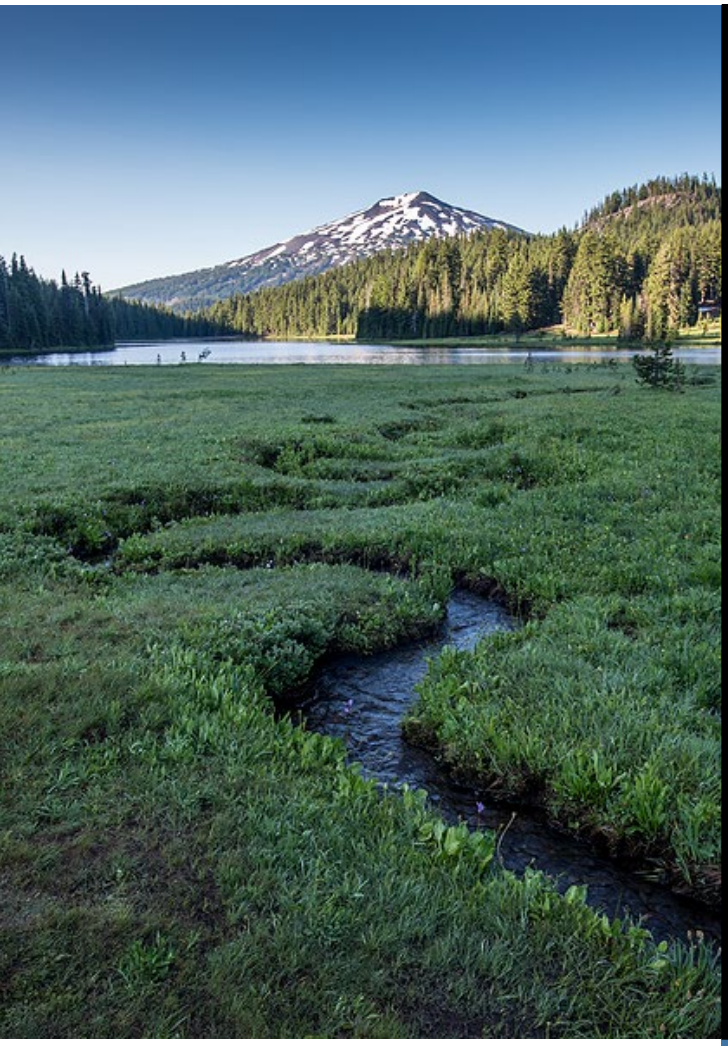

Modeling Quality Assurance Project Plan for the Temperature Total Maximum Daily Loads in the John Day River Basin

DEQ24-WQ-0044-QAPP

Version 1.0

Sept. 11, 2024

State of Oregon
DEQ Department of Environmental Quality

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1.1.1.1 Translation or other formats

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Approval Sheet

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Abbreviations

AWQMS	Ambient Water Quality Monitoring System
BLM	United States Bureau of Land Management
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CTWS	Confederated Tribes of the Warm Springs
CTWSIR	Confederated Tribes of the Warm Springs Indian Reservation
DEQ	Oregon Department of Environmental Quality
DMR	Discharge Monitoring Report
DOGAMI	Oregon Department of Geology and Mineral Industries
DRI	Desert Research Institute
NCDC	National Climatic Data Center
NPDES	National Pollutant Discharge Elimination System
OAR	Oregon Administrative Rule
ODFW	Oregon Department of Fish and Wildlife
OWRD	Oregon Water Resources Department
QAPP	Quality Assurance Project Plan
RAWS	Remote Automatic Weather Stations
STP	Sewage Treatment Plant
SWCD	Soil and Water Conservation District
TIR	Thermal Infrared Radiometry
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USGS	United States Geological Survey
WQX	Water Quality Exchange
WRIS	Water Rights Information System
WWTP	Waste water treatment plant

1 Introduction

This Quality Assurance Project Plan summarizes the modeling approach to be used for the temperature Total Maximum Daily Load, or TMDL, replacement project applicable within the John Day Basin (170702). The John Day Basin consists of four subbasins: the Lower John Day Subbasin (17070204), the Middle Fork John Day Subbasin (17070203), the North Fork John Day Subbasin (17070202), and the Upper John Day Subbasin (17070201).

A TMDL is a water quality restoration plan and the calculation of the maximum amount of a pollutant that a waterbody can receive while still meeting water quality standards for that particular pollutant. The maximum amount of loading a waterbody can receive is called the loading capacity. Loading from all pollutant sources must not exceed the loading capacity (TMDL) of a waterbody, including an appropriate margin of safety.

Load allocations are portions of the loading capacity that are allocated to background sources or non-point sources, such as urban, rural agriculture, or forestry activities. Wasteload allocations are portions of the total load, which are allocated to NPDES permitted sources, such as wastewater treatment plants or industries. Wasteload allocations are used to establish effluent limits in NPDES discharge permits. Allocations may also be reserved for future uses, called reserve capacity. Allocations are quantified measures that assure water quality standards will be met and may distribute the pollutant loads between nonpoint and point sources. This general TMDL concept is represented by Equation 1.

$$TMDL = \sum WLA + \sum LA + \text{Reserve Capacity} + MOS \qquad \text{Equation 1}$$

Where $\sum WLA$ is the sum of wasteload allocations (NPDES permitted sources), $\sum LA$ is the sum of load allocations (nonpoint sources and background), *Reserve Capacity* is allocations reserved for future uses, and *MOS* is a margin of safety to account for uncertainty. For a temperature TMDL, these elements establish the maximum thermal loads that a waterbody may receive without exceeding applicable water quality standards for temperature designed to protect aquatic life and other beneficial uses.

The Clean Water Act requires TMDLs be developed for waterbodies that do not meet water quality standards and are listed as water quality impaired on the State's 303(d) list. The John Day River Basin includes several waterbodies listed on the Oregon 2022 Section 303(d) Category 5 list as water quality limited for temperature (Table 2.1). A TMDL that was previously developed for the John Day River Basin (DEQ, 2010) must be replaced due to recent litigation.

In 2013, the United States Environmental Protection Agency (USEPA) disapproved the Natural Conditions Criterion contained in Oregon's water quality standard for temperature due to the 2012 U.S. District Court decision for NWEA v. EPA, 855 F. Supp. 2d 1199 (D. Or., 2012). This portion of the temperature water quality standard was used in most temperature TMDLs issued from 2003 through 2012. On October 4, 2019, the U.S. District Court issued a judgment for NWEA v. EPA, No. 3:12-cv-01751-HZ (D. Or., Oct. 4, 2019) and required DEQ and USEPA to replace 15 Oregon temperature TMDLs that were based on the Natural Conditions Criterion and to reissue the temperature TMDLs based on the remaining elements of the temperature water quality standard.

This QAPP is consistent with DEQ's and USEPA's modeling QAPP guidance (DEQ, 2017; EPA, 2016) and documents the analysis and numerical modeling approach that will support the updated John Day River Basin temperature TMDL as well as other project details. In particular, this QAPP details the following:

- Definition of the issue and objectives, including the spatial and temporal extents of the water quality impairments (Section 2);
- A high-level description of the key processes and variables for temperature (Section 3);
- The overarching technical approach, including the appropriate modeling and analytical tools to be used (Section 4);
- The data sources for defining and creating inputs to the model, including data that were used in the modeling for the original TMDL. Examples of these inputs include meteorological data, stream flow and temperature, point sources and vegetation characteristics (Sections 5 and 6);
- How the analysis and modeling will be evaluated for acceptability (Sections 7 and 9);
- Scenarios for evaluating management strategies for reducing anthropogenic thermal loads (Section 10);
- Various aspects for managing the TMDLs development project, including documentation (Section 8), the project team (Section 11), data and records management (Sections 12 and 13); and
- Aspects relating to this QAPP and its role in the project (Sections 14 and 15).

2 Problem definition and management objectives

Multiple waterbodies in the John Day River Basin do not meet the water quality standards for temperature and are listed as Category 5, water quality limited on Oregon's 2022 Section 303(d) list (Table 2.1). The temperature water quality standards are set at a level to protect the most sensitive beneficial uses. The beneficial uses most sensitive to water temperature are fish and aquatic life. The temperature water quality standards in the John Day River Basin include the numeric criteria identified below. The numeric temperature criteria are based on a seven-day average daily maximum continuous measurement of temperature.

- Bull Trout Spawning and Juvenile Rearing: 12.0°C (OAR 340-041-0028(4)(f))
- Salmon and Steelhead Spawning: 13.0°C (OAR 340-041-0028(4)(a))
- Core Cold Water Habitat: 16.0°C (OAR 340-041-0028(4)(b))
- Salmon and Trout Rearing and Migration: 18.0°C (OAR 340-041-0028(4)(c))

- Salmon and Steelhead Migration Corridors: 20.0°C (OAR 340-041-0028(4)(d))

Where and when the applicable criteria apply are based on the designated fish uses maps in OAR 340-041-0170 Figure 170A and Figure 170B. The fish use designations and applicable criteria are shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

The temperature standard authorizes insignificant additions of heat from human sources in waters that exceed the applicable temperature criteria as follows: Following a temperature TMDL or other cumulative effects analysis, the human use allowance (HUA) will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3°C (OAR 340-041-0028(12)(b)).

As described in Section 1, the U.S. Environmental Protection Agency (USEPA) and the State of Oregon are required to revise the water temperature TMDL for the John Day River Basin. In revising the TMDLs, all of the allocations will be updated to target the applicable biologically-based numeric criteria (BBNC) and HUA components of the water quality temperature standards.

The 2010 John Day River Basin TMDL addressed all waters in the basin. Since the issuance of the original TMDL, the extent and number of waterbodies that are identified as water quality limited for temperature have changed. As part of the TMDL update, DEQ will address all current temperature listings based on the most recent integrated report list. The current listings, as they pertain to the John Day River Basin QAPP project area, were obtained from Oregon's 2022 Integrated Report and are summarized in Table 2.1. The listings are also shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

The TMDL will provide load and wasteload allocations for sources of thermal loads. The existing Heat Source models from the 2010 John Day River Basin TMDL were developed primarily to address summer (non-spawning) periods in 2002 for the Middle Fork and North Fork John Day Rivers, and summer periods in 2004 for the mainstem John Day River. The Middle Fork John Day River model covers some periods during which Salmon and Steelhead spawning occur, however, neither the mainstem nor the North Fork John Day River models cover Salmon and Steelhead spawning periods. The models simulated thermal impacts from point sources, showing that each point source's potential temperature impacts dissipate before causing an instream increase of 0.1°C. Based on these simulations, DEQ has determined that it is appropriate to use the existing models to extrapolate results to develop wasteload allocations for the spawning periods. It is not anticipated additional modeling or modeling updates will need to be made; however, the cumulative effects analysis will be addressed in the TMDL.

To the extent existing data and information allow, the primary analysis and modeling objectives for this TMDL include:

1) Complete a source assessment and cumulative effects analysis to characterize or identify:
    a) Anthropogenic sources of stream temperature warming;
    b) How much warming comes from background sources;
    c) How much warming comes from each anthropogenic source or source category;
    d) The cumulative warming from all anthropogenic sources combined;

e) Where along the stream anthropogenic warming occurs;
f) Where the point of maximum stream warming is located; and
g) The amount of stream warming that exceeds the HUA and applicable water quality standards.

2) Determine TMDL elements and allocations that attain the applicable temperature criteria by identifying:

a) The thermal loading capacity for each temperature listed waterbody;
b) The excess thermal load exceeding the loading capacity for each temperature listed waterbody;
c) The thermal load and wasteload allocations necessary to meet the applicable water quality standards for each listed waterbody;
d) Any surrogate measures;
e) Any reserve capacity;
f) Any margin of safety; and
g) The seasonal variation and critical conditions corresponding to the time period when the applicable temperature criteria are exceeded.

3) Support the development of the TMDL Water Quality Management Planas necessary and as resources allow..

a) Evaluate existing land management plans, TMDL implementation plans, or rules for sufficiency in minimizing anthropogenic warming to the level established by the TMDL allocations.

b) Identify additional management strategies or surrogate measures.

Table 2.1: John Day River Basin assessment units that are classified as water quality limited category 5 for temperature based on the Section 303(d) 2022 Integrated Report.

Assessment Unit Name	Assessment Unit ID	Use Period (Year Listed)
Alder Creek	OR_WS_170702040108_05_102187	Spawn (2022), Year-round (2022)
Balance Creek-Middle Fork John Day River	OR_WS_170702030208_05_102163	Year-round (2010)
Baldy Creek-North Fork John Day River	OR_WS_170702020101_05_102087	Year-round (2010)
Battle Creek	OR_SR_1707020111_05_101556	Year-round (2010)
Bear Creek	OR_SR_1707020106_05_101534	Year-round (2010)
Bear Creek	OR_SR_1707020403_05_101648	Year-round (2010)
Bear Creek-Middle Fork John Day River	OR_WS_170702030301_05_102164	Spawn (2018), Year-round (2018)
Beaver Creek	OR_WS_170702020203_05_102094	Year-round (2010)
Beech Creek	OR_SR_1707020108_05_101540	Year-round (2022)
Big Creek	OR_SR_1707020203_05_101573	Year-round (2010)
Big Creek	OR_SR_1707020203_05_101577	Year-round (2010)
Big Creek	OR_SR_1707020303_05_101626	Year-round (2018)
Big Creek	OR_WS_170702020303_05_102099	Year-round (2010)
Big Creek	OR_WS_170702030302_05_102165	Year-round (2018)

Assessment Unit Name	Assessment Unit ID	Use Period (Year Listed)
Big Wall Creek	OR_SR_1707020208_05_101605	Year-round (2010)
Bowman Creek-Camas Creek	OR_WS_170702020502_05_102108	Year-round (2010)
Bridge Creek	OR_SR_1707020403_05_101647	Spawn (2018), Year-round (2010)
Bridge Creek	OR_SR_1707020403_05_101650	Year-round (2010)
Bridge Creek	OR_SR_1707020403_05_101651	Year-round (2010)
Bridge Creek	OR_WS_170702020608_05_102119	Year-round (2010)
Bridge Creek	OR_WS_170702030105_05_102155	Spawn (2018), Year-round (2010)
Brown Creek	OR_WS_170702041106_05_102250	Year-round (2010)
Buckhorn Creek	OR_WS_170702041105_05_102249	Year-round (2010)
Bull Run Creek	OR_WS_170702020202_05_102093	Year-round (2010)
Cable Creek	OR_SR_1707020205_05_101582	Year-round (2010)
Cable Creek	OR_WS_170702020504_05_102110	Spawn (2010), Year-round (2010)
Camas Creek	OR_SR_1707020205_05_101581	Spawn (2010), Year-round (2010)
Camas Creek	OR_SR_1707020205_05_101584	Spawn (2010), Year-round (2010)
Camas Creek	OR_SR_1707020206_05_101587	Year-round (2010)
Camas Creek	OR_SR_1707020206_05_101588	Year-round (2010)
Camp Creek	OR_SR_1707020302_05_101618	Spawn (2022), Year-round (2010)
Camp Creek	OR_SR_1707020302_05_101623	Spawn (2010), Year-round (2010)
Canyon Creek	OR_SR_1707020107_05_101537	Year-round (2010)
Canyon Creek	OR_SR_1707020107_05_101538	Year-round (2010)
Canyon Meadows Lake	OR_LK_1707020107_05_100025	Year-round (2010)
Castle Creek-John Day River	OR_WS_170702010606_05_102048	Year-round (2010)
Clear Creek	OR_SR_1707020202_05_101571	Year-round (2010)
Clear Creek	OR_WS_170702020204_05_102095	Year-round (2010)
Clear Creek	OR_WS_170702030104_05_102154	Year-round (2010)
Cottonwood Creek	OR_SR_1707020111_05_101558	Year-round (2010)
Cottonwood Creek	OR_WS_170702011102_05_102072	Year-round (2010)
Cottonwood Creek-Butte Creek	OR_WS_170702040501_05_102213	Year-round (2010)
Crane Creek-North Fork John Day River	OR_WS_170702020105_05_102091	Year-round (2010)
Dads Creek-John Day River	OR_WS_170702010505_05_102042	Year-round (2010)
Desolation Creek	OR_SR_1707020204_05_101579	Spawn (2010), Year-round (2010)
Ditch Creek	OR_SR_1707020207_05_101592	Year-round (2010)
Dog Creek-John Day River	OR_WS_170702010608_05_102050	Year-round (2010)
Dry Camas Creek-Camas Creek	OR_WS_170702020501_05_102107	Year-round (2010)
Dry Fork Clear Creek	OR_WS_170702030103_05_102153	Year-round (2018)
Dry Fork Thirtymile Creek	OR_SR_1707020408_05_101680	Year-round (2022)

Assessment Unit Name	Assessment Unit ID	Use Period (Year Listed)
East Fork Beech Creek	OR_WS_170702010802_05_102056	Year-round (2010)
East Fork Canyon Creek	OR_SR_1707020107_05_101539	Year-round (2010)
East Fork Cottonwood Creek	OR_SR_1707020209_05_101609	Year-round (2010)
Ellis Creek-Potamus Creek	OR_WS_170702020706_05_102126	Spawn (2022), Year-round (2010)
Fields Creek	OR_SR_1707020110_05_101550	Year-round (2010)
Fivemile Creek	OR_SR_1707020206_05_101590	Year-round (2010)
Granite Boulder Creek-Middle Fork John Day River	OR_WS_170702030203_05_102571	Year-round (2010)
Granite Creek	OR_SR_1707020202_05_101570	Year-round (2010)
Granite Creek	OR_SR_1707020202_05_101572	Year-round (2010)
Grass Valley Canyon	OR_SR_1707020413_05_101708	Spawn (2022), Year-round (2010)
Grub Creek	OR_SR_1707020106_05_101531	Year-round (2010)
Grub Creek	OR_WS_170702010607_05_102049	Year-round (2010)
Hay Creek	OR_SR_1707020410_05_101697	Year-round (2010)
Headwaters Desolation Creek	OR_WS_170702020401_05_102103	Year-round (2010)
Headwaters John Day River	OR_WS_170702010501_05_102038	Year-round (2010)
Headwaters Long Creek	OR_WS_170702030401_05_102169	Year-round (2010)
Headwaters Murderers Creek	OR_WS_170702010301_05_102028	Year-round (2010)
Headwaters South Fork John Day River	OR_WS_170702010102_05_102016	Year-round (2022)
Hidaway Creek	OR_SR_1707020205_05_101583	Spawn (2018), Year-round (2010)
Indian Creek	OR_SR_1707020106_05_101532	Year-round (2010)
Indian Creek	OR_SR_1707020208_05_101607	Spawn (2018), Year-round (2010)
Indian Creek-Middle Fork John Day River	OR_WS_170702030303_05_102166	Spawn (2022), Year-round (2022)
John Day River	OR_SR_1707020111_05_102568	Year-round (2010)
John Day River	OR_SR_1707020114_05_102609	Year-round (2010)
Lake Penland	OR_LK_1707020207_05_100032	Year-round (2010)
Lane Creek	OR_SR_1707020205_05_101580	Year-round (2010)
Lane Creek-Camas Creek	OR_WS_170702020505_05_102111	Year-round (2010)
Lick Creek	OR_SR_1707020302_05_101622	Spawn (2018), Year-round (2018)
Lick Creek	OR_WS_170702030206_05_102161	Year-round (2018)
Little Boulder Creek-Middle Fork John Day River	OR_WS_170702030202_05_102158	Year-round (2010)
Little Wall Creek	OR_SR_1707020208_05_101603	Spawn (2018), Year-round (2018)
Little Wall Creek	OR_WS_170702020802_05_102133	Spawn (2018), Year-round (2018)
Lonesome Creek	OR_WS_170702010101_05_102015	Year-round (2010)
Lower Camp Creek	OR_WS_170702030207_05_102162	Year-round (2018)
Lower Deer Creek	OR_WS_170702010206_05_102026	Year-round (2010)

