in the affected watersheds. Thus, there are no wasteload allocations in this TMDL. Should a point source be proposed that would have thermal consequence on these waters, then background provisions addressing such discharges in

Idaho water quality standards (IDAPA 58.01.02.200.09 and IDAPA 58.01.02.401.03) should be involved (Appendix A).

3.4.2 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 load analysis. Although the load 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.

3.4.3 Seasonal Variation

This TMDL is based on average summer loads. All loads have been calculated to be inclusive of the six month period from April through September. This time period was chosen because it represents the time period when the combination of increasing air and water temperatures coincides with increasing solar inputs and increasing vegetative shade. The critical time period is April through June when spring salmonids spawning is occurring, July and August when maximum temperatures exceed cold water aquatic life criteria, and September when fall salmonids spawning is most likely to be affected by higher temperatures. Water temperature is not likely to be a problem for beneficial uses outside of this time period because of cooler weather and lower sun angle.

3.4.4 Construction Storm Water and TMDL Waste Load Allocations

3.4.4.1 Construction Storm Water

In the previous Priest River subbasin assessment and TMDLs there was no mention of construction stormwater requirements in the watersheds. We have included this section because of the potential for stormwater to contribute to existing pollutant loads. Increases of sediment, nutrients, *E. coli*, as well as temperature can be associated with stormwater runoff.

The Clean Water Act requires operators of construction sites to obtain permit coverage to discharge storm water to a water body or to a municipal storm sewer. In Idaho, EPA has issued a general permit for storm water discharges from construction sites. In the past storm water was treated as a non-point source of pollutants. However, because storm water can be managed on site through management practices or when discharged through a discrete conveyance such as a storm sewer, it now requires a National Pollution Discharge Elimination System (NPDES) Permit.

3.4.4.2 The Construction General Permit (CGP)

If a construction project disturbs more than one acre of land (or is part of larger common development) that will disturb more than one acre), the operator is required to apply for permit coverage from EPA after developing a site-specific Storm Water Pollution Prevention Plan.

3.4.4.3 Storm Water Pollution Prevention Plan (SWPPP)

In order to obtain the Construction General Permit operators must develop a site-specific Storm Water Pollution Prevention Plan. The operator must document the erosion, sediment, and pollution controls they intend to use, inspect the controls periodically and maintain the best management practices (BMPs) through the life of the project

3.4.4.4 Construction Storm Water Requirements

When a stream is on Idaho's § 303(d) list and has a TMDL developed DEQ now incorporates a gross waste load allocation (WLA) for anticipated construction storm water activities. TMDLs developed in the past that did not have a WLA for construction storm water activities will also be considered in compliance with provisions of the TMDL if they obtain a CGP under the NPDES program and implement the appropriate Best Management Practices.

Typically there are specific requirements you must follow to be consistent with any local pollutant allocations. Many communities throughout Idaho are currently developing rules for post-construction storm water management. Sediment is usually the main pollutant of concern in storm water from construction sites. The application of specific best management practices from Idaho's *Catalog of Storm Water Best Management Practices for Idaho Cities and Counties* is generally sufficient to meet the standards and requirements of the General Construction Permit, unless local ordinances have more stringent and site specific standards that are applicable.

3.4.5 Climate Change

Substantial scientific evidence indicates that air temperatures are rising across much of the earth, including the American West, and that most of this warming is due to increasing concentrations of carbon dioxide and other heat-trapping gases in the atmosphere (NRC 2010). While climate naturally varies in short- and long-term patterns, research suggests that human activities are causing an increase in greenhouse gases and causing air temperature changes far outside the natural range of variability (NRC 2010).

If predictions about the future climate are accurate, these changes pose economic and environmental threats to many parts of the world, including Idaho. Water resources and aquatic life may be particularly affected. Many possible impacts to water quality and aquatic life in the Pacific Northwest are presented by Hamlet et al. (2005); Karl et al. (2009); Mote and Salathé (2009); the National Research Council (2010); and Isaak et al. (2010) and can be summarized as follows:

- Increasingly warm air temperatures
- Amplified precipitation variability with decreased summer precipitation and increased winter precipitation
- Increased insect outbreaks, wildfire activity, and altered stream hydrologies
- Altered vegetation conditions—forests are predicted to change in the future with altered species composition adapted to the most recent climate conditions
- Warming water temperatures in streams and rivers

Scientists have also evaluated the risk posed to westslope cutthroat trout and bull trout by predicted summer temperature increases, uncharacteristic winter flooding, and increased wildfires. They determined that 65% of habitat currently occupied by westslope cutthroat trout will be at high risk from one or more of these factors (Williams et al. 2009).

Other research has evaluated possible risks to bull trout from a changing climate. Researchers found that predicted warming could result in losses of 18–92% of thermally suitable natal habitat areas and an even greater proportion of large (>10,000 hectares) habitat patches (Rieman et al. 2007). In addition, stream temperature increases associated with a changing climate may allow nonnative species such as eastern brook trout, rainbow trout, and smallmouth bass to invade further upstream and potentially threaten the persistence of native trout (Fausch et al. 2006; Rieman et al. 2007; Rahel and Olden 2008; Isaak et al. 2010).

These temperature TMDLs are designed to ensure compliance with Idaho water quality standards based on current and historic climatic conditions. If predictions are correct, future changes in stream temperature related to warming air temperatures and changing climate may warrant further investigation. This information also suggests that efforts to protect and restore water quality are all the more important. Shade can provide cooling effects to the stream fairly independent of climate and can help to insulate the stream from increasing air temperatures.

3.5 Implementation Strategies

Implementation strategies for TMDLs produced using PNV-based shade and solar loading should incorporate the load analysis tables presented in this TMDL (Appendix D). These tables need to be updated, first to field-verify the existing shade levels that have not yet been field-verified 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. Due to the inexact nature of the aerial photo interpretation technique, these tables should not be viewed as complete until verified. Implementation strategies should include Solar Pathfinder monitoring to simultaneously field-verify the TMDL and mark progress toward achieving desired reductions in solar loads.

Portions of some watersheds have natural conditions that limit riparian vegetation growth. Steep topography, rocky slopes, or rock cliffs limit vegetative growth in these areas, and achieving potential natural shade as depicted by the modeled shade curve is not practical in these areas. These natural occurrences may result in a lack of shade as identified in the model, but these areas will not be expected to reach full potential shading from riparian vegetation.

Stream segments with existing bankfull widths significantly wider (over 3 meters) than the estimated natural bankfull widths should also be a focus of future monitoring efforts. In these areas, existing and potential shade is limited due to the over-widened stream channel. The cause for the over widening is most likely excess bed load sediment. The excess bed load alters the bankfull width-to-depth ratio, making the stream wider than it would be naturally. The greater width-to-depth ratio results in a wide, shallow stream, oftentimes with mid- channel bars or extensive point bars. The excess near-bank stress applied to the streambanks in these situations also exacerbates the problem by causing bank instability and erosion. The eroded material is transported downstream resulting in more stream widening. In these locations, measures should be taken to mitigate bank erosion before the full potential riparian vegetation can be established.

Beaver damming is also a naturally occurring phenomenon within the Priest River subbasin. If not recognized during the aerial photo interpretation, the beaver dam and resulting pond could result in a misinterpretation of the existing shade, target shade, and stream width. When noted, beaver dams were incorporated into the PNV model as natural. If beaver dams are found to be causing erroneous PNV analysis during implementation of this TMDL, the area should be noted and incorporated into the TMDL 5-year review. Efforts to reach full target shade in these areas may not be practical.

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.

3.5.1 Time Frame

Increases in shade provided to the stream from riparian vegetation may only take a few years to establish, but many years will be required for vegetation to achieve its full potential to reduce solar inputs. Once implementation actions and strategies have been established, at least 20 years (depending on vegetation type) will be required for a diverse and mature vegetative community to become well established and provide maximum shade. Achievement of shade targets will not occur at once. Shade targets for smaller streams may be reached sooner than those established for larger streams given their smaller bankfull widths.

DEQ and the designated watershed advisory group (WAG) will continue to re-evaluate TMDLs on a 5-year cycle. During the 5-year review, implementation actions taken, in-progress, and planned will be reviewed, and pollutant load allocations will be reassessed accordingly.

3.5.2 Approach

TMDLs will be implemented through the continuation of ongoing pollution control activities in the watershed. The designated WAG, designated management agencies (DMAs), local organizations, and other appropriate public process participants are expected to do the following:

- Develop BMPs to achieve load allocations.
- Give reasonable assurance that management actions will meet load allocations through both quantitative and qualitative analysis of management measures.
- Adhere to measurable milestones for progress.
- Develop a timeline for implementation, including cost and funding.
- Develop a monitoring plan to determine if BMPs are being implemented, if individual BMPs are effective, and if load allocations are being met.

The responsible DMA will recommend specific control actions then submit the implementation plan to DEQ. DEQ will act as a repository for the implementation plan and conduct 5-year reviews of progress toward TMDL goals.

3.5.3 Responsible Parties

In addition to the DMAs, the public-through the WAG and other equivalent organizations or processes-will have opportunities to be involved in developing the implementation plan to the maximum extent practical. The following Idaho DMAs are responsible for management activities:

- 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
- DEQ for all other activities

Although not an Idaho DMA, the USFS is responsible for implementing TMDL activities on land which it manages.

3.5.4 Reasonable Assurance

All load allocations within this document are directed at nonpoint source activities. The completion of on-the-ground actions designed to reduce pollutant loads will be completed through DMA and citizen participation. DEQ’s continued interaction with these groups will help ensure progress is made towards pollutant reductions. DEQ will inform these groups on the current water quality data, updated BMPs, and potential funding sources.

3.5.5 Monitoring Strategy

Monitoring conducted within the Priest River subbasin to evaluate the effectiveness of BMPs and ambient water quality will be done using DEQ-approved monitoring procedures at the time of sampling. These procedures will help to ensure the data collected is compatible and usable during the DEQ assessment process.

Monitoring progress towards achieving shade targets will follow the guidelines established in *The Potential Natural Vegetation (PNV) Temperature Total Maximum Daily Load (TMDL) Procedures Manual* (Shumar and de Varona 2009).

3.5.6 Pollutant Trading

Pollutant trading (i.e., water quality trading) is a contractual agreement to exchange pollution reductions between two parties. Pollutant trading is a business-like way of helping to solve water quality problems by focusing on cost-effective, local solutions to problems caused by pollutant discharges to surface waters. Pollutant trading is voluntary. Parties trade only if both are better off as a result of the trade. Trading allows parties to decide how to best reduce pollutant loads within the limits of certain requirements. The appeal of trading emerges when pollutant sources face substantially different pollutant reduction costs. Typically, a party facing relatively high pollutant reduction costs compensates another party to achieve an equivalent, though less costly, pollutant reduction.

Pollutant trading is recognized in Idaho’s water quality standards in IDAPA 58.01.02.054.06. Currently, DEQ’s policy is to allow for pollutant trading as a means to meet

TMDLs and restore water quality limited water bodies to compliance with water quality standards. The *Water Quality Pollutant Trading Guidance* (DEQ 2010) document sets forth the procedures for pollutant trading. No pollutant trading is currently planned for the watersheds in the Priest River subbasin.

4 Conclusions

Effective shade targets were established for all streams based on the concept of maximum shading under potential natural vegetation equals natural background temperature levels. Shade targets were actually derived from effective shade curves developed for similar vegetation types in Idaho. Existing shade was determined from aerial photo interpretation field verified with Solar Pathfinder data.

Most assessment units examined lack shade and have excess solar loads as a result (Table 14). Some units have relatively low excess loads with needed reductions varying from 1-19%. Others have considerably larger excess loads. Target shade levels for individual reaches should be the goal managers strive for with future implementation plans. Managers should key in on the largest differences between existing and target shade as locations to prioritize implementation efforts.

Table 14. Summary of assessment outcomes.

Stream	Assessment Unit	Pollutant	TMDL(s) Completed	Recommended Changes to §303(d) List	Justification
Lower Priest River	ID17010215PN001_05	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Middle Fork East River	ID17010215PN003_02 ID17010215PN003_03	Temperature	Yes	No change	Excess solar Load from lack of shade
East River	ID17010215PN003_04	Temperature	Yes	No change	Excess solar Load from lack of shade
North Fork East River	ID17010215PN004_02 ID17010215PN004_03	Temperature	Yes	No change	Excess solar Load from lack of shade
Soldier Creek	ID17010215PN008_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Hunt Creek	ID17010215PN009_03	Temperature	Yes	Move to 4a	Unlisted but Impaired
Indian Creek	ID17010215PN010_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of Shade
Indian Creek	ID17010215PN010_03	Temperature	Yes	Move to 4a	Unlisted but Impaired
Two Mouth Creek	ID17010215PN012_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Lion Creek	ID17010215PN013_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Trapper Creek	ID17010215PN017_02 ID17010215PN017_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Upper Priest River	ID17010215PN018_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Hughes Fork	ID17010215PN019_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Beaver Creek	ID17010215PN020_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade

Stream	Assessment Unit	Pollutant	TMDL(s) Completed	Recommended Changes to §303(d) List	Justification
Granite Creek	ID17010215PN022_04	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Reeder Creek	ID17010215PN023_02 ID17010215PN023_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Kalispell Creek	ID17010215PN024_03	Temperature	Yes	Move to 4a	Excess solar Load from lack of Shade
Lamb Creek	ID17010215PN025_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Binarch Creek	ID17010215PN026_02	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Upper West Branch Priest River	ID17010215PN027_04	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Goose Creek	ID17010215PN028_03	Temperature	Yes	Move to 4a	Unlisted but Impaired
Lower West Branch Priest River	ID17010215PN030_03 ID17010215PN030_04	Temperature	Yes	Move to 4a	Excess solar Load from lack of shade
Moores Creek	ID17010215PN031_03	Temperature	Yes	Move to 4a	Unlisted but Impaired

This document was prepared with input from the public, as described in Appendix E. Following the public comment period, comments and DEQ responses will also be included in this appendix, and a distribution list will be included in Appendix F.

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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* (Grafe et al. 2002).

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(ing)

The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Loading 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 uncertainly 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; construction and mining sites; 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* (Grafe et al. 2002).

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.

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Appendix A. State and Site-Specific Standards and Criteria

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Water Quality Standards Applicable to Salmonid Spawning Temperature

Water quality standards for temperature are specific numeric values not to be exceeded during the salmonid spawning and egg incubation period, which varies by species. For spring-spawning salmonids (including westslope cutthroat trout), the default spawning and incubation period recognized by the Idaho Department of Environmental Quality (DEQ) is generally from March 15 to July 1 each year (Grafe et al. 2002). The Coeur d'Alene Regional Office further divided the general spawning and incubation windows with assistance from the Idaho Department of Fish and Game to better reflect and protect salmonid spawning and incubation in north Idaho. The adjusted spawning and incubation windows account for differences in elevation, a watershed characteristic not accounted for originally (Table A1). Fall spawning can occur as early as August 15 and continue with incubation into the following spring up to June 1. As per IDAPA 58.01 .02.250.02.f.ii., the following water quality criteria need to be met during the specified time period:

13 °C as a maximum daily maximum water temperature

DEQ is recently changed the water quality criteria with removal of the salmonid spawning 9 °C maximum daily average temperature. This was adopted by the Idaho Legislature in 2012.

The cold water aquatic life beneficial use, of which salmonid spawning is a subset, identifies water temperatures intended to protect and maintain a viable community for coldwater fish species and for other coldwater species (IDAPA 58.01 .02.250.02.b). As per IDAPA 58.01 .02.250.02.b., the following water quality criteria need to be met for cold water aquatic life:

- 22 °C maximum daily maximum water temperature
- 19 °C maximum daily average water temperature

Bull trout (*Salvelinus confluentus*) is listed as a threatened species by the US Fish and Wildlife Service. To protect the species in Idaho, a recovery plan was developed by the State in which water temperature criteria were set to protect the threatened species (IDAPA 58.01 .02.250.02.g). The US Environmental Protection Agency (EPA) also promulgated bull trout water quality temperature criteria (40 CFR § 131.33). State and federal temperature criteria are summarized in Table A1.

The cold water aquatic life criteria is not discussed in this section because where the cold water aquatic life beneficial use criteria apply, the salmonid spawning criteria also apply and are more protective (i.e., require a lower temperature) than the cold water aquatic life criteria. When temperature data exceed the more protective criteria (salmonid spawning), the water body is identified as impaired by temperature regardless of whether it fails the cold water aquatic life criteria also.

Table A1. State and federal water temperature standards applicable in the Priest River tributaries subbasin.

Type	Location	Criteria	Dates	
Cold Water Aquatic Life	Applies to entire subbasin	22 °C (71.6 °F) Maximum Daily Maximum Temperature (MDMT)	Applies entire year	
		19 °C (66.2 °F) Maximum Daily Average Temperature (MDAT)		
Salmonid Spawning	Applies to entire subbasin where beneficial use is designated or existing	13 °C (55.4 °F) Maximum Daily Maximum Temperature (MDMT)	Spring Spawning	Fall Spawning
		9 °C (48.2 °F) Maximum Daily Average Temperature (MDAT)	>4,000 ft Jun 1–July 31 3,000–4,000 ft May 15–July 15 <3,000 ft May 1–July 1	Aug 15–Nov 15
Idaho Bull Trout Criteria[a]	Applies to the entire drainage to Priest Lake, excluding Soldier Creek	13 °C (55.4 °F) Maximum Weekly Maximum Temperature (MWMT)	Rearing Jun 1–Aug 31	n.a.
		9 °C (48.2 °F) Maximum Daily Average Temperature (MDAT)	n.a.	Spawning Sep 1–Oct 31
US Environmental Protection Agency Bull Trout Criteria	Abandon, Athol, Bath, Bear, Bench, Blacktail, Bog, Boulder, Bugle, Canyon, Caribou, Cedar, Chicopee, Deadman, East Fork Trapper, Fedar, Floss, Gold, Granite, Horton, Hughes Fork, Indian, Jackson, Jost, Kalispell, Kent, Keokee, Lime, Lion, Lost, Lucky, Malcom, Middle Fork East River, Muskegon, North Fork Granite, North Fork Indian, Packer, Rock, Ruby, South Fork Granite, South Fork Indian, South Fork Lion, Squaw, Tango, Tarlac, Trapper, Two Mouth, Uleda, and Zero Creeks, Priest River (above Priest Lake), The Thorofare, East River	10 °C (50 °F) Maximum Weekly Maximum Temperature (MWMT)	Jun 1–Sep 30	

[a] Current Idaho temperature criteria for bull trout have not been approved or disapproved by the US Environmental Protection Agency.

Natural Background Provisions

For potential natural vegetation temperature TMDLs, it is assumed that natural temperatures may exceed these numeric criteria during certain time periods. If potential natural vegetation targets are achieved, yet stream temperatures are warmer than these criteria, it is assumed that the stream's temperature is natural (provided there are no point sources or human- induced ground water sources of heat) and natural background provisions of Idaho's water quality standards apply (IDA PA 58.01.02.200.09):

> When natural background conditions exceed any applicable water quality criteria set forth in Sections 210, 250, 251, 252, or 253, the applicable water quality criteria shall not apply; instead, there shall be no lowering of water quality from natural
>
> background conditions. Provided, however, that temperature may be increased above natural background conditions when allowed under Section 401.

Section 401 relates to point source wastewater treatment requirements. In this case, if temperature criteria for any aquatic life use are exceeded due to natural conditions, then a point source discharge cannot raise the water temperature by more than 0.3 °C (IDAPA 58.01.02.401.01 .c).

Minor Exceedances of Water Quality Standards for Temperature

It is currently DEQ's policy to allow for minor exceedances of water quality temperature criteria when the exceedance occurs less than 10% of the critical time period and there is no other evidence of thermal inputs (Grafe et al. 2002). Exceptions are also made for water temperature exceedances that occur during periods when air temperatures exceed the 90th percentile of air temperatures recorded in the area (Grafe et al. 2002).

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Appendix B. Data Sources

Table B1. Data sources for the Priest River Subbasin TMDLs.

Water Body	Data Source	Type of Data	When Collected
10 water bodies	DEQ CDA Regional Office, FPA Water Quality Audit	Pathfinder effective shade and stream width	2008, 2009
All waters	DEQ State Technical Services Office	Aerial Photo Interpretation of existing shade and stream width estimation	2009
	DEQ IDASA Database	Temperature	

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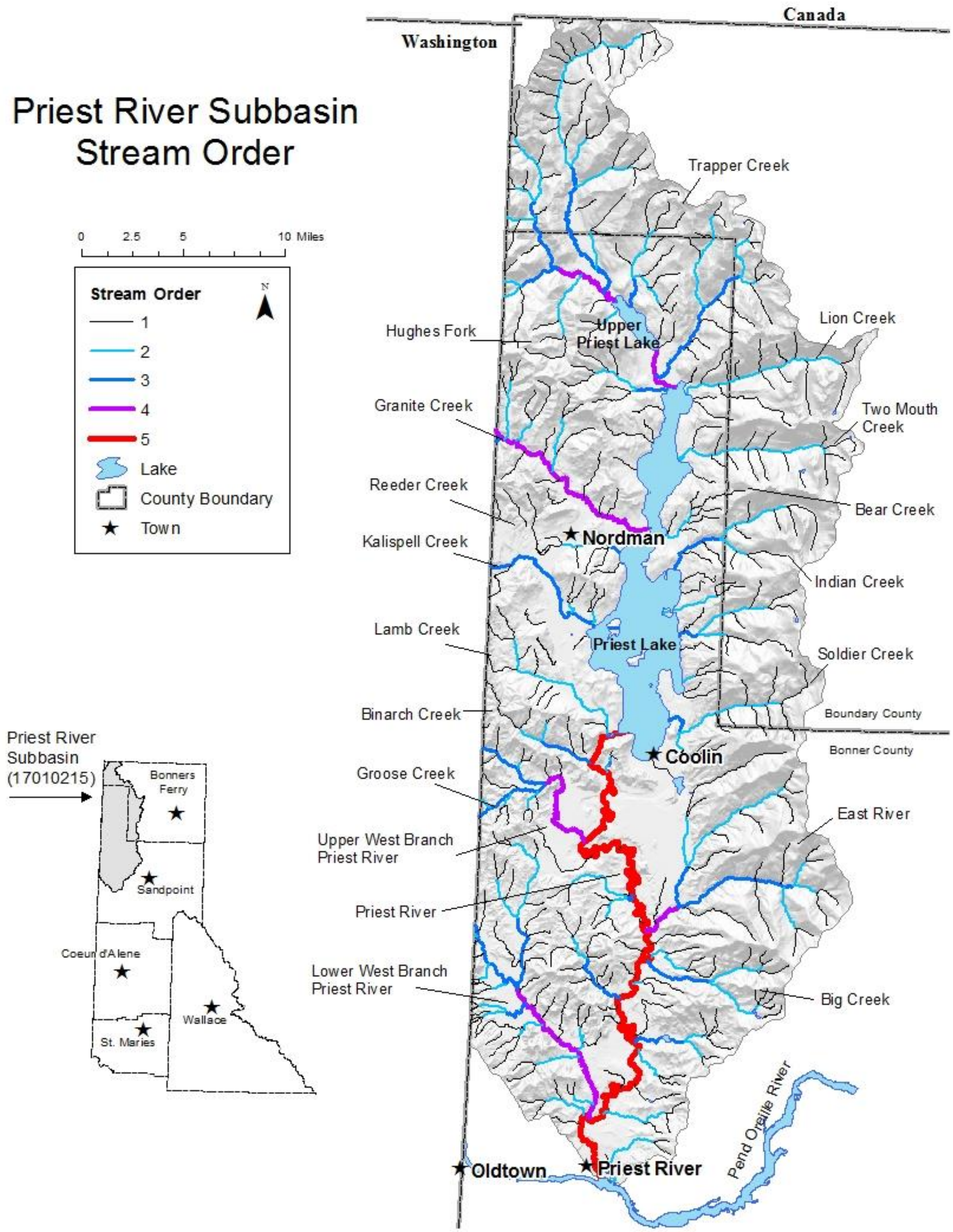

Figure B1. Stream orders for the Priest River region,

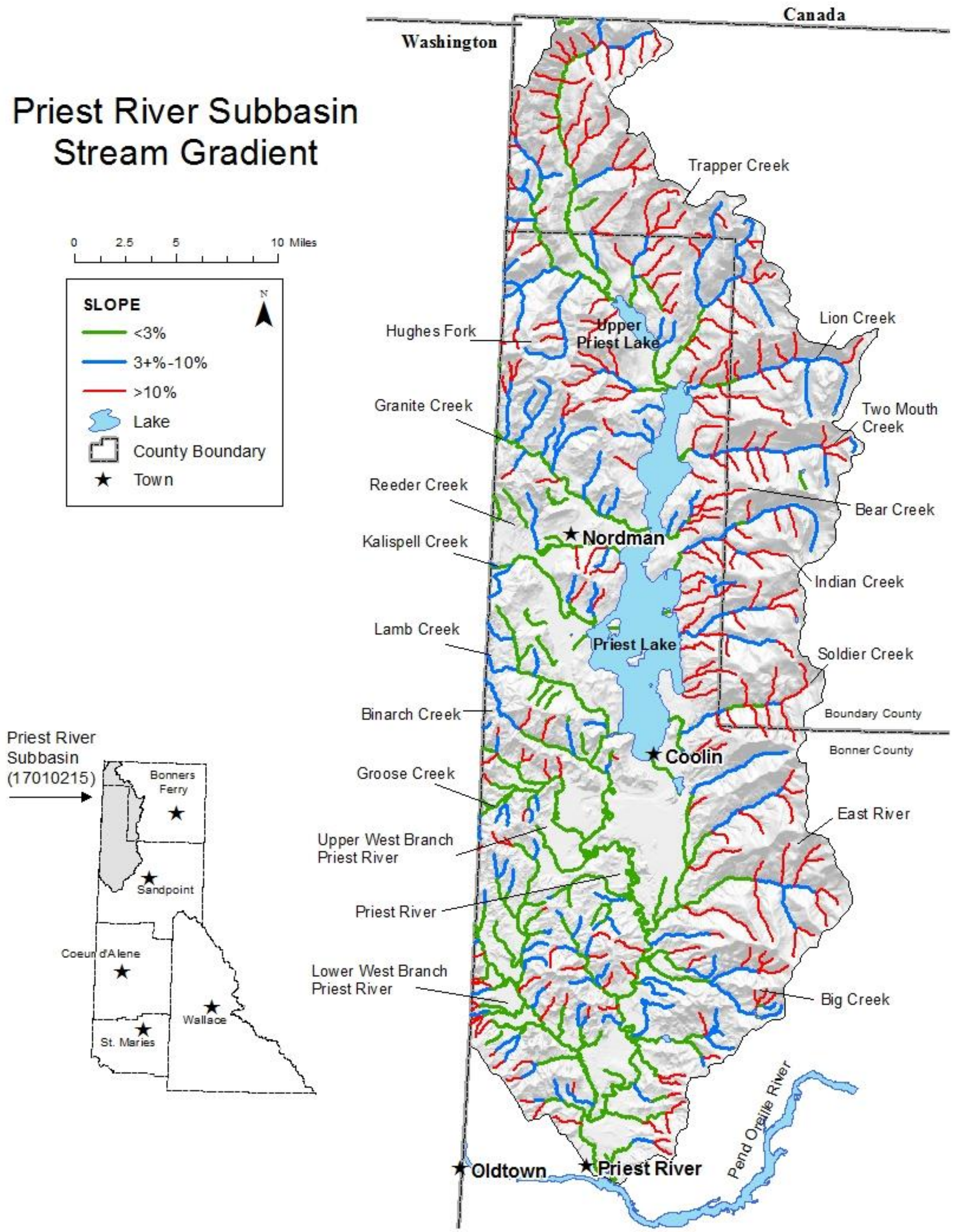

Figure B2. Stream gradient for the Priest River region.

Appendix C. Estimates of Natural Bankfull Width

Table C1. Bankfull width estimation for Binarch Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Binarch Creek @ mouth	10.6	8	7	5	6	
Binarch Cr ab 3rd tributary	8.62	7	6	5	5	5.4
Binarch Cr ab 2nd tributary	6.26	6	5	4	4	
Binarch Cr ab 1st tributary	4.4	5	4	3	4	
Binarch Cr @ state border	0.99	2	2	2	2	

Table C2. Bankfull width estimation for Beaver Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Beaver Creek @ mouth	10.19	8	6	5	6	4.9
Beaver Cr ab 4th tributary	6.72	6	5	4	5	
Beaver Cr ab 3rd tributary	4.69	5	4	3	4	
Beaver Cr ab 2nd tributary	3.19	4	4	3	3	
Baver Cr ab 1st tributary	1.96	3	3	2	2	

Table C3. Bankfull width estimation for East River.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP data (m)
Lost Creek @ mouth	10.78	8	7	5	6	
Lost Cr ab 1st tributary	8.27	7	6	5	5	
Waters Cr @ mouth	1.86	3	3	2	2	
North Fork East River @ mouth	20.02	11	9	7	8	9.2
NF East River ab Lost Creek	16.36	10	8	7	7	
NF East River ab 3rd tributary	7.9	7	6	5	5	6.6
NF East River ab 2nd tributary	2.62	4	3	3	3	
Canyon Creek @ mouth	4.66	5	4	3	4	
Tarlac Creek @ mouth	3.15	4	4	3	3	
Uleda Creek @ mouth	5.49	6	5	4	4	
Middle Fork East River @ mouth	34.66	14	12	10	11	
MF East River ab Canyon Creek	29.95	13	11	9	10	8.4
MF East River ab Tarlac Creek	19.31	10	9	7	8	
MF East River ab Uleda Creek	9.75	7	6	5	6	
MF East River ab 1st tributary	1.8	3	3	2	2	
East River @ mouth	61.89	18	16	14	15	
East River ab 1st tributary	55.89	17	15	13	14	
East R. bl N. & Middle East Rivers	54.69	17	15	13	14	

Table C4. Bankfull width estimation for Goose Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Goose Creek @ mouth	22.55	11	10	8	9	
Goose Cr ab 3rd tributary	20.83	11	9	8	8	
Goose Cr ab Blonc Creek	18.64	10	9	7	8	
Goose Cr ab 2nd tributary	16.45	10	8	7	7	
Goose Cr ab Consalus Creek	9.64	7	6	5	6	
Goose Cr ab 1st tributary	8.23	7	6	5	5	
Goose Creek @ state border	8.1	7	6	5	5	
Blonc Creek @ mouth	1.06	3	2	2	2	
Consalus Creek @ mouth	6.31	6	5	4	4	

Table C5. Bankfull width estimation for Granite Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
SF Granite Creek @ mouth	34.11	14	12	10	11	
NF Granite Creek @ mouth	29.53	13	11	9	10	
Granite Creek @ mouth	98.72	23	20	17	19	23.5
Granite Cr ab Fedar Creek	88.49	22	19	16	18	
Granite Cr ab Blacktail Creek	79.15	20	18	16	17	
Granite Cr ab Athol Creek	74.18	20	17	15	16	
Granite Cr ab Packer Creek	68.99	19	17	14	16	
Granite Cr @ NF & SF confluence	63.69	18	16	14	15	
Zero Creek @ mouth	5.02	5	5	4	4	
Packer Creek @ mouth	4.1	5	4	3	4	
Athol Creek @ mouth	2.14	4	3	2	3	
Blacktail Creek @ mouth	6.31	6	5	4	4	
Jost Creek @ mouth	2.79	4	3	3	3	
Fedar Creek @ mouth	2.81	4	3	3	3	
un-connected stream # 33 @ mouth	1.16	3	2	2	2	

Table C6. Bankfull width estimation for Hughes Fork Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Bench Creek @ mouth	4.6	5	4	3	4	
Jackson Creek @ mouth	7.13	6	5	4	5	
Gold Creek @ mouth	21.28	11	9	8	8	9.8
Gold Cr ab Muskegon Cr	12.07	8	7	6	6	6.9
Muskegon Creek @ mouth	6.36	6	5	4	4	
South Fork Gold Cr @ mouth	2.8	4	3	3	3	
Boulder Cr @ mouth	9.09	7	6	5	5	5.7
Boulder Cr ab 1st tributary	3.56	5	4	3	3	
Hughes Fork @ mouth	59.66	18	16	13	14	
Hughes Fork ab Boulder Cr	49.95	16	14	12	13	7.6
Hughes Fork ab Gold Cr	27.21	12	11	9	10	7.8
Hughes Fork ab Jackson Cr	16.13	10	8	7	7	
Hughes Fork ab Bench Cr	10.8	8	7	5	6	

Table C7. Bankfull width estimation for Hunt Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
SF Hunt Creek @ mouth	7.23	6	5	4	5	
Sf Hunt Cr ab 1st tributary	5.35	6	5	4	4	
Hunt Creek @ mouth	18.58	10	9	7	8	
Hunt Cr ab 3rd tributary	17.78	10	9	7	8	
Hunt Cr ab SF Hunt Creek	10.02	8	6	5	6	
Hunt Cr ab 2nd tributary	5.48	6	5	4	4	
Hunt Cr ab 1st tributary	1.77	3	3	2	2	

Table C8. Bankfull width estimation for Indian Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
North Fork Indian Creek @ mouth	14.2	9	8	6	7	9.9, 15
North Fork Indian ab 3rd tributay	10.89	8	7	5	6	
North Fork Indian ab 1st tributary	5.65	6	5	4	4	
South Fork Indian Creek @ mouth	5.82	6	5	4	4	6.3
South Fork Indian ab 2nd tributary	4.81	5	4	4	4	
South Fork Indian ab 1st tributary	2.82	4	3	3	3	
Indian Creek @ mouth	23.5	11	10	8	9	
Indian Cr ab 2nd tributary	22.26	11	10	8	9	
Indian Cr ab 1st tributary	20.95	11	9	8	8	
Indian Cr @ confluence of NF & SF	20.05	11	9	7	8	

Table C9. Bankfull width estimation for Kalispell Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Kalispell Creek @ mouth	45.99	16	14	12	13	
Kalispell Cr ab 2nd tributary	44.62	16	14	11	12	
Kalispell Cr ab 1st tributary	42.2	15	13	11	12	8
Kalispell Cr ab Bath Creek	19.12	10	9	7	8	6.8, 6
Kalispell Cr @ state border	12.99	9	7	6	7	
Bath Creek @ mouth	5.86	6	5	4	4	
Nuisance Creek @ mouth	5.74	6	5	4	4	
un-connected stream # 30 @ end	2.42	4	3	2	3	

Table C10. Bankfull width estimation for Lamb Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Lamb Creek @ mouth	22.31	11	10	9	9	
Lamb Cr ab 5th tributary	21.32	11	9	9	8	7.2
Lamb Cr ab 4th tributary	15.12	9	8	8	7	
Lamb Cr ab 2nd tributary	12.48	8	7	7	6	
Lamb Cr ab 1st tributary	11.83	8	7	7	6	
Lamb Cr ab NF Lamb Creek	5.22	6	5	5	4	4.7
Lamb Creek @ state border	3.11	4	4	4	3	
un-connected stream #28 @ end	1.06	3	2	3	2	
North Fork Lamb Creek @ mouth	5.75	6	5	5	4	
NF Lamb Cr ab 1st tributary	4.26	5	4	5	4	
NF Lamb Cr ab Skip Creek	1.53	3	3	3	2	
Skip Creek @ mouth	2.08	4	3	3	3	

Table C11. Bankfull width estimation for Lion Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Kent Creek @ mouth	3.71	5	4	4	3	
South Fork Lion Creek @ mouth	4.58	5	4	5	4	
Lucky Creek @ mouth	1.66	3	3	3	2	
Lion Creek @ mouth	28.48	13	11	10	10	17.2
Lion Cr ab Lucky Creek	26.39	12	10	9	9	
Lion Cr ab South Fork Lion Cr	21.04	11	9	9	8	
Lion Cr ab 6th tributary	15.86	9	8	8	7	
Lion Cr ab 2nd tributary	11.7	8	7	7	6	
Lion Cr ab Kent Creek	7.23	6	5	6	5	
Lion Cr ab 1st tributary	3.04	4	4	4	3	

Table C12. Bankfull width estimation for Lower West Branch Priest River.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
LWB Priest River @ mouth	82.69	21	18	15	17	14.7
LWB Priest River ab Pine Creek	74.49	20	18	14	16	
LWB Priest River ab Peewee Creek	71.46	19	17	14	16	
LWB Priest River ab Snow Creek	57.72	18	15	13	14	
LWB Priest River ab Tunnel Creek	54.53	17	15	13	14	9.7
LWB Priest River ab Moores Creek	38.78	15	13	11	12	
LWB Priest River ab Ole Creek	35.2	14	12	11	11	
LWB Priest River ab Slough Creek	33.04	13	12	10	11	
LWB Priest River ab Bear Paw Cr	20.16	11	9	8	8	
Bear Paw Creek @ mouth	8.83	7	6	6	5	
Mosquito Creek @ mouth	1.59	3	3	3	2	
Roger Creek @ mouth	0.62	2	2	2	1	
Slough Creek @ mouth	1.13	3	2	3	2	
Ole Creek @ mouth	3.14	4	4	4	3	
Tunnel Creek @ mouth	4.06	5	4	4	4	
Snow Creek @ mouth	9.7	7	6	6	6	
Snow Cr ab 2nd tributary	6.43	6	5	5	5	
Peewee Creek @ mouth	2.98	4	4	4	3	
Pine Creek @ mouth	5.1	5	5	5	4	
Moores Creek @ mouth	14.81	9	8	7	7	
Moores Cr ab 7th tributary	12.32	8	7	7	6	
Moores Cr ab 4th tributary	7.79	7	6	6	5	
Moores Cr ab West Fork Moores Cr	6.91	6	5	6	5	
Moores Cr ab 2nd tributary	3.16	4	4	4	3	
West Fork Moores Creek @ mouth	4.64	5	4	5	4	
WF Moores Cr ab 2nd tributary	2.55	4	3	4	3	
Moores Cr 7th tributary @ mouth	1.13	3	2	3	2	

Table C13. Bankfull width estimation for Priest River.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Upper Priest River @ mouth	114.57	24	22	19	20	21.4, 18.8
Upper Priest R. ab Malcom Creek	1.65	3	3	2	2	
The Thorofare bl Upper Priest Lake	145.13	27	24	21	23	
The Thorofare ab Priest Lake	190.28	31	28	25	26	
Priest River bl Lake	595.45	54	50	45	48	
Priest River @ mouth	957.87	68	63	58	61	

Table C14. Bankfull width estimation for Reeder Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Reeder Creek @ mouth	12.81	9	7	7	6	
Reeder Cr ab 3rd tributary	11.4	8	7	7	6	
Reeder Cr ab 2nd tributary	8.84	7	6	6	5	3.2
Reeder Cr ab Indian Creek	1.61	3	3	3	2	
un-connected stream # 32 @ end	0.79	2	2	2	2	
Indian Creek @ mouth	2.28	4	3	4	3	
Reeder Cr 3rd tributary @ mouth	1.36	3	2	3	2	
3rd tributary ab tributary 3.1	0.62	2	2	2	1	

Table C15. Bankfull width estimation for Soldier Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Lee Creek @ mouth	3.71	5	4	4	3	
Lee Cr ab 1st tributary	1.64	3	3	3	2	
Soldier Creek @ mouth	25.04	12	10	9	9	
Soldier Cr ab Lee Creek	19.09	10	9	8	8	
Soldier Cr ab 7th tributary	16.38	10	8	8	7	
Soldier Cr ab 5th tributary	12.74	9	7	7	6	
Soldier Cr ab 3rd tributary	9.69	7	6	6	6	
Soldier Cr ab 1st tributary	3.98	5	4	4	4	

Table C16. Bankfull width estimation for Trapper Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Floss Creek @ mouth	3.62	5	4	4	3	
Floss Cr ab 1st tributary	1.32	3	2	3	2	
Floss Cr 1st tributary @ mouth	2.04	4	3	3	2	
East Fork Trapper Cr @ mouth	4.97	5	5	5	4	
East Fork Trapper Cr ab Floss Cr	1.19	3	2	3	2	
Trapper Creek @ mouth	19.13	10	9	8	8	7.7
Trapper Cr ab East Fork Trapper Cr	12.7	8	7	7	6	5.1
Trapper Cr ab 1st tributary	3.87	5	4	4	3	7.6

Table C17. Bankfull width estimation for Two Mouth Creek.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Two Mouth 12th tributay @ mouth	1.59	3	3	3	2	
Two Mouth 7th tributay @ mouth	0.81	2	2	2	2	
Two Mouth 2nd tributay @ mouth	1.11	3	2	3	2	
Two Mouth Creek @ mouth	24.14	12	10	9	9	11.5, 15.2
Two Mouth Cr ab 12th tributay	21.84	11	9	9	9	
Two Mouth Cr ab 10th tributay	19.57	10	9	8	8	
Two Mouth Cr ab 7th tributay	15.26	9	8	8	7	22.1
Two Mouth Cr ab 5th tributay	12.69	8	7	7	6	
Two Mouth Cr ab 2nd tributay	3.09	4	4	4	3	
Two Mouth Cr ab 1st tributay	2.58	4	3	4	3	

Table C18. Bankfull width estimation for Upper West Branch Priest River.

Location	area (sq mi)	Spokane (m)	Kootenai (m)	PendOreille (m)	Clearwater (m)	BURP Data (m)
Upper W Branch Priest R. @ mouth	69.9	19	17	14	16	
UWB Priest R. ab 6th tributary	63.16	18	16	13	15	13
UWB Priest R. ab Goose Creek	38.85	15	13	11	12	
UWB Priest R. ab 4th tributary	37.16	14	12	11	11	
UWB Priest R. ab 2nd tributary	34.36	14	12	10	11	
UWB Priest R. @ state border	33.89	14	12	10	11	11.1
Tola Creek @ state border	0.39	2	1	2	1	

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Appendix D. Existing and Potential Solar Load Tables and Target Shade Curves

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Loading Tables for the Upper Priest River Region

Table D1. Existing and potential solar loads for the Upper Priest River named tributaries.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
018_02	Rock Creek	1	1800	Group B	98%	0.11	2	4,000	500	70%	1.71	2	4,000	7,000	7,000	-28%
018_02	Rock Creek	2	2000	Group B	97%	0.17	3	6,000	1,000	80%	1.14	3	6,000	7,000	6,000	-17%
018_02	Rock Creek	3	2400	Group B	96%	0.23	4	10,000	2,000	90%	0.57	4	10,000	6,000	4,000	-6%
018_02	Lime Creek	1	3000	Group B	97%	0.17	3	9,000	2,000	80%	1.14	3	9,000	10,000	8,000	-17%
018_02	Lime Creek	2	3430	Group B	94%	0.34	5	20,000	7,000	90%	0.57	6	20,000	10,000	3,000	-4%
018_02	trib to Lime Cr.	1	360	Group B	98%	0.11	1	400	50	80%	1.14	1	400	500	500	-18%
018_02	trib to Lime Cr.	2	250	Group B	98%	0.11	1	300	30	60%	2.28	1	300	700	700	-38%
018_02	trib to Lime Cr.	3	800	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
018_02	trib to Lime Cr.	4	330	Group B	98%	0.11	2	700	80	90%	0.57	2	700	400	300	-8%
018_02	Cedar Creek	1	2100	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
018_02	Cedar Creek	2	4760	Group B	96%	0.23	4	20,000	5,000	80%	1.14	4	20,000	20,000	20,000	-16%
018_02	1st trib to Cedar	1	1600	Group B	98%	0.11	1	2,000	200	70%	1.71	1	2,000	3,000	3,000	-28%
018_02	1st trib to Cedar	2	390	Group B	98%	0.11	2	800	90	80%	1.14	2	800	900	800	-18%
018_02	2nd trib to Cedar	1	690	Group C	98%	0.11	1	700	80	70%	1.71	1	700	1,000	900	-28%
018_02	2nd trib to Cedar	2	500	Group B	98%	0.11	2	1,000	100	80%	1.14	2	1,000	1,000	900	-18%
018_02	2nd trib to Cedar	3	430	Group B	97%	0.17	3	1,000	200	70%	1.71	3	1,000	2,000	2,000	-27%
018_02	3rd trib to Cedar	1	210	Group B	98%	0.11	1	200	20	80%	1.14	1	200	200	200	-18%
018_02	3rd trib to Cedar	2	2600	Group B	98%	0.11	2	5,000	600	90%	0.57	2	5,000	3,000	2,000	-8%
018_02	Ruby Creek	1	550	Group B	98%	0.11	1	600	70	50%	2.85	1	600	2,000	2,000	-48%
018_02	Ruby Creek	2	470	Group B	98%	0.11	1	500	60	60%	2.28	1	500	1,000	900	-38%
018_02	Ruby Creek	3	280	Group B	98%	0.11	2	600	70	50%	2.85	2	600	2,000	2,000	-48%
018_02	Ruby Creek	4	2800	Group B	97%	0.17	3	8,000	1,000	90%	0.57	3	8,000	5,000	4,000	-7%
018_02	Ruby Creek	5	530	Group B	97%	0.17	3	2,000	300	90%	0.57	3	2,000	1,000	700	-7%
018_02	Ruby Creek	6	2500	Group B	96%	0.23	4	10,000	2,000	90%	0.57	4	10,000	6,000	4,000	-6%
018_02	trib to Ruby	1	1800	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
018_02	Snow Creek	1	440	Group B	98%	0.11	1	400	50	60%	2.28	1	400	900	900	-38%
018_02	Snow Creek	2	710	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
018_02	Snow Creek	3	360	Group B	98%	0.11	2	700	80	70%	1.71	2	700	1,000	900	-28%
018_02	Snow Creek	4	1250	Group B	97%	0.17	3	4,000	700	90%	0.57	3	4,000	2,000	1,000	-7%
018_02	Togo Gulch	1	2000	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
							Totals		25,000					100,000	83,000	