Assessment Unit Name	Assessment Unit ID	Use Period (Year Listed)
Lower Granite Creek	OR_WS_170702020206_05_102096	Year-round (2010)
Lower Mountain Creek	OR_SR_1707020112_05_101560	Year-round (2010)
Mallory Creek	OR_SR_1707020207_05_101594	Year-round (2010)
Mallory Creek	OR_WS_170702020708_05_102128	Year-round (2010)
Meadow Creek	OR_SR_1707020203_05_101578	Spawn (2022), Year-round (2010)
Middle Desolation Creek	OR_WS_170702020403_05_102105	Year-round (2018)
Middle Fork John Day River	OR_SR_1707020301_05_101617	Year-round (2010)
Middle Fork John Day River	OR_SR_1707020302_05_101619	Year-round (2010)
Middle Fork John Day River	OR_SR_1707020302_05_102577	Spawn (2010), Year-round (2010)
Middle Fork John Day River	OR_SR_1707020303_05_101624	Spawn (2010), Year-round (2010)
Middle Fork John Day River	OR_SR_1707020305_05_101597	Year-round (2010)
Mill Creek-Middle Fork John Day River	OR_WS_170702030106_05_102156	Year-round (2010)
Mountain Creek	OR_SR_1707020112_05_101561	Year-round (2010)
Murderers Creek	OR_SR_1707020103_05_101525	Year-round (2010)
Murderers Creek	OR_SR_1707020103_05_101526	Year-round (2010)
North Fork John Day River	OR_SR_1707020201_05_101569	Spawn (2010), Year-round (2010)
North Fork John Day River	OR_SR_1707020203_05_101574	Spawn (2010), Year-round (2010)
North Fork John Day River	OR_SR_1707020203_05_101575	Spawn (2010), Year-round (2010)
North Fork John Day River	OR_SR_1707020207_05_101595	Year-round (2010)
North Fork John Day River	OR_SR_1707020207_05_101596	Spawn (2010), Year-round (2010)
North Fork John Day River	OR_SR_1707020210_05_101613	Year-round (2010)
Onion Creek-North Fork John Day River	OR_WS_170702020103_05_102089	Year-round (2018)
Owens Creek	OR_SR_1707020206_05_101586	Year-round (2010)
Owens Creek	OR_SR_1707020206_05_101591	Year-round (2010)
Pine Creek	OR_SR_1707020102_05_101521	Year-round (2010)
Pine Creek	OR_SR_1707020404_05_101662	Spawn (2018), Year-round (2010)
Pine Creek	OR_SR_1707020404_05_101664	Year-round (2010)
Reynolds Creek	OR_WS_170702010503_05_102040	Year-round (2018)
Rock Creek	OR_SR_1707020113_05_101564	Year-round (2010)
Rock Creek	OR_SR_1707020411_05_101705	Year-round (2010)
Rock Creek	OR_SR_1707020412_05_101701	Year-round (2010)
Rosebush Creek	OR_SR_1707020413_05_101709	Year-round (2010)
Rudio Creek	OR_SR_1707020210_05_101616	Year-round (2010)
Service Creek-John Day River	OR_WS_170702040201_05_102189	Year-round (2010)
Skookum Creek	OR_SR_1707020208_05_101600	Year-round (2010)
Skookum Creek	OR_SR_1707020208_05_102569	Year-round (2018)

Assessment Unit Name	Assessment Unit ID	Use Period (Year Listed)
Sorefoot Creek	OR_SR_1707020407_05_101677	Year-round (2010)
Sorefoot Creek-John Day River	OR_WS_170702040701_05_102222	Year-round (2010)
South Fork John Day River	OR_SR_1707020101_05_101516	Year-round (2010)
South Fork John Day River	OR_SR_1707020102_05_101519	Year-round (2010)
Squaw Creek	OR_WS_170702030101_05_102151	Year-round (2010)
Strawberry Creek-John Day River	OR_WS_170702010601_05_102043	Year-round (2010)
Summit Creek	OR_WS_170702030102_05_102152	Year-round (2010)
Sunflower Creek	OR_WS_170702010204_05_102024	Year-round (2010)
Swale Creek	OR_SR_1707020208_05_101608	Spawn (2018), Year-round (2010)
Swale Creek	OR_WS_170702020801_05_102132	Year-round (2010)
Texas Bar Creek	OR_SR_1707020203_05_101576	Year-round (2018)
Texas Bar Creek-North Fork John Day River	OR_WS_170702020306_05_102102	Spawn (2018), Year-round (2018)
Thirtymile Creek	OR_SR_1707020408_05_101684	Year-round (2010)
Thirtymile Creek	OR_SR_1707020408_05_101685	Year-round (2022)
Trail Creek	OR_WS_170702020102_05_102088	Year-round (2010)
Upper Beech Creek	OR_WS_170702010801_05_102055	Year-round (2010)
Upper Bridge Creek	OR_WS_170702040303_05_102198	Year-round (2010)
Upper Camp Creek	OR_WS_170702030205_05_102160	Spawn (2022), Year-round (2018)
Upper Canyon Creek	OR_WS_170702010701_05_102051	Year-round (2010)
Upper Deer Creek	OR_WS_170702010205_05_102025	Year-round (2010)
Upper Desolation Creek	OR_WS_170702020402_05_102104	Year-round (2010)
Upper Fivemile Creek	OR_WS_170702020604_05_102115	Year-round (2010)
Upper Granite Creek	OR_WS_170702020201_05_102092	Year-round (2010)
Upper Grass Valley Canyon	OR_WS_170702041304_05_102261	Year-round (2010)
Upper Kahler Creek	OR_WS_170702040103_05_102182	Year-round (2010)
Upper Mountain Creek	OR_WS_170702011201_05_102074	Year-round (2010)
Upper Owens Creek	OR_WS_170702020602_05_102113	Year-round (2010)
Utley Creek	OR_WS_170702010104_05_102018	Year-round (2010)
Vinegar Creek	OR_SR_1707020302_05_101620	Year-round (2010)
Vinegar Creek-Middle Fork John Day River	OR_WS_170702030201_05_102157	Year-round (2010)
Wall Creek	OR_SR_1707020208_05_101606	Year-round (2010)
West Fork Meadow Brook	OR_SR_1707020207_05_101599	Spawn (2018), Year-round (2018)
Wilson Creek	OR_SR_1707020208_05_101601	Spawn (2018), Year-round (2010)
Wilson Creek	OR_WS_170702020804_05_102135	Spawn (2018), Year-round (2018)

3 Conceptual model: key processes and variables

The current theory to explain the nature of heat is called the kinetic-molecular theory. The modern version of this theory was developed in the mid-19th century by Rudolf Clausis, James Clerk Maxwell, and Ludwig Boltzmann. The theory is based on the assumption that all matter is composed of a tiny population of molecules that are always in motion. The molecules in hot objects are moving faster and hence have greater kinetic energy than the molecules in cold objects. Individual molecules have a certain amount of kinetic energy based on their mass and velocity. The thermal energy of an object is determined by adding up the kinetic energy of all the molecules in that object. When a hot and cold object comes in contact with each other, the molecules collide and the kinetic energy flows from the molecules with more kinetic energy to molecules with less kinetic energy. This type of flow of kinetic energy is called heat.

Temperature is an intensive property and much like concentration measures the “strength” rather than “quantity” of kinetic energy. The temperature of an object is the measure of the average kinetic energy of all the molecules in that object. Hot water has greater average kinetic energy than cold water but may not have greater total kinetic energy. For example, a small pot of water with a temperature near the boiling point has a higher average kinetic energy than a swimming pool at room temperature. The swimming pool has a much larger quantity of molecules and therefore a higher total kinetic energy than the pot of water.

Temperature is the water quality parameter of concern, but heat, in particular heat from human activities or anthropogenic sources, is the pollutant of concern. Water temperature change (ΔTw) is a function of the heat transfer in a discrete volume and may be described in terms of changes in heat per unit volume. Conversely, a change in volume can result in a water temperature change for a defined amount of heat exchange. With this basic conceptual framework of water temperature change, it is possible to discuss stream temperature change as a function of two variables: heat and mass transfer.

Water Temperature Change as a Function of Heat Exchange and Volume,

$$\Delta Tw = \frac{\Delta Heat}{Density \times \text{Specific Heat} \times \Delta Volume} \qquad \text{Equation 2}$$

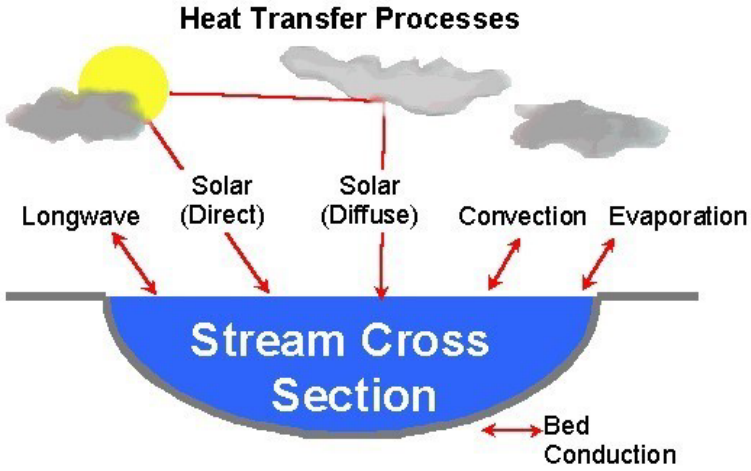

Figure 3.1: Major heat transfer processes.

Heat transfer relates to processes that change heat in a defined water volume. There are several thermodynamic pathways that can introduce or remove heat from a stream. These different processes are shown in Figure 3.1. For any given stream reach heat exchange is closely related to the season, time of day and the surrounding environment and the stream characteristics. Heat transfer can be dynamic and change over relatively small distances and time periods. Equation 3 describes the several heat transfer processes that change stream temperature (Wunderlich, 1972; Jobson and Keefer, 1979; Beschta and Weatherred, 1984; Sinokrot and Stefan, 1993; Boyd, 1996; Johnson, 2004; Hannah et al., 2008; Benyahya et al., 2012).

$$\Phi_{total} = \Phi_{solar} + \Phi_{longwave} + \Phi_{streambed} + \Phi_{convection} + \Phi_{evaporation} \qquad \text{Equation 3}$$

Where,
Φ_{total} = Net heat energy flux (+/-)
Φ_{solar} = Shortwave direct and diffuse solar radiation (+ only)
$\Phi_{longwave}$ = Longwave (thermal) radiation (+/-)
$\Phi_{streambed}$ = Streambed conduction (+/-)
$\Phi_{convection}$ = Stream/air convection[1] (+/-)
$\Phi_{evaporation}$ = Evaporation (+/-)

Mass transfer relates to the transport of flow volume downstream, instream mixing, and the introduction or removal of water from a stream. For instance, flow from a tributary will cause a temperature change if the temperature is different from the receiving water. Mass transfer commonly occurs in stream systems as a result of:

- Advection
- Dispersion
- Groundwater exchange
- Hyporheic flows
- Surface water exchange (e.g. tributary input, precipitation) and
- Other human related activities that alter stream flow volume.

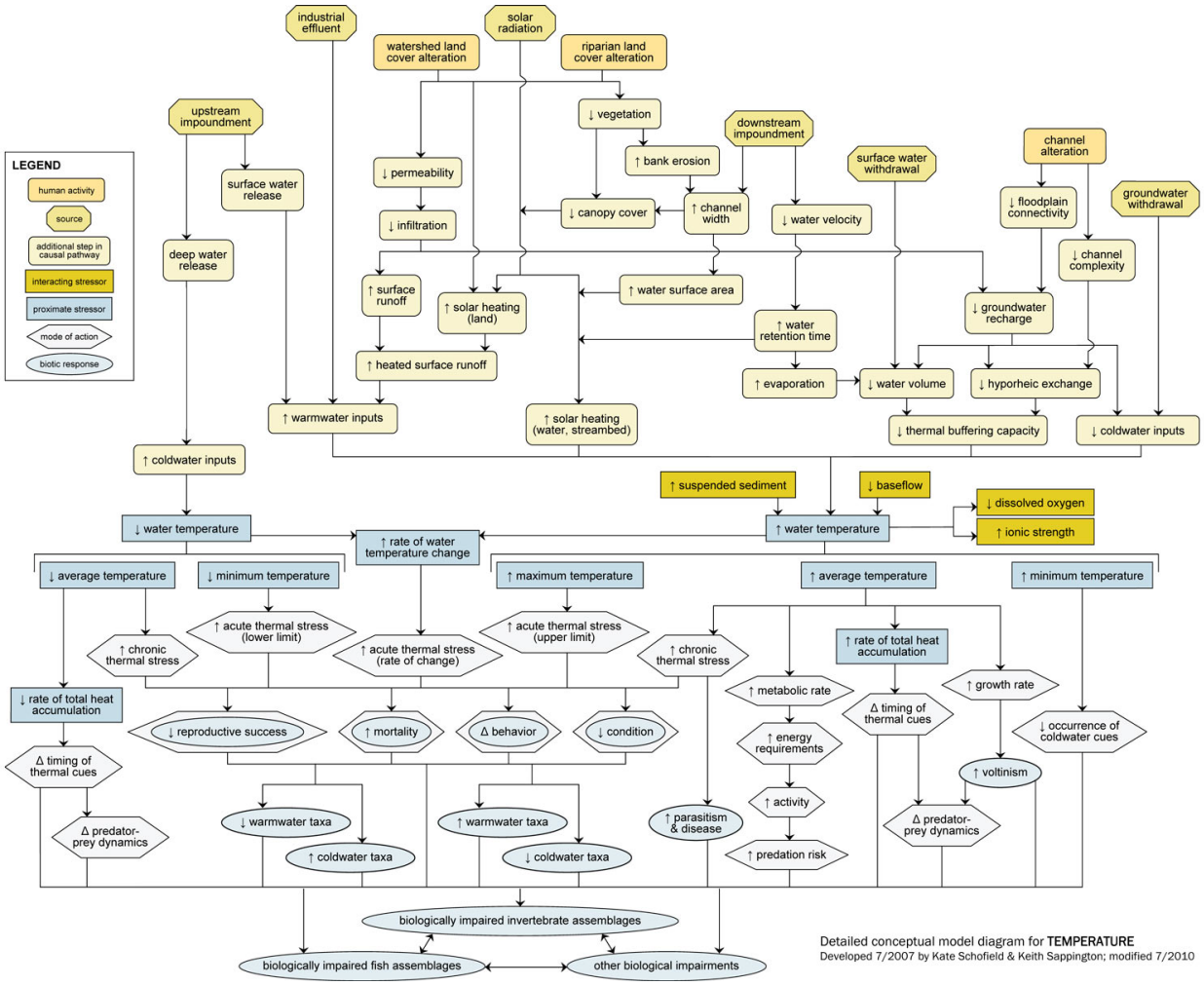

Figure 3.2: Conceptual diagram that identifies the key processes and variables that drive stream temperature changes and the biological responses (Schofield and Sappington, 2010).

Stream temperature is influenced by both human and natural factors. Figure 3.2 is a conceptual diagram that identifies the key process and variables that drive stream temperature. Human sources and natural sources are identified. Near the bottom of the diagram, the biological responses are identified.

Anthropogenic Nonpoint Sources: Temperature increases from human-caused nonpoint sources are caused by increases in solar radiation loading to the stream network from the disturbance or removal of near-stream vegetation, channel modification and widening, reductions to the stream flow rate or volume as well as, changes in hyporheic flows and channel connectivity, reductions in cold groundwater inflows, and changes to meteorological conditions, such as those caused by climate change.

Anthropogenic Point Sources: Temperature increases from point sources are those caused by warm water discharges from NPDES-permitted facilities, such as industrial outfalls, municipal wastewater treatment plants (WWTP), and other point sources.

Background Sources: Background sources include all sources of pollution or pollutants not originating from human activities. In the context of a TMDL, background sources may also

include anthropogenic sources of a pollutant that DEQ or another Oregon state agency does not have authority to regulate, such as pollutants emanating from another state, tribal lands, or sources otherwise beyond the jurisdiction of the state (OAR 340-042-0030(1)). Additionally, effective shade levels on smaller streams are more sensitive to riparian disturbances and so the differences between current condition solar flux and background solar flux can be larger.

4 Technical approach

4.1 Overview

Stream temperature TMDLs are generally scaled to a subbasin or basin scale since stream temperatures are affected by cumulative interactions between upstream and local sources. For this reason, the TMDL considers all surface waters that affect the temperatures of 303(d) listed waterbodies. For example, the North Fork John Day River is water quality limited for temperature. To address this listing in the TMDL, all major tributaries are included in the TMDL analysis and TMDL allocations are applied throughout the entire stream network and include all waters of the state.

An important step in the TMDL is to perform a source assessment which quantifies the background and anthropogenic contributions to stream heating. Models provide a way to evaluate potential sources of stream warming and, to the extent existing data allow, the amount of pollutant loading from these sources. The model that is selected for the TMDL analysis should support the needs of the project. Section 4.2 describes the model framework needed for this project and the models that will be used to support the TMDL.

TMDLs also require the identification of seasonal variations and critical conditions. The TMDL analysis will determine seasonal variation by including a statistical summary and visual plots summarizing the instream temperatures and flow rates observed at various monitoring locations. The time period when the applicable temperature criteria are exceeded will be described in relation to the critical conditions.

The TMDL will establish a loading capacity that specifies the amount of a pollutant or pollutants that a waterbody can receive and still meet water quality standards. The pollutant addressed in the temperature TMDL is heat. The TMDL will divide the loading capacity into thermal wasteload allocations for NPDES permittees and load allocations for background and nonpoint sources of heat to ensure that the applicable temperature standards are achieved. Anthropogenic nonpoint and NPDES permitted point sources are not permitted to heat a waterbody more than 0.3°C above the applicable criteria, cumulatively at the point of maximum impact. The portion of the HUA allocated to each source will be determined in the TMDL with the modeling approach supporting the assessment of different allocation options. The modeling approach may also be used to support development of TMDL surrogate measures such as effective shade targets. Nonpoint source allocations can be translated into surrogate measures when a pollutant is difficult to measure, highly variable, or difficult to monitor (OAR 340-042-0040(5)(b)). Thermal load allocations for nonpoint sources can be difficult to measure and monitor. Attainment of the surrogate measures ensures compliance with the nonpoint source allocations.

Stream temperatures for the John Day River Basin TMDL and WQMP (DEQ, 2010) were simulated using a computer model (Heat Source version 8 temperature model). The model

extents include most of the main rivers and their larger tributaries that contain or influence primary fish habitat. Site-specific load allocations will be developed for the streams that are simulated. Other streams may be assigned generalized load allocations based on effective shade surrogate measures that target site potential or restored vegetation types. Numeric or narrative wasteload allocations will be developed for all NPDES permittees.

4.2 Model selection

DEQ has developed Heat Source models (version 8) for the mainstem, North Fork and Middle Fork John Day Rivers for the 2010 temperature TMDL. These models will be carried forward into the revised TMDL scope of work and will define the technical basis of the TMDL and thermal load and wasteload allocations. The modeling framework needs for this project include:

1. Prediction of hourly stream temperatures over a period of months and at a no greater than 500-meter longitudinal resolution.
2. Prediction of hourly solar radiation flux and daily effective shade at a no greater than 100-meter longitudinal resolution.
3. Ability to evaluate hourly stream temperature response from changes in streamside vegetation.
4. Ability to evaluate hourly stream temperature response from changes in water withdrawals and tributary stream flow within the upstream catchment.
5. Ability to evaluate hourly stream temperature response from changes in channel morphology within the upstream catchment.
6. Ability to evaluate hourly stream temperature response from changes in effluent temperature and flow discharge from NPDES-permitted facilities.

The Heat Source stream thermodynamics model (Boyd and Kasper, 2003) was used to model several streams for the development of TMDL in the John Day River Basin (DEQ, 2010a). Because these models already exist and meet all the model framework needs, Heat Source was selected for stream temperature simulation in the project area. The Heat Source model was originally developed at Oregon State University as a master's thesis where it was evaluated and approved by an academic committee (Boyd, 1996). Development of the model continued and in 1999 DEQ submitted the model equations and methodology for peer review (DEQ, 1999) and again in 2004 to the Independent Multidisciplinary Science Team (IMST, 2004) where the model was found to be scientifically sound.

The Heat Source model has been used in numerous stream temperature-related studies including Loheide and Gorelick (2006), Diabat et al. (2013), Holzapfel et al. (2013), Lawrence et al. (2014), Bond et al. (2015), Woltemade and Hawkins (2016), Justice et al. (2017), and Wondzell et al. (2019). Heat Source has also been used in numerous Oregon TMDLs (DEQ, 2001, 2002, 2003, 2005, 2006, 2007, 2008, 2010, 2018, 2019).

4.3 Software Development Quality Assessment

We do not anticipate any new software development or model code changes as part of this project.

5 Data availability and quality

This Section describes the data that is available to support the TMDL project and the quality assurance procedures used when collecting or reviewing the available data.

5.1 Meteorology

Meteorological data includes air temperature, cloudiness, relative humidity, and wind speed. Table A.1 through Table A.5 Appendix A lists the stations where meteorological data available in the John Day River Basin, including 39 stations from National Oceanic and Atmospheric Association (NOAA)'s National Climatic Data Center (NCDC), 3 stations from National Interagency Fire Center's Remote Automatic Weather Stations (RAWS), 2 stations from Bureau of Reclamation Cooperative Agricultural Weather Network (AgriMet), 67 stations from University of Utah MesoWest database, and 6 stations from DEQ's files. The meteorological monitoring stations are also shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D. The station IDs in Table A.1 are the NCDC ID, which may differ from the station identifiers used by other sources.

The meteorological data obtained from the NCDC includes the Local Climatological Dataset (NOAA, 2005) and the Global Integrated Surface Dataset (NOAA, 2001). The Local Climatological Dataset includes quality-controlled meteorological data from airports and other prominent weather stations managed by the National Weather Service, Federal Aviation Administration, and the U.S. Department of Defense. The Global Integrated Surface Dataset provides a long-term record of hourly, sub-hourly, and synoptic weather observations from a variety of meteorological networks around the world. The dataset includes observations from the World Meteorological Organization, Automated Surface Observing System, Automated Weather Observing Stations, U.S. Climate Reference Network, and others.

5.2 Thermal Infrared Radiometry (TIR) data

DEQ contracted with Watershed Sciences, Inc. to provide airborne Thermal Infrared Radiometry (TIR) imagery of spatial temperature patterns within the John Day River Basin (Watershed Sciences, 2003a; Watershed Sciences, 2003b; Watershed Sciences, 2005a; Watershed Sciences, 2005b). TIR data are used to support model calibration on model streams and characterize the longitudinal thermal regime and habitat quality. All streams and the TIR collection dates are summarized in Table 5.1.