Table D2. Existing and potential solar loads for the Upper Priest River unnamed tributaries.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
018_02	border stream	1	820	Rock/	40%	3.42	1	800	3,000	40%	3.42	1	800	3,000	0	0%
018_02	border stream	2	410	Avalanche	60%	2.28	2	800	2,000	60%	2.28	2	800	2,000	0	0%
018_02	(Snowy Top)	3	410	Group C	96%	0.23	3	1,000	200	90%	0.57	3	1,000	600	400	-6%
018_02	1st tributary	1	810	Rock/	60%	2.28	1	800	2,000	60%	2.28	1	800	2,000	0	0%
018_02	1st tributary	2	680	Avalanche	70%	1.71	2	1,000	2,000	70%	1.71	2	1,000	2,000	0	0%
018_02	1st tributary	3	260	Group B	97%	0.17	3	800	100	90%	0.57	3	800	500	400	-7%
018_02	2nd tributary	1	610	Group B	98%	0.11	1	600	70	80%	1.14	1	600	700	600	-18%
018_02	2nd tributary	2	70	Group B	98%	0.11	2	100	10	50%	2.85	2	100	300	300	-48%
018_02	2nd tributary	3	1100	Group B	97%	0.17	3	3,000	500	90%	0.57	3	3,000	2,000	2,000	-7%
018_02	3rd tributary	1	1700	Rock/	60%	2.28	2	3,000	7,000	60%	2.28	2	3,000	7,000	0	0%
018_02	4th tributary	1	1700	Avalanche	50%	2.85	1	2,000	6,000	50%	2.85	1	2,000	6,000	0	0%
018_02	4th tributary	2	330	Rock/	40%	3.42	2	700	2,000	40%	3.42	2	700	2,000	0	0%
018_02	5th tributary	1	720	Avalanche	60%	2.28	1	700	2,000	60%	2.28	1	700	2,000	0	0%
018_02	5th tributary	2	770	Rock/	70%	1.71	2	2,000	3,000	70%	1.71	2	2,000	3,000	0	0%
018_02	5th tributary	3	120	Avalanche	50%	2.85	3	400	1,000	50%	2.85	3	400	1,000	0	0%
018_02	6th tributary	1	630	Group B	98%	0.11	1	600	70	80%	1.14	1	600	700	600	-18%
018_02	6th tributary	2	1300	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
018_02	7th tributary	1	1200	Nonforest 1	97%	0.17	1	1,000	200	80%	1.14	1	1,000	1,000	800	-17%
018_02	7th tributary	2	1200	Nonforest 1	94%	0.34	2	2,000	700	90%	0.57	2	2,000	1,000	300	-4%
018_02	8th tributary	1	940	Group B	98%	0.11	1	900	100	80%	1.14	1	900	1,000	900	-18%
018_02	8th tributary	2	1500	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
018_02	9th tributary	1	1700	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
018_02	10th tributary	1	1700	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
							Totals		33,000					46,000	14,000	

Table D3. Existing and potential solar loads for Malcom Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
018_02	1st tributary	1	1900	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
018_02	1st tributary	2	350	Group B	98%	0.11	2	700	80	80%	1.14	2	700	800	700	-18%
018_02	Spread Creek	1	1500	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
018_02	Spread Creek	2	60	Group B	98%	0.11	2	100	10	40%	3.42	2	100	300	300	-58%
018_02	Spread Creek	3	940	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
018_02	Continental Cr.	1	2100	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
018_02	Continental Cr.	2	80	Group B	98%	0.11	2	200	20	40%	3.42	2	200	700	700	-58%
018_02	Continental Cr.	3	700	Group B	98%	0.11	2	1,000	100	80%	1.14	2	1,000	1,000	900	-18%
018_02	Malcom Creek	1	3400	Group B	98%	0.11	1	3,000	300	90%	0.57	1	3,000	2,000	2,000	-8%
018_02	Malcom Creek	2	1000	Group B	97%	0.17	3	3,000	500	80%	1.14	3	3,000	3,000	3,000	-17%
018_02	Malcom Creek	3	450	Group B	96%	0.23	4	2,000	500	90%	0.57	4	2,000	1,000	500	-6%
018_02	Malcom Creek	4	1420	Group B	94%	0.34	5	7,000	2,000	80%	1.14	5	7,000	8,000	6,000	-14%
018_02	Malcom Creek	5	550	Group B	94%	0.34	5	3,000	1,000	70%	1.71	5	3,000	5,000	4,000	-24%
018_02	Malcom Creek	6	740	Group B	94%	0.34	5	4,000	1,000	90%	0.57	6	4,000	2,000	1,000	-4%
							Totals		6,300					29,000	24,000	

Table D4. Existing and potential solar loads for Hughes Fork Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
019_02	Hughes Fork	1	2200	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
019_02	Hughes Fork	2	160	Avalanche Path	60%	2.28	2	300	700	60%	2.28	2	300	700	0	0%
019_02	Hughes Fork	3	110	Group B	98%	0.11	2	200	20	80%	1.14	2	200	200	200	-18%
019_02	Hughes Fork	4	980	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
019_02	Hughes Fork	5	380	Group B	97%	0.17	3	1,000	200	80%	1.14	3	1,000	1,000	800	-17%
019_02	Hughes Fork	6	480	Group B	97%	0.17	3	1,000	200	90%	0.57	3	1,000	600	400	-7%
019_02	Hughes Fork	7	230	Group B	97%	0.17	3	700	100	80%	1.14	3	700	800	700	-17%
019_02	Hughes Fork	8	2750	Group B	97%	0.17	3	8,000	1,000	90%	0.57	3	8,000	5,000	4,000	-7%
019_02	Hughes Fork	9	700	Group B	96%	0.23	4	3,000	700	70%	1.71	4	3,000	5,000	4,000	-26%
019_02	Hughes Fork	10	620	Nonforest 1	78%	1.25	4	2,000	3,000	60%	2.28	4	2,000	5,000	2,000	-18%
019_02	Hughes Fork	11	490	Nonforest 1	78%	1.25	4	2,000	3,000	70%	1.71	4	2,000	3,000	0	-8%
019_02	Hughes Fork	12	1300	Nonforest 1	72%	1.60	5	7,000	10,000	40%	3.42	10	10,000	30,000	20,000	-32%
019_03	Hughes Fork	1	1500	Nonforest 1	72%	1.60	5	8,000	10,000	40%	3.42	8	10,000	30,000	20,000	-32%
019_03	Hughes Fork	2	1190	beaver	65%	2.00	6	7,000	10,000	30%	3.99	8	10,000	40,000	30,000	-35%
019_03	Hughes Fork	3	580	Nonforest 1	65%	2.00	6	3,000	6,000	70%	1.71	6	3,000	5,000	(1,000)	0%
019_03	Hughes Fork	4	900	Group B	60%	2.28	7	6,000	10,000	40%	3.42	14	10,000	30,000	20,000	-20%
019_03	Hughes Fork	5	1400	Group B	90%	0.57	7	10,000	6,000	70%	1.71	10	10,000	20,000	10,000	-20%
019_03	Hughes Fork	6	880	Nonforest 1	55%	2.57	8	7,000	20,000	30%	3.99	8	7,000	30,000	10,000	-25%
019_03	Hughes Fork	7	580	Nonforest 1	55%	2.57	8	5,000	10,000	70%	1.71	8	5,000	9,000	(1,000)	0%
019_04	Hughes Fork	1	1500	Group B	83%	0.97	9	10,000	10,000	70%	1.71	9	10,000	20,000	10,000	-13%
019_04	Hughes Fork	2	390	Nonforest 1	48%	2.96	10	3,900	12,000	40%	3.42	10	3,900	13,000	1,000	-8%
019_04	Hughes Fork	3	440	Nonforest 1	48%	2.96	10	4,400	13,000	60%	2.28	10	4,400	10,000	(3,000)	0%
019_04	Hughes Fork	4	600	Nonforest 1	48%	2.96	10	6,000	18,000	40%	3.42	10	6,000	21,000	3,000	-8%
019_04	Hughes Fork	5	2440	Nonforest 1	41%	3.36	12	29,000	98,000	30%	3.99	12	29,000	120,000	22,000	-11%
							Totals		240,000					400,000	150,000	

Table D5. Existing and potential solar loads for the Hughes Fork tributaries.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
019_02	Bench Creek	1	1420	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
019_02	Bench Creek	2	1040	Group B	96%	0.23	4	4,000	900	90%	0.57	4	4,000	2,000	1,000	-6%
019_02	Bench Creek	3	320	Group B	94%	0.34	5	2,000	700	80%	1.14	5	2,000	2,000	1,000	-14%
019_02	Bench Creek	4	320	Group B	94%	0.34	5	2,000	700	70%	1.71	5	2,000	3,000	2,000	-24%
019_02	1st trib to Bench	1	680	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
019_02	2nd trib to Bench	1	1900	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
019_02	1st tributary	1	700	Group B	98%	0.11	1	700	80	90%	0.57	1	700	400	300	-8%
019_02	2nd tributary	1	760	Group B	98%	0.11	1	800	90	90%	0.57	1	800	500	400	-8%
019_02	3rd tributary	1	1700	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
019_02	4th tributary	1	1700	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
019_02	5th tributary	1	1000	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
019_02	5th tributary	2	270	Group B	98%	0.11	2	500	60	30%	3.99	2	500	2,000	2,000	-68%
019_02	Jackson Creek	1	1650	Group B	97%	0.17	3	5,000	900	90%	0.57	3	5,000	3,000	2,000	-7%
019_02	Jackson Creek	2	740	Group B	92%	0.46	6	4,000	2,000	80%	1.14	6	4,000	5,000	3,000	-12%
019_02	Ledge Creek	1	1300	Group B	98%	0.11	2	3,000	300	70%	1.71	2	3,000	5,000	5,000	-28%
019_02	Ledge Creek	2	1400	Group B	97%	0.17	3	4,000	700	90%	0.57	3	4,000	2,000	1,000	-7%
019_02	6th tributary	1	1200	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
019_02	6th tributary	2	740	Group B	97%	0.17	3	2,000	300	90%	0.57	3	2,000	1,000	700	-7%
							Totals		8,300					38,000	30,000	

Table D6. Existing and potential solar loads for Gold Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
019_02	Muskegon Cr.	1	1660	Group B	94%	0.34	5	8,000	3,000	80%	1.14	5	8,000	9,000	6,000	-14%
019_02	trib. to Muskegon	1	310	Group B	98%	0.11	1	300	30	90%	0.57	1	300	200	200	-8%
019_02	SF Gold Creek	1	860	Group C	98%	0.11	1	900	100	80%	1.14	1	900	1,000	900	-18%
019_02	SF Gold Creek	2	2200	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
019_02	SF Gold Creek	3	2200	Group B	96%	0.23	4	9,000	2,000	90%	0.57	4	9,000	5,000	3,000	-6%
019_02	SF Gold Creek	4	120	Group B	96%	0.23	4	500	100	80%	1.14	4	500	600	500	-16%
019_02	trib. to Gold Cr.	1	1090	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
019_02	trib. to Gold Cr.	2	350	Group B	98%	0.11	2	700	80	90%	0.57	2	700	400	300	-8%
019_02	Gold Creek	1	1500	Group B	90%	0.57	7	10,000	6,000	80%	1.14	7	10,000	10,000	4,000	-10%
019_03	Gold Creek	2	380	Group B	83%	0.97	9	3,000	3,000	80%	1.14	9	3,000	3,000	0	-3%
019_03	Gold Creek	3	3200	Group B	83%	0.97	9	30,000	30,000	70%	1.71	9	30,000	50,000	20,000	-13%
								Totals	45,000					82,000	37,000	

Table D7. Existing and potential solar loads for Boulder Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
019_02	1st tributary	1	810	Group B	98%	0.11	1	800	90	90%	0.57	1	800	500	400	-8%
019_02	1st tributary	2	1400	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
019_02	2nd tributary	1	1400	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
019_02	2nd tributary	2	970	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
019_02	Boulder Creek	1	540	Group B	98%	0.11	1	500	60	90%	0.57	1	500	300	200	-8%
019_02	Boulder Creek	2	950	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
019_02	Boulder Creek	3	4550	Group B	96%	0.23	4	20,000	5,000	80%	1.14	4	20,000	20,000	20,000	-16%
019_02	Boulder Creek	4	4480	Group B	92%	0.46	6	30,000	10,000	90%	0.57	6	30,000	20,000	10,000	-2%
							Totals		16,000					47,000	37,000	

Table D8. Existing and potential solar loads for Trapper Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
017_02	1st tributary	1	1000	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
017_02	1st tributary	2	1500	Group B	98%	0.11	2	3,000	300	80%	1.14	2	3,000	3,000	3,000	-18%
017_02	1st tributary	3	130	Group B	98%	0.11	2	300	30	60%	2.28	2	300	700	700	-38%
017_02	1st tributary	4	1240	Group B	97%	0.17	3	4,000	700	90%	0.57	3	4,000	2,000	1,000	-7%
017_02	trib to 1st trib	1	420	Rocky/High Elv	95%	0.29	1	400	100	80%	1.14	1	400	500	400	-15%
017_02	trib to 1st trib	2	630	Group B	98%	0.11	1	600	70	80%	1.14	1	600	700	600	-18%
017_02	trib to 1st trib	3	350	Group B	98%	0.11	1	400	50	90%	0.57	1	400	200	200	-8%
017_02	trib to 1st trib	4	410	Group B	98%	0.11	2	800	90	80%	1.14	2	800	900	800	-18%
017_02	trib to 1st trib	5	920	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
017_02	2nd tributary	1	200	Group B	98%	0.11	1	200	20	90%	0.57	1	200	100	80	-8%
017_02	2nd tributary	2	550	Group B	98%	0.11	1	600	70	70%	1.71	1	600	1,000	900	-28%
017_02	2nd tributary	3	890	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
017_02	3rd tributary	1	950	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
017_02	3rd tributary	2	1400	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
017_02	EF Trapper Cr.	1	900	Group B	98%	0.11	1	900	100	90%	0.57	1	900	500	400	-8%
017_02	EF Trapper Cr.	2	2000	Group B	98%	0.11	2	4,000	500	80%	1.14	2	4,000	5,000	5,000	-18%
017_02	EF Trapper Cr.	3	900	Group B	97%	0.17	3	3,000	500	80%	1.14	3	3,000	3,000	3,000	-17%
017_02	EF Trapper Cr.	4	680	Group B	94%	0.34	5	3,000	1,000	90%	0.57	5	3,000	2,000	1,000	-4%
017_02	Trapper Creek	1	1420	Rocky/High Elv	95%	0.29	1	1,000	300	60%	2.28	1	1,000	2,000	2,000	-35%
017_02	Trapper Creek	2	1220	Rocky/High Elv	89%	0.63	2	2,000	1,000	70%	1.71	2	2,000	3,000	2,000	-19%
017_02	Trapper Creek	3	430	Group B	98%	0.11	2	900	100	70%	1.71	2	900	2,000	2,000	-28%
017_02	Trapper Creek	4	2200	Group B	96%	0.23	4	9,000	2,000	80%	1.14	7	20,000	20,000	20,000	-16%
017_02	Trapper Creek	5	1860	Group B	94%	0.34	5	9,000	3,000	90%	0.57	7	10,000	6,000	3,000	-4%
017_02	Trapper Creek	6	700	Rocky/High Elv	54%	2.62	6	4,000	10,000	80%	1.14	7	5,000	6,000	(4,000)	0%
017_02	Trapper Creek	7	1030	Group B	92%	0.46	6	6,000	3,000	80%	1.14	7	7,000	8,000	5,000	-12%
017_02	Trapper Creek	8	1080	Group B	90%	0.57	7	8,000	5,000	90%	0.57	7	8,000	5,000	0	0%
017_03	Trapper Creek	9	970	Thinleaf alder	34%	3.76	8	8,000	30,000	50%	2.85	8	8,000	20,000	(10,000)	0%
017_03	Trapper Creek	10	1100	Group B	87%	0.74	8	9,000	7,000	90%	0.57	8	9,000	5,000	(2,000)	0%
017_03	Trapper Creek	11	620	Nonforest 1	55%	2.57	8	5,000	10,000	70%	1.71	8	5,000	9,000	(1,000)	0%
							Totals		76,000					110,000	39,000	

Table D9. Existing and potential solar loads for Floss Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
017_02	1st tributary	1	1700	Group B	98%	0.11	1	2,000	200	80%	1.14	1	2,000	2,000	2,000	-18%
017_02	1st tributary	2	240	Thinleaf alder	86%	0.80	2	500	400	40%	3.42	2	500	2,000	2,000	-46%
017_02	1st tributary	3	650	Thinleaf alder	86%	0.80	2	1,000	800	70%	1.71	2	1,000	2,000	1,000	-16%
017_02	1st tributary	4	890	Thinleaf alder	43%	3.25	6	5,000	20,000	40%	3.42	6	5,000	20,000	0	-3%
017_02	1st tributary	5	620	Nonforest 1	86%	0.80	3	2,000	2,000	80%	1.14	3	2,000	2,000	0	-6%
017_02	trib to 1st trib	1	1100	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
017_02	trib to 1st trib	2	1400	Group B	98%	0.11	2	3,000	300	80%	1.14	2	3,000	3,000	3,000	-18%
017_02	Floss Creek	1	980	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
017_02	Floss Creek	2	1500	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
017_02	Floss Creek	3	710	Group B	97%	0.17	3	2,000	300	80%	1.14	3	2,000	2,000	2,000	-17%
017_02	Floss Creek	4	910	Thinleaf alder	59%	2.34	4	4,000	9,000	60%	2.28	4	4,000	9,000	0	0%
017_02	Floss Creek	5	160	Thinleaf alder	59%	2.34	4	600	1,000	70%	1.71	4	600	1,000	0	0%
							Totals		35,000					46,000	13,000	

Loading Tables for the Eastside Priest Lake Region

Table D10. Existing and potential solar loads for Lion Creek.

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
013_02	Lion Creek	1	360	Lake	0%	5.70	240	86,400	492,000	0%	5.70	240	86,400	492,000	0	0%
013_02	Lion Creek	2	1200	Rocky/High Elv	89%	0.63	2	2,000	1,000	90%	0.57	2	2,000	1,000	0	0%
013_02	Lion Creek	3	290	Rocky/High Elv	67%	1.88	4	1,000	2,000	70%	1.71	4	1,000	2,000	0	0%
013_02	Lion Creek	4	2100	Rocky/High Elv	67%	1.88	4	8,000	20,000	80%	1.14	4	8,000	9,000	(10,000)	0%
013_02	Lion Creek	5	850	Rocky/High Elv	67%	1.88	4	3,000	6,000	80%	1.14	4	3,000	3,000	(3,000)	0%
013_02	Lion Creek	6	390	Rocky/High Elv	60%	2.28	5	2,000	5,000	50%	2.85	5	2,000	6,000	1,000	-10%
013_02	Lion Creek	7	1000	Rocky/High Elv	60%	2.28	5	5,000	10,000	80%	1.14	5	5,000	6,000	(4,000)	0%
013_02	Lion Creek	8	1200	Rocky/High Elv	54%	2.62	6	7,000	20,000	80%	1.14	6	7,000	8,000	(10,000)	0%
013_02	Lion Creek	9	920	Rocky/High Elv	48%	2.96	7	6,000	20,000	70%	1.71	7	6,000	10,000	(10,000)	0%
013_02	Lion Creek	10	700	Rocky/High Elv	44%	3.19	8	6,000	20,000	40%	3.42	8	6,000	20,000	0	-4%
013_02	Lion Creek	11	4160	Rocky/High Elv	44%	3.19	8	30,000	100,000	50%	2.85	8	30,000	90,000	(10,000)	0%
013_02	Lion Creek	12	1140	Rocky/High Elv	40%	3.42	9	10,000	30,000	50%	2.85	9	10,000	30,000	0	0%
013_02	Lion Creek	13	270	Thinleaf alder	31%	3.93	9	2,000	8,000	50%	2.85	9	2,000	6,000	(2,000)	0%
013_02	Lion Creek	14	450	Thinleaf alder	31%	3.93	9	4,000	20,000	30%	3.99	9	4,000	20,000	0	-1%
013_02	Lion Creek	15	160	Thinleaf alder	31%	3.93	9	1,000	4,000	60%	2.28	9	1,000	2,000	(2,000)	0%
013_02	Lion Creek	16	1500	Group B	83%	0.97	9	10,000	10,000	80%	1.14	10	20,000	20,000	10,000	-3%
013_02	Lion Creek	17	360	Group B	83%	0.97	10	3,600	3,500	70%	1.71	12	4,300	7,400	3,900	-13%
013_02	Lion Creek	18	1130	Group B	83%	0.97	10	11,000	11,000	70%	1.71	17	19,000	32,000	21,000	-13%
013_02	Lion Creek	19	230	Nonforest	48%	2.96	10	2,300	6,800	20%	4.56	20	4,600	21,000	14,000	-28%
							Totals		790,000					790,000	-1,100	