Table 5.1: Summary of TIR surveys collection dates in the John Day River Basin.

Stream	Survey Extent	Date	Time	Survey Distance (mile)
Black Canyon Creek	Mouth to headwaters	2004-08-19	13:01-13:36	8.7
John Day River	North Fork John Day to headwaters	2004-08-29	13:31-15:55	95
John Day River	Mouth to North Fork John Day	2004-08-30	13:36-17:35	182
Middle Fork John Day River	Route 395 Bridge to Summit Creek	1998-08-05	14:09-14:55	46.4

Stream	Survey Extent	Date	Time	Survey Distance (mile)
Middle Fork John Day River	Mouth to Big Creek	2002-08-10	14:15-15:28	40
Murderers Creek	Mouth to headwaters	2004-08-19	13:28-14:28	23.1
North Fork John Day River	Desolation Creek to headwaters	1998-08-04	14:06-14:52	46
North Fork John Day River	Mouth to Granite Creek	2002-08-11	13:52-16:17	86.5
South Fork John Day River	Mouth to Sheep Creek	2004-08-19	15:45-17:33	40

5.3 Continuous stream temperature data

All available continuous stream temperature data were retrieved from DEQ's Ambient Water Quality Monitoring System (AWQMS), USGS's National Water Information System (NWIS), or were obtained during the data solicitation for DEQ's temperature TMDL replacement project. Some temperature data presented in this QAPP were retrieved from DEQ's files and were not available in AWQMS or USGS's database.

The data retrieval period for continuous stream temperature data are from January 1, 1990, to December 31, 2020. Data retrieved from the AWQMS database has a Data Quality Level (DQL) of A, B or E and a result status of "Final" or "Provisional". The data quality level criteria are outlined in DEQ's data validation criteria for water quality Parameters measured in the field (DEQ, 2013). The TMDL program uses waterbody results with a data quality level of A, B, or E (DEQ, 2021). Data of unknown quality are used after careful review.

Appendix B summarizes 504 locations where continuous stream temperature data were collected in the John Day River Basin and the organizations that collected that data in Table B.1, and when data were collected at each location in Table B.2. The location of these stations is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

5.4 Stream flow data

Table C.1 through Table C.3 in Appendix C lists the stations where continuous and instantaneous flow volume data were available in the John Day River Basin, including 11 stations from USGS, 10 stations from OWRD, and 21 stations from DEQ's files. Table C.4 lists the years that continuous stream flow data were collected at each location. The location of these stations is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D. DEQ relies upon the quality control checks implemented by USGS and OWRD. DEQ-collected stream flow measurements utilize field and quality control methods outlined in DEQ's Mode of Operations Manual (DEQ, 2023).

5.5 Point source discharges

Table 5.2 identifies all the active individual NPDES permittees in the John Day River Basin as of the date of this QAPP. Table 5.3 lists the registrants covered under the general NPDES GEN04 permits in the John Day River Basin. This group of general permits is highlighted because the permits require temperature monitoring at a frequency of at least one grab sample per month.

The location of these NPDES permittees is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D. Many of these permittees submit Discharge Monitoring Reports (DMRs) as a condition of their permit. Depending on the monitoring requirements in the permit, some permittees are required to report effluent temperature and effluent flow rates in the DMR. The frequency and type of reporting varies by permit and permit type. Some permits only require monthly, weekly, or daily grab samples while others require summary statistics such as daily maximum, daily mean, or seven-day average daily maximum. The NPDES permits require data to be collected and reported on the DMR using appropriate methods based on a quality assurance and quality control plan. Where possible, DEQ will utilize any continuous effluent data that has been provided to DEQ. When continuous data are not available, DMR data will be utilized to characterize point source discharges. Table 5.4 lists the current number of registrants for all the other general NPDES permits in the John Day River Basin that are not listed in Table 5.3.

In addition to the NPDES point sources, one additional point source, the City of John Day WWTP maintains a water pollution control facility (WPCF) permit (File No. #43569) that has a wasteload allocation in the TMDL as part of the reserve capacity. The John Day WWTP discharges to lagoons north of the mainstem John Day River. These lagoons rapidly infiltrate wastewater into the underlying substrate, which is believed to convey water directly to the river and is considered a point source discharge.

Table 5.2: Summary of individual NPDES permitted discharges in the John Day River Basin.

Facility Name (Facility Number)	Latitude/Longitude	Permit Type and Description	Stream River Mile
City Of Dayville (23560)	44.4644/-119.511	NPDES-DOM-Db: Sewage – less than 1 MGD with discharging lagoons	John Day River RM 211.6
Long Creek STP (51180)	44.7284/-119.104	NPDES-DOM-Da: Sewage – less than 1 MGD	Long Creek RM 20
Mt Vernon STP (59065)	44.4106/-119.117	NPDES-DOM-Db: Sewage – less than 1 MGD with discharging lagoons	John Day River RM 239

Table 5.3: Summary of current registrants under the general NPDES GEN04 permits in the John Day River Basin.

Facility Name (Facility Number)	Latitude/Longitude	Permit Type and Description	Stream River Mile
PRAIRIE WOOD PRODUCTS (ABN) (100059)	44.457/-118.695	GEN04: Industrial Wastewater; NPDES log ponds	John Day River RM 255.2

Table 5.4: Summary of the current number of registrants for all the other general NPDES permits in the John Day River Basin that are not listed in Table 5.3.

Permit Type and Description	Current Number of Registrants
GEN12C: Stormwater; NPDES construction more than 1 acre disturbed ground	4
GEN12Z: Stormwater; NPDES specific SIC codes	1

5.6 Water rights/surface water diversions

Data on surface water diversion rates (usage) and the points of diversion (location) are available from the Oregon Water Resources Department (OWRD). OWRD regulates all commercial, industrial, domestic, and agricultural water use in the state of Oregon through water rights.

Estimates of water diversion rates and location of points of diversion can be derived from the following OWRD sources:

- Water Rights Information System (WRIS) – the WRIS database contains all permitted or certificated water rights. Data in the WRIS corresponding to quantities of water for use are expressed as maximum use allowable, generally as monthly, seasonal, or annual rates or volumes. These maximum values may not correspond to actual usage, which will likely vary based on factors such as irrigation application rate or household consumer demand. DEQ may choose to incorporate the maximum amount allowable or some lesser quantity provided sufficient information is available to support those rates in the modeling. Water rights information can also be accessed using their online mapping application (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx).
- Water Use Reports – some, but not all, water rights holders must monitor and report the water they use to the state, typically on a monthly or yearly basis, as a requirement of their water rights. These water use reports will be used to develop withdrawal time series based on available information.

5.7 Effective shade measurements

Effective shade is the percent of potential daily solar radiation flux that is blocked by vegetation and topography. DEQ and/or partner agency staff used an instrument called a solar pathfinder to collect effective shade measurements in the field. The effective shade measurement methods and quality control procedures used are outlined in the Water Quality Monitoring Technical Guide Book (OWEB, 1999) and the Solar Pathfinder manual (Solar Pathfinder, 2016). Table 5.5 lists the locations where effective shade measurements were collected and the effective shade value for August 2002 and 2004.

Table 5.5: Effective shade data collected in the John Day River Basin.

Station ID	Station	Latitude/Longitude	Effective Shade (%)
No Station ID	Middle Fork John Day River 0.3 mile above Windlass Creek	44.6355/-118.625	25
No Station ID	Middle Fork John Day River BLM 1/16 Section 1-Mile Above Ritter Hot Springs	44.8812/-119.137	9
No Station ID	Middle Fork John Day River BLM Site 0.1 Mile Below Galena	44.7306/-118.826	5
No Station ID	Middle Fork John Day River BLM Site, Gravel Quarry 1.0 Mile Above Big Creek	44.7627/-118.858	3
31984-ORDEQ	Priest Hole (100 Meters Above Boat Ramp Parking Area)	44.7389/-120.283	0
31985-ORDEQ	100 Meters Above Bone Creek	44.7017/-119.647	4
31986-ORDEQ	Shady Grove BLM Day Use Area	44.8116/-119.719	2.5
31995-ORDEQ	0.1 Mile Above ODFW Public Access Bridge at River Mile 219	44.4557/-119.445	7
No Station ID	0.25 Mile Below McDonald's Ferry BLM Boat Launch	45.5742/-120.405	0
No Station ID	0.5 Mile Below Trail Creek	44.9169/-118.411	15
No Station ID	1.3 Miles Above Oriental Creek	44.9744/-118.716	24

Station ID	Station	Latitude/Longitude	Effective Shade (%)
No Station ID	1.8 Miles Above Desolation Creek	45.003/-118.916	5
No Station ID	1200 Feet Below Baldy Creek	44.9092/-118.321	64
No Station ID	1200 Feet Below Site Hwy 52 Bridge (Above Trail Creek)	44.9134/-118.402	33
No Station ID	2.5 Miles Below Clarno Bridge (4 km below)	44.9498/-120.484	0
No Station ID	600 Feet Below Baldy Creek	44.9092/-118.32	74
No Station ID	850 Feet Below Baldy Creek	44.9095/-118.319	82
No Station ID	900 Feet Below Hwy 52 Bridge (Above Trail Creek)	44.913/-118.402	61
No Station ID	BLM 8S 28E S17 SW ¼, 5 Miles Above Monument	44.8745/-119.403	0
No Station ID	BLM Access, 0.1 Mile Below Lone Pine	44.7774/-119.625	3
No Station ID	BLM Access, Lone Pine	44.777/-119.624	5
No Station ID	BLM Boat Launch 0.25 Mile Above Service Creek USGS Gage Site	44.7917/-120.001	5
No Station ID	BLM Site 0.5 Mile Below Hunter Creek	44.9973/-119.073	0
No Station ID	BLM Site One Mile Below Reichman Canyon	44.9637/-119.284	22
No Station ID	Clarno Bridge	44.9159/-120.47	0
No Station ID	Clyde Holliday State Park 0.05 Mile Below Amphitheater	44.4157/-119.09	17
No Station ID	Clyde Holliday State Park 0.1 Miles Above Amphitheater	44.4154/-119.088	36
No Station ID	Clyde Holliday State Park 0.2 Miles Above Amphitheater	44.415/-119.086	51
No Station ID	Clyde Holliday State Park 0.3 Mile Below Amphitheater	44.4153/-119.093	25
No Station ID	Cottonwood Bridge	45.4771/-120.469	0
No Station ID	CTWSIR Property above Prairie City, river mile 264	44.4591/-118.695	0
No Station ID	John Day WWTP	44.4222/-118.966	2
No Station ID	Jun 3, 2006, DB Field Note Site 1	44.9214/-118.416	8
No Station ID	Jun 3, 2006, DB Field Note Site 11	44.905/-118.475	14
No Station ID	Jun 3, 2006, DB Field Note Site 12	44.8931/-118.481	2.5
No Station ID	Jun 3, 2006, DB Field Note Site 2	44.9244/-118.435	53.5
No Station ID	Jun 3, 2006, DB Field Note Site 3	44.9264/-118.445	49.5
No Station ID	Jun 3, 2006, DB Field Note Site 7	44.9163/-118.46	26
No Station ID	McDonald's Ferry at BLM Boat Launch	45.5699/-120.403	0
No Station ID	One Mile Above Texas Bar Creek	45.0076/-118.831	28
No Station ID	Private Property at Rains Canyon (River Mile 8.8)	44.7959/-119.529	1
No Station ID	Trout Farm Campground 0.05 Mile Below Bridge	44.3064/-118.552	99
No Station ID	Volunteer Shade Data Collected By Boat With GPS	44.9047/-120.455	4
No Station ID	Volunteer Shade Data Collected By Boat With GPS	44.8828/-120.456	3
No Station ID	Volunteer Shade Data Collected By Boat With GPS	44.7729/-120.392	5
No Station ID	Volunteer Shade Data Collected By Boat With GPS	44.7426/-120.34	4
No Station ID	Volunteer Shade Data Collected By Boat With GPS	44.7464/-120.255	2
Trout Farm	Trout Farm Campground 0.01 Mile Below Bridge	44.3054/-118.552	84
14046000	North Fork John Day River at Monument, OR	44.8139/-119.431	2
No Station ID	1000 Feet Below Baldy Creek	44.9092/-118.321	80
No Station ID	250 Feet Below Baldy Creek	44.9095/-118.319	65
No Station ID	600 Feet Below Hwy 52 Bridge (Above Trail Creek)	44.9134/-118.402	25

Station ID	Station	Latitude/Longitude	Effective Shade (%)
No Station ID	ODFW Public Access at River Mile 219	44.4557/-119.445	1

6 Model development and calibration

Waterbodies, where model development was initiated for the John Day River Basin TMDL and WQMP (DEQ, 2010), are listed in Table 6.1. The extent and location of these models is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

Table 6.1: Waterbodies where a model has already been developed.

Model Version	Model Waterbody
Heat Source version 8 temperature model	John Day River, Middle Fork John Day River, North Fork John Day River
Heat Source version 6 shade model	Not waterbody specific

The setup and calibration for the models listed in Table 6.1 was completed by DEQ and documented in the John Day River Basin TMDL and WQMP (DEQ, 2010). Adjustments to the existing calibrated models are unlikely to occur as part of this project. However, if it is determined that the model calibration needs to be updated, the model inputs that are expected to be modified are described in Section 6.1. DEQ will follow the model acceptance criteria and model fit statistics described in Section 7.2.

DEQ will develop effective shade curves for all other waterbodies that were not specifically listed in Table 6.1. Effective shade curves represent the maximum possible effective shade for different vegetation types, stream widths, and stream aspect. Every combination of these conditions are modeled in Heat Source to develop the estimated effective shade. The results are summarized in shade curve plots and/or a lookup table that includes additional combinations of vegetation height, density, and buffer width. Effective shade curves have been developed for the original John Day River Basin TMDL and WQMP (DEQ, 2010). Adjustments to the existing shade curve models are unlikely to occur as part of this project. However, if it is determined that the models need to be updated, DEQ will follow the procedures outlined in this QAPP.

6.1 General model inputs and parameters

6.1.1 Heat Source version 8

Table 6.2 summarizes all of the user entered model inputs and parameters required to run Heat Source version 8; and identifies the subset of inputs and parameters that could possibly be modified to improve the calibration of the model. It should be noted, it is unlikely all of these will be used as calibration parameters; rather this list identifies the candidate model inputs that will be considered for adjustment through the calibration process. The following bulleted list of input categories and specific inputs describes the general form and function of the inputs, and why the inputs are candidates for adjustment during calibration:

- **Morphology** – The morphology inputs that could be used as calibration parameters fall into two categories: channel hydraulics and bed conduction.

  Channel hydraulics include stream gradient, bottom width, side slope angle, and Manning's *n*. Channel hydraulics are important for predicting stream temperatures because they govern the surface area of water that could be exposed to solar radiation, the residence time for exposure, and the degree of light penetration into the water column. Field data for these inputs are often difficult to collect over large spatial scales, and values can vary significantly on a small scale. Heat Source is a one-dimensional model and complex channel configurations are represented as a trapezoidal pattern. Adjustments to inputs that affect channel hydraulic are often necessary to calibrate the model.

  Bed conduction inputs include hyporheic zone thickness, percent hyporheic exchange, and porosity. Bottom width and side slope angle also affect these inputs by controlling the wetted perimeter of the channel (i.e., the portion or lateral length of the channel bed in direct contact with the stream). These stream morphological characteristics largely govern heat and mass transfer across the stream bed. Typically information on the waterbody sediment size class (e.g. bedrock, gravel, sand, silt) is used as the basis for selecting literature values for these inputs.
- **Meteorology** – The two meteorological inputs typically modified in calibration are percent cloudiness and wind speed. Both cloudiness and wind speed can vary significantly on a small geographic scale and the distance to the source of the meteorological data is often much greater than the small-scale localized weather. Hence, adjusting wind and cloudiness is an appropriate calibration method to account for more site-specific weather patterns.

- **Mass and thermal flux** – Mass and thermal inflows and outflows are inputs often adjusted during the calibration process. These inflows of heat and water consist of tributary and groundwater inflows as well as diversions (i.e., water rights withdrawals) and groundwater losses. The temporal and geographic extents of flow gaging and temperature monitoring on tributaries or groundwater are generally sparse. An effective way of improving the calibration is to complete a flow mass balance with from available data, and then add, subtract, or adjust flows either globally or in specific locations within the bounds of the flow mass balance and available measurements, and the temperature response predicted by the model.

- **Vegetation** – Vegetation characteristics input into the model are often derived from aerial imagery or LiDAR. The vegetation characteristics determine the degree to which near-stream vegetation has the capacity to block incidental solar radiation on the surface of the modeled waterbody. Three vegetation inputs incorporated into the model calibration process are the vegetation density, overhang, and height. Field measurements offer a general understanding of vegetation characteristics within the watershed; however, variability in these parameters can be significant on smaller geographic scales. To improve the model fit these model inputs may be modified on a global scale for different vegetation classes within the bounds of available data.

Table 6.2: Summary of model inputs required for Heat Source version 8.

Input Type	Input/Parameter	Units	Calibration Parameter
General	Simulation Name	-	NO
General	Stream Length	Kilometers	NO
General	Modeling Data Start Date	date (mm/dd/yyyy)	NO
General	Modeling Start Date	date (mm/dd/yyyy)	NO
General	Modeling End Date	date (mm/dd/yyyy)	NO
General	Modeling Data End Date	date (mm/dd/yyyy)	NO
General	Flush Initial Condition	Days	NO
General	Time Offset From UTC	Hours	NO
General	Model Time Step	Minutes	NO
General	Model Distance Step	Meters	NO
General	Longitudinal Stream Sample Distance	Meters	NO
General	Number Of Tributary Inflow Sites	-	NO
General	Number Of Meteorological Data Sites	-	NO
General	Include Evaporation Losses From Flow (True/False)	-	NO
General	Evaporation Method (Mass Transfer/Penman)	-	NO
General	Wind Function Coefficient, *a*	Unitless	NO
General	Wind Function Coefficient, *b*	Unitless	NO
General	Include Deep Alluvium Temperature (True/False)	-	NO
General	Deep Alluvium Temperature	degrees Celsius	NO
General	Number Of Samples Per Transect	-	NO
General	Distance Between Transect Samples	Meters	NO
General	Account For Emergent Veg Shading (True/False)	-	NO
General	Land Cover Sample Method (Point/Zone)	-	NO
General	LiDAR Data Used For Veg Codes (True/False)	-	NO
General	LiDAR Density	proportion (0-1)	YES
General	LiDAR Overhang	Meters	YES
Meteorological Data	Meteorological Data Model Kilometers	Kilometers	NO
Meteorological Data	Cloudiness	proportion (0-1)	YES
Meteorological Data	Wind Speed	meters/second	YES
Meteorological Data	Relative Humidity	proportion (0-1)	NO
Meteorological Data	Air Temperature	degrees Celsius	NO
Accretion	Stream Kilometers	Kilometers	NO
Accretion	Accretion Inflow Rate	cubic meters/second	YES
Accretion	Water Temperature	degrees Celsius	YES

Input Type	Input/Parameter	Units	Calibration Parameter
Accretion	Withdrawal Flow Rate	cubic meters/second	YES
Boundary Condition	Boundary Condition Inflow Rate	cubic meters/second	NO
Boundary Condition	Water Temperature	degrees Celsius	NO
Tributary	Tributary Inflow Model Kilometers	Kilometers	NO
Tributary	Tributary Inflow Rate	cubic meters/second	YES
Tributary	Water Temperature	degrees Celsius	YES
Land Cover Data	Longitude	decimal degrees	NO
Land Cover Data	Latitude	decimal degrees	NO
Land Cover Data	Topographic Shade Angle – West	Degrees	NO
Land Cover Data	Topographic Shade Angle – South	Degrees	NO
Land Cover Data	Topographic Shade Angle – East	Degrees	NO
Land Cover Data	Landover Ground Elevation	Meters	NO
Land Cover Codes	Land Cover Name	-	NO
Land Cover Codes	Land Cover Code	-	NO
Land Cover Codes	Land Cover Height	Meters	YES
Land Cover Codes	Canopy Density	proportion (0-1)	YES
Land Cover Codes	Land Cover Overhang	Meters	YES
Morphology Data	Stream Kilometers	Kilometers	NO
Morphology Data	Channel Bed Elevation	Meters	NO
Morphology Data	Channel Gradient	meters/meters	YES
Morphology Data	Channel Bottom Width	Meters	YES
Morphology Data	Channel Angle, *z*	meters/meters	YES
Morphology Data	Manning's Roughness Coefficient, *n*	seconds/meter	YES
Morphology Data	Sediment Thermal Conductivity	watts/meters/degrees Celsius	NO
Morphology Data	Sediment Thermal Diffusivity	square centimeters/second	NO
Morphology Data	Hyporheic Zone Thickness	Meters	YES
Morphology Data	Percent Hyporheic Exchange	proportion (0-1)	YES
Morphology Data	Porosity	proportion (0-1)	YES

6.2 Data gaps

Non-steady state stream models typically require a significant amount of data because of the large spatial and temporal extents the models typically encompass. As the model size or modeling period increases, the amount of information needed to parameterize it also increases. Often it is not possible to parameterize a model entirely from field data because it can be resource intensive or impractical to collect everything that is needed. In general, these data

gaps may be considered and addressed in a number of ways. Table 6.3 summarizes methods that are used to derive the data needed to parameterize the model.

To the greatest extent possible, the method used to derive the model parameters for the existing TMDL models has been summarized in the boundary conditions and tributary inputs tables in Section 6. The tables are located in sections 6.x.6 where x is the specific sub-section for each model (e.g. Section 6.4.6 for the John Day River).

Table 6.3: Methods to derive model parameters for data gaps.

Method	Possible Parameters	Description
Direct surrogate	Tributary temperatures, meteorological inputs, sediment	Often, neighboring or nearby tributary watersheds share climatological and landscape features. Model parameters with incomplete records or no data may be parameterized using data from a neighboring or nearby location where data are available.
Calibration adjustment	All inputs	In some instances, a significant input may be required for appropriate representation in the modeling; however, little may be known about the nature of that input. An example of this is groundwater influx and temperature. Datasets for these inputs can be estimated by adjusting the necessary values within acceptable ranges during the calibration process.
Literature-based values	All inputs	Literature values are often used for model parameters or unquantified model inputs when little is known about the site-specific nature of those inputs. Examples of these types of parameters include stream bed heat transfer properties, hyporheic characteristics, or substrate porosity (Bencala and Walters, 1983; Hart, 1995; Pelletier et al., 2006; Sinokrot and Stefan, 1993).
Mass balance	Tributary temperature and flow	On mainstem-modeled reaches, tributary stream flow or temperature can be estimated using a mass balance approach assuming either flow or temperature data for the tributary are known. If estimating temperature, flow is required, and if estimating flow, temperature is required. Often TIR data are used to estimate tributary flow because upstream, downstream, and tributary temperatures are known, and upstream and tributary flows are known (or estimated).
Simple linear regression	Tributary temperature and flow	Parameters such as flow and temperature in neighboring or nearby tributaries often demonstrate similar diurnal patterns or hydrographs which allow for the development of suitable mathematical relationships (simple linear regression) in order to fill the data gaps for those inputs. This method requires at least some data exist for the incomplete dataset in order to develop the relationship.
Drainage area ratio	Tributary flow	For ungaged tributaries, flows can be estimated using the ratio between the watershed drainage areas of the ungaged location and from a nearby gaged tributary (Gianfagna, 2015; Ries et al., 2017; Risley, 2009). For example, if the watershed area upstream of a gaged tributary is 10 km^2, and the watershed area of an ungaged tributary is 5 km^2, the flows in the ungaged tributary are estimated to be half of those in the gaged tributary. The method is typically used to calculate low flow or flood frequency statistics. In that context, a weighting factor is recommended when the drainage area ratio of the two sites is between 0.5 and 1.5. Weighting factors can be evaluated if instantaneous observed flows are available at the ungaged location.

Method	Possible Parameters	Description
Flow-probability-probability-flow (QPPQ)	Tributary flow	The flow-probability-probability-flow (QPPQ) method makes use of relating flow duration curves between a gaged tributary and an ungaged tributary (Lorenz and Ziegeweid, 2016). The flow duration curve at ungaged sites is estimated using regression approaches (Risley et al., 2008) and the online USGS tool StreamStats (Ries et al., 2017).
Adiabatic adjustment	Air temperature	Air temperature can vary significantly throughout a watershed, particularly with large differences in elevation from headwaters to the mouth of the drainage. To account for these differences, air temperatures can be adjusted using an equation that relates air temperature measured at a meteorological station to a location of a given elevation using the dry adiabatic lapse rate of 9.8 °C/km and the differences in elevation.
GIS Data	Channel position, Channel width, Land cover, Gradient, Elevation, Topographic shade angles	Several landscape-scale GIS data sets can be used to derive a number of model parameters. Digital orthophotos quads (DOQs) are used to classify land cover and estimate vegetation type, height, density, and overhang. DOQs can also be used to determine stream position, stream aspect, and channel width. A digital elevation model (DEM) consists of digital information that provides a uniform matrix of terrain elevation values. It provides basic quantitative data for deriving surface elevation, stream gradient, and maximum topographic shade angles.

6.3 Effective shade curves and lookup tables

Effective shade curves are plots that present the maximum possible effective shade as a function of different types of natural near-stream vegetation, active channel widths, and stream aspects. Channel width is plotted on the x-axis, effective shade is on the y-axis, and a separate symbol and/or line color is used for each stream aspect. Separate plots are produced for each type of natural vegetation that is expected in the TMDL project area. The plots are called effective shade curves because the pattern on the plot resembles a gentle downward-slopping curve. As channel width increases effective shade gets smaller. The plots are produced from the output of Heat Source version 6 shade models that have been parameterized with every combination of the previously mentioned conditions. The effective shade curve approach can be used almost anywhere to quantify the amount of background solar radiation loading and the effective shade necessary to eliminate temperature increases from anthropogenic disturbance or removal of near-stream vegetation.

This model approach can also be used to develop a lookup table to determine the effective shade resulting from other combinations vegetation height, vegetation density, vegetation overhang, and vegetation buffer widths that are different from background conditions. The lookup table provides a convenient way for readers of the TMDL to estimate the effective shade for current conditions without using the model. The lookup table can also be used as a reverse lookup to determine what vegetation height, buffer width, or vegetation density would achieve a certain effective shade.

6.3.1 Model domain

The model domain is not specific to any single waterbody but will be parameterized using latitude and longitude located in the TMDL watershed to ensure that the modeled solar altitude and sun angles are appropriate for the area.

6.3.2 Spatial and temporal resolution

The model input spatial resolution (*dx*) is 30 meters. Outputs are generated every 100 meters. The spatial resolution is not very meaningful, however, since each output distance step will represent a unique combination of the different modeled vegetation and channel conditions. The model time step (*dt*) is 1 minute and outputs are generated every hour.

6.3.3 Source characteristics

The effective shade curve approach can be used almost anywhere in the watershed to quantify the amount of background solar radiation loading and the effective shade necessary to eliminate temperature increases from anthropogenic disturbance or removal of near-stream vegetation.

The lookup tables can be used to estimate existing shade or current solar loading. Other potential sources of thermal loading and the temperature response will not be evaluated by this model.

6.3.4 Time frame of simulation

The model period is a single day in late July or early August. This time frame was chosen to characterize the solar loading when maximum stream temperatures are observed, the sun altitude angle is highest, and the period of solar exposure is longest.

6.3.5 Important assumptions

Models used to develop effective shade curves assume no cloud cover and no topographic shade. The modeled terrain is flat so there is no difference in ground elevation between the stream and the adjacent vegetation buffer area. The vegetation density, vegetation height, vegetation overhang, and vegetation buffer width are assumed to be equal on both sides of the stream. The width of the active channel is assumed to be equal to the distance between near-stream vegetation on either side of the stream.

Effective shade curves were developed for the original John Day River Basin TMDL and WQMP (DEQ, 2010). Adjustments to the existing shade curve models are unlikely to occur as part of this project. However, if it is determined that the models need to be updated, DEQ will follow the procedures outlined in this QAPP.

6.3.6 Model inputs

There are two categories of models, each with a different set of inputs:

- **Effective shade curves**: Model input values for vegetation height, vegetation density, vegetation overhang, and vegetation buffer width correspond to the restored streamside vegetation types expected in areas that are currently lacking streamside vegetation because of anthropogenic disturbance. The specific values will be determined during the TMDL process and will likely be the same or similar to the values presented in the John Day River Basin TMDL and WQMP (DEQ, 2010). The other model inputs are the same as what is described in Table 6.4.
- **Effective shade lookup tables**: Model input values to be used for the lookup tables are described in Table 6.4.

Table 6.4: Range of model inputs to be used for effective shade lookup tables.

Model Input	Value Range
Vegetation height (meters)	0 – 90 (or expected maximum)
Vegetation density (percent)	0 -100
Vegetation overhang (meters)	0 – 3 (or expected maximum)
Vegetation buffer width (meters)	0 – 45
Active channel width (meters)	0 – 100 (or expected maximum)
Stream aspect (degrees)	North/South (0/180); Northeast/Southwest (45/225); East/West (90/270); Southeast/Northwest (135/315)
Topographic shade angles (degrees)	0
Cloudiness	0

6.4 John Day River

The John Day River model is a temperature model developed using Heat Source 8.0. The model was developed by DEQ.

6.4.1 Model domain

The extent of the model domain is the John Day River from Tumwater Falls to Trout Farm Campground. The model extent is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

6.4.2 Spatial and temporal resolution

The model input spatial resolution (*dx*) is 50 meters. Outputs are generated every 1000 meters. The model time step (*dt*) is 1 minute and outputs are generated every hour.

A *dx* of 50 meters was chosen to capture the range of solar flux input caused by the varied vegetation conditions along the length of the stream. The high resolution *dx* will allow evaluation of multiple vegetation management scenarios for each designated management agency.

6.4.3 Source characteristics

The primary sources of thermal loading contributing to temperatures exceedances in the John Day River include increases in solar radiation loading from the disturbance or removal of near-stream vegetation, point source discharges, reductions to stream flow rate or volume, and background sources (DEQ, 2010). Other potential sources include channel modification and widening, and warming caused by climate change. The contribution of these latter potential sources may be investigated as part of a literature review and using the results of the original TMDL model analyses. New model scenarios will only be developed if time allows.

There are two permitted individual NPDES point sources along the model extent. Detail about each point source is summarized in Table 6.5.

Table 6.5: Summary of individual NPDES permitted discharges in the John Day River.

Facility Name (Facility Number)	Latitude/Longitude	Permit Type and Description	Stream/River Mile
City Of Dayville (23560)	44.4644/-119.511	NPDES-DOM-Db: Sewage – less than 1 MGD with discharging lagoons	John Day River RM 211.6
Mt Vernon STP (59065)	44.4106/-119.117	NPDES-DOM-Db: Sewage – less than 1 MGD with discharging lagoons	John Day River RM 239

The majority land use along the John Day River is rangeland accounting for about 65 percent of the near-stream area. Table 6.6 summarizes all the land uses within 100 meters of the digitized John Day River centerline. Land uses were summarized using the 2016 National Land Cover Database (Yang et al., 2018). Note that Shrub/Scrub and Herbaceous land uses can be areas where forest clearcuts have occurred and would be classified as forest after regrowth.

Table 6.6: Summary of land uses along the model extent within 100 meters of the digitized John Day River centerline based on the 2016 National Land Cover Database (Yang et al., 2018).

2016 NLCD Land Cover	Acres	Percent of Total Acres
Shrub/Scrub	8621.8	50.5
Emergent Herbaceous Wetlands	2557.3	15
Herbaceous	2472.6	14.5
Developed, Open Space	837.3	4.9
Evergreen Forest	679.6	4
Hay/Pasture	458.8	2.7
Cultivated Crops	446.8	2.6
Woody Wetlands	433.4	2.5
Developed, Low Intensity	336.3	2
Barren Land	177.5	1
Developed, Medium Intensity	34.5	0.2
Developed, High Intensity	2.0	<0.05

Anthropogenic-related stream warming caused by nonpoint sources is closely associated with the uses, the activities, and the condition of vegetation adjacent to the stream. How activities and uses are managed in these areas is partially determined by a variety of different rules and management plans established by the landowner and any agency with land use authority. To better understand the spatial distribution of different agency rules or management plans along the model extent DEQ mapped known designated management agencies (Table 6.7).

A designated management agency is defined in OAR 340-042-0030(2) as a federal, state, or local governmental agency that has legal authority over a sector or source contributing pollutants. Typically, persons or designated management agencies that are identified in the TMDL Water Quality Management Plan (WQMP) are responsible for developing TMDL implementation plans and implementing management strategies to reduce pollutant loading. Table 6.7 summarizes the potential designated management agencies and responsible persons along the John Day River model extent.

Table 6.7: Summary of potential designated management agencies (DMAs) or responsible persons along the model extent within 100 meters of the digitized John Day River centerline.

DMA or Responsible Person	Acres	Percent of Total Acres
Oregon Department of Agriculture	8798.1	41.1
U.S. Bureau of Land Management	7326.4	34.2
Grant County	2019.7	9.4
Oregon Department of Transportation	609.8	2.8
U.S. National Park Service	435.9	2
Oregon Parks and Recreation Department	356.8	1.7
Oregon Department of State Lands – Waterway	282.2	1.3
Jefferson County	270.3	1.3
Oregon Department of Forestry – Private Forestland	262.5	1.2
Confederated Tribes of Warm Springs	240.8	1.1
City of John Day	135.0	0.6
Sherman County	112.7	0.5
U.S. Government	96.8	0.5
Oregon Department of Fish and Wildlife	84.2	0.4
U.S. Forest Service	80.8	0.4
State of Oregon	76.1	0.4
Wheeler County	71.9	0.3
City of Spray	52.2	0.2
City of Mt. Vernon	45.9	0.2
City of Prairie City	43.3	0.2
Gilliam County	19.5	0.1
City of Dayville	5.3	<0.05
City of Mount Vernon	1.6	<0.05
Wasco County	0.8	<0.05

6.4.4 Time frame of simulation

The model period is July 01, 2004 to September 01, 2004.

6.4.5 Important assumptions

The effort currently described in the QAPP includes the use of existing models. Key calibration assumptions made during the model setup and calibration process were documented in the original TMDL (DEQ, 2010), the model user guide (Boyd and Kasper, 2003).

6.4.6 Model inputs

Table 6.8 summarizes the current configuration of the model input parameters and the source of these data. Temperature, flow, and meteorological input parameters are summarized to improve documentation of the TMDL approach.

Table 6.8: Boundary condition and tributary inputs to the existing John Day River Heat Source model.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
John Day River headwaters (Trout Farm)	437	Boundary Condition	Flow	Derived data.	Flows at the boundary condition were estimated based on an instantaneous flow measurement at Trout Farm and the flow gage at Blue Mountain Hot Springs.
John Day River headwaters (Trout Farm)	437	Boundary Condition	Water Temperature	Derived data.	Data were collected at the headwaters from 7/14/2004 to 8/31/2004. Temperature data prior to 7/14 by correlating hourly temperatures with data from a nearby gage (Deardorff Creek) with some concurrent data.
Upper springs	436	Tributary	Flow	Derived data.	Added during calibration: variable based on hydrologic calibrations
Call Creek (14036860)	434.9	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Roberts Creek	430.9	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration; JDR gage at Blue Mt. Hot Springs
Rail Creek (14036860)	430.7	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Blue Mt. Hot Springs (TIR)	429.9	Tributary	Flow	Derived data. Watershed Sciences (2005)	Flow derived using flow mass balance using TIR temperatures: 0.00089 cms.
Upper springs	429.8	Tributary	Flow	Derived data.	Added during calibration: 0.11000

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Graham Creek (14036860)	427.8	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Deardorff Creek (14036860)	424.8	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
French ditch	423.6	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Reynolds Creek (14036860)	421.7	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Isham Creek – return of side channel (14036860)	417.8	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Power Mill ditch + Galbraith (23.15) & Tucker (20.20)	413.8	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Strawberry Creek (14036860)	412.1	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Slyfe/Strawberry Creek (14036860)	409	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Dixie Creek (14036860)	408.4	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
John Day River ditch + Bradford ditch (29.00)	403.9	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Indian Creek (14036860)	400	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Pine Creek (upper) (14036860)	397.6	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Seep (near Dean & Dissel Creeks) (TIR)	392.7	Tributary	Flow	Derived data. Watershed Sciences (2005)	Flow derived using flow mass balance using TIR temperatures: 0.00001 cms.
Diversions	392.1	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Canyon Creek (14036860)	384.7	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Enterprise ditch (#14038655) + Luce Long (53.20)	379.6	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Laycock Creek (14036860)	376.4	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Panama Ditch (#14038670)	376.1	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration; Combined with diversions for hydrologic calibration
Enterprise drain return flow	375.9	Tributary	Flow	OWRD	Value of 0.05663 cms reported by basin Water Master.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Beech Creek (14039500)	370.6	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Canal diversion (LB) = Blue Mt. Ditch	369.4	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Spring (near Birch Creek) (TIR)	360.5	Tributary	Flow	Derived data. Watershed Sciences (2005)	Flow derived using flow mass balance using TIR temperatures: 0.00708 cms.
Spring (TIR)	357.1	Tributary	Flow	Derived data. Watershed Sciences (2005)	Flow derived using flow mass balance using TIR temperatures: 0.10198 cms.
Belshaw Creek & Fields Creek (14039500)	352.1	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Lumped diversions	346.4	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Diversions between S. Fork JDR and ODFW bridge (Stewart McRae diversion location)	330.4	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration; Combined with diversions for hydrologic calibration
Spring (TIR)	329	Tributary	Flow	Derived data. Watershed Sciences (2005)	Flow derived using flow mass balance using TIR temperatures: 0.00085 cms.
S. Fork John Day River (14039500)	326	Tributary	Flow	OWRD	
Diversions between South Fork JDR and Picture Gorge (Clausen diversion site)	324.1	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Cottonwood Creek (14039500)	319	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Rock Creek (upper) (14039500)	314.2	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Squaw Creek (14039500)	306.2	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Diversions between Picture Gorge and Bone Creek site	295.1	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Seep (RB) (near Branson Creek) (TIR)	294.5	Tributary	Flow	Derived data. Watershed Sciences (2005)	Flow derived using flow mass balance using TIR temperatures: 0.00001 cms.
Johnson Creek (14039500)	283.5	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
North Fork John Day River at Monument, OR (14046000)	282.2	Tributary	Flow	USGS	
Bologna Canyon (14039500)	278.1	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Diversions between Bone Creek and Shady Grove	275.1	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration; Combined with diversions for hydrologic calibration

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Diversions between Shady Grove and Service Creek	260.6	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Parrish Creek & Kahler Creek (14039500)	257	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Alder Creek (14039500)	241.8	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Shoofly Creek (14039500)	226.7	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Spring/seep (near Girds Creek) (TIR)	217.6	Tributary	Flow	Derived data. Watershed Sciences (2005)	Flow derived using flow mass balance using TIR temperatures: 0.00001 cms.
Diversions between Service Creek and Priest Hole	215.7	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Bridge Creek (14039500)	202.2	Tributary	Flow	Derived data. OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Diversions between Priest Hole (231.15) and 281.85	173.3	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Pine Creek (lower) (14046890)	164.5	Tributary	Flow	USGS	
Diversions between Clarno flow point (281.85) and Thirtymile Creek	146.6	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Butte Creek (14046890)	139.7	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Thirtymile Creek (14046890)	118.2	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Hay Creek (14046890)	30.1	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Diversions between Hay and the mouth	22.9	Tributary	Flow	Derived data.	Combined with diversions for hydrologic calibration
Rock Creek (lower) (14046890)	17.2	Tributary	Flow	Derived data. USGS and OWRD	Monthly flow estimate based on proportion of flows from USGS gage data and OWRD Water Availability Basins (WAB)
Upper springs	436	Tributary	Water Temperature	Derived data.	Estimated groundwater temperature (11.5C), (best professional judgment)
Call Creek (MNF-12)	434.9	Tributary	Water Temperature	USFS	These data are not in AWQMS.
Roberts Creek	430.9	Tributary	Water Temperature	Derived data.	Call Creek data used as surrogate.
Rail Creek	430.7	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Call Creek data using a ratio of 1.
Blue Mt. Hot Springs	429.9	Tributary	Water Temperature	Derived data. DOGAMI	Estimated temperature from DOGAMI (58.C) (DOGAMI website).
Upper springs	429.8	Tributary	Water Temperature	Derived data.	Estimated groundwater temperature (11.C) , (best professional judgment)