Table D11. Existing and potential solar loads for Lion Creek tributaries.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
013_02	1st tributary	1	840	Rocky/High Elv	95%	0.29	1	800	200	90%	0.57	1	800	500	300	-5%
013_02	1st tributary	2	180	Avalanche/	60%	2.28	2	400	900	60%	2.28	2	400	900	0	0%
013_02	1st tributary	3	200	Rocky/High Elv	89%	0.63	2	400	300	80%	1.14	2	400	500	200	-9%
013_02	1st tributary	4	1200	Rocky/High Elv	89%	0.63	2	2,000	1,000	90%	0.57	2	2,000	1,000	0	0%
013_02	1st tributary	5	620	Rocky/High Elv	76%	1.37	3	2,000	3,000	90%	0.57	3	2,000	1,000	(2,000)	0%
013_02	2nd tributary	1	780	AV/Rock	80%	1.14	1	800	900	80%	1.14	1	800	900	0	0%
013_02	2nd tributary	2	520	Rocky/High Elv	95%	0.29	1	500	100	90%	0.57	1	500	300	200	-5%
013_02	2nd tributary	3	910	Rocky/High Elv	89%	0.63	2	2,000	1,000	90%	0.57	2	2,000	1,000	0	0%
013_02	3rd tributary	1	650	Rocky/High Elv	95%	0.29	1	700	200	90%	0.57	1	700	400	200	-5%
013_02	3rd tributary	2	220	Rocky/High Elv	89%	0.63	2	400	300	90%	0.57	2	400	200	(100)	0%
013_02	3rd tributary	3	260	Group C	97%	0.17	2	500	90	90%	0.57	2	500	300	200	-7%
013_02	3rd tributary	4	340	Group B	98%	0.11	2	700	80	90%	0.57	2	700	400	300	-8%
013_02	3rd tributary	5	340	Rocky/High Elv	89%	0.63	2	700	400	90%	0.57	2	700	400	0	0%
013_02	4th tributary	1	880	Rocky/High Elv	95%	0.29	1	900	300	90%	0.57	1	900	500	200	-5%
013_02	4th tributary	2	770	Rocky/High Elv	89%	0.63	2	2,000	1,000	80%	1.14	2	2,000	2,000	1,000	-9%
013_02	5th tributary	1	350	Group C	98%	0.11	1	400	50	90%	0.57	1	400	200	200	-8%
013_02	5th tributary	2	250	Group B	98%	0.11	1	300	30	90%	0.57	1	300	200	200	-8%
013_02	5th tributary	3	210	Rocky/High Elv	95%	0.29	1	200	60	90%	0.57	1	200	100	40	-5%
013_02	5th tributary	4	580	Rocky/High Elv	89%	0.63	2	1,000	600	80%	1.14	2	1,000	1,000	400	-9%
013_02	5th tributary	5	460	Rocky/High Elv	89%	0.63	2	900	600	90%	0.57	2	900	500	(100)	0%
013_02	6th tributary	1	870	Rocky/High Elv	95%	0.29	1	900	300	90%	0.57	1	900	500	200	-5%
013_02	6th tributary	2	320	Rocky/High Elv	89%	0.63	2	600	400	80%	1.14	2	600	700	300	-9%
013_02	6th tributary	3	640	Rocky/High Elv	89%	0.63	2	1,000	600	90%	0.57	2	1,000	600	0	0%
013_02	6th tributary	4	460	Rocky/High Elv	76%	1.37	3	1,000	1,000	60%	2.28	3	1,000	2,000	1,000	-16%
013_02	6th tributary	5	180	Group B	97%	0.17	3	500	90	70%	1.71	3	500	900	800	-27%
013_02	6th tributary	6	230	Group B	97%	0.17	3	700	100	90%	0.57	3	700	400	300	-7%
013_02	7th tributary	1	670	Rocky/High Elv	95%	0.29	1	700	200	80%	1.14	1	700	800	600	-15%
013_02	7th tributary	2	410	Rocky/High Elv	89%	0.63	2	800	500	90%	0.57	2	800	500	0	0%
013_02	7th tributary	3	660	Rocky/High Elv	89%	0.63	2	1,000	600	80%	1.14	2	1,000	1,000	400	-9%
013_02	8th tributary	1	740	Rocky/High Elv	95%	0.29	1	700	200	80%	1.14	1	700	800	600	-15%
013_02	8th tributary	2	300	Rocky/High Elv	89%	0.63	2	600	400	70%	1.71	2	600	1,000	600	-19%
013_02	8th tributary	3	700	Rocky/High Elv	89%	0.63	2	1,000	600	90%	0.57	2	1,000	600	0	0%
013_02	8th tributary	4	60	Lake	0%	5.70	80	4,800	27,000	0%	5.70	80	4,800	27,000	0	0%
013_02	SF Lion Creek	1	1070	Rocky/High Elv	95%	0.29	1	1,000	300	90%	0.57	1	1,000	600	300	-5%
013_02	SF Lion Creek	2	2420	Rocky/High Elv	76%	1.37	3	7,000	10,000	90%	0.57	3	7,000	4,000	(6,000)	0%
013_02	SF Lion Creek	3	3940	Rocky/High Elv	60%	2.28	5	20,000	50,000	90%	0.57	5	20,000	10,000	(40,000)	0%
013_02	SF Lion Creek	4	560	Group B	94%	0.34	5	3,000	1,000	90%	0.57	5	3,000	2,000	1,000	-4%
013_02	Lucky Creek	1	50	Lake	0%	5.70	30	1,500	8,600	0%	5.70	30	1,500	8,600	0	0%
013_02	Lucky Creek	2	1100	Rocky/High Elv	95%	0.29	1	1,000	300	90%	0.57	1	1,000	600	300	-5%
013_02	Lucky Creek	3	330	Rocky/High Elv	89%	0.63	2	700	400	80%	1.14	2	700	800	400	-9%
013_02	Lucky Creek	4	3100	Group B	97%	0.17	3	9,000	2,000	90%	0.57	3	9,000	5,000	3,000	-7%
017_02	Kent Creek	1	180	Rocky/High Elv	95%	0.29	1	200	60	80%	1.14	1	200	200	100	-15%
017_02	Kent Creek	2	1590	Rocky/High Elv	89%	0.63	2	3,000	2,000	90%	0.57	2	3,000	2,000	0	0%
017_02	Kent Creek	3	920	Rocky/High Elv	76%	1.37	3	3,000	4,000	90%	0.57	3	3,000	2,000	(2,000)	0%
017_02	Kent Creek	4	750	Rocky/High Elv	76%	1.37	3	2,000	3,000	80%	1.14	3	2,000	2,000	(1,000)	0%
017_02	Kent Creek	5	300	Rocky/High Elv	67%	1.88	4	1,000	2,000	60%	2.28	4	1,000	2,000	0	-7%
017_02	Kent Creek	6	960	Rocky/High Elv	67%	1.88	4	4,000	8,000	80%	1.14	4	4,000	5,000	(3,000)	0%
							Totals		130,000					94,000	-41,000	

Table D12. Existing and potential solar loads for Two Mouth Creek.

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
012_02	Two Mouth Creek	1	3060	Rocky/High Elv	67%	1.88	4	10,000	20,000	80%	1.14	4	10,000	10,000	(10,000)	0%
012_02	Two Mouth Creek	2	3380	Rocky/High Elv	54%	2.62	6	20,000	50,000	80%	1.14	6	20,000	20,000	(30,000)	0%
012_02	Two Mouth Creek	3	670	Rocky/High Elv	54%	2.62	6	4,000	10,000	80%	1.14	8	5,000	6,000	(4,000)	0%
012_02	Two Mouth Creek	4	580	Group B	92%	0.46	6	3,000	1,000	80%	1.14	8	5,000	6,000	5,000	-12%
012_02	Two Mouth Creek	5	360	Thinleaf alder	38%	3.53	7	3,000	10,000	40%	3.42	15	5,000	20,000	10,000	0%
012_02	Two Mouth Creek	6	110	Rocky/High Elv	44%	3.19	8	900	3,000	70%	1.71	8	900	2,000	(1,000)	0%
012_02	Two Mouth Creek	7	500	Group B	87%	0.74	8	4,000	3,000	70%	1.71	8	4,000	7,000	4,000	-17%
012_02	Two Mouth Creek	8	620	Group B	87%	0.74	8	5,000	4,000	70%	1.71	10	6,000	10,000	6,000	-17%
012_02	Two Mouth Creek	9	1810	Group B	87%	0.74	8	10,000	7,000	80%	1.14	8	10,000	10,000	3,000	-7%
012_02	Two Mouth Creek	10	1150	Group B	87%	0.74	8	9,000	7,000	70%	1.71	8	9,000	20,000	10,000	-17%
012_02	Two Mouth Creek	11	241	Group B	83%	0.97	9	2,000	2,000	60%	2.28	15	4,000	9,000	7,000	-23%
012_02	Two Mouth Creek	12	1700	Group B	83%	0.97	9	20,000	20,000	80%	1.14	11	20,000	20,000	0	-3%
012_02	Two Mouth Creek	13	300	Group B	83%	0.97	9	3,000	3,000	70%	1.71	9	3,000	5,000	2,000	-13%
012_02	Two Mouth Creek	14	420	Nonforest 1	52%	2.74	9	4,000	10,000	30%	3.99	20	8,000	30,000	20,000	-22%
012_02	Two Mouth Creek	15	1580	Nonforest 1	52%	2.74	9	10,000	30,000	40%	3.42	14	20,000	70,000	40,000	-12%
							Totals		180,000					250,000	62,000	

Table D13. Existing and potential solar loads for the Two Mouth Creek tributaries.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
012_02	1st tributary	1	970	Rocky/High Elv	95%	0.29	1	1,000	300	90%	0.57	1	1,000	600	300	-5%
012_02	1st tributary	2	130	Rocky/High Elv	89%	0.63	2	300	200	70%	1.71	2	300	500	300	-19%
012_02	1st tributary	3	330	Rocky/High Elv	89%	0.63	2	700	400	90%	0.57	2	700	400	0	0%
012_02	1st tributary	4	430	Rocky/High Elv	89%	0.63	2	900	600	90%	0.57	2	900	500	(100)	0%
012_02	2nd tributary	1	120	Lake	0%	5.70	60	7,200	41,000	0%	5.70	60	7,200	41,000	0	0%
012_02	2nd tributary	2	400	Group D	96%	0.23	1	400	90	90%	0.57	1	400	200	100	-6%
012_02	2nd tributary	3	360	Group C	98%	0.11	1	400	50	90%	0.57	1	400	200	200	-8%
012_02	2nd tributary	4	700	Lake/Meadows	0%	5.70	20	14,000	80,000	0%	5.70	20	14,000	80,000	0	0%
012_02	2nd tributary	5	710	Rocky/High Elv	89%	0.63	2	1,000	600	90%	0.57	2	1,000	600	0	0%
012_02	2nd tributary	6	470	Rocky/High Elv	76%	1.37	3	1,000	1,000	90%	0.57	3	1,000	600	(400)	0%
012_02	2nd tributary	7	680	Rocky/High Elv	76%	1.37	3	2,000	3,000	90%	0.57	3	2,000	1,000	(2,000)	0%
012_02	2nd tributary	8	340	Rocky/High Elv	76%	1.37	3	1,000	1,000	90%	0.57	3	1,000	600	(400)	0%
012_02	3rd tributary	1	690	Rocky/High Elv	95%	0.29	1	700	200	90%	0.57	1	700	400	200	-5%
012_02	3rd tributary	2	690	Rocky/High Elv	89%	0.63	2	1,000	600	90%	0.57	2	1,000	600	0	0%
012_02	3rd tributary	3	430	Rocky/High Elv	89%	0.63	2	900	600	90%	0.57	2	900	500	(100)	0%
012_02	4th tributary	1	250	Lake	0%	5.70	150	37,500	214,000	0%	5.70	150	37,500	214,000	0	0%
012_02	4th tributary	2	490	Rocky/High Elv	89%	0.63	2	1,000	600	90%	0.57	2	1,000	600	0	0%
012_02	4th tributary	3	1170	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
012_02	5th tributary	1	960	Rocky/High Elv	95%	0.29	1	1,000	300	90%	0.57	1	1,000	600	300	-5%
012_02	5th tributary	2	1000	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
012_02	6th tributary	1	490	Rocky/High Elv	95%	0.29	1	500	100	90%	0.57	1	500	300	200	-5%
012_02	6th tributary	2	710	Rocky/High Elv	95%	0.29	1	700	200	90%	0.57	1	700	400	200	-5%
012_02	6th tributary	3	810	Rocky/High Elv	89%	0.63	2	2,000	1,000	80%	1.14	2	2,000	2,000	1,000	-9%
012_02	6th tributary	4	260	Rocky/High Elv	76%	1.37	3	800	1,000	90%	0.57	3	800	500	(500)	0%
012_02	6th tributary	5	610	Group B	97%	0.17	3	2,000	300	90%	0.57	3	2,000	1,000	700	-7%
012_02	7th tributary	1	570	Rocky/High Elv	95%	0.29	1	600	200	90%	0.57	1	600	300	100	-5%
012_02	7th tributary	2	280	Rocky/High Elv	95%	0.29	1	300	90	90%	0.57	1	300	200	100	-5%
012_02	7th tributary	3	290	Rocky/High Elv	95%	0.29	1	300	90	60%	2.28	1	300	700	600	-35%
012_02	7th tributary	4	940	Rocky/High Elv	89%	0.63	2	2,000	1,000	90%	0.57	2	2,000	1,000	0	0%
012_02	7th tributary	5	590	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
012_02	8th tributary	1	570	Group B	98%	0.11	1	600	70	90%	0.57	1	600	300	200	-8%
012_02	8th tributary	2	390	Group B	98%	0.11	1	400	50	80%	1.14	1	400	500	500	-18%
012_02	8th tributary	3	250	Group B	98%	0.11	2	500	60	90%	0.57	2	500	300	200	-8%
012_02	8th tributary	4	540	Rocky/High Elv	89%	0.63	2	1,000	600	90%	0.57	2	1,000	600	0	0%
012_02	9th tributary	1	390	Rocky/High Elv	95%	0.29	1	400	100	90%	0.57	1	400	200	100	-5%
012_02	9th tributary	2	1360	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
012_02	10th tributary	1	230	Group B	98%	0.11	1	200	20	80%	1.14	1	200	200	200	-18%
012_02	10th tributary	2	360	Group B	98%	0.11	1	400	50	90%	0.57	1	400	200	200	-8%
012_02	10th tributary	3	700	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
012_02	11th tributary	1	1900	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
012_02	12th tributary	1	120	Group B	98%	0.11	1	100	10	90%	0.57	1	100	60	50	-8%
012_02	12th tributary	2	140	Group B	98%	0.11	1	100	10	70%	1.71	1	100	200	200	-28%
012_02	12th tributary	3	120	Group B	98%	0.11	1	100	10	90%	0.57	1	100	60	50	-8%
012_02	12th tributary	4	800	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
012_02	12th tributary	5	2600	Group B	97%	0.17	3	8,000	1,000	90%	0.57	3	8,000	5,000	4,000	-7%
							Totals		350,000					370,000	15,000	

Table D14. Existing and potential solar loads for Indian Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
010_02	1st tributary	1	500	Group D	96%	0.23	1	500	100	90%	0.57	1	500	300	200	-6%
010_02	1st tributary	2	460	Group B	98%	0.11	1	500	60	80%	1.14	1	500	600	500	-18%
010_02	1st tributary	3	1500	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
010_02	1st tributary	4	520	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
010_02	2nd tributary	1	200	Group B	98%	0.11	1	200	20	90%	0.57	1	200	100	80	-8%
010_02	2nd tributary	2	560	Group B	98%	0.11	1	600	70	80%	1.14	1	600	700	600	-18%
010_02	2nd tributary	3	1530	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
010_03	Indian Creek	1	1500	Group B	87%	0.74	8	10,000	7,000	70%	1.71	10	20,000	30,000	20,000	-17%
010_03	Indian Creek	2	1900	Group B	83%	0.97	9	20,000	20,000	70%	1.71	11	20,000	30,000	10,000	-13%
010_03	Indian Creek	3	700	Nonforest 1	52%	2.74	9	6,000	20,000	40%	3.42	12	8,000	30,000	10,000	-12%
010_03	Indian Creek	4	880	Group B	83%	0.97	9	8,000	8,000	70%	1.71	12	10,000	20,000	10,000	-13%
010_03	Indian Creek	5	220	Group B	83%	0.97	9	2,000	2,000	60%	2.28	13	3,000	7,000	5,000	-23%
							Totals		58,000					120,000	61,000	

Table D15. Existing and potential solar loads for North Fork Indian Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
010_02	1st tributary	1	560	Rocky/High Elv	95%	0.29	1	600	200	90%	0.57	1	600	300	100	-5%
010_02	1st tributary	2	640	Rocky/High Elv	89%	0.63	2	1,000	600	90%	0.57	2	1,000	600	0	0%
010_02	1st tributary	3	1370	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
010_02	2nd tributary	1	900	Rocky/High Elv	95%	0.29	1	900	300	90%	0.57	1	900	500	200	-5%
010_02	2nd tributary	2	920	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
010_02	3rd tributary	1	220	Group B	98%	0.11	1	200	20	90%	0.57	1	200	100	80	-8%
010_02	3rd tributary	2	820	Group B	98%	0.11	1	800	90	80%	1.14	1	800	900	800	-18%
010_02	3rd tributary	3	810	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
010_02	4th tributary	1	1900	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
010_02	N.F. Indian Cr.	1	540	Rocky/High Elv	95%	0.29	1	500	100	80%	1.14	1	500	600	500	-15%
010_02	N.F. Indian Cr.	2	980	Rocky/High Elv	89%	0.63	2	2,000	1,000	70%	1.71	2	2,000	3,000	2,000	-19%
010_02	N.F. Indian Cr.	3	960	Rocky/High Elv	76%	1.37	3	3,000	4,000	70%	1.71	3	3,000	5,000	1,000	-6%
010_02	N.F. Indian Cr.	4	1740	Rocky/High Elv	67%	1.88	4	7,000	10,000	80%	1.14	4	7,000	8,000	(2,000)	0%
010_02	N.F. Indian Cr.	5	1220	Rocky/High Elv	60%	2.28	5	6,000	10,000	80%	1.14	5	6,000	7,000	(3,000)	0%
010_02	N.F. Indian Cr.	6	1100	Rocky/High Elv	54%	2.62	6	7,000	20,000	70%	1.71	6	7,000	10,000	(10,000)	0%
010_02	N.F. Indian Cr.	7	640	Rocky/High Elv	54%	2.62	6	4,000	10,000	60%	2.28	7	4,000	9,000	(1,000)	0%
010_02	N.F. Indian Cr.	8	1800	Rocky/High Elv	48%	2.96	7	10,000	30,000	70%	1.71	8	10,000	20,000	(10,000)	0%
010_02	N.F. Indian Cr.	9	1000	Rocky/High Elv	48%	2.96	7	7,000	20,000	70%	1.71	9	9,000	20,000	0	0%
010_02	N.F. Indian Cr.	10	1800	Rocky/High Elv	48%	2.96	7	10,000	30,000	70%	1.71	15	30,000	50,000	20,000	0%
							Totals		140,000					140,000	4,300	

Table D16. Existing and potential solar loads for South Fork Indian Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
010_02	1st tributary	1	1700	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
010_02	2nd tributary	1	500	Group D	96%	0.23	1	500	100	90%	0.57	1	500	300	200	-6%
010_02	2nd tributary	2	1180	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
010_02	SF Indian Creek	1	1200	Rocky/High Elv	89%	0.63	2	2,000	1,000	90%	0.57	2	2,000	1,000	0	0%
010_02	SF Indian Creek	2	2100	Group B	96%	0.23	4	8,000	2,000	90%	0.57	4	8,000	5,000	3,000	-6%
010_02	SF Indian Creek	3	900	Group B	94%	0.34	5	5,000	2,000	80%	1.14	5	5,000	6,000	4,000	-14%
010_02	SF Indian Creek	4	340	Rocky/High Elv	60%	2.28	5	2,000	5,000	80%	1.14	5	2,000	2,000	(3,000)	0%
010_02	SF Indian Creek	5	810	Rocky/High Elv	60%	2.28	5	4,000	9,000	70%	1.71	6	5,000	9,000	0	0%
010_02	SF Indian Creek	6	500	Rocky/High Elv	60%	2.28	5	3,000	7,000	90%	0.57	6	3,000	2,000	(5,000)	0%
							Totals		27,000					28,000	2,000	

Table D17. Existing and potential solar loads for Horton Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
010_02	1st tributary	1	90	Group B	98%	0.11	1	90	10	70%	1.71	1	90	200	200	-28%
010_02	1st tributary	2	1900	Group B	98%	0.11	1	2,000	200	80%	1.14	1	2,000	2,000	2,000	-18%
010_02	1st tributary	3	530	Group B	98%	0.11	2	1,000	100	60%	2.28	2	1,000	2,000	2,000	-38%
010_02	Horton Creek	1	350	Group B	98%	0.11	1	400	50	80%	1.14	1	400	500	500	-18%
010_02	Horton Creek	2	2000	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
010_02	Horton Creek	3	480	Group B	97%	0.17	3	1,000	200	80%	1.14	3	1,000	1,000	800	-17%
010_02	Horton Creek	4	690	Group B	96%	0.23	4	3,000	700	90%	0.57	4	3,000	2,000	1,000	-6%
010_02	Horton Creek	5	380	Group B	96%	0.23	4	2,000	500	80%	1.14	4	2,000	2,000	2,000	-16%
010_02	Horton Creek	6	2830	Group B	96%	0.23	4	10,000	2,000	90%	0.57	4	10,000	6,000	4,000	-6%
							Totals		4,300					18,000	15,000	

Table D18. Existing and potential solar loads for Hunt Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
009_02	1st tributary	1	570	Group C	98%	0.11	1	600	70	90%	0.57	1	600	300	200	-8%
009_02	1st tributary	2	460	Group D	96%	0.23	1	500	100	90%	0.57	1	500	300	200	-6%
009_02	1st tributary	3	460	Group C	97%	0.17	2	900	200	90%	0.57	2	900	500	300	-7%
009_02	1st tributary	4	820	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
009_02	1st tributary	5	490	Group B	97%	0.17	3	1,000	200	90%	0.57	3	1,000	600	400	-7%
009_02	2nd tributary	1	850	Group B	98%	0.11	1	900	100	80%	1.14	1	900	1,000	900	-18%
009_02	2nd tributary	2	1600	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
009_02	3rd tributary	1	1800	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
009_02	4th tributary	1	290	Group A	94%	0.34	1	300	100	80%	1.14	1	300	300	200	-14%
009_02	4th tributary	2	850	Group B	98%	0.11	1	900	100	90%	0.57	1	900	500	400	-8%
009_02	4th tributary	3	560	Group A	93%	0.40	2	1,000	400	90%	0.57	2	1,000	600	200	-3%
009_02	4th tributary	4	440	Group B	98%	0.11	2	900	100	80%	1.14	2	900	1,000	900	-18%
009_02	4th tributary	5	410	Group B	97%	0.17	3	1,000	200	90%	0.57	3	1,000	600	400	-7%
009_02	4th tributary	6	410	Group B	97%	0.17	3	1,000	200	80%	1.14	3	1,000	1,000	800	-17%
009_02	Hunt Creek	1	530	Lake	0%	5.70	120	63,600	363,000	0%	5.70	120	63,600	363,000	0	0%
009_02	Hunt Creek	2	180	Group C	98%	0.11	1	200	20	90%	0.57	1	200	100	80	-8%
009_02	Hunt Creek	3	70	Lake	0%	5.70	30	2,100	12,000	0%	5.70	30	2,100	12,000	0	0%
009_02	Hunt Creek	4	430	Group D	96%	0.23	1	400	90	90%	0.57	1	400	200	100	-6%
009_02	Hunt Creek	5	570	Group C	97%	0.17	2	1,000	200	90%	0.57	2	1,000	600	400	-7%
009_02	Hunt Creek	6	1560	Group B	97%	0.17	3	5,000	900	90%	0.57	3	5,000	3,000	2,000	-7%
009_02	Hunt Creek	7	3200	Group B	94%	0.34	5	20,000	7,000	90%	0.57	5	20,000	10,000	3,000	-4%
009_02	Hunt Creek	8	730	Group B	92%	0.46	6	4,000	2,000	70%	1.71	6	4,000	7,000	5,000	-22%
009_02	Hunt Creek	9	1010	Group B	92%	0.46	6	6,000	3,000	90%	0.57	6	6,000	3,000	0	-2%
009_02	Hunt Creek	10	1530	Group A	65%	2.00	6	9,000	20,000	70%	1.71	6	9,000	20,000	0	0%
009_03	Hunt Creek	11	250	Group A	60%	2.28	7	2,000	5,000	70%	1.71	7	2,000	3,000	(2,000)	0%
009_03	Hunt Creek	12	1650	Group B	87%	0.74	8	10,000	7,000	90%	0.57	8	10,000	6,000	(1,000)	0%
							Totals		420,000					440,000	17,000	

Table D19. Existing and potential solar loads for Soldier Creek.