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Graham Creek	427.8	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Deardorff Creek data using a ratio of 1.5.
Deardorff Creek (MNF-28)	424.8	Tributary	Water Temperature	USFS	These data are not in AWQMS.
French ditch	423.6	Tributary	Water Temperature	Derived data.	Deardorff Creek data used as surrogate.
Reynolds Creek (MNF-6)	421.7	Tributary	Water Temperature	USFS	These data are not in AWQMS.
Isham Creek – return of side channel	417.8	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from nearby unnamed tributary (km 411.1); Canyon Creek data used as surrogate with a ratio of 1.7.
Power Mill ditch + Galbraith (23.15) & Tucker (20.20)	413.8	Tributary	Water Temperature	Derived data.	Estimated based on TIR data from nearby unnamed tributary (km 411.1) and Canyon Creek data using a ratio of 1.7.
Strawberry Creek	412.1	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from nearby unnamed tributary (km 411.1); Canyon Creek data used as surrogate with a ratio of 1.7.
Slyfe/Strawberry Creek	409	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from nearby unnamed tributary (km 411.1); Canyon Creek data used as surrogate with a ratio of 1.7.
Dixie Creek	408.4	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from Shaw Gulch (km 44.9); Canyon Creek data used as surrogate with a ratio of .95.
John Day River ditch + Bradford ditch (29.00)	403.9	Tributary	Water Temperature	Derived data.	Estimated based on TIR data from Shaw Gulch (km 44.9) and Canyon Creek data using a ratio of 0.95.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Indian Creek	400	Tributary	Water Temperature	Derived data.	No after before 7/24/24, estimated temperature based on Canyon Creek data using a variable hourly ratio of 0.95-1.35.
Pine Creek (upper)	397.6	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from Fish Creek (km 398.65); Canyon Creek data used as surrogate with a ratio of 1.13.
Seep (near Dean & Dissel Creeks)	392.7	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Canyon Creek data using a ratio of 1.14.
Diversions	392.1	Tributary	Water Temperature	Derived data.	Canyon Creek data used as surrogate with a ratio of 0.9.
Canyon Creek (31987-ORDEQ)	384.7	Tributary	Water Temperature	DEQ	No data before 7/14/24; estimated temperature based on Pine Creek (lower) data using an average 48-hour ratio of 1.2.
Enterprise ditch (#14038655) + Luce Long (53.20)	379.6	Tributary	Water Temperature	Derived data.	Canyon Creek data used as surrogate.
Laycock Creek	376.4	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Canyon Creek data using a ratio of 1.16.
Panama Ditch (#14038670)	376.1	Tributary	Water Temperature	DEQ	Not applicable – no inflow
Enterprise drain return flow	375.9	Tributary	Water Temperature	Derived data.	Estimated temperature based on Canyon Creek data using a ratio of 0.9.
Beech Creek	370.6	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Canyon Creek data using a ratio of 1.23.
Canal diversion (LB) = Blue Mt. Ditch	369.4	Tributary	Water Temperature	Derived data.	Beech Creek data used as surrogate.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Spring (near Birch Creek)	360.5	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Canyon Creek data using a ratio of 1.1.
Spring	357.1	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data, assumed constant TIR temperature (16.9C) ; data used as surrogate with a ratio of .
Belshaw Creek & Fields Creek	352.1	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from spring (km 36.5); Canyon Creek data used as surrogate with a ratio of 1.1.
Lumped Diversions	346.4	Tributary	Water Temperature	Derived data.	Estimated based on TIR data from Cummings Creek (km 346.65) and Canyon Creek data using a ratio of 1.22.
Diversions between S. Fork JDR and ODFW bridge (Stewart McRae diversion location)	330.4	Tributary	Water Temperature	DEQ	Not applicable – no inflow
Spring	329	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Canyon Creek data using a ratio of 1.26.
S. Fork John Day River (31991-ORDEQ)	326	Tributary	Water Temperature	DEQ	No data before 7/14/24; estimated temperature based on Pine Creek (lower) data using an average 48-hour ratio of 1.25.
Diversions between South Fork JDR and Picture Gorge (Clausen diversion site)	324.1	Tributary	Water Temperature	Derived data.	Estimated based on TIR data from Rattlesnake Creek (km 316.5) and Pine Creek (lower) data using a ratio of 1.24.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Cottonwood Creek	319	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from Rattlesnake Creek (km 316.5); Pine Creek (lower) data used as surrogate with a ratio of 1.24.
Rock Creek (upper) (24479-ORDEQ)	314.2	Tributary	Water Temperature	DEQ	No data before 7/14/24; estimated temperature based on Pine Creek (lower) data using an average 48-hour ratio of 1.26.
Squaw Creek	306.2	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from Rattlesnake Creek (km 316.5) & Rock Creek (averaged); Pine Creek (lower) data used as surrogate with a ratio of 1.25.
Diversions between Picture Gorge and Bone Creek site	295.1	Tributary	Water Temperature	Derived data.	Rock Creek (upper) data used as surrogate.
Seep (RB) (near Branson Creek)	294.5	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Pine Creek (lower) data using a ratio of 1.21.
Johnson Creek	283.5	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from Rattlesnake Creek (km 316.5) & Rock Creek (averaged); Pine Creek (lower) data used as surrogate with a ratio of 1.25.
North Fork John Day River at Monument, OR	282.2	Tributary	Water Temperature	DEQ	
Bologna Canyon	278.1	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Pine Creek (lower) data using a ratio of 1.18.
Diversions between Bone Creek and Shady Grove	275.1	Tributary	Water Temperature	DEQ	Not applicable – no inflow

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Diversions between Shady Grove and Service Creek	260.6	Tributary	Water Temperature	Derived data.	Johnson Creek data used as surrogate.
Parrish Creek & Kahler Creek	257	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from Kahler Creek; Pine Creek (lower) data used as surrogate with a ratio of 1.5.
Alder Creek	241.8	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Pine Creek (lower) data using a ratio of 1.49.
Shoofly Creek	226.7	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from Alder Creek & Bridge Creek (averaged); Pine Creek (lower) data used as surrogate with a ratio of 1.45.
Spring/seep (near Girds Creek)	217.6	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Pine Creek (lower) data using a ratio of 1.18.
Diversions between Service Creek and Priest Hole	215.7	Tributary	Water Temperature	Derived data.	Bridge Creek data used as surrogate.
Bridge Creek	202.2	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Pine Creek (lower) data using a ratio of 1.41.
Diversions between Priest Hole (231.15) and 281.85	173.3	Tributary	Water Temperature	Derived data.	Pine Creek (lower) data used as surrogate.
Pine Creek (lower) (14046890)	164.5	Tributary	Water Temperature	USGS	
Diversions between Clarno flow point (281.85) and Thirtymile Creek	146.6	Tributary	Water Temperature	Derived data.	Butte Creek data used as surrogate.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Butte Creek	139.7	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data from Muddy Creek (km 172.5) & Thirtymile Creek (averaged); Pine Creek (lower) data used as surrogate with a ratio of 1.35.
Thirtymile Creek	118.2	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Pine Creek (lower) data using a ratio of 1.34.
Hay Creek	30.1	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Pine Creek (lower) data using a ratio of 1.32.
Diversions between Hay and the mouth	22.9	Tributary	Water Temperature	Derived data.	Rock Creek (lower) data used as surrogate.
Rock Creek (lower)	17.2	Tributary	Water Temperature	Derived data.	Estimated temperature based on TIR data and Pine Creek (lower) data using a ratio of 1.27.
Clarno	120, 160.1, 205.8	Meteorological	Air Temperature	DEQ	
Clyde-Holliday	325.2, 336.8, 373	Meteorological	Air Temperature	DEQ	
Kimberly	237.7, 271.4, 284, 290, 315.3	Meteorological	Air Temperature	SWCD	
McDonald Ferry	7.2, 46.8	Meteorological	Air Temperature	DEQ	
Mitchell	120, 160.1, 205.8, 237.7, 271.4, 284, 290, 315.3	Meteorological	Cloudiness, Wind Speed	DRI-RAWS	
Trout Farm	431.2, 431.6	Meteorological	Air Temperature	DEQ	
golw – Goldendale	7.2, 46.8	Meteorological	Cloudiness, Wind Speed	Oregon AgriMet Weather Station	

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
pcyo – Prairie City	7.2, 46.8, 120, 160.1, 205.8, 237.7, 271.4, 284, 290, 315.3, 325.2, 336.8, 373, 384.1, 389.5, 400.4, 408.9, 409.8, 411, 431.2, 431.6	Meteorological	Air Temperature, Cloudiness, Relative Humidity, Wind Speed	Oregon AgriMet Weather Station	

Hourly meteorology inputs into the model include air temperature, cloudiness, relative humidity, and wind speed. Air temperature data were modified using the dry adiabatic lapse rate to adjust for differences in elevation between the measurement location and the model input location. Wind speeds were adjusted to improve the calibration using a wind-sheltering coefficient to represent difference in wind speed between the measurement location and above the stream within the riparian area.

6.4.7 Model calibration

The expected model calibration sites and data sources are summarized in Table 6.9. The model location in the table below describes the distance of each input from the most downstream model node. Effective shade model calibrations sites are summarized in Table 5.5. The model inputs and parameters that are expected to be modified to improve model fit are described in Section 6.1.

Table 6.9: Calibration sites and parameters used in the existing John Day River Heat Source model.

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
John Day River headwaters (Trout Farm)	437	Wetted Width, Velocity, Flow, Depth	DEQ
Trout Farm Campground 0.01 Mile Below Bridge (Trout Farm)	437	Effective Shade	DEQ
Trout Farm Campground 0.05 Mile Below Bridge	436.85	Effective Shade	DEQ
John Day River Upstream of Blue Mt. Hot Springs	431.55	Water Temperature	CTWS
John Day River at Blue Mtn Hot Springs Nr Prairie City, OR (14036860)	429	Flow	USGS
John Day River 2 km above Prairie City	411.05	Water Temperature	CTWS
CTWSIR Property above Prairie City, river mile 264	410.25	Wetted Width, Velocity, Flow, Effective Shade, Depth	DEQ
John Day River 0.9 km above Prairie City	409.75	Water Temperature	CTWS
John Day River at Prairie City	408.85	Water Temperature	CTWS
John Day River 7.5 km below Prairie City	400.35	Water Temperature	CTWS
John Day River near John Day, OR (14038530)	390	Flow	USGS

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
John Day River 17 km below Prairie City	389.5	Water Temperature	CTWS
John Day River at John Day WWTP (31988-ORDEQ)	384.15	Water Temperature	DEQ
John Day WWTP	384.15	Effective Shade	DEQ
Clyde Holliday State Park 0.2 Miles Above Amphitheater	373.3	Effective Shade	DEQ
Clyde Holliday State Park 0.1 Miles Above Amphitheater	373.1	Wetted Width, Velocity, Flow, Effective Shade, Depth	DEQ
Clyde Holliday State Park 0.05 Mile Below Amphitheater	372.95	Effective Shade	DEQ
John Day River at Clyde-Holliday State Park	372.95	Water Temperature	DEQ
Clyde Holliday State Park 0.3 Mile Below Amphitheater	372.7	Effective Shade	DEQ
0.1 Mile Above ODFW Public Access Bridge at River Mile 219 (31995-ORDEQ)	336.75	Effective Shade	DEQ
John Day River at ODFW Bridge above Dayville (31995-ORDEQ)	336.75	Wetted Width, Water Temperature, Velocity, Flow, Depth	DEQ
ODFW Public Access at River Mile 219	336.65	Effective Shade	DEQ
John Day River below Dayville	325.25	Water Temperature	CTWS
John Day River at Picture Gorge	315.3	Water Temperature	BLM
John Day River at Picture Gorge, Nr Dayville, OR (14040500)	315	Flow	OWRD
100 Meters Above Bone Creek (31985-ORDEQ)	289.95	Effective Shade	DEQ
John Day River upstream of Bone Creek (31985-ORDEQ)	289.95	Wetted Width, Water Temperature, Velocity, Flow, Depth	DEQ
John Day River at Shady Grove BLM Wayside (31986-ORDEQ)	271.4	Wetted Width, Water Temperature, Velocity, Flow, Depth	DEQ
Shady Grove BLM Day Use Area (31986-ORDEQ)	271.4	Effective Shade	DEQ
John Day River near Service Creek	237.7	Water Temperature	BLM
BLM Boat Launch 0.25 Mile Above Service Creek USGS Gage Site	237.4	Effective Shade	DEQ
John Day River at Service Creek, OR (14046500)	237	Flow	USGS
Volunteer Shade Data Collected By Boat With GPS	207.55	Effective Shade	DEQ
John Day River at Priest Hole BLM Boat Ramp (31984-ORDEQ)	205.8	Wetted Width, Water Temperature, Velocity, Flow, Depth	DEQ, BLM
Priest Hole (100 Meters Above Boat Ramp Parking Area) (31984-ORDEQ)	205.8	Effective Shade	DEQ

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
Volunteer Shade Data Collected By Boat With GPS	199.3	Effective Shade	DEQ
Volunteer Shade Data Collected By Boat With GPS	191.65	Effective Shade	DEQ
Volunteer Shade Data Collected By Boat With GPS	168.35	Effective Shade	DEQ
Volunteer Shade Data Collected By Boat With GPS	163.25	Effective Shade	DEQ
Clarno Bridge	160.05	Effective Shade	DEQ
John Day River at Hwy218 Clarno (31983-ORDEQ)	160.05	Water Temperature	DEQ
2.5 Miles Below Clarno Bridge (4 km below)	155.05	Wetted Width, Velocity, Flow, Effective Shade, Depth	DEQ
John Day River above Pine Hollow	119.95	Water Temperature	BLM
Cottonwood Bridge	46.8	Effective Shade	DEQ
John Day River at Hwy 206 (Hwy from Wasco to Condon) (11386-ORDEQ)	46.8	Water Temperature	DEQ
McDonald's Ferry at BLM Boat Launch	18.05	Effective Shade	DEQ
0.25 Mile Below McDonald's Ferry BLM Boat Launch	17.55	Effective Shade	DEQ
John Day River at McDonald Ferry, OR (14048000)	16	Flow	USGS
John Day River at River Mile 15	7.15	Water Temperature	BLM
Model extent	Model extent	Water Temperature (TIR)	Watershed Sciences (2005)

6.5 Middle Fork John Day River

The Middle Fork John Day River model is a temperature model developed using Heat Source 8.0. The model was developed by DEQ.

6.5.1 Model domain

The extent of the model domain is the Middle Fork John Day River from the mouth to just downstream of the confluence with Clear Creek. The model extent is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

6.5.2 Spatial and temporal resolution

The model input spatial resolution (*dx*) is 50 meters. Outputs are generated every 200 meters. The model time step (*dt*) is 0.5 minutes and outputs are generated every hour.

A *dx* of 50 meters was chosen to capture the range of solar flux input caused by the varied vegetation conditions along the length of the stream. The high resolution *dx* will allow evaluation of multiple vegetation management scenarios for each designated management agency.

6.5.3 Source characteristics

The primary sources of thermal loading contributing to temperatures exceedances in the Middle Fork John Day River include increases in solar radiation loading from the disturbance or removal of near-stream vegetation, and background sources (DEQ, 2010). Other potential sources include channel modification and widening, reductions to stream flow rate, and warming caused by climate change. The contribution of these latter potential sources may be investigated as part of a literature review and using results of the original TMDL model analyses. New model scenarios will only be developed if time allows.

There are no permitted individual NPDES point sources along the model extent.

The majority land uses along the Middle Fork John Day River are rangeland and forestry accounting for about 91 percent of the near-stream area. Table 6.10 summarizes all the land uses within 100 meters of the digitized Middle Fork John Day River centerline. Land uses were summarized using the 2016 National Land Cover Database (Yang et al., 2018). Note that Shrub/Scrub and Herbaceous land uses can be areas where forest clearcuts have occurred and would be classified as forest after regrowth.

Table 6.10: Summary of land uses along the model extent within 100 meters of the digitized Middle Fork John Day River centerline based on the 2016 National Land Cover Database (Yang et al., 2018).

2016 NLCD Land Cover	Acres	Percent of Total Acres
Shrub/Scrub	2316.0	42.1
Evergreen Forest	1957.7	35.6
Herbaceous	475.9	8.7
Emergent Herbaceous Wetlands	317.4	5.8
Woody Wetlands	274.7	5
Developed, Open Space	58.0	1.1
Cultivated Crops	50.5	0.9
Hay/Pasture	43.8	0.8
Developed, Low Intensity	2.7	<0.05
Barren Land	0.9	<0.05

Anthropogenic related stream warming caused by nonpoint sources is closely associated with the uses, the activities, and the condition of vegetation adjacent to the stream. How activities and uses are managed in these areas is partially determined by a variety of different rules and management plans established by the landowner and any agency with land use authority. To better understand the spatial distribution of different agency rules or management plans along the model extent DEQ mapped known designated management agencies (Table 6.11).

A designated management agency is defined in OAR 340-042-0030(2) as a federal, state, or local governmental agency that has legal authority over a sector or source contributing pollutants. Typically, persons or designated management agencies that are identified in the TMDL Water Quality Management Plan (WQMP) are responsible for developing TMDL implementation plans and implementing management strategies to reduce pollutant loading. Table 6.11 summarizes the potential designated management agencies and responsible persons along the Middle Fork John Day River model extent.

Table 6.11: Summary of potential designated management agencies (DMAs) or responsible persons along the model extent within 100 meters of the digitized Middle Fork John Day River centerline.

DMA or Responsible Person	Acres	Percent of Total Acres
Grant County	3017.3	52.2
Oregon Department of Forestry – Private Forestland	1598.1	27.7
U.S. Forest Service	1025.9	17.8
U.S. Bureau of Land Management	98.4	1.7
Oregon Parks and Recreation Department	21.7	0.4
Oregon Department of Transportation	6.8	0.1
U.S. Government	5.5	0.1
State of Oregon	3.1	0.1

6.5.4 Time frame of simulation

The model period is May 01, 2002 to October 31, 2002.

6.5.5 Important assumptions

The effort currently described in the QAPP includes use of existing models. Key calibration assumptions made during the model setup and calibration process were documented in the original TMDL (DEQ, 2010), the model user guide (Boyd and Kasper, 2003).

6.5.6 Model inputs

Table 6.12 summarizes the current configuration of the model input parameters and the source of these data. Temperature, flow, and meteorological input parameters are summarized to improve documentation of the TMDL approach.

Table 6.12: Boundary condition and tributary inputs to the existing Middle Fork John Day River Heat Source model.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Middle Fork John Day River Model Upper Boundary (14044000)	113	Boundary Condition	Flow	Derived data. USGS and DEQ	Estimated based on flows from gage at Ritter (14044000), instantaneous flow measurement on 8/10/02, and historical flow measurements at inactive flow gage at Austin
Middle Fork John Day at Headwaters (mswcd_29)	113	Boundary Condition	Water Temperature	Derived data. Monument SWCD	Estimated based on nearby thermistor, TIR and generic temperature profile.
Clear Creek	111.5	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.001.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Bridge (Bates pond)	110.7	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and TIR temperature balance with a flow factor of 0.0344.
Davis Creek	109.3	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and TIR temperature balance with a flow factor of 0.1494.
Vinegar Creek	108.7	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.009.
Vincent Creek	107.6	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.007.
Dead Cow Creek	107.4	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and TIR temperature balance with a flow factor of 0.1042.
TIR pool	103.6	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.003.
Deerhorn Creek	102.6	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.002.
Little Boulder Creek	101.8	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and TIR temperature balance with a flow factor of 0.1712.
Little Butte Creek	99.8	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.002.
Hunt Gulch	99.3	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and TIR temperature balance with a flow factor of 0.0318.
Butte Creek	95.2	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.038.
Granite Boulder Creek	93.6	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.01.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Calibration flow	93.3	Tributary	Flow	Derived data.	
Beaver Creek	92.2	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.01.
Ruby Creek	92.2	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and TIR temperature balance with a flow factor of 0.0662.
Ragged Creek	91.9	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.002.
Dry Creek	88.9	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.003.
Big Boulder Creek	87.4	Tributary	Flow	Derived data. Multiple sources	Estimated using TIR pool data.
Dunston Creek	83.6	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.002.
Camp Creek	79.2	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.003.
Gibbs Creek	78	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.002.
Quartz Gulch	76.3	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.051.
Calibration flow	76	Tributary	Flow	Derived data.	
Deep Creek	74.5	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.01.
Armstrong Creek	69.3	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.005.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Big Creek	64.2	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.024.
Huckleberry Creek	62.1	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.035.
Calibration flow	61.7	Tributary	Flow	Derived data.	
Cross Hollow	61.1	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.035.
Indian Creek	58.4	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.01.
Slide Creek	53.7	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.005.
Hansen Canyon Creek (RB)	45	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.015.
Lick Creek	44.4	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.002.
Granite Creek	41.8	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.0001.
Flowers Gulch	41.3	Tributary	Flow	Derived data. Multiple sources	Estimated based on historical accounts.
Spring (LB)	30.4	Tributary	Flow	Derived data. Multiple sources	Estimated based on historical accounts.
Upper Ritter H.S.	24.4	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.0001.
Ritter Hot Springs	22.9	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.005.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Calibration flow	9.9	Tributary	Flow	Derived data.	
Long Creek	9.2	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and watershed area method with a flow factor of 0.005.
Spring Complex (LB)	3.8	Tributary	Flow	Derived data. Multiple sources	Estimated using flow data from gage at Ritter and Historic gage data with a flow factor of 0.0769.
Clear Creek	111.5	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.95.
Bridge (Bates pond)	110.7	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.06.
Davis Creek	109.3	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.
Vinegar Creek	108.7	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.08.
Vincent Creek	107.6	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.93.
Dead Cow Creek (ctws_104)	107.4	Tributary	Water Temperature	CTWSIR	Data for 6/26/2002 to 10/7/2002. Estimated with generic temperature series and adjustment of 0.63 outside of those dates.
TIR pool	103.6	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data.
Deerhorn Creek	102.6	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.09.
Little Boulder Creek	101.8	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.
Little Butte Creek	99.8	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.91.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Hunt Gulch	99.3	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.01.
Butte Creek (ctws_48)	95.2	Tributary	Water Temperature	CTWSIR	Data for 6/26/2002 to 9/28/2004. Estimated with generic temperature series and adjustment of 0.83 outside of those dates.
Granite Boulder Creek (ctws_21)	93.6	Tributary	Water Temperature	CTWSIR	Data for 6/26/2002 to 10/7/2002. Estimated with generic temperature series and adjustment of 0.72 outside of those dates.
Calibration flow	93.3	Tributary	Water Temperature	Derived data.	Based on generic temperature profile
Beaver Creek (ctws_67)	92.2	Tributary	Water Temperature	CTWSIR	Data for 6/28/2002 to 10/7/2002. Estimated with generic temperature series and adjustment of 1 outside of those dates.
Ruby Creek (ctws_29)	92.2	Tributary	Water Temperature	CTWSIR	Data for 6/26/2002 to 9/29/2004. Estimated with generic temperature series and adjustment of 0.81 outside of those dates.
Ragged Creek	91.9	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.96.
Dry Creek	88.9	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.99.
Big Boulder Creek	87.4	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series and adjustment of 0.85.
Dunston Creek	83.6	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.03.
Camp Creek (ctws_26)	79.2	Tributary	Water Temperature	CTWSIR	Data for 6/28/2002 to 9/28/2004. Estimated with generic temperature series and adjustment of 1.18 outside of those dates.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Gibbs Creek	78	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.05.
Quartz Gulch	76.3	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.84.
Calibration flow	76	Tributary	Water Temperature	Derived data.	Based on generic temperature profile
Deep Creek	74.5	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.81.
Armstrong Creek	69.3	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.08.
Big Creek	64.2	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.96.
Huckleberry Creek	62.1	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 0.97.
Calibration flow	61.7	Tributary	Water Temperature	Derived data.	Based on generic temperature profile
Cross Hollow	61.1	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.03.
Indian Creek	58.4	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.09.
Slide Creek	53.7	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series and adjustment of 0.85.
Hansen Canyon Creek (RB)	45	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.16.
Lick Creek	44.4	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.09.
Granite Creek	41.8	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.09.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Flowers Gulch	41.3	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 1998 data, and an adjustment of 1.01.
Spring (LB)	30.4	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 2002 data, and an adjustment of 1.04.
Upper Ritter H.S.	24.4	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series.
Ritter Hot Springs	22.9	Tributary	Water Temperature	Derived data. Multiple sources	Estimated using historical notes.
Calibration flow	9.9	Tributary	Water Temperature	Derived data.	Based on generic temperature profile
Long Creek	9.2	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series.
Spring Complex (LB)	3.8	Tributary	Water Temperature	Derived data. Multiple sources	Estimated with generic temperature series, TIR 2002 data, and an adjustment of 1.03.
pcyo – Prairie City	0, 20.4, 53, 71.1, 79.2, 89.2, 89.8, 93.4, 95.2, 96.6, 104.3	Meteorological	Air Temperature, Wind Speed	Oregon AgriMet Weather Station	
pcyo – Prairie City	0	Meteorological	Cloudiness, Relative Humidity	Oregon AgriMet Weather Station	

Hourly meteorology inputs into the model include air temperature, cloudiness, relative humidity, and wind speed. Air temperature data were modified using the dry adiabatic lapse rate to adjust for differences in elevation between the measurement location and the model input location. Wind speeds were adjusted to improve the calibration using a wind-sheltering coefficient to represent difference in wind speed between the measurement location and above the stream within the riparian area.

6.5.7 Model calibration

The expected model calibration sites and data sources are summarized in Table 6.13. The model location in the table below describes the distance of each input from the most downstream model node. Effective shade model calibrations sites are summarized in Table 5.5. The model inputs and parameters that are expected to be modified to improve model fit are described in Section 6.1.

Table 6.13: Calibration sites and parameters used in the existing Middle Fork John Day River Heat Source model.

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
Middle Fork John Day River Model Upper Boundary	112.95	Wetted Width, Velocity, Flow, Average Wetted Depth	DEQ
Middle Fork John Day River at Caribou Creek (ctws_13)	104.3	Water Temperature	CTWSIR
Middle Fork John Day River 0.3 mile above Windlass Creek	98.55	Effective Shade	DEQ
Middle Fork John Day River Above Big Boulder Creek	97.95	Wetted Width, Velocity, Flow, Average Wetted Depth	DEQ
Middle Fork John Day River upstream of Butte Creek (ctws_32)	96.55	Water Temperature	CTWSIR
Middle Fork John Day River at Butte Creek (ctws_73)	95.15	Water Temperature	CTWSIR
Middle Fork John Day River at Riverside R (ctws_69)	93.45	Water Temperature	CTWSIR
Middle Fork John Day River upstream of Sunshine Creek (ctws_70)	89.75	Water Temperature	CTWSIR
Sunshine Ranger Station (Sunshine MNF) (Sunshine MNF)	89.2	Water Temperature	DEQ
Middle Fork John Day River at Camp Creek (ctws_31)	79.2	Water Temperature	CTWSIR
Middle Fork John Day River BLM Site 0.1 Mile Below Galena	73	Effective Shade	DEQ
Middle Fork John Day River Above Cole Canyon	71.55	Wetted Width, Velocity, Flow, Average Wetted Depth	DEQ
Middle Fork John Day River BLM Site, Gravel Quarry 1.0 Mile Above Big Creek	66.2	Effective Shade	DEQ
Middle Fork John Day River at Burn Canyon (mswcd_29)	53.05	Water Temperature	Monument SWCD
Middle Fork John Day River at Hwy 395	42.45	Wetted Width, Velocity, Flow, Average Wetted Depth	DEQ
Middle Fork John Day River BLM 1/16 Section 1-Mile Above Ritter Hot Springs	25.75	Effective Shade	DEQ
Middle Fork John Day River Ritter Gage	24.45	Wetted Width, Velocity, Flow, Average Wetted Depth	DEQ
Middle Fork John Day River at Ritter (14044000)	24.45	Flow	USGS
Middle Fork John Day River upstream of Eightmile Creek (DEQ Ritter Lower)	20.45	Water Temperature	DEQ
Middle Fork John Day River at the mouth	0	Wetted Width, Velocity, Flow, Average Wetted Depth	DEQ
Middle Fork John Day River at the mouth (jd_060)	0	Water Temperature	CTWSIR

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
Middle Fork John Day River from just upstream of Big Creek to Summit Creek (LiDAR)		Vegetation Height	Watershed Sciences (2006)
Model extent	Model extent	Water Temperature (TIR)	Watershed Sciences (2003)

6.6 North Fork John Day River

The North Fork John Day River model is a temperature model developed using Heat Source 8.0. The model was developed by DEQ.

6.6.1 Model domain

The extent of the model domain is the North Fork John Day River from the mouth to confluence with Baldy Creek. The model extent is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

6.6.2 Spatial and temporal resolution

The model input spatial resolution (*dx*) is 50 meters. Outputs are generated every 100 meters. The model time step (*dt*) is 0.5 minutes and outputs are generated every hour.

A *dx* of 50 meters was chosen to capture the range of solar flux input caused by the varied vegetation conditions along the length of the stream. The high resolution *dx* will allow evaluation of multiple vegetation management scenarios for each designated management agency.

6.6.3 Source characteristics

The primary sources of thermal loading contributing to temperatures exceedances in the North Fork John Day River include increases in solar radiation loading from the disturbance or removal of near-stream vegetation, and background sources (DEQ, 2010). Other potential sources include channel modification and widening, reductions to stream flow rate, and warming caused by climate change. The contribution of these latter potential sources may be investigated as part of a literature review and using results of the original TMDL model analyses. New model scenarios will only be developed if time allows.

There are no permitted individual NPDES point sources along the model extent.

The majority land uses along the North Fork John Day River are forestry and rangeland accounting for about 93 percent of the near-stream area. Table 6.14 summarizes all the land uses within 100 meters of the digitized North Fork John Day River centerline. Land uses were summarized using the 2016 National Land Cover Database (Yang et al., 2018). Note that Shrub/Scrub and Herbaceous land uses can be areas where forest clearcuts have occurred and would be classified as forest after regrowth.

Table 6.14: Summary of land uses along the model extent within 100 meters of the digitized North Fork John Day River centerline based on the 2016 National Land Cover Database (Yang et al., 2018).

2016 NLCD Land Cover	Acres	Percent of Total Acres
Evergreen Forest	4308.2	56.7
Shrub/Scrub	1953.7	25.7
Herbaceous	755.7	9.9
Developed, Open Space	314.9	4.1
Hay/Pasture	124.5	1.6
Cultivated Crops	82.5	1.1
Developed, Low Intensity	38.7	0.5
Woody Wetlands	11.8	0.2
Barren Land	4.0	0.1
Emergent Herbaceous Wetlands	4.0	0.1
Developed, Medium Intensity	0.4	<0.05

Anthropogenic related stream warming caused by nonpoint sources is closely associated with the uses, the activities, and the condition of vegetation adjacent to the stream. How activities and uses are managed in these areas is partially determined by a variety of different rules and management plans established by the landowner and any agency with land use authority. To better understand the spatial distribution of different agency rules or management plans along the model extent DEQ mapped known designated management agencies (Table 6.15).

A designated management agency is defined in OAR 340-042-0030(2) as a federal, state, or local governmental agency that has legal authority over a sector or source contributing pollutants. Typically, persons or designated management agencies that are identified in the TMDL Water Quality Management Plan (WQMP) are responsible for developing TMDL implementation plans and implementing management strategies to reduce pollutant loading. Table 6.15 summarizes the potential designated management agencies and responsible persons along the North Fork John Day River model extent.

Table 6.15: Summary of potential designated management agencies (DMAs) or responsible persons along the model extent within 100 meters of the digitized North Fork John Day River centerline.

DMA or Responsible Person	Acres	Percent of Total Acres
U.S. Forest Service	3468.8	40
U.S. Bureau of Land Management	2319.1	26.7
Grant County	1188.0	13.7
Oregon Department of Agriculture	792.5	9.1
Oregon Department of Forestry – Private Forestland	302.7	3.5
State of Oregon	242.9	2.8
Oregon Department of Transportation	129.5	1.5
Umatilla County	101.7	1.2
City of Monument	66.0	0.8
Oregon Department of State Lands	64.7	0.7
U.S. Government	0.4	<0.05

6.6.4 Time frame of simulation

The model period is June 15, 2002 to September 01, 2002.

6.6.5 Important assumptions

The effort currently described in the QAPP includes use of existing models. Key calibration assumptions made during the model setup and calibration process were documented in the original TMDL (DEQ, 2010), the model user guide (Boyd and Kasper, 2003).

6.6.6 Model inputs

Table 6.16 summarizes the current configuration of the model input parameters and the source of these data. Temperature, flow, and meteorological input parameters are summarized to improve documentation of the TMDL approach.

Table 6.16: Boundary condition and tributary inputs to the existing North Fork John Day River Heat Source model.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
North Fork John Day River at Baldy Creek (14046000)	172.9	Boundary Condition	Flow	Derived data. USGS	Estimated based on ratio (0.0674) of measured flow at the headwaters to measured flow at the USGS gage at Monument for one day.
North Fork John Day River at Baldy Creek	172.9	Boundary Condition	Water Temperature	DEQ	
Onion Creek	164.4	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.009.
Trail Creek	163.8	Tributary	Flow	Derived data.	Based on instantaneous flow measurement method using flow factor of 0.094.
Trout Creek	159.7	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.023.
Crane Creek	153.8	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.016.
Bear Gulch on left	146.3	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.006.
Granite Creek	141.4	Tributary	Flow	Derived data.	Based on instantaneous flow measurement method using flow factor of 0.268 and calibration factor of 1.5.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Backout Creek	139.4	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.014 and calibration factor of 2.
Glade Creek	134.8	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.006 and calibration factor of 2.
Basin Creek	129.5	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.013 and calibration factor of 4.
Big Creek	123.6	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.142 and calibration factor of 3.2.
Oriental Creek	118.2	Tributary	Flow	Derived data.	Based on instantaneous flow measurement method using flow factor of 0.02 and calibration factor of 4.
Otter Creek	115	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.005 and calibration factor of 4.
Texas Bar Creek	105.5	Tributary	Flow	Derived data.	Based on instantaneous flow measurement method using flow factor of 0.018.
Desolation Creek	97.2	Tributary	Flow	Derived data.	Based on TIR temperature balance method using flow factor of 1.062 and calibration factor of 1.5.
Meadowbrook Creek	96.4	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.152 and calibration factor of 2.
Camas Creek (14042500)	91.4	Tributary	Flow	OWRD	
Spring (Left Bank)	75.5	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.001.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Stony Creek	72.1	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.037.
Potamus Creek	62	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.097.
Mallory Creek	60.4	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.038.
Ditch Creek	56.6	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.023.
Middle Fork John Day River at Ritter (14044000)	51.6	Tributary	Flow	USGS	
Calibration flow	51	Tributary	Flow	Derived data.	Used as a flow calibration input to balance flow discrepancies.
Cabin Creek	44.8	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.013 and calibration factor of 0.8 (after 8/1).
Wall Creek	36	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.38 and calibration factor of 0.8 (after 8/1).
Deer Creek	27.9	Tributary	Flow	Derived data.	Based on watershed area method using flow factor of 0.084.
Cottonwood Creek	25.4	Tributary	Flow	Derived data.	Based on TIR temperature balance method using flow factor of 0.5.
Rudio Creek	8.3	Tributary	Flow	Derived data.	Based on instantaneous flow measurement method using flow factor of 0.016.
Onion Creek	164.4	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.765 using TIR 1998 data.
Trail Creek	163.8	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 1.075 using TIR 1998 data.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Trout Creek	159.7	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 1.027 using TIR 1998 data.
Crane Creek	153.8	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.923 using TIR 1998 data.
Bear Gulch on left	146.3	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.88 using TIR 1998 data.
Granite Creek (unfn_30)	141.4	Tributary	Water Temperature	USFS	Some estimated data; adjusted by factor of 1.012.
Backout Creek (unfn_6)	139.4	Tributary	Water Temperature	USFS	Some estimated data; adjusted by factor of 0.823.
Glade Creek	134.8	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 1.063 using TIR 1998 data.
Basin Creek	129.5	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.743 using TIR 2002 data.
Big Creek (unfn_9)	123.6	Tributary	Water Temperature	USFS	
Oriental Creek (26927-ORDEQ)	118.2	Tributary	Water Temperature	US Environmental Protection Agency	
Otter Creek (unfn_56)	115	Tributary	Water Temperature	USFS	Some estimated data; adjusted by factor of 0.779.
Texas Bar Creek (unfn_172)	105.5	Tributary	Water Temperature	USFS	Some estimated data; adjusted by factor of 0.799.
Desolation Creek (mswcd_27)	97.2	Tributary	Water Temperature	Monument SWCD	
Meadowbrook Creek (unfo_90)	96.4	Tributary	Water Temperature	USFS	Some estimated data; adjusted by factor of 0.94.
Camas Creek (26880-ORDEQ)	91.4	Tributary	Water Temperature	US Environmental Protection Agency	
Spring (Left Bank)	75.5	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.992 using TIR 2002 data.

Model Location Name (Station ID)	Model Location (kilometers)	Input Type	Model Input	Data Source	Note
Stony Creek	72.1	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.85.
Potamus Creek (unfn_62)	62	Tributary	Water Temperature	USFS	
Stadler Creek above Mallory (unfn_70)	60.4	Tributary	Water Temperature	USFS	
Ditch Creek	56.6	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.85.
Middle Fork John Day River at Ritter (jd_060)	51.6	Tributary	Water Temperature	BLM	Some estimated data; adjusted by factor of 1.109.
Calibration flow	51	Tributary	Water Temperature	Derived data.	Calibration flow temperature based on Middle Fork John Day temperature.
Cabin Creek (jd_070)	44.8	Tributary	Water Temperature	BLM	Some estimated data; adjusted by factor of 0.859.
Wall Creek (unfn_75)	36	Tributary	Water Temperature	USFS	Some estimated data; adjusted by factor of 0.646 plus 4°C.
Deer Creek	27.9	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.85.
Cottonwood Creek	25.4	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.85.
Rudio Creek	8.3	Tributary	Water Temperature	Derived data.	Generic temperature time series; adjusted by factor of 0.85.
Case	8.5, 44.4, 56, 82.7, 91.6, 99.6, 105.7, 112.7, 123.8, 141.5	Meteorological	Air Temperature, Relative Humidity	DRI-RAWS	
pcyo - Prairie City	8.5, 44.4, 56, 82.7, 91.6, 99.6, 105.7, 112.7, 123.8, 141.5	Meteorological	Cloudiness, Wind Speed	Oregon AgriMet Weather Station	

Hourly meteorology inputs into the model include air temperature, cloudiness, relative humidity, and wind speed. Air temperature data were modified using the dry adiabatic lapse rate to adjust for differences in elevation between the measurement location and the model input location. Wind speeds were adjusted to improve the calibration using a wind-sheltering coefficient to represent difference in wind speed between the measurement location and above the stream within the riparian area.

6.6.7 Model calibration

The expected model calibration sites and data sources are summarized in Table 6.17. The model location in the table below describes the distance of each input from the most downstream model node. Effective shade model calibrations sites are summarized in Table 5.5. The model inputs and parameters that are expected to be modified to improve model fit are described in Section 6.1.

Table 6.17: Calibration sites and parameters used in the existing North Fork John Day River Heat Source model.

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
250 Feet Below Baldy Creek	172.82	Wetted Width, Flow, Effective Shade	DEQ
850 Feet Below Baldy Creek	172.8	Effective Shade	DEQ
600 Feet Below Baldy Creek	172.7	Effective Shade	DEQ
1000 Feet Below Baldy Creek	172.65	Effective Shade	DEQ
1200 Feet Below Baldy Creek	172.6	Effective Shade	DEQ
Above Trail Creek (USFS)	164.5	Wetted Width, Velocity, Flow, Depth	DEQ
900 Feet Below Hwy 52 Bridge (Above Trail Creek)	164.3	Effective Shade	DEQ
1200 Feet Below Site Hwy 52 Bridge (Above Trail Creek)	164.25	Effective Shade	DEQ
600 Feet Below Hwy 52 Bridge (Above Trail Creek)	164.25	Effective Shade	DEQ
0.5 Mile Below Trail Creek	163.35	Effective Shade	DEQ
Jun 3, 2006, DB Field Note Site 1	162.6	Effective Shade	DEQ
Jun 3, 2006, DB Field Note Site 2	160.65	Effective Shade	DEQ
Jun 3, 2006, DB Field Note Site 3	159.65	Effective Shade	DEQ
Jun 3, 2006, DB Field Note Site 7	157.55	Effective Shade	DEQ
Jun 3, 2006, DB Field Note Site 11	155.6	Effective Shade	DEQ
Jun 3, 2006, DB Field Note Site 12	153.55	Effective Shade	DEQ
North Fork John Day River above Granite Creek (unfn_356)	141.5	Water Temperature	DEQ
0.1 Mile Above Granite Creek	141.45	Wetted Width, Velocity, Flow, Depth	DEQ
North Fork John Day River above Big Creek (unfn_52)	123.8	Water Temperature	USFS
1.3 Miles Above Oriental Creek	120.2	Effective Shade	DEQ
50 Feet Below Oriental Creek	118.35	Wetted Width, Velocity, Flow, Depth	DEQ
0.3 Mile Below Sulphur Creek	112.8	Wetted Width, Velocity, Flow, Depth	DEQ
North Fork John Day River above Camp Creek (nfjd_4p5us_of55junct)	112.7	Water Temperature	USFS
One Mile Above Texas Bar Creek	107.7	Effective Shade	DEQ
North Fork John Day River above Texas Bar Creek (28874-ORDEQ)	105.7	Water Temperature	DEQ

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
North Fork John Day River above Desolation Creek (25544-ORDEQ)	99.6	Water Temperature	DEQ
1.8 Miles Above Desolation Creek	99.05	Effective Shade	DEQ
0.4 Mile above Hwy 395 Bridge	96.75	Wetted Width, Velocity, Flow, Depth	DEQ
North Fork John Day River above Camas Creek (unfn_53)	91.55	Water Temperature	USFS
BLM Site 0.5 Mile Below Hunter Creek	82.85	Effective Shade	DEQ
5.2 Mile Below Camas Creek	82.75	Wetted Width, Velocity, Flow, Depth	DEQ
North Fork John Day River below Sulphur Gulch (nfjd_5p2ds_nfjd_rd)	82.7	Water Temperature	USFS
BLM Site One Mile Below Reichman Canyon	59.25	Effective Shade	DEQ
Jd_070 (jd_071)	55.95	Water Temperature	BLM
Jd_071 (jd_070)	44.4	Water Temperature	BLM
BLM 8S 28E S17 SW 1/4, 5 Miles Above Monument	33.85	Effective Shade	DEQ
North Fork John Day River at Monument, OR (14046000)	24.25	Flow, Effective Shade	USGS
Private Property at Rains Canyon (River Mile 8.8)	14.15	Effective Shade	DEQ
North Fork John Day River above Rudio Creek (28457-ORDEQ)	8.45	Water Temperature	DEQ
BLM Access, Lone Pine	3.1	Effective Shade	DEQ
BLM Access, 0.1 Mile Below Lone Pine	3	Effective Shade	DEQ
Model extent	Model extent	Water Temperature (TIR)	Watershed Sciences (2003)

7 Model evaluation and acceptance

7.1 Model uncertainty and sensitivity

Model uncertainty can arise from a number of sources including error associated with measuring field parameters used for model input or calibration, lack of knowledge on the appropriate value to use for model parameters or constants, or an imperfect mathematical formulation in the model of real world physical processes. A model's sensitivity is the degree to which predictions are affected by changes in a single or multiple input parameters.