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
008_02	1st tributary	1	90	Lake	0%	5.70	50	4,500	26,000	0%	5.70	50	4,500	26,000	0	0%
008_02	1st tributary	2	900	Group C	98%	0.11	1	900	100	80%	1.14	1	900	1,000	900	-18%
008_02	1st tributary	3	890	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
008_02	1st tributary	4	1630	Group B	97%	0.17	3	5,000	900	60%	2.28	7	10,000	20,000	20,000	-37%
008_02	2nd tributary	1	1210	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
008_02	2nd tributary	2	1260	Group B	98%	0.11	2	3,000	300	70%	1.71	2	3,000	5,000	5,000	-28%
008_02	2nd tributary	3	650	Group B	98%	0.11	2	1,000	100	80%	1.14	2	1,000	1,000	900	-18%
008_02	3rd tributary	1	1280	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
008_02	3rd tributary	2	640	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
008_02	4th tributary	1	850	Group C	98%	0.11	1	900	100	70%	1.71	1	900	2,000	2,000	-28%
008_02	4th tributary	2	1270	Group B	98%	0.11	2	3,000	300	80%	1.14	2	3,000	3,000	3,000	-18%
008_02	4th tributary	3	840	Group B	97%	0.17	3	3,000	500	90%	0.57	3	3,000	2,000	2,000	-7%
008_02	5th tributary	1	660	Group B	98%	0.11	1	700	80	90%	0.57	1	700	400	300	-8%
008_02	5th tributary	2	640	Group B	98%	0.11	1	600	70	80%	1.14	1	600	700	600	-18%
008_02	5th tributary	3	530	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
008_02	5th tributary	4	480	Group B	98%	0.11	2	1,000	100	80%	1.14	2	1,000	1,000	900	-18%
008_02	6th tributary	1	790	Group B	98%	0.11	1	800	90	80%	1.14	1	800	900	800	-18%
008_02	6th tributary	2	860	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
008_02	7th tributary	1	2100	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
008_02	Soldier Creek	1	1290	Group D	96%	0.23	2	3,000	700	50%	2.85	2	3,000	9,000	8,000	-46%
008_02	Soldier Creek	2	3430	Group B	96%	0.23	4	10,000	2,000	60%	2.28	4	10,000	20,000	20,000	-36%
008_02	Soldier Creek	3	1280	Group B	92%	0.46	6	8,000	4,000	50%	2.85	7	9,000	30,000	30,000	-42%
008_02	Soldier Creek	4	1650	Group B	90%	0.57	7	10,000	6,000	50%	2.85	11	20,000	60,000	50,000	-40%
008_02	Soldier Creek	5	1100	Group B	90%	0.57	7	8,000	5,000	70%	1.71	10	10,000	20,000	20,000	-20%
008_02	Soldier Creek	6	1430	Nonforest 1	55%	2.57	8	10,000	30,000	60%	2.28	10	10,000	20,000	(10,000)	0%
008_02	Soldier Creek	7	1400	Group A	56%	2.51	8	10,000	30,000	70%	1.71	10	10,000	20,000	(10,000)	0%
008_02	Soldier Creek	8	900	Group B	87%	0.74	8	7,000	5,000	70%	1.71	10	9,000	20,000	20,000	-17%
008_02	Soldier Creek	9	610	Group B	87%	0.74	8	5,000	4,000	80%	1.14	10	6,000	7,000	3,000	-7%
008_02	Soldier Creek	10	440	Group B	87%	0.74	8	4,000	3,000	50%	2.85	10	4,000	10,000	7,000	-37%
008_03	Soldier Creek	11	1180	Thinleaf alder	31%	3.93	9	10,000	40,000	10%	5.13	10	10,000	50,000	10,000	-21%
008_03	Soldier Creek	12	520	Thinleaf alder	31%	3.93	9	5,000	20,000	0%	5.70	10	5,000	30,000	10,000	-31%
008_03	Soldier Creek	13	320	Thinleaf alder	31%	3.93	9	3,000	10,000	30%	3.99	10	3,000	10,000	0	-1%
008_03	Soldier Creek	14	850	Thinleaf alder	31%	3.93	9	8,000	30,000	10%	5.13	12	10,000	50,000	20,000	-21%
							Totals		220,000					430,000	220,000	

Loading Tables for the Westside Priest Lake Region

Table D20. Existing and potential solar loads for Beaver Creek.

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
020_02	1st tributary	1	2100	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
020_02	2nd tributary	1	260	Group B	98%	0.11	1	300	30	50%	2.85	1	300	900	900	-48%
020_02	2nd tributary	2	2800	Group B	98%	0.11	2	6,000	700	90%	0.57	2	6,000	3,000	2,000	-8%
020_02	3rd tributary	1	1500	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
020_02	3rd tributary	2	350	Group B	98%	0.11	2	700	80	80%	1.14	2	700	800	700	-18%
020_02	3rd tributary	3	560	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
020_02	4th tributary	1	620	Group B	98%	0.11	1	600	70	80%	1.14	1	600	700	600	-18%
020_02	4th tributary	2	530	Group B	98%	0.11	1	500	60	90%	0.57	1	500	300	200	-8%
020_02	4th tributary	3	1320	Group B	97%	0.17	3	4,000	700	80%	1.14	3	4,000	5,000	4,000	-17%
020_02	trib to 4th trib	1	1400	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
020_02	trib to 4th trib	2	1100	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
020_02	trib to 4th trib	3	1000	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
020_02	Beaver Creek	1	210	Group B	98%	0.11	1	200	20	60%	2.28	1	200	500	500	-38%
020_02	Beaver Creek	2	810	Group B	98%	0.11	1	800	90	80%	1.14	1	800	900	800	-18%
020_02	Beaver Creek	3	420	Group B	98%	0.11	2	800	90	60%	2.28	2	800	2,000	2,000	-38%
020_02	Beaver Creek	4	2800	Group B	96%	0.23	4	10,000	2,000	90%	0.57	4	10,000	6,000	4,000	-6%
020_02	Beaver Creek	5	2640	Group B	94%	0.34	5	10,000	3,000	80%	1.14	5	10,000	10,000	7,000	-14%
020_03	Beaver Creek	1	1700	Nonforest 1	65%	2.00	6	10,000	20,000	70%	1.71	6	10,000	20,000	0	0%
020_03	Beaver Creek	2	1000	Nonforest 1	65%	2.00	6	6,000	10,000	60%	2.28	6	6,000	10,000	0	-5%
							Totals		38,000					67,000	29,000	

Table D21. Existing and potential solar loads for Granite Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
022_03	SF Granite Cr.	1	260	Group B	78%	1.25	10	2,600	3,300	70%	1.71	10	2,600	4,400	1,100	-8%
022_03	SF Granite Cr.	2	290	Nonforest 1	48%	2.96	10	2,900	8,600	30%	3.99	10	2,900	12,000	3,400	-18%
022_04	NF Granite Cr.	1	600	Nonforest 1	48%	2.96	10	6,000	18,000	40%	3.42	10	6,000	21,000	3,000	-8%
022_04	Granite Creek	1	470	Nonforest 1	39%	3.48	13	6,100	21,000	30%	3.99	13	6,100	24,000	3,000	-9%
022_04	Granite Creek	2	1100	Group B	62%	2.17	14	15,000	32,000	60%	2.28	14	15,000	34,000	2,000	-2%
022_04	Granite Creek	3	500	Nonforest 1	37%	3.59	14	7,000	25,000	50%	2.85	14	7,000	20,000	(5,000)	0%
022_04	Granite Creek	4	680	Group B	62%	2.17	14	9,500	21,000	60%	2.28	14	9,500	22,000	1,000	-2%
022_04	Granite Creek	5	310	Nonforest 1	37%	3.59	14	4,300	15,000	50%	2.85	14	4,300	12,000	(3,000)	0%
022_04	Granite Creek	6	320	Group B	62%	2.17	14	4,500	9,700	60%	2.28	14	4,500	10,000	300	-2%
022_04	Granite Creek	7	930	Nonforest 1	37%	3.59	14	13,000	47,000	50%	2.85	14	13,000	37,000	(10,000)	0%
022_04	Granite Creek	8	340	Nonforest 1	35%	3.71	15	5,100	19,000	40%	3.42	15	5,100	17,000	(2,000)	0%
022_04	Granite Creek	9	2100	Group B	59%	2.34	15	32,000	75,000	60%	2.28	15	32,000	73,000	(2,000)	0%
022_04	Granite Creek	10	1060	Nonforest 1	35%	3.71	15	16,000	59,000	40%	3.42	15	16,000	55,000	(4,000)	0%
022_04	Granite Creek	11	870	Nonforest 1	35%	3.71	15	13,000	48,000	20%	4.56	15	13,000	59,000	11,000	-15%
022_04	Granite Creek	12	570	Nonforest 1	35%	3.71	15	8,600	32,000	30%	3.99	15	8,600	34,000	2,000	-5%
022_04	Granite Creek	13	710	Nonforest 1	35%	3.71	15	11,000	41,000	10%	5.13	15	11,000	56,000	15,000	-25%
022_04	Granite Creek	14	1250	Nonforest 1	35%	3.71	15	19,000	70,000	20%	4.56	15	19,000	87,000	17,000	-15%
022_04	Granite Creek	15	4990	Nonforest 1	33%	3.82	16	80,000	310,000	10%	5.13	16	80,000	410,000	100,000	-23%
022_04	Granite Creek	16	150	Nonforest 1	33%	3.82	16	2,400	9,200	20%	4.56	23	3,500	16,000	6,800	-13%
							Totals		860,000					1,000,000	140,000	

Table D22. Existing and potential solar loads for Reeder Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
023_02	border stream	1	560	Group B	98%	0.11	1	600	70	90%	0.57	1	600	300	200	-8%
023_02	border stream	2	800	Group B	98%	0.11	1	800	90	60%	2.28	1	800	2,000	2,000	-38%
023_02	(W of Indian Cr)	3	1000	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
023_02	Indian Creek	1	1030	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
023_02	Indian Creek	2	390	Group B	98%	0.11	2	800	90	60%	2.28	2	800	2,000	2,000	-38%
023_02	Indian Creek	3	2300	Group B	96%	0.23	4	9,000	2,000	80%	1.14	4	9,000	10,000	8,000	-16%
023_02	1st tributary	1	270	Nonforest 1	97%	0.17	1	300	50	80%	1.14	1	300	300	300	-17%
023_02	1st tributary	2	1600	Thinleaf alder	86%	0.80	2	3,000	2,000	70%	1.71	2	3,000	5,000	3,000	-16%
023_02	2nd tributary	1	1600	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
023_02	2nd tributary	2	190	Group B	98%	0.11	2	400	50	70%	1.71	2	400	700	700	-28%
023_02	3rd tributary	1	40	Group B	98%	0.11	1	40	5	90%	0.57	1	40	20	20	-8%
023_02	3rd tributary	2	390	Group B	98%	0.11	1	400	50	60%	2.28	1	400	900	900	-38%
023_02	3rd tributary	3	240	Group B	98%	0.11	1	200	20	70%	1.71	1	200	300	300	-28%
023_02	3rd tributary	4	460	Group B	98%	0.11	1	500	60	90%	0.57	1	500	300	200	-8%
023_02	3rd tributary	5	400	Group B	98%	0.11	2	800	90	80%	1.14	2	800	900	800	-18%
023_02	3rd tributary	6	220	Group B	98%	0.11	2	400	50	60%	2.28	2	400	900	900	-38%
023_02	3rd tributary	7	890	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
023_02	3rd tributary	8	420	Group B	98%	0.11	2	800	90	60%	2.28	2	800	2,000	2,000	-38%
023_02	3rd tributary	9	410	Group B	97%	0.17	3	1,000	200	70%	1.71	3	1,000	2,000	2,000	-27%
023_02	trib to 3rd trib	1	520	Group B	98%	0.11	1	500	60	70%	1.71	1	500	900	800	-28%
023_02	trib to 3rd trib	2	1400	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
023_02	trib to 3rd trib	3	280	Group B	98%	0.11	2	600	70	80%	1.14	2	600	700	600	-18%
023_02	Reeder Creek	1	470	Group B	98%	0.11	1	500	60	90%	0.57	1	500	300	200	-8%
023_02	Reeder Creek	2	2800	Group B	97%	0.17	3	8,000	1,000	80%	1.14	3	8,000	9,000	8,000	-17%
023_02	Reeder Creek	3	1400	Thinleaf alder	59%	2.34	4	6,000	10,000	60%	2.28	4	6,000	10,000	0	0%
023_02	Reeder Creek	4	6090	Thinleaf alder	50%	2.85	5	30,000	90,000	40%	3.42	5	30,000	100,000	10,000	-10%
023_02	Reeder Creek	5	670	Thinleaf alder	43%	3.25	6	4,000	10,000	50%	2.85	6	4,000	10,000	0	0%
023_02	Reeder Creek	6	1300	Thinleaf alder	43%	3.25	6	8,000	30,000	40%	3.42	6	8,000	30,000	0	-3%
023_02	Reeder Creek	7	260	Nonforest 1	65%	2.00	6	2,000	4,000	50%	2.85	6	2,000	6,000	2,000	-15%
023_03	Reeder Creek	8	450	Nonforest 1	60%	2.28	7	3,000	7,000	50%	2.85	7	3,000	9,000	2,000	-10%
023_03	Reeder Creek	9	580	Nonforest 1	60%	2.28	7	4,000	9,000	60%	2.28	7	4,000	9,000	0	0%
							Totals		170,000					220,000	56,000	

Table D23. Existing and potential solar loads for Kalispell Creek.

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	un-connected	1	330	Group B	98%	0.11	1	300	30	60%	2.28	1	300	700	700	-38%
024_02	stream 30	2	950	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
024_02	stream 30	3	1700	Group B	96%	0.23	4	7,000	2,000	70%	1.71	4	7,000	10,000	8,000	-26%
024_02	Nuisance Cr.	1	540	Group B	94%	0.34	5	3,000	1,000	70%	1.71	5	3,000	5,000	4,000	-24%
024_02	Bath Creek	1	570	Group B	97%	0.17	3	2,000	300	80%	1.14	3	2,000	2,000	2,000	-17%
024_02	Bath Creek	2	740	Group B	96%	0.23	4	3,000	700	60%	2.28	4	3,000	7,000	6,000	-36%
024_02	Bath Creek	3	500	Group B	96%	0.23	4	2,000	500	50%	2.85	4	2,000	6,000	6,000	-46%
024_02	Bath Creek	4	2200	Group B	94%	0.34	5	10,000	3,000	60%	2.28	5	10,000	20,000	20,000	-34%
024_02	Hazard Creek	1	290	Group B	98%	0.11	1	300	30	70%	1.71	1	300	500	500	-28%
024_02	Hazard Creek	2	2300	Group B	98%	0.11	2	5,000	600	90%	0.57	2	5,000	3,000	2,000	-8%
024_02	Hazard Creek	3	440	Nonforest 1	86%	0.80	3	1,000	800	80%	1.14	3	1,000	1,000	200	-6%
024_02	Hazard Creek	4	630	Nonforest 1	86%	0.80	3	2,000	2,000	70%	1.71	3	2,000	3,000	1,000	-16%
024_02	trib to Hazard	1	1200	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
024_02	trib to Hazard	2	330	Group B	98%	0.11	2	700	80	60%	2.28	2	700	2,000	2,000	-38%
024_02	trib to Hazard	3	720	Group B	98%	0.11	2	1,000	100	80%	1.14	2	1,000	1,000	900	-18%
024_02	2nd tributary	1	2500	Group B	98%	0.11	1	3,000	300	90%	0.57	1	3,000	2,000	2,000	-8%
024_02	2nd tributary	2	800	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
024_02	2nd tributary	3	610	Nonforest 1	86%	0.80	3	2,000	2,000	60%	2.28	3	2,000	5,000	3,000	-26%
024_02	2nd tributary	4	160	Nonforest 1	86%	0.80	3	500	400	70%	1.71	3	500	900	500	-16%
024_02	trib to 2nd trib	1	2200	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
024_03	Kalispell Creek	1	2270	Nonforest 1	55%	2.57	8	20,000	50,000	60%	2.28	8	20,000	50,000	0	0%
024_03	Kalispell Creek	2	290	Group B	87%	0.74	8	2,000	1,000	70%	1.71	8	2,000	3,000	2,000	-17%
024_03	Kalispell Creek	3	1300	Nonforest 1	52%	2.74	9	10,000	30,000	60%	2.28	9	10,000	20,000	(10,000)	0%
024_03	Kalispell Creek	4	1800	Nonforest 1	52%	2.74	9	20,000	50,000	50%	2.85	9	20,000	60,000	10,000	-2%
024_03	Kalispell Creek	5	1100	Nonforest 1	48%	2.96	10	11,000	33,000	40%	3.42	10	11,000	38,000	5,000	-8%
024_03	Kalispell Creek	6	440	Nonforest 1	45%	3.14	11	4,800	15,000	50%	2.85	11	4,800	14,000	(1,000)	0%
024_03	Kalispell Creek	7	860	Nonforest 1	45%	3.14	11	9,500	30,000	40%	3.42	11	9,500	32,000	2,000	-5%
024_03	Kalispell Creek	8	390	Nonforest 1	45%	3.14	11	4,300	13,000	50%	2.85	11	4,300	12,000	(1,000)	0%
024_03	Kalispell Creek	9	4990	Nonforest 1	41%	3.36	12	60,000	200,000	40%	3.42	12	60,000	210,000	10,000	-1%
							Totals		440,000					510,000	81,000	

Table D24. Existing and potential solar loads for Lamb Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
025_02	1st tributary	1	580	Group B	98%	0.11	1	600	70	60%	2.28	1	600	1,000	900	-38%
025_02	1st tributary	2	450	Group B	98%	0.11	1	500	60	80%	1.14	1	500	600	500	-18%
025_02	1st tributary	3	910	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
025_02	1st tributary	4	380	Thinleaf alder	86%	0.80	2	800	600	50%	2.85	2	800	2,000	1,000	-36%
025_02	2nd tributary	1	1900	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
025_02	3rd tributary	1	2000	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
025_02	4th tributary	1	1600	Group B	98%	0.11	1	2,000	200	90%	0.57	1	2,000	1,000	800	-8%
025_02	4th tributary	2	280	Group B	98%	0.11	1	300	30	50%	2.85	1	300	900	900	-48%
025_02	5th tributary	1	250	Group B	98%	0.11	1	300	30	60%	2.28	1	300	700	700	-38%
025_02	5th tributary	2	1500	Group B	98%	0.11	1	2,000	200	70%	1.71	1	2,000	3,000	3,000	-28%
025_02	5th tributary	3	350	Group B	98%	0.11	2	700	80	80%	1.14	2	700	800	700	-18%
025_02	stream 28	1	830	Group B	98%	0.11	1	800	90	90%	0.57	1	800	500	400	-8%
025_02	stream 28	2	220	Group B	98%	0.11	1	200	20	50%	2.85	1	200	600	600	-48%
025_02	stream 28	3	290	Group B	98%	0.11	2	600	70	80%	1.14	2	600	700	600	-18%
025_02	stream 28	4	300	Group B	98%	0.11	2	600	70	70%	1.71	2	600	1,000	900	-28%
025_02	stream 28	5	160	Group B	98%	0.11	2	300	30	50%	2.85	2	300	900	900	-48%
025_02	stream 28	6	610	Group B	97%	0.17	3	2,000	300	80%	1.14	3	2,000	2,000	2,000	-17%
025_02	stream 28	7	850	Group B	97%	0.17	3	3,000	500	70%	1.71	3	3,000	5,000	5,000	-27%
025_02	Lamb Creek	1	540	Group B	96%	0.23	4	2,000	500	70%	1.71	4	2,000	3,000	3,000	-26%
025_02	Lamb Creek	2	2300	Group B	96%	0.23	4	9,000	2,000	80%	1.14	4	9,000	10,000	8,000	-16%
025_02	Lamb Creek	3	420	Group B	94%	0.34	5	2,000	700	70%	1.71	5	2,000	3,000	2,000	-24%
025_02	Lamb Creek	4	350	Nonforest 1	72%	1.60	5	2,000	3,000	60%	2.28	5	2,000	5,000	2,000	-12%
025_02	Lamb Creek	5	380	Thinleaf alder	38%	3.53	7	3,000	10,000	50%	2.85	7	3,000	9,000	(1,000)	0%
025_02	Lamb Creek	6	1100	Thinleaf alder	38%	3.53	7	8,000	30,000	60%	2.28	7	8,000	20,000	(10,000)	0%
025_02	Lamb Creek	7	1600	Thinleaf alder	38%	3.53	7	10,000	40,000	50%	2.85	7	10,000	30,000	(10,000)	0%
025_02	Lamb Creek	8	1300	Thinleaf alder	34%	3.76	8	10,000	40,000	30%	3.99	8	10,000	40,000	0	-4%
025_02	Lamb Creek	9	440	Nonforest 1	55%	2.57	8	4,000	10,000	50%	2.85	8	4,000	10,000	0	-5%
025_02	Lamb Creek	10	1900	Thinleaf alder	34%	3.76	8	20,000	80,000	20%	4.56	8	20,000	90,000	10,000	-14%
025_02	Lamb Creek	11	860	Thinleaf alder	31%	3.93	9	8,000	30,000	40%	3.42	9	8,000	30,000	0	0%
025_02	Lamb Creek	12	200	Thinleaf alder	31%	3.93	30	6,000	24,000	30%	3.99	30	6,000	24,000	0	-1%
025_02	Lamb Creek	13	470	Thinleaf alder	31%	3.93	9	4,000	20,000	40%	3.42	9	4,000	10,000	(10,000)	0%
025_02	Lamb Creek	14	320	Thinleaf alder	31%	3.93	9	3,000	10,000	60%	2.28	9	3,000	7,000	(3,000)	0%
025_02	Lamb Creek	15	360	Thinleaf alder	31%	3.93	9	3,000	10,000	30%	3.99	9	3,000	10,000	0	-1%
025_02	Lamb Creek	16	1300	Nonforest 1	52%	2.74	9	10,000	30,000	60%	2.28	9	10,000	20,000	(10,000)	0%
025_02	Lamb Creek	17	600	Nonforest 1	52%	2.74	9	5,000	10,000	50%	2.85	9	5,000	10,000	0	-2%
							Totals		350,000					360,000	4,500	

Table D25. Existing and potential solar loads for North Fork Lamb Creek.