In many cases, the major source of uncertainty is due to uncertainty in spatial representation of the river channel and adjacent land cover (e.g., bathymetry, vegetation height and density) from lack of data or simplification, configuration of the boundary conditions (e.g., uncertainty in estimation of ungaged tributary flows or temperatures), and uncertainty from limited amount or spatial distribution of observed data used for calibration. These sources of uncertainty are largely unavoidable, but do not invalidate the use of the model for decision purposes.

During the calibration process, it is good practice to evaluate and minimize uncertainty associated with the model parameters to the greatest extent practical (Beck, 1987; EPA, 2009). During the model calibration process, the responsiveness of the model predictions to various assumptions and rate constants should be evaluated. The model setup should include parameters based on literature recommendations and best professional judgment.

Reducing uncertainty in measured field parameters used for model input and calibration is accomplished in the following ways:

- Data used for the TMDL must have been collected based on a project plan with quality assurance and quality control protocols for collecting and analyzing samples.
- The sampling and laboratory analysis must follow widely accepted scientific methods and protocols. These may include DEQ's Mode of Operations Manual (DEQ, 2023), USEPA methods, USGS's published techniques of water-resources investigations, the USGS national field manuals, or standard methods for the examination of water and wastewater. All acceptable methods include applicable precision and accuracy checks.
- When possible, accuracy and precision should be evaluated using DEQ's data validation criteria as outlined in DEQ's data validation criteria for water quality parameters measured in the field (DEQ, 2013). The TMDL program uses waterbody results that demonstrate a data quality level of A, B, or E with careful review (DEQ, 2021). For continuous temperature data a data quality of A or B corresponds to an absolute accuracy 1.0°C and absolute precision 2.0°C. Data of unknown quality lacking audit and pre and post accuracy checks may also be used following a careful review where it is determined the results appear reasonable and free of issues based on professional judgment.

Uncertainties in the mathematical formulation are addressed by using open source models that allow free and transparent inspection of model code, and models that have had their methodologies peer reviewed and evaluated.

It is not anticipated that additional uncertainty or sensitivity analyses will be performed on the existing calibrated models.

7.2 Model acceptance

This section identifies the model acceptance criteria. Model acceptance relies on satisfying seven (7) conditions:

1. Incorporation of all available field observations of the system (e.g., geometry, flow, boundary inputs/withdrawals, and meteorology) for the time period simulated.
2. Model parameters and unmeasured boundary conditions that are within literature-supported and physically defensible ranges.
3. Model predicted results have been compared with the associated observed measurements using graphical presentations. Visual comparisons are useful in evaluating model performance over the appropriate temporal or spatial scales.

4. Goodness of fit statistics have been calculated comparing the model predicted results to the associated observed measurements. The calibration goodness of fit statistics are shown in Equation 4 through Equation 8.

5. Goodness of fit statistics have been used to inform the appropriate use of the model. Where a model achieves an excellent or good fit it can generally assume a strong role in decision making about appropriate management options. Conversely, where a model achieves only a fair or poor fit it should assume a much less prominent role in decision making about appropriate management options. If a desired level of quality is not achieved on some or all measures, the model might still be useful; however, a detailed description of its potential range of applicability will be provided.

6. Written documentation of all important elements in the model, including model setup, model parameterization, key assumptions, and known areas of uncertainty.

7. Peer review as described in Section 9.

Equation 5 through Equation 8 are the goodness of fit statistics to be calculated for each calibrated temperature model. Equation 4 through Equation 7 are the goodness of fit statistics to be calculated for each calibrated shade model.

Coefficient of Determination – R squared (R^2): A coefficient of determination, or R^2, of one indicates a perfect fit. R^2 is a measure of how well predicted values fit the observed data. It compares the variations in the residuals to the variation of the observed data.

$$R^2 = 1 - \frac{\sum(X_{obs} - X_{mod})^2}{\sum\left(X_{obs} - \overline{X_{obs}}\right)^2} \qquad \text{Equation 4}$$

Mean Error (ME): A mean error of zero indicates a perfect fit. A positive value indicates on average the model predicted values are less than the observed data. A negative value indicates on average the model predicted values are greater than the observed data. The mean error statistic may give a false ideal value of zero (or near zero) if the average of the positive deviations between predictions and observations is about equal to the average of the negative deviations in a data set. Because of this, the mean absolute error (MAE) statistic should be used in conjunction with mean error to evaluate model performance.

$$ME = \frac{1}{n}\sum(X_{mod} - X_{obs}) \qquad \text{Equation 5}$$

Mean Absolute Error (MAE): A mean absolute error of zero indicates a perfect fit. The magnitude of the mean absolute error indicates the average deviation between model predicted values and observed data. The mean absolute error cannot give a false zero.

$$MAE = \frac{1}{n}\sum|X_{mod} - X_{obs}| \qquad \text{Equation 6}$$

Root Mean Square Error (RMSE): A root mean square error of zero indicates a perfect fit. Root mean square error is a measure of the magnitude of the difference between model predicted values and observed data.

$$RMSE = \sqrt{\frac{1}{n}\sum(X_{mod} - X_{obs})^2} \qquad \text{Equation 7}$$

Nash-Sutcliffe efficiency coefficient (NS): Nash-Sutcliffe efficiencies can range from -∞ to 1. An efficiency of 1 corresponds to a perfect match of modeled predicted values to the observed data. An efficiency of 0 indicates that the model predictions are as accurate as the mean of the observed data, whereas an efficiency less than zero occurs when the observed mean is a better predictor than the model.

$$NS = 1 - \frac{\sum(X_{obs} - X_{mod})^2}{\sum\left(X_{obs} - \overline{X_{obs}}\right)^2} \qquad \text{Equation 8}$$

where,
X_{mod} = The model predicted results;
X_{obs} = The observed or measured results;
$\overline{X}_{obs}$ = The mean of the observed or measured temperature;
n = The sample size.

8 Documentation in model reports

Model documentation will consist of a series of TMDL technical appendices describing the model setup, model calibration results, model scenario setup, and model scenario results.

The model setup and calibration documentation will include details on the calibrated model domain and layout; spatial and temporal resolution; timeframe of simulation; summary of data used for model inputs; summary of methods used to fill data gaps; summary of data used for calibration; time series plots comparing observed and model predicted temperatures and other parameters as appropriate; goodness-of-fit statistics, and plots and tables summarizing temperature and effective shade model results.

The model scenario setup and scenario results documentation will include a description of the scenario, what model elements were modified for the scenario; tables, plots, or narrative summarizing the final values for any modified inputs or parameters; methods or data sources used to setup the scenario; and plots and tables that summarize the scenario results.

When no changes or minor changes are made to the existing TMDL models, the existing TMDL technical appendices will be amended as necessary to document any changes to the existing calibration or management scenarios. For more extensive changes, including extending the model time period or developing entirely new models, new technical appendices may need to be developed to document the models and results.

9 Peer review

Peer review of the models and model results will be conducted in the following ways:

DEQ will conduct internal peer review during the modeling process with input from USEPA Region 10 as needed. For models being developed by USEPA's contractor, Tetra Tech, USEPA and DEQ will peer review all contractor developed models and model documentation.

DEQ will consider feedback on model scenarios and results from the TMDL rulemaking advisory committee and make changes as appropriate.

DEQ will review and respond to any public comments received on the model and model results, and make changes as appropriate.

10 Management scenarios

Management scenarios described in this section summarize the means by which sources of stream warming and different management alternatives will be evaluated. Some of these model scenarios may not be developed due to lack of sufficient data and information, because the management scenario is not applicable to the specific waterbody, or because it is determined the scenario will require an effort and timeline that does not align with the project schedule or available resources. In some cases, the management scenario has already been developed as part of the previous TMDL and does not need further adjustment. DEQ will review all available data and information during model development and document final model scenario decisions, setup, and results in the TMDL technical appendix.

10.1 Current conditions

This scenario evaluates the stream temperature response under current existing conditions. This scenario is similar to the calibrated model except that some sources conditions will be modified, may be removed, or new ones added to reflect the current conditions or discharge loads if they are significantly different from the calibrated model. To date there have been no significant changes to source conditions that would require development of a current condition scenario. If new information is identified during the TMDL process that requires this scenario be developed, the assumptions and methods will be documented in the TMDL.

10.2 Background

This scenario evaluates the stream temperature response from background sources only. Background sources include all sources of pollution or pollutants not originating from human activities. Background sources may also include anthropogenic sources of a pollutant that DEQ or another Oregon state agency does not have authority to regulate, such as pollutants emanating from another state, tribal lands, or sources otherwise beyond the jurisdiction of the state (OAR 340-042-0030(1)). This scenario essentially combines the following model scenarios: restored vegetation and natural stream flow. Other elements may include improvements to channel morphology if appropriate. The background scenario will be compared

to the current conditions model scenario to determine the point of maximum impact, and the amount of cumulative warming originating from human activities that DEQ or another Oregon state agency have authority to regulate.

10.3 Restored vegetation

This scenario evaluates the stream temperature response with streamside vegetation at restored conditions. The stream temperature warming or cooling contributed by removal of streamside vegetation is evaluated by comparing this scenario to the current condition model. Elements of this scenario or scenarios may include:

- Streamside vegetation will be set to restored conditions in areas along the model extent that are currently characterized as lacking streamside vegetation because of anthropogenic disturbance. The restored vegetation type, height, density, and overhang values will be determined during the TMDL process and will likely be the same or similar to the values presented in the John Day River Basin TMDL and WQMP (DEQ, 2010).
- Model inputs for land cover height, canopy density, and overhang will be modified to reflect the restored conditions.
- All other model inputs will be the same as the current condition model.

10.4 Natural stream flow

This scenario evaluates stream temperature response by changing permitted water withdrawals to instream flow. The stream temperature warming or cooling from keeping permitted water withdrawals as instream flow is evaluated by comparing this scenario to the current conditions model scenario. Assumptions and methods used to estimate restored stream flow will be documented in the TMDL. Elements of this scenario or scenarios may include:

- Maintaining all currently permitted water withdrawals as instream flow in order to increase the thermal loading capacity and reduce stream warming.
- Model boundary and tributary flows will be set to reflect the additional instream flows.
- All other model inputs will be the same as the current condition model.

10.5 Tributary temperatures

This scenario evaluates the stream temperature response when the temperature of tributaries that exceed applicable temperature standards are set to temperatures that attain the those temperature standards. This scenario will be compared to the current condition model to quantify the stream temperature impact of tributary temperature standard exceedances. Assumptions and methods used to estimate tributary temperatures that attain the applicable temperature standard will be documented in the TMDL. Elements of this scenario or scenarios may include:

- Tributary temperature inputs set so they attain the applicable temperature standards.

- All other model inputs, including tributary flow, will be the same as the current condition model.

10.6 Channel morphology

This scenario evaluates stream temperature response from improvements to channel morphology, including projects to restore cold water refuges. The warming or cooling from channel morphology improvements is evaluated by comparing this scenario to the current conditions model scenario. Assumptions and methods used to develop this scenario will be documented in the TMDL. Elements of this scenario or scenarios may include:

- Modifying channel width and/or depth to reflect a range of morphological conditions. The approach from the 2005 TMDL will be utilized where bankfull width is reduced by 10-50%, while cross sectional area is preserved. As bankfull width is reduced, some wetted area will become dry land. The vegetation type assigned to these areas will be based on the nearest vegetation type downstream.
- Model configurations for channel width, bank angle, channel position, Manning's *n*, gradient, elevation, porosity, percent hyporheic flow, hyporheic zone thickness, land cover height, density, and overhang may be modified in areas with improved channel morphology.
- All other model inputs will be the same as the current condition model.

10.7 No point sources

This scenario evaluates the stream temperature response from removing point source heat load. The stream temperature warming or cooling from permitted NPDES point sources is evaluated by comparing this scenario to the current conditions model scenario. Elements of this scenario or scenarios may include:

- Removal of all point sources from the model.
- All other model inputs will be the same as the current condition model.

10.8 TMDL wasteload allocations

This scenario evaluates stream temperature warming or cooling from the TMDL wasteload allocations. These scenarios will be compared to the no point source model scenario to evaluate attainment of the HUA allocations. Numeric or narrative wasteload allocations will be developed for all NPDES permittees but some of the permittees may not be included in this model scenario due to availability of effluent data, lack of discharge, or because the discharge is not a significant source or thermal loading. Elements of this scenario or scenarios may include:

- Modifying point source discharges to reflect proposed or existing TMDL wasteload allocations.
- All other model inputs will be the same as the current condition model.

10.9 Attainment scenario

The attainment scenario evaluates attainment of the cumulative HUA (0.3°C) based on point and nonpoint sources being set at their respective allocations. This scenario will be compared to the background or similar scenario that excludes the sources receiving a TMDL allocation. Elements of this scenario or scenarios may include:

- Point source discharges are set to reflect individual proposed wasteload allocation flows and temperatures.
- Tributary temperatures are increased by the portion of the HUA assigned to point or nonpoint sources on that tributary. HUA held as reserve capacity is not included.
- Streamside vegetation will be set to restored conditions in areas along the model extent that are currently characterized as lacking streamside vegetation because of anthropogenic disturbance. The restored vegetation type, height, density, and overhang values will be determined during the TMDL process and will likely be the same or similar to the values presented in the John Day River Basin TMDL and WQMP (DEQ, 2010). Model inputs for land cover height, canopy density, and overhang will be modified to reflect the restored conditions.

11 Project organization

11.1 Project team/roles

Project roles and responsibilities are described in Table 11.1.

Table 11.1: The roles and responsibilities of each team member involved in the temperature TMDL replacement project.

Name	Position	Role and Responsibilities
Jennifer Wigal	Water Quality Administrator, Oregon DEQ	**Sponsor** 1. Provide guidance to team and project manager 2. Approve project plan and changes to the project, scope, budget, and schedule (pending manager elevation as necessary) 3. Sustain support of decision makers at their level, all stakeholders 4. Remove roadblocks 5. Communicate progress to other managers and Water Quality Director 6. Review project status 7. Manage resistance 8. Ensure communication with employees affected by changes 9. Provide forum to listen to concerns
Steve Mrazik	Manager, Watershed Management, Oregon DEQ	**Manager** 1. Review and approve teamwork products 2. Communicate progress to other managers

Name	Position	Role and Responsibilities
		3. Approve project plan, changes to the project, and any changes that affect scope and schedule 4. Approve development and finalization of solutions to issues that occur during the project 5. Decide measures of project success
Michele Martin	Project Manager, Water Quality, Oregon DEQ	**Project Manager** 1. Facilitate meetings, effective meeting management 2. Provide feedback and leadership in the development of meeting agendas, activities during meetings, and tasks 3. Provide feedback on project planning and design 4. Keep sponsor informed 5. Develop project charter 6. Develop project plan (including major tasks, milestones, project schedule, communication plan, risk analysis, etc.) 7. Develop team meeting agendas 8. Keep track of meeting decisions and notes (very brief), and team ideas 9. Ensure team's work drives towards outcomes and deliverables 10. Sustain engagement of team members and team performance 11. Control project scope (with Technical Lead) 12. Coordinate team communication: emails, SharePoint, shared drives 13. Closeout project and document lessons learned
Ryan Michie	Senior Water Quality Analyst, Watershed Management, Oregon DEQ	**Project Technical Lead** 1. Lead, oversee, and direct development of the project QAPP 2. Lead, oversee, and direct the public data solicitation process 3. Coordination with EPA and Contractor 4. Lead, oversee, and direct DEQ technical staff 5. Perform model calibration/evaluation 6. Run model scenarios 7. Analyze and interpret model results 8. Lead, oversee, and direct TMDL document writing 9. Participate and present at TMDL public meetings 10. Respond to public comments
Yuan Grund	Water Quality Analyst, Watershed Management, Oregon DEQ	1. Write QAPP 2. Develop and configure models 3. Perform model calibration/evaluation 4. Run model scenarios 5. Analyze and interpret model results 6. Write TMDL 7. Participate and present at TMDL public meetings 8. Respond to public comments

Name	Position	Role and Responsibilities
Trea Nance	Basin Coordinator, Oregon DEQ	1. Review QAPP and TMDL 2. Write WQMP 3. TMDL rulemaking advisory committee coordinator 4. Participate and present at TMDL public meetings 5. Respond to public comments
Travis Bartholomew	Agency QA Officer, Oregon DEQ	Review QAPP
Dianne Lloyd	Oregon Department of Justice	**Legal Counsel**
Rob Burkhardt	Water Quality Specialist, Oregon DEQ	1. Project team point of contact to NPDES permit program and permittees 2. Review wasteload allocations
Tetra Tech	Contractor	TMDL development support
Rebecca Veiga Nascimento	EPA Region 10 Oregon TMDL Program Manager	**EPA TMDL Lead** 1. Review EPA Contractor work products 2. Technical TMDL reviewer 3. Regulatory/Policy TMDL reviewer
Ben Cope	EPA Region 10 QAPP Officer for Modeling Projects	**EPA Modeling Lead** 1. Review QAPPs 2. Review EPA Contractor work products
Gunnar Johnson	EPA Region 10 EPA Task Order Manager	**Direct EPA Contractor**
TMDL rulemaking advisory committee	This TMDL will have a rulemaking advisory committee.	1. Participate in TMDL rulemaking advisory committee meetings 2. Provide input to DEQ on TMDL and WQMP elements 3. Advise DEQ on economic and fiscal impacts of the proposed rules for entities impacted by the proposed TMDL and potential impacts on small businesses

11.2 Expertise and special training requirements

Additional expertise or special training is not necessary at this time.

DEQ staff involved in developing and configuring models, performing model calibration, running model scenarios, and analyzing and interpreting model results have experience in these tasks from numerous other modeling projects. The Project Manager has extensive experience managing large complex projects and will ensure strict adherence to the project protocols.

11.3 Reports to management

The DEQ Project Manager (or designee) will provide progress reports to DEQ Management and USEPA as needed based on new project information. As appropriate, these reports will provide information on the following:

- Adherence to project schedule and/or budget.
- Deviations from approved QAPP, as determined from project assessment and oversight activities.
- The impact of any deviations on model application quality and uncertainty.
- The need for and results of response actions to correct any deviations.
- Potential uncertainties in decisions based on model predictions and data.
- Data quality assessment findings regarding model input data and model outputs.

11.4 Project schedule

The John Day River Basin TMDL project is scheduled to occur in two phases. The pre TMDL project phase, and the TMDL and WQMP development phase.

Pre TMDL project phase

The pre TMDL project phase spans between January 2020 through the end of February 2025. In this phase most of the planning and technical work occurs. To date, the majority of these tasks have been completed. Specific tasks include:

Task P1 Data gathering and project organization.

P1.1 Organize and gather effluent data from all active NPDES permittees in the temperature TMDL replacement project area.

P1.2 Organize and gather all available and relevant river temperature, stream flow, habitat, effective shade, and channel morphology.

P1.3 Complete an open data solicitation. During the solicitation period, the public may submit continuous stream temperature data and NPDES effluent data to DEQ in the watersheds subject to the temperature TMDL replacements.

P1.4 Review data collected. Data submitted to DEQ will be screened for completeness and quality, and whether the results are within the typical range expected for that season and time of day.

P1.5 Stream temperature data will be made available in DEQ's AWQMS database.

Task P2 Develop modeling QAPPs. The modeling QAPPs will identify the available data and overall technical approach to be taken for each TMDL project.

Task P3 Mapping of Designated Management Agencies (DMAs) and Responsible Persons for counties that are within the project area. All Oregon counties are within the project area except Tillamook, Clatsop, and Deschutes counties.

Task P4 Development of computer code to streamline analysis tasks and TMDL document production.

Task P5 Development of template TMDL and WQMP section outlines and language.

Task P6 Implement Modeling QAPPs (Task P2). Gathering of new data and completing the new technical work described in the modeling QAPPs, as well as finalizing the modeling work.

TMDL and WQMP development phase

The development phase for the TMDL and WQMP is scheduled to begin in 2024, with USEPA's final agency action, approving or disapproving the TMDL, no later than April 17, 2026. In this phase, the draft TMDL and WQMP documents will be written; a TMDL rulemaking advisory committee will be convened to discuss the updated TMDL allocations, any revisions to the WQMP, and potential fiscal impacts in the case of a rulemaking process; and finally, DEQ will conduct a public comment period. DEQ will respond to all public comments received and revise the TMDL and WQMP as necessary. In the case of a rulemaking, DEQ will present the proposed TMDL to the Environmental Quality Commission for rule adoption, and then submit the final TMDL to USEPA for their action.

12 Data management

DEQ does not anticipate collecting additional field samples. Water quality data gathered and used for this project will be managed in DEQ's AWQMS database or the project files.

The modeling software to be used for this project is available on DEQ's TMDL program website.

Model-generated data resulting from testing, calibration, and scenarios will be stored in spreadsheets and text files by DEQ in the TMDL project directory. Metadata describing the content, date, and personnel involved in modeling will be documented alongside raw and summarized data.

Secondary data developed as part of this task will be maintained as hardcopy only, both hardcopy and electronic, or electronic only, depending on their nature.

All electronic data will be maintained on DEQ's computers and servers. DEQ's computers are serviced by in-house specialists. When a problem with DEQ's computers and servers occurs, in-house computer specialists diagnose the problem and correct it if possible. When outside assistance is necessary, the computer specialists call the appropriate vendor. For other computer equipment requiring outside repair and not covered by a service contract, local computer service companies are used on a time-and-materials basis.