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
025_02	Skip Creek	1	2900	Group B	97%	0.17	3	9,000	2,000	80%	1.14	3	9,000	10,000	8,000	-17%
025_02	1st tributary	1	300	Group B	98%	0.11	1	300	30	60%	2.28	1	300	700	700	-38%
025_02	1st tributary	2	920	Group B	98%	0.11	1	900	100	70%	1.71	1	900	2,000	2,000	-28%
025_02	1st tributary	3	360	Group B	98%	0.11	2	700	80	80%	1.14	2	700	800	700	-18%
025_02	1st tributary	4	120	Thinleaf alder	86%	0.80	2	200	200	50%	2.85	2	200	600	400	-36%
025_02	NF Lamb Creek	1	640	Nonforest 1	97%	0.17	1	600	100	80%	1.14	1	600	700	600	-17%
025_02	NF Lamb Creek	2	320	Nonforest 1	97%	0.17	1	300	50	70%	1.71	1	300	500	500	-27%
025_02	NF Lamb Creek	3	1100	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
025_02	NF Lamb Creek	4	290	pond	0%	5.70	3	900	5,000	0%	5.70	3	900	5,000	0	0%
025_02	NF Lamb Creek	5	330	Group B	97%	0.17	3	1,000	200	80%	1.14	3	1,000	1,000	800	-17%
025_02	NF Lamb Creek	6	410	Thinleaf alder	72%	1.60	3	1,000	2,000	50%	2.85	3	1,000	3,000	1,000	-22%
025_02	NF Lamb Creek	7	540	Thinleaf alder	59%	2.34	4	2,000	5,000	60%	2.28	4	2,000	5,000	0	0%
025_02	NF Lamb Creek	8	190	Thinleaf alder	78%	1.25	4	800	1,000	50%	2.85	4	800	2,000	1,000	-28%
025_02	NF Lamb Creek	9	440	Nonforest 1	78%	1.25	4	2,000	3,000	60%	2.28	4	2,000	5,000	2,000	-18%
025_02	NF Lamb Creek	10	1400	Thinleaf alder	50%	2.85	5	7,000	20,000	50%	2.85	5	7,000	20,000	0	0%
							Totals		39,000					57,000	19,000	

Loading Tables for the Lower Priest River Region

Table D26. Existing and potential solar loads for Binarch Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
026_02	1st tributary	1	740	Group B	98%	0.11	1	700	80	70%	1.71	1	700	1,000	900	-28%
026_02	1st tributary	2	1200	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
026_02	2nd tributary	1	360	Group B	98%	0.11	1	400	50	80%	1.14	1	400	500	500	-18%
026_02	2nd tributary	2	670	Group B	98%	0.11	2	1,000	100	70%	1.71	2	1,000	2,000	2,000	-28%
026_02	2nd tributary	3	550	Group B	98%	0.11	2	1,000	100	80%	1.14	2	1,000	1,000	900	-18%
026_02	trib to 2nd trib	1	280	Group B	98%	0.11	1	300	30	70%	1.71	1	300	500	500	-28%
026_02	trib to 2nd trib	2	560	Group B	98%	0.11	1	600	70	80%	1.14	1	600	700	600	-18%
026_02	3rd tributary	1	2350	Group B	98%	0.11	1	2,000	200	80%	1.14	1	2,000	2,000	2,000	-18%
026_02	3rd tributary	2	790	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
026_02	Binarch Creek	1	640	Group B	97%	0.17	3	2,000	300	80%	1.14	3	2,000	2,000	2,000	-17%
026_02	Binarch Creek	2	1500	Group B	97%	0.17	3	5,000	900	70%	1.71	3	5,000	9,000	8,000	-27%
026_02	Binarch Creek	3	1000	Group B	96%	0.23	4	4,000	900	60%	2.28	4	4,000	9,000	8,000	-36%
026_02	Binarch Creek	4	320	Group B	96%	0.23	4	1,000	200	50%	2.85	4	1,000	3,000	3,000	-46%
026_02	Binarch Creek	5	370	Group B	96%	0.23	4	1,000	200	60%	2.28	4	1,000	2,000	2,000	-36%
026_02	Binarch Creek	6	90	pond	0%	5.70	30	2,700	15,000	0%	5.70	30	2,700	15,000	0	0%
026_02	Binarch Creek	7	360	Group B	94%	0.34	5	2,000	700	70%	1.71	5	2,000	3,000	2,000	-24%
026_02	Binarch Creek	8	1000	Group B	94%	0.34	5	5,000	2,000	50%	2.85	5	5,000	10,000	8,000	-44%
026_02	Binarch Creek	9	310	Nonforest 1	72%	1.60	5	2,000	3,000	60%	2.28	5	2,000	5,000	2,000	-12%
026_02	Binarch Creek	10	1700	Nonforest 1	72%	1.60	5	9,000	10,000	50%	2.85	5	9,000	30,000	20,000	-22%
026_02	Binarch Creek	11	870	Nonforest 1	65%	2.00	6	5,000	10,000	60%	2.28	6	5,000	10,000	0	-5%
026_02	Binarch Creek	12	340	Nonforest 1	65%	2.00	6	2,000	4,000	40%	3.42	6	2,000	7,000	3,000	-25%
026_02	Binarch Creek	13	2460	Nonforest 1	65%	2.00	6	10,000	20,000	70%	1.71	6	10,000	20,000	0	0%
026_02	Binarch Creek	14	740	Group B	90%	0.57	7	5,000	3,000	80%	1.14	7	5,000	6,000	3,000	-10%
							Totals		71,000					140,000	73,000	

Table D27. Existing and potential solar loads for Goose Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
028_02	1st tributary	1	1100	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
028_02	1st tributary	2	840	Group B	98%	0.11	2	2,000	200	60%	2.28	2	2,000	5,000	5,000	-38%
028_02	Consalus Creek	1	550	Nonforest 1	72%	1.60	5	3,000	5,000	60%	2.28	5	3,000	7,000	2,000	-12%
028_02	Consalus Creek	2	450	Nonforest 1	72%	1.60	5	2,000	3,000	70%	1.71	5	2,000	3,000	0	-2%
028_02	Consalus Creek	3	250	Nonforest 1	72%	1.60	5	1,000	2,000	50%	2.85	5	1,000	3,000	1,000	-22%
028_02	2nd tributary	1	110	Group B	98%	0.11	1	100	10	60%	2.28	1	100	200	200	-38%
028_02	2nd tributary	2	1200	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
028_02	2nd tributary	3	620	Group B	98%	0.11	2	1,000	100	70%	1.71	2	1,000	2,000	2,000	-28%
028_02	2nd tributary	4	290	Nonforest 1	86%	0.80	3	900	700	50%	2.85	3	900	3,000	2,000	-36%
028_02	2nd tributary	5	790	Nonforest 1	86%	0.80	3	2,000	2,000	40%	3.42	3	2,000	7,000	5,000	-46%
028_02	trib To 2nd trib	1	130	Group B	98%	0.11	1	100	10	60%	2.28	1	100	200	200	-38%
028_02	trib To 2nd trib	2	1400	Group B	98%	0.11	2	3,000	300	80%	1.14	2	3,000	3,000	3,000	-18%
028_02	trib To 2nd trib	3	140	Group B	98%	0.11	2	300	30	70%	1.71	2	300	500	500	-28%
028_02	Blonc Creek	1	1050	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
028_02	Blonc Creek	2	740	Nonforest 1	94%	0.34	2	1,000	300	90%	0.57	2	1,000	600	300	-4%
028_02	Blonc Creek	3	520	Nonforest 1	94%	0.34	2	1,000	300	40%	3.42	2	1,000	3,000	3,000	-54%
028_02	Blonc Creek	4	200	Nonforest 1	86%	0.80	3	600	500	60%	2.28	3	600	1,000	500	-26%
028_02	Blonc Creek	5	910	Nonforest 1	86%	0.80	3	3,000	2,000	40%	3.42	3	3,000	10,000	8,000	-46%
028_02	3rd tributary	1	810	Group B	98%	0.11	1	800	90	90%	0.57	1	800	500	400	-8%
028_02	3rd tributary	2	280	Group B	98%	0.11	2	600	70	70%	1.71	2	600	1,000	900	-28%
028_02	3rd tributary	3	240	Nonforest 1	94%	0.34	2	500	200	60%	2.28	2	500	1,000	800	-34%
028_02	3rd tributary	4	320	Nonforest 1	94%	0.34	2	600	200	80%	1.14	2	600	700	500	-14%
028_02	3rd tributary	5	1230	Nonforest 1	86%	0.80	3	4,000	3,000	50%	2.85	3	4,000	10,000	7,000	-36%
028_02	1st trib to 3rd	1	340	Group B	98%	0.11	1	300	30	80%	1.14	1	300	300	300	-18%
028_02	1st trib to 3rd	2	510	Group B	98%	0.11	1	500	60	70%	1.71	1	500	900	800	-28%
028_02	1st trib to 3rd	3	390	Group B	98%	0.11	2	800	90	60%	2.28	2	800	2,000	2,000	-38%
028_02	2nd trib to 3rd	1	370	Nonforest 1	97%	0.17	1	400	70	80%	1.14	1	400	500	400	-17%
028_02	2nd trib to 3rd	2	750	Nonforest 1	94%	0.34	2	2,000	700	70%	1.71	2	2,000	3,000	2,000	-24%
028_02	2nd trib to 3rd	3	150	Nonforest 1	94%	0.34	2	300	100	50%	2.85	2	300	900	800	-44%
028_03	Goose Creek	1	1010	Nonforest 1	65%	2.00	6	6,000	10,000	60%	2.28	6	6,000	10,000	0	-5%
028_03	Goose Creek	2	750	Nonforest 1	60%	2.28	7	5,000	10,000	40%	3.42	7	5,000	20,000	10,000	-20%
028_03	Goose Creek	3	610	Nonforest 1	55%	2.57	8	5,000	10,000	50%	2.85	8	5,000	10,000	0	-5%
028_03	Goose Creek	4	1130	Nonforest 1	55%	2.57	8	9,000	20,000	40%	3.42	8	9,000	30,000	10,000	-15%
028_03	Goose Creek	5	2760	Nonforest 1	52%	2.74	9	20,000	50,000	30%	3.99	9	20,000	80,000	30,000	-22%
028_03	Goose Creek	6	250	Nonforest 1	52%	2.74	9	2,000	5,000	40%	3.42	9	2,000	7,000	2,000	-12%
							Totals		130,000					230,000	100,000	

Table D28. Existing and potential solar loads for Upper West Branch Priest River.

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
027_02	Tola Cr	1	760	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
027_02	2nd tributary	1	680	Group B	98%	0.11	1	700	80	70%	1.71	1	700	1,000	900	-28%
027_02	2nd tributary	2	140	Group B	98%	0.11	1	100	10	80%	1.14	1	100	100	90	-18%
027_02	2nd tributary	3	1200	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
027_02	3rd tributary	1	1600	Group B	98%	0.11	2	3,000	300	80%	1.14	2	3,000	3,000	3,000	-18%
027_02	4th tributary	1	970	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
027_02	4th tributary	2	610	Nonforest 1	94%	0.34	2	1,000	300	60%	2.28	2	1,000	2,000	2,000	-34%
027_02	4th tributary	3	260	Nonforest 1	86%	0.80	3	800	600	70%	1.71	3	800	1,000	400	-16%
027_02	trib to 4th trib	1	630	Group B	98%	0.11	1	600	70	90%	0.57	1	600	300	200	-8%
027_02	trib to 4th trib	2	330	Group B	98%	0.11	2	700	80	80%	1.14	2	700	800	700	-18%
027_02	trib to 4th trib	3	190	Group B	98%	0.11	2	400	50	60%	2.28	2	400	900	900	-38%
027_02	5th tributary	1	1400	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
027_02	5th tributary	2	260	Group B	98%	0.11	2	500	60	50%	2.85	2	500	1,000	900	-48%
027_02	6th tributary	1	760	Group B	98%	0.11	1	800	90	70%	1.71	1	800	1,000	900	-28%
027_02	6th tributary	2	390	Group B	98%	0.11	2	800	90	80%	1.14	2	800	900	800	-18%
027_02	6th tributary	3	570	Group B	98%	0.11	2	1,000	100	70%	1.71	2	1,000	2,000	2,000	-28%
027_03	UWB Priest R.	1	1950	Nonforest 1	48%	2.96	10	20,000	59,000	40%	3.42	10	20,000	68,000	9,000	-8%
027_03	UWB Priest R.	2	320	Nonforest 1	48%	2.96	10	3,200	9,500	50%	2.85	10	3,200	9,100	(400)	0%
027_03	UWB Priest R.	3	2090	Nonforest 1	45%	3.14	11	23,000	72,000	40%	3.42	11	23,000	79,000	7,000	-5%
027_03	UWB Priest R.	4	1300	Nonforest 1	45%	3.14	11	14,000	44,000	10%	5.13	11	14,000	72,000	28,000	-35%
027_03	UWB Priest R.	5	1000	Nonforest 1	45%	3.14	11	11,000	34,000	40%	3.42	11	11,000	38,000	4,000	-5%
027_04	UWB Priest R.	1	5310	Nonforest 1	39%	3.48	13	69,000	240,000	40%	3.42	13	69,000	240,000	0	0%
027_04	UWB Priest R.	2	130	Nonforest 1	37%	3.59	14	1,800	6,500	50%	2.85	14	1,800	5,100	(1,400)	0%
027_04	UWB Priest R.	3	600	Nonforest 1	37%	3.59	14	8,400	30,000	20%	4.56	14	8,400	38,000	8,000	-17%
027_04	UWB Priest R.	4	950	Nonforest 1	37%	3.59	14	13,000	47,000	50%	2.85	14	13,000	37,000	(10,000)	0%
027_04	UWB Priest R.	5	2700	Nonforest 1	37%	3.59	14	38,000	140,000	30%	3.99	14	38,000	150,000	10,000	-7%
027_04	UWB Priest R.	6	320	Nonforest 1	37%	3.59	14	4,500	16,000	50%	2.85	14	4,500	13,000	(3,000)	0%
027_04	UWB Priest R.	7	460	Nonforest 1	37%	3.59	14	6,400	23,000	40%	3.42	14	6,400	22,000	(1,000)	0%
027_04	UWB Priest R.	8	360	Nonforest 1	37%	3.59	14	5,000	18,000	10%	5.13	14	5,000	26,000	8,000	-27%
							Totals		740,000					820,000	79,000	

Table D29. Existing and potential solar loads for North Fork East River.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
004_02	1st tributary	1	490	Rocky/High Elv	95%	0.29	1	500	100	70%	1.71	1	500	900	800	-25%
004_02	1st tributary	2	430	Group B	98%	0.11	2	900	100	80%	1.14	2	900	1,000	900	-18%
004_02	1st tributary	3	890	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
004_02	Race Creek	1	960	Rocky/High Elv	95%	0.29	1	1,000	300	70%	1.71	1	1,000	2,000	2,000	-25%
004_02	Race Creek	2	2100	Group B	98%	0.11	2	4,000	500	80%	1.14	2	4,000	5,000	5,000	-18%
004_02	Junta Creek	1	1300	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
004_02	Junta Creek	2	1600	Group B	98%	0.11	2	3,000	300	80%	1.14	2	3,000	3,000	3,000	-18%
004_02	4th tributary	1	80	Group B	98%	0.11	1	80	9	90%	0.57	1	80	50	40	-8%
004_02	4th tributary	2	600	Group B	98%	0.11	1	600	70	60%	2.28	1	600	1,000	900	-38%
004_02	4th tributary	3	1100	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
004_02	NF East River	1	1600	Group B	98%	0.11	2	3,000	300	90%	0.57	2	3,000	2,000	2,000	-8%
004_02	NF East River	2	870	Group B	96%	0.23	4	3,000	700	80%	1.14	4	3,000	3,000	2,000	-16%
004_02	NF East River	3	2700	Group B	94%	0.34	5	10,000	3,000	70%	1.71	5	10,000	20,000	20,000	-24%
004_02	NF East River	4	630	Group B	92%	0.46	6	4,000	2,000	60%	2.28	6	4,000	9,000	7,000	-32%
004_02	NF East River	5	1800	Group B	92%	0.46	6	10,000	5,000	70%	1.71	6	10,000	20,000	20,000	-22%
004_02	NF East River	6	720	Group B	92%	0.46	6	4,000	2,000	60%	2.28	6	4,000	9,000	7,000	-32%
004_02	NF East River	7	1000	Thinleaf alder	43%	3.25	6	6,000	20,000	60%	2.28	6	6,000	10,000	(10,000)	0%
004_02	NF East River	8	760	Nonforest 1	60%	2.28	7	5,000	10,000	70%	1.71	7	5,000	9,000	(1,000)	0%
004_02	NF East River	9	1100	Nonforest 1	60%	2.28	7	8,000	20,000	50%	2.85	7	8,000	20,000	0	-10%
004_02	NF East River	10	320	Nonforest 1	60%	2.28	7	2,000	5,000	40%	3.42	7	2,000	7,000	2,000	-20%
004_02	NF East River	11	920	Nonforest 1	55%	2.57	8	7,000	20,000	50%	2.85	8	7,000	20,000	0	-5%
004_03	NF East River	12	890	Nonforest 1	55%	2.57	8	7,000	20,000	50%	2.85	8	7,000	20,000	0	-5%
004_03	NF East River	13	490	Nonforest 1	55%	2.57	8	4,000	10,000	40%	3.42	8	4,000	10,000	0	-15%
004_03	NF East River	14	1600	Nonforest 1	55%	2.57	8	10,000	30,000	60%	2.28	8	10,000	20,000	(10,000)	0%
004_03	NF East River	15	420	Thinleaf alder	34%	3.76	8	3,000	10,000	40%	3.42	8	3,000	10,000	0	0%
004_03	NF East River	16	180	Nonforest 1	34%	3.76	8	1,000	4,000	30%	3.99	9	2,000	8,000	4,000	-4%
							Totals		160,000					210,000	60,000	

Table D30. Existing and potential solar loads for Lost Creek.

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	1st tributary	1	2200	Group B	98%	0.11	2	4,000	500	90%	0.57	2	4,000	2,000	2,000	-8%
004_02	Lost Creek	1	1800	Group B	98%	0.11	1	2,000	200	70%	1.71	1	2,000	3,000	3,000	-28%
004_02	Lost Creek	2	2600	Group B	97%	0.17	3	8,000	1,000	60%	2.28	3	8,000	20,000	20,000	-37%
004_02	Lost Creek	3	660	Group B	96%	0.23	4	3,000	700	90%	0.57	4	3,000	2,000	1,000	-6%
004_02	Lost Creek	4	570	Group B	96%	0.23	4	2,000	500	80%	1.14	4	2,000	2,000	2,000	-16%
004_02	Lost Creek	5	3310	Group B	94%	0.34	5	20,000	7,000	90%	0.57	5	20,000	10,000	3,000	-4%
004_02	Lost Creek	6	580	Group B	92%	0.46	6	3,000	1,000	80%	1.14	6	3,000	3,000	2,000	-12%
004_02	Lost Creek	7	250	Group B	92%	0.46	6	2,000	900	70%	1.71	6	2,000	3,000	2,000	-22%
004_02	Lost Creek	8	890	Group B	92%	0.46	6	5,000	2,000	90%	0.57	6	5,000	3,000	1,000	-2%
004_02	Lost Creek	9	530	Group B	92%	0.46	6	3,000	1,000	90%	0.57	6	3,000	2,000	1,000	-2%
							Totals		15,000					50,000	37,000	

Table D31. Existing and potential solar loads for Middle Fork East River.

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
003_02	MF East River	1	870	Rocky/High Elv	95%	0.29	1	900	300	70%	1.71	1	900	2,000	2,000	-25%
003_02	MF East River	2	2000	Group B	97%	0.17	3	6,000	1,000	80%	1.14	3	6,000	7,000	6,000	-17%
003_02	MF East River	3	2000	Group B	96%	0.23	4	8,000	2,000	70%	1.71	4	8,000	10,000	8,000	-26%
003_03	MF East River	4	2320	Rocky/High Elv	54%	2.62	6	10,000	30,000	70%	1.71	6	10,000	20,000	(10,000)	0%
003_03	MF East River	5	1100	Group B	87%	0.74	8	9,000	7,000	60%	2.28	8	9,000	20,000	10,000	-27%
003_03	MF East River	6	550	Nonforest 1	55%	2.57	8	4,000	10,000	60%	2.28	8	4,000	9,000	(1,000)	0%
003_03	MF East River	7	440	Nonforest 1	55%	2.57	8	4,000	10,000	50%	2.85	8	4,000	10,000	0	-5%
003_03	MF East River	8	380	Nonforest 1	52%	2.74	9	3,000	8,000	60%	2.28	9	3,000	7,000	(1,000)	0%
003_03	MF East River	9	1100	Nonforest 1	52%	2.74	9	10,000	30,000	50%	2.85	9	10,000	30,000	0	-2%
003_03	MF East River	10	820	Nonforest 1	52%	2.74	9	7,000	20,000	40%	3.42	9	7,000	20,000	0	-12%
003_03	MF East River	11	1200	Nonforest 1	48%	2.96	10	12,000	36,000	50%	2.85	10	12,000	34,000	(2,000)	0%
003_03	MF East River	12	780	Nonforest 1	48%	2.96	10	7,800	23,000	40%	3.42	10	7,800	27,000	4,000	-8%
003_03	MF East River	13	480	Nonforest 1	48%	2.96	10	4,800	14,000	50%	2.85	10	4,800	14,000	0	0%
003_03	MF East River	14	1380	Nonforest 1	45%	3.14	11	15,000	47,000	30%	3.99	11	15,000	60,000	13,000	-15%
							Totals		240,000					270,000	29,000	

Table D32. Existing and potential solar loads for Middle Fork East River tributaries.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
003_02	1st tributary	1	960	Group C	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
003_02	1st tributary	2	1500	Group B	98%	0.11	2	3,000	300	70%	1.71	2	3,000	5,000	5,000	-28%
003_02	Keokee Creek	1	920	Rocky/High Elv	89%	0.63	2	2,000	1,000	90%	0.57	2	2,000	1,000	0	0%
003_02	Keokee Creek	2	940	Group B	98%	0.11	2	2,000	200	90%	0.57	2	2,000	1,000	800	-8%
003_02	Keokee Creek	3	2300	Group B	97%	0.17	3	7,000	1,000	70%	1.71	3	7,000	10,000	9,000	-27%
003_02	trib to Keokee	1	670	Rocky/High Elv	95%	0.29	1	700	200	80%	1.14	1	700	800	600	-15%
003_02	trib to Keokee	2	720	Group B	98%	0.11	2	1,000	100	90%	0.57	2	1,000	600	500	-8%
003_02	Uleda Creek	1	1400	Rocky/High Elv	95%	0.29	1	1,000	300	70%	1.71	1	1,000	2,000	2,000	-25%
003_02	Uleda Creek	2	850	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
003_02	Uleda Creek	3	1900	Rocky/High Elv	76%	1.37	3	6,000	8,000	70%	1.71	3	6,000	10,000	2,000	-6%
003_02	Uleda Creek	4	620	Rocky/High Elv	67%	1.88	4	2,000	4,000	60%	2.28	4	2,000	5,000	1,000	-7%
003_02	Uleda Creek	5	1000	Rocky/High Elv	60%	2.28	5	5,000	10,000	70%	1.71	5	5,000	9,000	(1,000)	0%
003_02	trib to Uleda	1	570	Rocky/High Elv	89%	0.63	2	1,000	600	70%	1.71	2	1,000	2,000	1,000	-19%
003_02	trib to Uleda	2	1020	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
003_02	Chicopee Creek	1	770	Group B	98%	0.11	1	800	90	60%	2.28	1	800	2,000	2,000	-38%
003_02	Chicopee Creek	2	510	Rocky/High Elv	95%	0.29	1	500	100	60%	2.28	1	500	1,000	900	-35%
003_02	Chicopee Creek	3	440	Group B	98%	0.11	1	400	50	60%	2.28	1	400	900	900	-38%
003_02	Chicopee Creek	4	1800	Group B	98%	0.11	2	4,000	500	70%	1.71	2	4,000	7,000	7,000	-28%
003_02	Tarlac Creek	1	1200	Rocky/High Elv	95%	0.29	1	1,000	300	70%	1.71	1	1,000	2,000	2,000	-25%
003_02	Tarlac Creek	2	1900	Group B	98%	0.11	2	4,000	500	80%	1.14	2	4,000	5,000	5,000	-18%
003_02	Tarlac Creek	3	1000	Group B	97%	0.17	3	3,000	500	70%	1.71	3	3,000	5,000	5,000	-27%
003_02	Tarlac Creek	4	1200	Group B	96%	0.23	4	5,000	1,000	80%	1.14	4	5,000	6,000	5,000	-16%
003_02	6th tributary	1	490	Rocky/High Elv	95%	0.29	1	500	100	70%	1.71	1	500	900	800	-25%
003_02	6th tributary	2	670	Rocky/High Elv	89%	0.63	2	1,000	600	80%	1.14	2	1,000	1,000	400	-9%
003_02	6th tributary	3	190	Rocky/High Elv	76%	1.37	3	600	800	70%	1.71	3	600	1,000	200	-6%
003_02	6th tributary	4	540	Group B	97%	0.17	3	2,000	300	70%	1.71	3	2,000	3,000	3,000	-27%
003_02	Canyon Creek	1	620	Thinleaf alder	91%	0.51	1	600	300	70%	1.71	1	600	1,000	700	-21%
003_02	Canyon Creek	2	2310	Group B	97%	0.17	3	7,000	1,000	70%	1.71	1	2,000	3,000	2,000	-27%
003_02	Canyon Creek	3	2950	Rocky/High Elv	76%	1.37	3	9,000	10,000	70%	1.71	1	3,000	5,000	(5,000)	-6%
003_02	Canyon Creek	4	1310	Group B	97%	0.17	3	4,000	700	80%	1.14	3	4,000	5,000	4,000	-17%
							Totals		43,000					100,000	61,000	

Table D33. Existing and potential solar loads for Lower West Branch Priest River.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
030_03	LWB Priest R.	1	1220	Nonforest 1	55%	2.57	8	10,000	30,000	40%	3.42	8	10,000	30,000	0	-15%
030_03	LWB Priest R.	2	450	Nonforest 1	52%	2.74	9	4,000	10,000	30%	3.99	9	4,000	20,000	10,000	-22%
030_03	LWB Priest R.	3	270	Nonforest 1	52%	2.74	9	2,000	5,000	40%	3.42	9	2,000	7,000	2,000	-12%
030_03	LWB Priest R.	4	1200	Nonforest 1	48%	2.96	10	12,000	36,000	20%	4.56	10	12,000	55,000	19,000	-28%
030_03	LWB Priest R.	5	910	Nonforest 1	48%	2.96	10	9,100	27,000	30%	3.99	10	9,100	36,000	9,000	-18%
030_03	LWB Priest R.	6	4100	Nonforest 1	45%	3.14	11	45,000	140,000	50%	2.85	11	45,000	130,000	(10,000)	0%
030_03	LWB Priest R.	7	150	Nonforest 1	41%	3.36	12	1,800	6,100	40%	3.42	12	1,800	6,200	100	-1%
030_04	LWB Priest R.	1	2220	Nonforest 1	39%	3.48	13	29,000	100,000	40%	3.42	13	29,000	99,000	(1,000)	0%
030_04	LWB Priest R.	2	420	Nonforest 1	39%	3.48	13	5,500	19,000	30%	3.99	13	5,500	22,000	3,000	-9%
030_04	LWB Priest R.	3	1100	Nonforest 1	39%	3.48	13	14,000	49,000	20%	4.56	13	14,000	64,000	15,000	-19%
030_04	LWB Priest R.	4	2800	Nonforest 1	37%	3.59	14	39,000	140,000	10%	5.13	14	39,000	200,000	60,000	-27%
030_04	LWB Priest R.	5	880	Nonforest 1	37%	3.59	14	12,000	43,000	20%	4.56	14	12,000	55,000	12,000	-17%
030_04	LWB Priest R.	6	340	Nonforest 1	37%	3.59	14	4,800	17,000	10%	5.13	14	4,800	25,000	8,000	-27%
030_04	LWB Priest R.	7	1040	Nonforest 1	37%	3.59	14	15,000	54,000	20%	4.56	14	15,000	68,000	14,000	-17%
030_04	LWB Priest R.	8	860	Nonforest 1	37%	3.59	14	12,000	43,000	30%	3.99	14	12,000	48,000	5,000	-7%
030_04	LWB Priest R.	9	3100	Nonforest 1	35%	3.71	15	47,000	170,000	20%	4.56	15	47,000	210,000	40,000	-15%
030_04	LWB Priest R.	10	210	Nonforest 1	35%	3.71	15	3,200	12,000	10%	5.13	15	3,200	16,000	4,000	-25%
030_04	LWB Priest R.	11	160	Nonforest 1	35%	3.71	15	2,400	8,900	30%	3.99	15	2,400	9,600	700	-5%
030_04	LWB Priest R.	12	2260	Nonforest 1	35%	3.71	15	34,000	130,000	20%	4.56	15	34,000	160,000	30,000	-15%
030_04	LWB Priest R.	13	970	Nonforest 1	35%	3.71	15	15,000	56,000	10%	5.13	15	15,000	77,000	21,000	-25%
030_04	LWB Priest R.	14	360	Nonforest 1	35%	3.71	15	5,400	20,000	30%	3.99	15	5,400	22,000	2,000	-5%
030_04	LWB Priest R.	15	670	Nonforest 1	35%	3.71	15	10,000	37,000	0%	5.70	15	10,000	57,000	20,000	-35%
							Totals		1,200,000					1,400,000	260,000	

Table D34. Existing and potential solar loads for Tunnel Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/ day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
030_02	1st tributary	1	830	Group A	94%	0.34	1	800	300	80%	1.14	1	800	900	600	-14%
030_02	2nd tributary	1	310	Group B	98%	0.11	1	300	30	80%	1.14	1	300	300	300	-18%
030_02	2nd tributary	2	290	Group B	98%	0.11	1	300	30	70%	1.71	1	300	500	500	-28%
030_02	2nd tributary	3	1010	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
030_02	2nd tributary	4	420	Group B	98%	0.11	2	800	90	60%	2.28	2	800	2,000	2,000	-38%
030_02	2nd tributary	5	250	Nonforest 1	86%	0.80	3	800	600	40%	3.42	3	800	3,000	2,000	-46%
030_02	2nd tributary	6	390	Nonforest 1	86%	0.80	3	1,000	800	50%	2.85	3	1,000	3,000	2,000	-36%
030_02	2nd tributary	7	760	Nonforest 1	86%	0.80	3	2,000	2,000	40%	3.42	3	2,000	7,000	5,000	-46%
030_02	1st trib to 2nd	1	1300	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
030_02	2nd trib to 2nd	1	1200	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
030_02	3rd trib to 2nd	1	1100	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
030_02	3rd trib to 2nd	2	310	Group B	98%	0.11	1	300	30	70%	1.71	1	300	500	500	-28%
030_02	3rd trib to 2nd	3	210	Group B	98%	0.11	2	400	50	60%	2.28	2	400	900	900	-38%
030_02	3rd trib to 2nd	4	80	Group B	98%	0.11	2	200	20	40%	3.42	2	200	700	700	-58%
030_02	Tunnel Creek	1	990	Group B	98%	0.11	1	1,000	100	80%	1.14	1	1,000	1,000	900	-18%
030_02	Tunnel Creek	2	430	Nonforest 1	94%	0.34	2	900	300	70%	1.71	2	900	2,000	2,000	-24%
030_02	Tunnel Creek	3	270	Nonforest 1	94%	0.34	2	500	200	60%	2.28	2	500	1,000	800	-34%
030_02	Tunnel Creek	4	1600	Nonforest 1	86%	0.80	3	5,000	4,000	40%	3.42	3	5,000	20,000	20,000	-46%
030_03	Tunnel Creek	5	250	Nonforest 1	78%	1.25	4	1,000	1,000	40%	3.42	4	1,000	3,000	2,000	-38%
030_03	Tunnel Creek	6	1100	Nonforest 1	78%	1.25	4	4,000	5,000	70%	1.71	4	4,000	7,000	2,000	-8%
030_03	Tunnel Creek	7	450	Nonforest 1	78%	1.25	4	2,000	3,000	80%	1.14	4	2,000	2,000	(1,000)	0%
030_03	Tunnel Creek	8	1400	Nonforest 1	78%	1.25	4	6,000	8,000	70%	1.71	4	6,000	10,000	2,000	-8%
							Totals		26,000					70,000	48,000	

Table D35. Existing and potential solar loads for Snow Creek.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
030_02	1st tributary	1	1000	Group B	98%	0.11	1	1,000	100	90%	0.57	1	1,000	600	500	-8%
030_02	1st tributary	2	1000	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
030_02	1st tributary	3	480	Group B	97%	0.17	3	1,000	200	60%	2.28	3	1,000	2,000	2,000	-37%
030_02	1st tributary	4	470	Group B	97%	0.17	3	1,000	200	50%	2.85	3	1,000	3,000	3,000	-47%
030_02	2nd tributary	1	1900	Group B	98%	0.11	1	2,000	200	80%	1.14	1	2,000	2,000	2,000	-18%
030_02	2nd tributary	2	310	Nonforest 1	94%	0.34	2	600	200	60%	2.28	2	600	1,000	800	-34%
030_02	2nd tributary	3	280	Nonforest 1	94%	0.34	2	600	200	50%	2.85	2	600	2,000	2,000	-44%
030_02	2nd tributary	4	670	Nonforest 1	86%	0.80	3	2,000	2,000	60%	2.28	3	2,000	5,000	3,000	-26%
030_02	2nd tributary	5	620	Nonforest 1	78%	1.25	4	2,000	3,000	0%	5.70	4	2,000	10,000	7,000	-78%
030_02	2nd tributary	6	220	Nonforest 1	78%	1.25	4	900	1,000	20%	4.56	4	900	4,000	3,000	-58%
030_02	2nd tributary	7	1400	Nonforest 1	78%	1.25	4	6,000	8,000	70%	1.71	4	6,000	10,000	2,000	-8%
030_02	trib to 2nd trib	1	1770	Group B	98%	0.11	2	4,000	500	80%	1.14	2	4,000	5,000	5,000	-18%
030_02	trib to 2nd trib	2	350	Nonforest 1	94%	0.34	2	700	200	60%	2.28	2	700	2,000	2,000	-34%
030_02	Snow Creek	1	1200	Group B	98%	0.11	1	1,000	100	70%	1.71	1	1,000	2,000	2,000	-28%
030_02	Snow Creek	2	680	Group B	98%	0.11	2	1,000	100	60%	2.28	2	1,000	2,000	2,000	-38%
030_02	Snow Creek	3	310	Group B	98%	0.11	2	600	70	30%	3.99	2	600	2,000	2,000	-68%
030_02	Snow Creek	4	1000	Group B	97%	0.17	3	3,000	500	60%	2.28	3	3,000	7,000	7,000	-37%
030_02	Snow Creek	5	420	Group B	97%	0.17	3	1,000	200	30%	3.99	3	1,000	4,000	4,000	-67%
030_02	Snow Creek	6	990	Nonforest 1	72%	1.60	5	5,000	8,000	60%	2.28	5	5,000	10,000	2,000	-12%
030_03	Snow Creek	7	130	Nonforest 1	65%	2.00	6	800	2,000	70%	1.71	6	800	1,000	(1,000)	0%
030_03	Snow Creek	8	570	Thinleaf alder	43%	3.25	6	3,000	10,000	60%	2.28	6	3,000	7,000	(3,000)	0%
030_03	Snow Creek	9	200	Thinleaf alder	43%	3.25	6	1,000	3,000	50%	2.85	6	1,000	3,000	0	0%
030_03	Snow Creek	10	1100	Nonforest 1	65%	2.00	6	7,000	10,000	60%	2.28	6	7,000	20,000	10,000	-5%
							Totals		50,000					110,000	59,000	

Table D36. Existing and potential solar loads for Moores Creek.

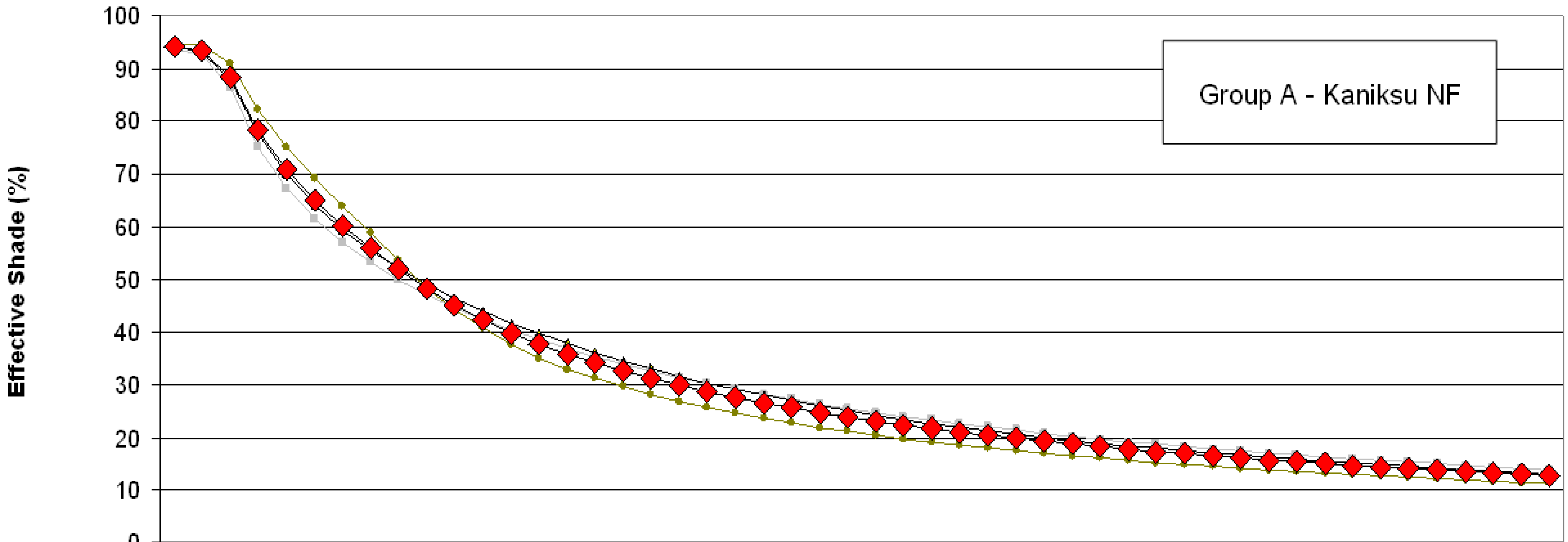
Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
031_02	Moores Creek	1	2400	Group B	98%	0.11	2	5,000	600	80%	1.14	2	5,000	6,000	5,000	-18%
031_02	Moores Creek	2	1000	Nonforest 1	86%	0.80	3	3,000	2,000	40%	3.42	3	3,000	10,000	8,000	-46%
031_02	Moores Creek	3	200	Nonforest 1	78%	1.25	4	800	1,000	30%	3.99	4	800	3,000	2,000	-48%
031_02	Moores Creek	4	230	Nonforest 1	78%	1.25	4	900	1,000	40%	3.42	4	900	3,000	2,000	-38%
031_02	Moores Creek	5	650	Nonforest 1	78%	1.25	4	3,000	4,000	20%	4.56	4	3,000	10,000	6,000	-58%
031_02	Moores Creek	6	240	Nonforest 1	72%	1.60	5	1,000	2,000	30%	3.99	5	1,000	4,000	2,000	-42%
031_02	Moores Creek	7	670	Nonforest 1	72%	1.60	5	3,000	5,000	60%	2.28	5	3,000	7,000	2,000	-12%
031_02	Moores Creek	8	570	Nonforest 1	72%	1.60	5	3,000	5,000	30%	3.99	5	3,000	10,000	5,000	-42%
031_02	Moores Creek	9	1270	Nonforest 1	72%	1.60	5	6,000	10,000	10%	5.13	5	6,000	30,000	20,000	-62%
031_02	Moores Creek	10	960	Nonforest 1	72%	1.60	5	5,000	8,000	50%	2.85	5	5,000	10,000	2,000	-22%
031_02	Moores Creek	11	300	Nonforest 1	72%	1.60	5	2,000	3,000	30%	3.99	5	2,000	8,000	5,000	-42%
031_02	Moores Creek	12	1400	Nonforest 1	65%	2.00	6	8,000	20,000	20%	4.56	6	8,000	40,000	20,000	-45%
031_03	Moores Creek	13	2160	Nonforest 1	65%	2.00	6	10,000	20,000	10%	5.13	6	10,000	50,000	30,000	-55%
031_03	Moores Creek	14	790	Nonforest 1	60%	2.28	7	6,000	10,000	20%	4.56	7	6,000	30,000	20,000	-40%
031_03	Moores Creek	15	780	Nonforest 1	60%	2.28	7	5,000	10,000	60%	2.28	7	5,000	10,000	0	0%
031_03	Moores Creek	16	160	Nonforest 1	60%	2.28	7	1,000	2,000	50%	2.85	7	1,000	3,000	1,000	-10%
031_03	Moores Creek	17	270	Nonforest 1	60%	2.28	7	2,000	5,000	40%	3.42	7	2,000	7,000	2,000	-20%
031_03	Moores Creek	18	580	Nonforest 1	60%	2.28	7	4,000	9,000	20%	4.56	7	4,000	20,000	10,000	-40%
031_03	Moores Creek	19	1470	Nonforest 1	60%	2.28	7	10,000	20,000	60%	2.28	7	10,000	20,000	0	0%
							Totals		140,000					280,000	140,000	

Table D37. Existing and potential solar loads for Moores Creek tributaries.

Segment Details					Target					Existing					Summary	
AU	Stream Name	Number (top to bottom)	Length (m)	Vegetation Type	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Shade	Solar Radiation (kWh/m²/day)	Segment Width (m)	Segment Area (m²)	Solar Load (kWh/day)	Excess Load (kWh/day)	Lack of Shade
031_02	1st tributary	1	310	Group B	98%	0.11	1	300	30	80%	1.14	1	300	300	300	-18%
031_02	1st tributary	2	450	Group B	98%	0.11	2	900	100	60%	2.28	2	900	2,000	2,000	-38%
031_02	1st tributary	3	60	Group B	98%	0.11	2	100	10	80%	1.14	2	100	100	90	-18%
031_02	2nd tributary	1	630	Group B	98%	0.11	1	600	70	70%	1.71	1	600	1,000	900	-28%
031_02	2nd tributary	2	950	Group B	98%	0.11	2	2,000	200	80%	1.14	2	2,000	2,000	2,000	-18%
031_02	3rd tributary	1	290	Group B	98%	0.11	1	300	30	90%	0.57	1	300	200	200	-8%
031_02	3rd tributary	2	950	Group B	98%	0.11	2	2,000	200	70%	1.71	2	2,000	3,000	3,000	-28%
031_02	3rd tributary	3	300	Group B	97%	0.17	3	900	200	60%	2.28	3	900	2,000	2,000	-37%
031_02	3rd tributary	4	170	Group B	97%	0.17	3	500	90	30%	3.99	3	500	2,000	2,000	-67%
031_02	EF Moores Cr.	1	940	Group B	98%	0.11	1	900	100	80%	1.14	1	900	1,000	900	-18%
031_02	EF Moores Cr.	2	1400	Nonforest 1	94%	0.34	2	3,000	1,000	70%	1.71	2	3,000	5,000	4,000	-24%
031_02	EF Moores Cr.	3	590	Nonforest 1	86%	0.80	3	2,000	2,000	50%	2.85	3	2,000	6,000	4,000	-36%
031_02	EF Moores Cr.	4	200	Nonforest 1	86%	0.80	3	600	500	10%	5.13	3	600	3,000	3,000	-76%
031_02	5th tributary	1	660	Group B	98%	0.11	1	700	80	80%	1.14	1	700	800	700	-18%
031_02	5th tributary	2	1500	Nonforest 1	94%	0.34	2	3,000	1,000	70%	1.71	2	3,000	5,000	4,000	-24%
031_02	5th tributary	3	100	Nonforest 1	94%	0.34	2	200	70	40%	3.42	2	200	700	600	-54%
031_02	6th tributary	1	650	Group B	98%	0.11	1	700	80	90%	0.57	1	700	400	300	-8%
031_02	6th tributary	2	420	Group B	98%	0.11	2	800	90	70%	1.71	2	800	1,000	900	-28%
031_02	6th tributary	3	260	Group B	98%	0.11	2	500	60	50%	2.85	2	500	1,000	900	-48%
031_02	6th tributary	4	970	Group B	97%	0.17	3	3,000	500	80%	1.14	3	3,000	3,000	3,000	-17%
031_02	7th tributary	1	1100	Nonforest 1	97%	0.17	1	1,000	200	80%	1.14	1	1,000	1,000	800	-17%
031_02	7th tributary	2	490	Nonforest 1	97%	0.17	1	500	90	60%	2.28	1	500	1,000	900	-37%
031_02	7th tributary	3	870	Nonforest 1	94%	0.34	2	2,000	700	70%	1.71	2	2,000	3,000	2,000	-24%
031_02	7th tributary	4	1100	Nonforest 1	94%	0.34	2	2,000	700	80%	1.14	2	2,000	2,000	1,000	-14%
031_02	7th tributary	5	450	Nonforest 1	86%	0.80	3	1,000	800	70%	1.71	3	1,000	2,000	1,000	-16%
031_02	7th tributary	6	1000	Nonforest 1	86%	0.80	3	3,000	2,000	60%	2.28	3	3,000	7,000	5,000	-26%
031_02	7th tributary	7	490	Nonforest 1	86%	0.80	3	1,000	800	70%	1.71	3	1,000	2,000	1,000	-16%
031_02	8th tributary	1	270	Group B	98%	0.11	1	300	30	90%	0.57	1	300	200	200	-8%
031_02	8th tributary	2	590	Group B	98%	0.11	1	600	70	70%	1.71	1	600	1,000	900	-28%
031_02	8th tributary	3	250	Group B	98%	0.11	2	500	60	80%	1.14	2	500	600	500	-18%
031_02	8th tributary	4	690	Group B	98%	0.11	2	1,000	100	50%	2.85	2	1,000	3,000	3,000	-48%
031_02	8th tributary	5	940	Group B	97%	0.17	3	3,000	500	70%	1.71	3	3,000	5,000	5,000	-27%
							Totals		12,000					67,000	56,000	

Table D38. Existing and potential solar loads for the Priest River.

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
014_04	Priest River	1	4500	Nonforest 2	25%	4.28	20	90,000	380,000	0%	5.70	20	90,000	510,000	130,000	-25%
005_05	Priest River	2	1900	Nonforest 2	17%	4.73	33	63,000	300,000	0%	5.70	33	63,000	360,000	60,000	-17%
005_05	Priest River	3	1230	Nonforest 2	17%	4.73	33	41,000	190,000	10%	5.13	33	41,000	210,000	20,000	-7%
005_05	Priest River	4	1520	Nonforest 2	16%	4.79	34	52,000	250,000	0%	5.70	34	52,000	300,000	50,000	-16%
005_05	Priest River	5	310	Nonforest 2	16%	4.79	34	11,000	53,000	10%	5.13	34	11,000	56,000	3,000	-6%
005_05	Priest River	6	8100	Nonforest 2	16%	4.79	35	280,000	1,300,000	0%	5.70	35	280,000	1,600,000	300,000	-16%
005_05	Priest River	7	1100	Nonforest 2	16%	4.79	36	40,000	190,000	10%	5.13	36	40,000	210,000	20,000	-6%
001_05	Priest River	1	23850	Nonforest 2	15%	4.85	38	910,000	4,400,000	0%	5.70	38	910,000	5,200,000	800,000	-15%
001_05	Priest River	2	420	Nonforest 2	15%	4.85	39	16,000	78,000	10%	5.13	39	16,000	82,000	4,000	-5%
001_05	Priest River	3	35320	Nonforest 2	14%	4.90	40	1,400,000	6,900,000	0%	5.70	40	1,400,000	8,000,000	1,100,000	-14%
							Totals		14,000,000					17,000,000	2,500,000	

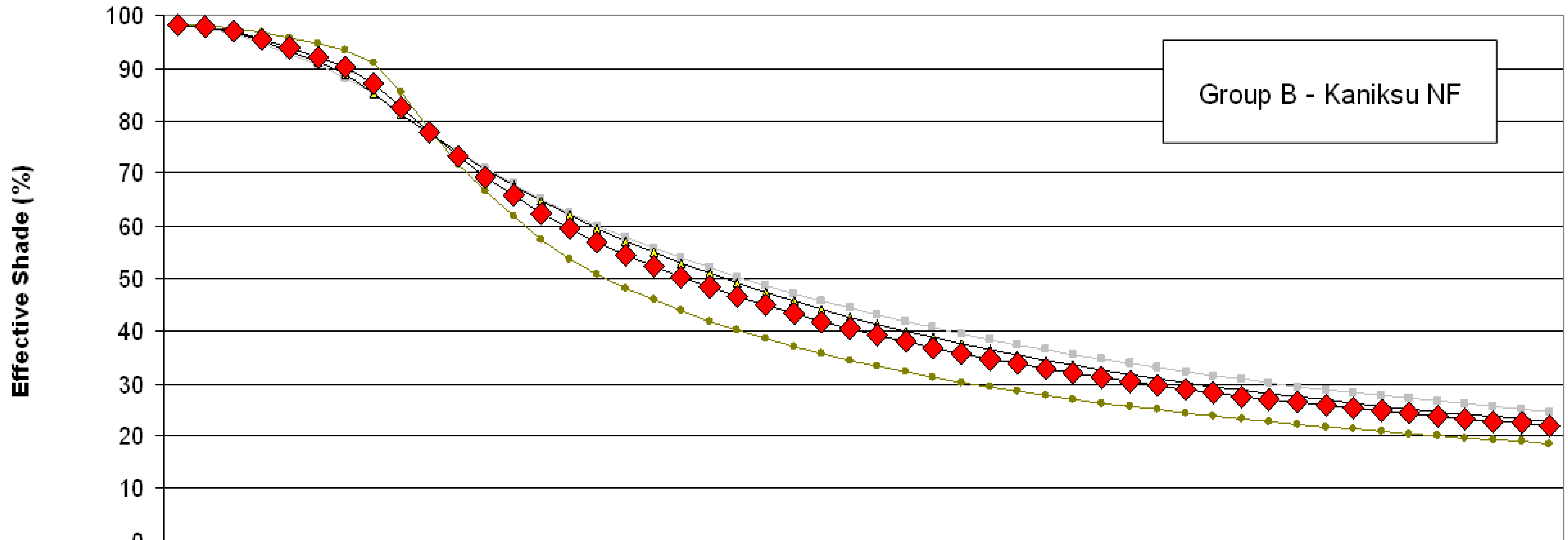


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
North - South	94	93	86	75	67	62	57	53	50	47	45	42	40	39	37	35	34	33	31	30	29	28	27	26	25
Northeast/Southwest	94	93	88	78	70	64	60	56	52	49	46	44	42	40	38	36	35	33	32	30	29	28	27	26	25
East - West	95	94	91	82	75	69	64	59	54	48	44	41	38	35	33	31	30	28	27	26	25	24	23	22	21
Average	94	93	88	78	71	65	60	56	52	48	45	42	40	38	36	34	33	31	30	29	28	27	26	25	24

	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	25	24	23	23	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14	14
Northeast/Southwest	24	23	23	22	21	21	20	19	19	18	18	17	17	17	16	16	15	15	15	14	14	14	14	13	13
East - West	20	20	19	19	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11
Average	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	14	13	13	13

"Vegetation" Channel Width (meters) and Calculated Shade Conditions

Figure D1. Target shade for the Kaniksu National Forest Group A forest type.

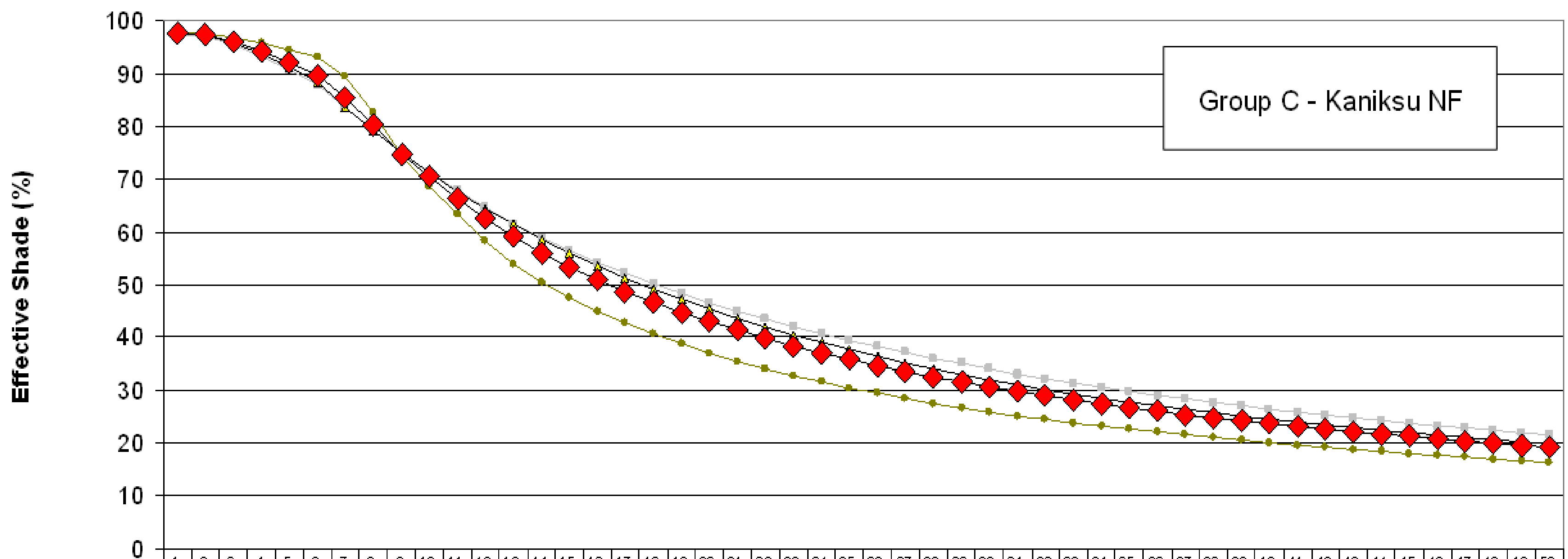


"Vegetation" Channel Width (meters)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
North - South	98	98	97	95	93	91	88	85	81	77	74	71	68	65	63	60	58	56	54	52	50	49	47	46	44
Northeast/Southwest	98	98	97	95	93	91	89	85	81	77	74	71	68	65	62	60	57	55	53	51	49	47	46	44	43
East - West	98	98	98	97	96	95	93	91	85	78	72	67	62	57	54	51	48	46	44	42	40	39	37	36	34
Average	98	98	97	96	94	92	90	87	83	78	73	69	66	62	59	57	54	52	50	48	47	45	43	42	40

"Vegetation" Channel Width (meters)	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	43	42	41	40	38	37	37	36	35	34	33	32	32	31	30	29	29	28	28	27	27	26	26	25	25
Northeast/Southwest	41	40	39	38	36	35	34	33	33	32	31	30	29	29	28	27	27	26	26	25	25	24	24	23	23
East - West	33	32	31	30	29	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	20	19	19	19
Average	39	38	37	36	35	34	33	32	31	30	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22

"Vegetation" Channel Width (meters) and Calculated Shade Conditions

Figure D2. Target shade for the Kaniksu National Forest Group B forest type.

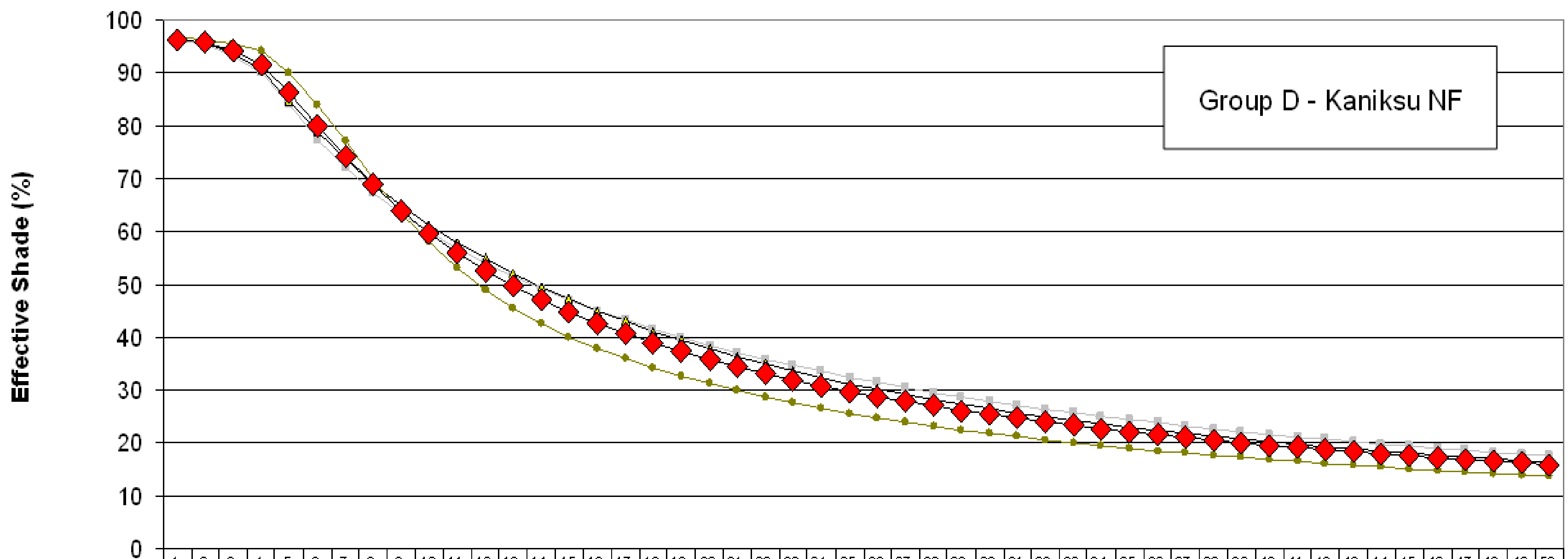


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
North - South	97	97	95	93	91	88	84	79	75	71	68	65	62	59	56	54	52	50	48	47	45	43	42	41	39
Northeast/Southwest	98	97	96	94	91	88	84	79	75	71	68	64	61	59	56	54	51	49	47	45	44	42	40	39	38
East - West	98	98	97	96	95	93	89	83	74	69	63	58	54	51	48	45	43	41	39	37	35	34	33	32	30
Average	98	97	96	94	92	90	86	80	75	70	66	62	59	56	53	51	49	47	45	43	41	40	38	37	36

	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	38	37	36	35	34	33	32	31	31	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22	22
Northeast/Southwest	36	35	34	33	32	31	30	29	29	28	27	26	26	25	25	24	23	23	22	22	22	21	21	20	20
East - West	29	28	28	27	26	25	24	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16
Average	35	34	33	32	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20	19

"Vegetation" Channel Width (meters) and Calculated Shade Conditions

Figure D3. Target shade for the Kaniksu National Forest Group C forest type.

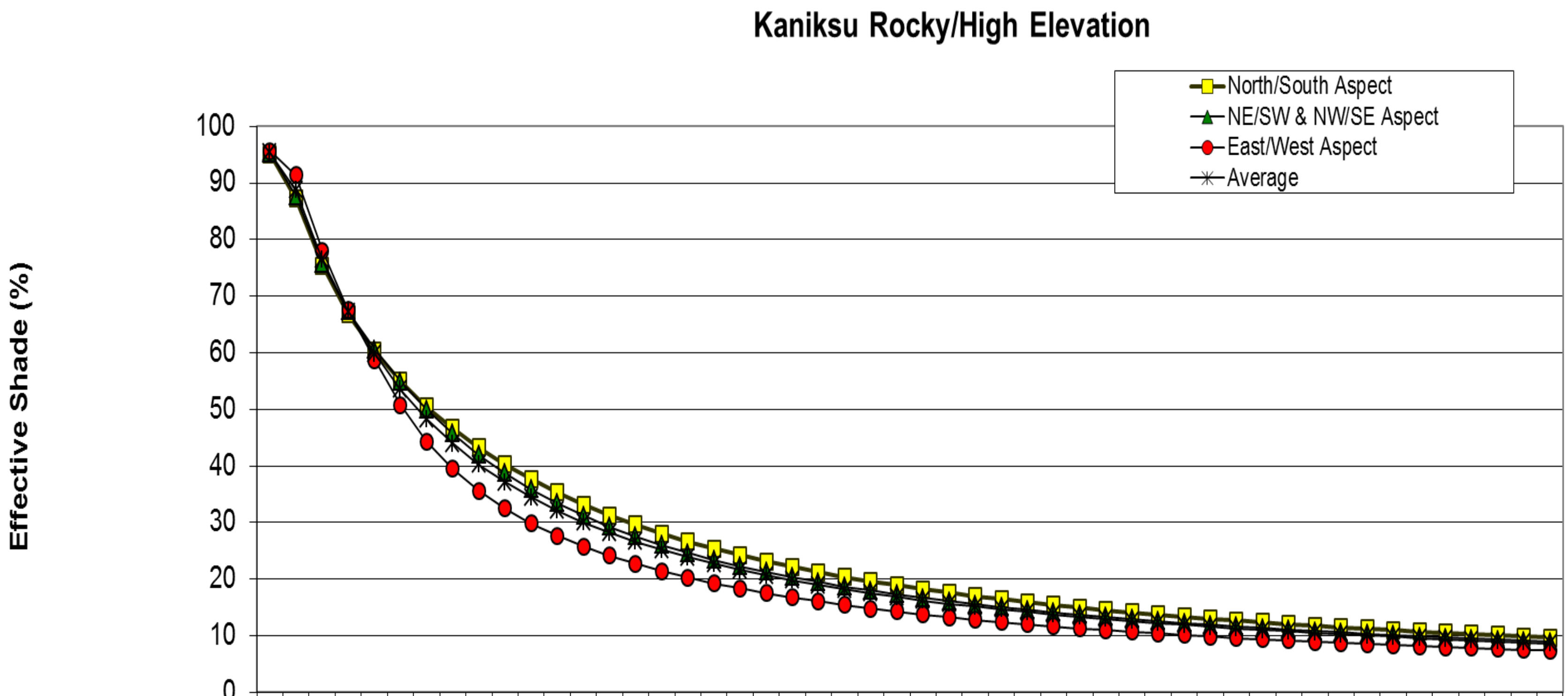


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
North - South	96	95	93	90	84	77	72	67	63	60	57	54	51	49	47	45	43	42	40	39	37	36	35	34	32
Northeast/Southwest	96	96	94	91	85	79	74	69	65	61	58	55	52	50	47	45	43	41	39	38	36	35	34	32	31
East - West	97	96	95	94	90	84	77	70	63	58	53	49	45	43	40	38	36	34	33	31	30	29	28	27	26
Average	96	96	94	92	86	80	74	69	64	60	56	53	50	47	45	43	41	39	37	36	34	33	32	31	30

	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	31	31	30	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	19	19	19	18	18	18
Northeast/Southwest	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16
East - West	25	24	23	22	22	21	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	15	14	14	14
Average	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16

"Vegetation" Channel Width (meters) and Calculated Shade Conditions

Figure D4. Target shade for the Kaniksu National Forest Group D forest type.

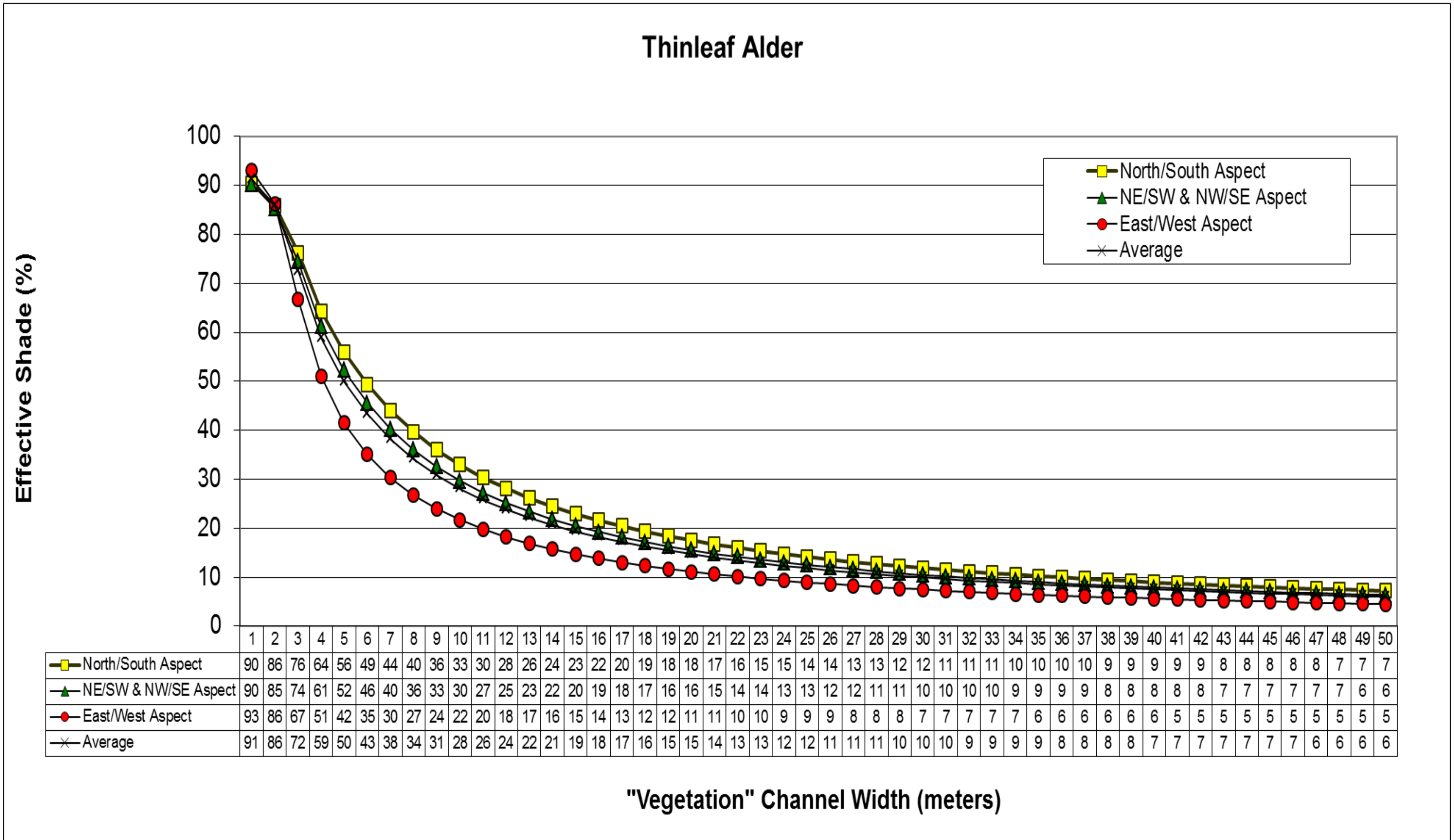


"Vegetation" Channel Width (meters)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
North/South Aspect	95	87	75	67	60	55	51	47	43	40	38	35	33	31	30	28	27	25	24	23	22	21	20	20	19
NE/SW & NW/SE Aspect	95	88	76	67	61	55	50	46	42	39	36	33	31	29	28	26	25	23	22	21	20	19	19	18	17
East/West Aspect	96	91	78	68	59	51	44	39	36	32	30	28	26	24	23	21	20	19	18	18	17	16	15	15	14
Average	95	89	76	67	60	54	48	44	40	37	34	32	30	28	27	25	24	23	22	21	20	19	18	17	17

"Vegetation" Channel Width (meters)	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	18	18	17	16	16	15	15	15	14	14	13	13	13	12	12	12	12	11	11	11	11	10	10	10	10
NE/SW & NW/SE Aspect	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9
East/West Aspect	14	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8	7
Average	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9

"Vegetation" Channel Width (meters)

Figure D5. Target shade for the Kaniksu Rocky/High Elevation forest type.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
North/South Aspect	90	86	76	64	56	49	44	40	36	33	30	28	26	24	23	22	20	19	18	18	17	16	15	15	14
NE/SW & NW/SE Aspect	90	85	74	61	52	46	40	36	33	30	27	25	23	22	20	19	18	17	16	16	15	14	14	13	13
East/West Aspect	93	86	67	51	42	35	30	27	24	22	20	18	17	16	15	14	13	12	12	11	11	10	10	9	9
Average	91	86	72	59	50	43	38	34	31	28	26	24	22	21	19	18	17	16	15	15	14	13	13	12	12

	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	14	13	13	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	7	7	7
NE/SW & NW/SE Aspect	12	12	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6
East/West Aspect	9	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5
Average	11	11	11	10	10	10	9	9	9	9	8	8	8	8	7	7	7	7	7	7	7	6	6	6	6

Figure D6. Target shade for the Thinleaf Alder (Alnus incana) type.

Appendix E. Public Participation and Public Comments

The TMDL addendum was developed with participation from
(identify the WAG/BAG and include dates of public meetings, public comment, etc.)

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Appendix F. Distribution List

To be inserted following the public comment period.

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