Routine maintenance of DEQ's computers and servers is performed by in-house computer specialists. Electric power to each computer flows through a surge suppressor to protect electronic components from potentially damaging voltage spikes. All computer users have been instructed on the importance of routinely archiving work assignment data files from hard drive to server storage. The office network server is backed up on tape nightly during the week. Screening for viruses on electronic files loaded on DEQ's computers or the network is standard policy. Automated screening systems have been placed on all computer systems and are

updated regularly to ensure that viruses are identified and destroyed. Annual maintenance of software is performed to keep up with evolutionary changes in computer storage, media, and programs.

13 Recordkeeping and archiving

All data and documents generated during the course of the TMDL project will be archived according to the current Oregon State Archives Division records retention schedules. Generally TMDL documents will be retained until 15 years after the TMDL is no longer operational.

Records that are stored in electronic format will be located in either the TMDL project folder or Master TMDL folder located on DEQ's TMDL server. The TMDL project folder will contain at minimum the following subfolders: "Project Plans", "Data", "NPDES", and "Models". Alternative names and additional subfolders can be used as appropriate. The Master TMDL folder will contain the written TMDL documents (Word, PDF) along with supporting written documents that support the public comment period and TMDL issuance. The contents and organization of these subfolders is described below.

Project Plans: All documents related to project planning, project proposals, project schedules, and the modeling QAPPs. Each will reside in their relevant subfolders. The final versions of documents will be clearly identified from drafts and ideally located in separate folders.

Data: All field data organized or collected in support of the TMDL project. This may include water quality samples, field sheets, photos, monitoring metadata, third party sampling project plans, or other documentation. The data should be organized by parameter and data source if possible.

NPDES: All available NPDES effluent data, discharge monitoring reports, copies of NPDES permits, and related information. Data and permit information will be organized for each permittee and located in separate subfolders.

Models: All models used for the TMDL project including calibration and scenario models. The models should be organized into subfolders for each model domain and model scenario. Draft models and the final TMDL models will be clearly identified and ideally saved in separate folders. The model folders should include:

- The model with all input and output files and any executable code used;
- Copy of all raw and summarized data (including GIS files) used for model input with data source and location metadata included;
- Scripts or spreadsheets used to transform raw data or used to derive model inputs;
- Key assumptions and documentation for the model setup and parameterization;
- Documentation of newly developed model code or modifications to the existing model; and
- Identification of staff that completed the model.

TMDL documents: At each key stage of TMDL and WQMP development copies of the following documents will be saved in separate subfolders within the project folder on the Master TMDL directory. The final versions of documents will be clearly identified from drafts and ideally saved in separate folders.

- Meetings: All documents produced for external meetings including agendas, presentations, and meeting materials. Material for each meeting will be saved in a subfolder organized by meeting type. Draft documents and final documents will be clearly identified.
- Public Notice Drafts:
    - Briefing memo to DEQ Water Quality Division Administrator or Director on public comment draft
    - Draft TMDL and WQMP Report (Both Word and PDF)
    - Draft TMDL Appendices (Both Word and PDF)
    - Public Notice document
    - TMDL Summary Fact Sheet
    - News release
    - GovDelivery Notice and email
    - Other public notification emails
    - Mailing List (if used)
    - Public Comments Errata
- Public Comments Received: Copy of all public comments received
- Final TMDL and WQMP documents:
    - Briefing memo to DEQ Water Quality Division Administrator or Director on final TMDL
    - Final TMDL EQC documents
    - WQMP DMA letters
    - TMDL issuance letter to USEPA (both Word and PDF)
    - USEPA approval letter (USEPA)
    - Response to Comment Document (both Word and PDF)
    - TMDL and WQMP Report (both Word and PDF)
    - TMDL Appendices (both Word and PDF)
    - TMDL Summary Fact Sheet
    - News release
    - GovDelivery Notice and email
    - Other public notification emails
    - Relevant EQC agenda documents
    - Designated Management Agency/Responsible Person notification letters (both Word and PDF)
    - Addendums
    - Errata
    - Petitions
    - Director’s Petition Action (acceptance or rejection of petition)

- Response to Petition
- ATTAINS upload files

14 QAPP review and approval

The DEQ Project Technical Lead will distribute the draft QAPP to the respective DEQ and USEPA project team members for review. Comments will be provided to the Project Technical Lead for further discussion. When possible, revision and submittal of the final plan will be made within 10 business days of receipt of comments. Following approval, the Project Technical Lead will distribute the final, signed copy to the respective DEQ and USEPA project team members.

USEPA has an independent responsibility for this QAPP and must complete a separate approval protocol. USEPA approval is necessary for USEPA contractors to begin any modeling work.

Official copies of the final, approved QAPP will be retained in DEQ's document control system. If any change(s) to the QAPP are required during the project, they must be described in a memorandum and approved by the signatories to this QAPP and attached to the QAPP.

15 Implementation and adaptive management

DEQ plans to develop a Risk Management Plan to identify project constraints, the risks that may arise during project implementation, and potential solutions. Identified project constraints include the abbreviated project schedule with hard deadlines established via court order, limited resources, uncertain funding from USEPA, and a complex TMDL technical effort which may require additional time and public process. Projects risks from these constraints and proposed solutions are described in Table 15.1.

Table 15.1: Projects risks and proposed solutions.

Risk Description	Solution
Extended public process for complex TMDLs	Communication to DEQ manager and external contacts as deemed necessary by the manager
Team member availability: Inadequate resources to effectively produce the TMDL	Dedicate additional resources to support the effort from internal staff
Delivery commitment	Designate the projects as priority and dedicate additional resources to support the effort from internal staff or contractor (depending on contractor funding)
Scope creep: Working on the TMDLs could be an opportunity for attempts to add additional technical work that are outside the project scope	Sponsor and Manager to address scope creep with stakeholders as necessary
In scope – no time e.g., technical work may take longer than expected. Prioritizing the in-scope work for only absolute requirements.	Request court extensions or allocate more resources to meet deadlines, if more resource are available, or reduce the in-scope requirements to the absolute minimum for a scientifically defensible and EPA approvable TMDL.

Should a situation arise that requires a significant change in the technical approach, the project team will update the QAPP as needed through revisions or addenda.

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17 Revision history

Table 17.1: QAPP revision history.

Revision	Date	Changes	Editor
1.0	9/10/2024	New QAPP	R. Michie

Appendix A Meteorology data summary

Table A.1: Meteorological stations and data available in the National Climatic Data Center (NCDC) database in the John Day River Basin.

Station ID	Station	Latitude/Longitude
20016110	JOHN DAY 3 E	44.4167/-118.9
20016112	JOHN DAY	44.4233/-118.959
20016125	PRAIRIE CITY RANGER STN	44.45/-118.717
20016145	AUSTIN 3 S	44.5747/-118.491
20016148	DAYVILLE 8 NW	44.5564/-119.645
20016178	LONG CREEK	44.7147/-119.103
20016205	MONUMENT	44.8167/-119.433
20016207	MONUMENT RANGER STN	44.8167/-119.417
20016208	SPRAY	44.8191/-119.776
20016245	FOSSIL	45/-120.217
20016260	UKIAH	45.1333/-118.933
20016280	CONDON	45.2333/-120.183
20016359	MIKKALO 6 W	45.4667/-120.35
20016360	MORO	45.4833/-120.717
20016535	JOHN DAY AIRPORT	44.4039/-118.963
30000212	MITCHELL 2 E	44.5681/-120.116
30014507	JOHN DAY 35 WNW	44.556/-119.646
30021618	PRAIRIE CITY 0.2NE	44.4636/-118.706
30026556	CONDON 1.8 NNE	45.2583/-120.164
30046390	KIMBERLY 8.2 SSW	44.63/-119.64
30048218	FOSSIL 0.2 SE	44.9966/-120.211
30067692	CONDON 5.5 W	45.25/-120.3
30070470	UKIAH 3.9 N	45.1896/-118.917
30074039	MOUNT VERNON 4.6SSE	44.3575/-119.074
30074644	CASE OREGON	44.9711/-118.93
30074902	MEYERS CANYON OREGON	44.61/-120.182
30075191	TUPPER OREGON	45.0708/-119.49
30075223	MADISON BUTTE	45.11/-119.5
30075307	KEENEY TWO OREGON	44.6661/-118.921
30075381	ARBUCKLE MTN	45.19/-119.25
30075774	FALL MOUNTAIN OREGON	44.2939/-119.033
30075855	NORTH POLE RIDGE OREGON	45.0375/-120.531
30075900	GOLD CENTER	44.76/-118.31
30075909	BOARD CREEK OREGON	44.5933/-119.278
30076204	BLUE MOUNTAIN SPRING	44.25/-118.52
30076350	SLIDE MOUNTAIN OREGON	44.4625/-120.294
30076366	MITCHELL OREGON	44.5819/-120.179

Station ID	Station	Latitude/Longitude
30091897	DAYVILLE 2.7 WNW	44.4877/-119.579
30121496	JOHN DAY 0.6 NW	44.426/-118.957

Table A.2: Meteorological stations and data, including humidity, precipitation, temperature, wind direction, and wind speed, available in the Remote Automatic Weather Station (RAWS) database in the John Day River Basin.

Station ID	Station	Latitude/Longitude	Agency
orOBDG	BRIDGE	45.0167/-118.867	
orOKEE	KEENEY CAMP	44.6667/-118.917	
orORAN	RANCH	45.2133/-118.667	USFS

Table A.3: Meteorological stations and data, including air temperature, precipitation, relative humidity and wind, available in the USBR AgriMet database in the John Day River Basin.

Station ID	Station	Latitude/Longitude
GOLW	GOLDENDALE, OREGON AGRIMET WEATHER STATION	45.8119/-120.824
PCYO	PRAIRIE CITY, OREGON AGRIMET WEATHER STATION	44.4408/-118.628

Table A.4: Meteorological stations and data, including air temperature, precipitation, relative humidity, wind speed and wind direction, available in the MesoWest database in the John Day River Basin.

Station ID	Station	Latitude/Longitude
2037P	OMSI HFS	44.9195/-120.426
A4204	JOHN DAY DAYTON ST	44.418/-118.951
AS144	N7GSU CONDON	45.2371/-120.299
AS463	KB7CPC GRASS VALLEY	45.335/-120.788
BCFO3	BOARD CREEK	44.5981/-119.308
BPWAS	WASCO	45.5003/-120.767
C0942	CW0942 WINLOCK	44.9117/-119.892
C2286	CW2286 MONUMENT	44.8181/-119.42
C3255	CW3255 DAYVILLE	44.4663/-119.54
C4012	CW4012 MITCHELL	44.5656/-120.153
C7527	CW7527 CONDON	45.2317/-120.183
C8140	CW8140 SPRAY	44.8343/-119.792
C8178	CW8178 PRAIRIE CITY	44.467/-118.712
C8927	CW8927 YOUNG LIFE RANCH	44.8288/-120.491
C9027	CW9027 UKIAH	45.1363/-118.935
C9800	CW9800 MIKKALO	45.469/-120.234
CDNOR	CONDON OR	45.24/-120.17
COOPCONO3	UNASSIGNED	45.23/-120.18
COOPDAVO3	DAYVILLE 8NW	44.56/-119.64
COOPMMTO3	MONUMENT 2	44.82/-119.42
CPC07	SHERMAN STATION LTE	45.4834/-120.719
D1028	DW1028 AJAX	45.3802/-120.463
D1430	DW1430 WYMAN SPRINGS RIDGE	44.8352/-120.626

Station ID	Station	Latitude/Longitude
D2545	DW2545 FOSSIL	45.0022/-120.213
D2631	DW2631 MOUNT VERNON	44.3573/-119.074
D3138	DW3138 HARDMAN	45.022/-119.671
DCIO	DEER CREEK NEAR IZEE, OR	44.1969/-119.469
DT093	BAR JJ	45.468/-120.718
E2055	EW2055 PRAIRIE CITY	44.4509/-118.716
E2137	EW2137 WASCO	45.6273/-120.6
E3865	EW3865 JOHN DAY	44.4205/-118.954
E6764	EW6764 MITCHELL8W	44.5973/-120.309
FMFO3	FALL MOUNTAIN	44.2969/-119.037
GRSO3	NRAWS #7 GROUSE CREEK NEAR CANYON CITY 5SSW	44.3194/-118.973
JBMO3	JOHN DAY RIVER AT BLUE MOUNTAIN HOT SPRINGS NEAR PRAIRIE CITY 10SE	44.3581/-118.575
JDMO3	JOHN DAY RIVER AT MCDONALD FERRY NEAR WASCO 14E	45.5878/-120.408
JHAO3	JOHN DAY RIVER NEAR JOHN DAY 3 MILES DOWNSTREAM	44.4333/-118.95
JHNO3	JOHN DAY RIVER NEAR JOHN DAY 3E	44.4186/-118.906
KEEO3	KEENEY TWO	44.6661/-118.922
KGCD	GRANT COUNTY REGIONAL AIRPORT	44.4029/-118.967
LRCO3	LONE ROCK CREEK NEAR CONDON 18SE	45.0897/-119.884
MONO3	NORTH FORK JOHN DAY RIVER AT MONUMENT	44.8139/-119.431
MWQFS	WINLOCK	44.912/-119.892
MWQJD	JOHN DAY AWOS	44.42/-118.94
MWQKE	KEYES SUMMIT	44.55/-120.04
MWQKI	UKIAK USFS - NORTH FORK JOHN DAY	45.14/-118.94
MWQKT	KENT	45.19/-120.69
MWQRU	RUFUS 2E	45.73/-120.65
MWQSH	SHANIKO	45/-120.75
NPFO3	NORTH POLE RIDGE	45.0275/-120.536
OD124	OR218 NB AT PRINDLE HILL MP37.50	44.9397/-120.232
OD127	US395B NB AT LONG CREEK MP94	44.706/-119.108
ODT17	I84 EB AT LEPAGE PARK - JOHN DAY RIVER MP114.41	45.7292/-120.653
ODT21	US395 NB AT BATTLE MT MP39.7	45.27/-118.978
ODT34	US97 NB AT SHANIKO MP56.4	45.0061/-120.752
ODT35	US26 EB AT KEYES SUMMIT MP74	44.5521/-120.042
ODT66	US97 NB AT MORO MP18.5	45.4742/-120.742
ODT67	OR19 AT CONDON MP40.8 NOAA NATIONAL WEATHER SERVICE	45.234/-120.185
PCCO3	PINE CREEK NEAR CLARNO 2E	44.9106/-120.44
RTRO3	MIDDLE FORK JOHN DAY RIVER AT RITTER	44.8889/-119.14
SERO3	JOHN DAY RIVER AT SERVICE CREEK NEAR SPRAY 10WSW	44.7939/-120.006
SHRO3	USCRN SITE AT JOHN DAY NM SHEEP ROCK UNIT NEAR JOHN DAY 35WNW	44.5558/-119.646
SLFO3	SLIDE MOUNTAIN	44.4622/-120.294
TS619	UMATILLA PORTABLE #1	44.9883/-119.759

Station ID	Station	Latitude/Longitude
TT455	UMATILLA PORTABLE #2	44.9613/-119.003
TUFO3	TUPPER	45.0664/-119.491
UKIO3	UKIAH RAIN	45.1347/-118.936

Table A.5: Meteorological data provided to DEQ from the various sources for the John Day River Basin.

Source	Latitude/Longitude	Available Data
CLARNO, DEQ	44.9162/-120.47	Air Temperature
CLYDE-HOLLIDAY, DEQ	44.4159/-119.089	Air Temperature
KIMBERLY, SWCD	44.756/-119.639	Air Temperature
MCDONALD FERRY, DEQ	45.577/-120.403	Air Temperature
MITCHELL, DRI-RAWS	44.5819/-120.181	Cloudiness, Wind Speed
TROUT FARM, DEQ	44.3054/-118.552	Air Temperature

Appendix B Continuous stream temperature data summary

Table B.1: Continuous temperature monitoring stations in the John Day River Basin currently available in public databases and DEQ files.

Station ID	Station	Latitude/Longitude	Organization
10400-ORDEQ	John Day River at Mcdonald Ferry	45.5892/-120.409	DEQ
11017-ORDEQ	North Fork John Day River at Kimberly	44.7562/-119.639	DEQ
11020-ORDEQ	South Fork John Day River at Dayville	44.4656/-119.532	DEQ
11386-ORDEQ	John Day River at Hwy 206	45.477/-120.47	DEQ
11479-ORDEQ	John Day River upstream of Dayville	44.466/-119.471	DEQ
24046-ORDEQ	East Fork Canyon Creek near Mosier Camp (John Day)	44.2658/-118.878	DEQ
24424-ORDEQ	Milk Creek, 1/4 mi upstream from USFS boundary (Bridge, John Day)	44.4765/-120.133	DEQ
24425-ORDEQ	Buck Creek, 1/4 mile upstream from Granite Creek (Granite, North Fork John Day, John Day)	44.8447/-118.495	DEQ
24426-ORDEQ	Tributary to Strawberry Creek, 1/8 mile upstream from wilderness boundary (Strawberry)	44.3331/-118.643	DEQ
24428-ORDEQ	Hidaway Creek, 1.3 miles on FSR 3154 (Camas, North Fork John Day, John Day)	45.093/-118.666	DEQ
24429-ORDEQ	Ennis Creek, 1/2 mile upstream from Beach Creek (Beach, John Day)	44.5391/-119.033	DEQ
24431-ORDEQ	North Fork Deer Creek, 260 m downstream of FSR 641 (Deer, SF John Day, John Day)	44.2076/-119.289	DEQ
24433-ORDEQ	Indian Creek, 0.25 mile on FSR 3990 to pullout (MF John Day, NF John Day, John Day)	44.8376/-118.879	DEQ
24434-ORDEQ	Clear Creek, 3.2 mile on Clear Creek Road (Middle Fork John Day, John Day)	44.5322/-118.479	DEQ
24435-ORDEQ	Summit Creek, 0.6 mile on FSR 240 (Bridge, John Day)	44.5839/-118.411	DEQ
24439-ORDEQ	North Reynolds Creek, 4.9 mi on FSR 2635 (Reynolds, John Day)	44.4324/-118.514	DEQ
24440-ORDEQ	Clear Creek, 0.1 mile on Clear Creek Road (Middle Fork John Day, John Day)	44.5756/-118.491	DEQ
24444-ORDEQ	Long Creek, 1/4 mile DS of Jugow Creek (MF John Day, NF John Day, John Day)	44.6114/-118.942	DEQ
24447-ORDEQ	Sponge Creek, 1 mile downstream of Sponge Creek Camp (North Fork John Day, John Day)	44.8548/-118.727	DEQ
24461-ORDEQ	North Fork John Day River at River Mile 33.5	44.9226/-119.293	DEQ
24479-ORDEQ	Rock Creek at mouth (tributary to John Day River)	44.528/-119.634	DEQ
24480-ORDEQ	Middle Fork John Day River at mouth	44.9152/-119.302	DEQ
24483-ORDEQ	North Fork John Day River at River Mile 16	44.8162/-119.417	DEQ
24484-ORDEQ	North Fork John Day River at Lone Pine	44.7766/-119.623	DEQ
24485-ORDEQ	John Day River at River Mile 185.7	44.7067/-119.646	DEQ
24486-ORDEQ	North Fork John Day River at mouth	44.7559/-119.639	DEQ
24497-ORDEQ	Butte Creek at Bear Hollow Campground (tributary to John Day River)	44.9382/-120.124	DEQ
24498-ORDEQ	Service Creek at Shelton Wayside (tributary to John Day River)	44.8952/-120.09	DEQ
25398-ORDEQ	Rush Cr	45.0246/-119.15	DEQ
25399-ORDEQ	Sunshine Cr	44.654/-118.729	DEQ
25401-ORDEQ	RILEY CR	44.3068/-119.176	DEQ
25403-ORDEQ	ELK CREEK	44.7108/-118.801	DEQ

Station ID	Station	Latitude/Longitude	Organization
25406-ORDEQ	ONION CREEK	44.8979/-118.382	DEQ
25408-ORDEQ	Pine Creek	44.0973/-119.517	DEQ
25412-ORDEQ	Vincent Cr	44.6714/-118.544	DEQ
25414-ORDEQ	Graves Creek 3/4 mile upstream from Mallory Creek	44.9716/-119.299	DEQ
25416-ORDEQ	Bridge Creek WORP98-0768	44.6218/-120.21	DEQ
25417-ORDEQ	Cable Creek, North Fork	45.0512/-118.665	DEQ
25419-ORDEQ	Fox Creek	44.6177/-119.299	DEQ
25430-ORDEQ	Middle Fork John Day River	44.6227/-118.578	DEQ
25433-ORDEQ	DEER CR	44.1998/-119.351	DEQ
25544-ORDEQ	North Fork John Day River upstream of Desolation Creek	44.9982/-118.935	DEQ
25546-ORDEQ	North Fork John Day River upstream of Onion Creek	44.9131/-118.4	DEQ
25547-ORDEQ	Trail Creek upstream off USFS Road 52 crossing	44.9236/-118.402	DEQ
25548-ORDEQ	North Trail Creek upstream of confluence with South Trail Creek	44.9373/-118.39	DEQ
25629-ORDEQ	Beeman	44.8495/-118.787	DEQ
25906-ORDEQ	Pine Creek 1 at River Mile 1.08	44.9098/-120.428	DEQ
25908-ORDEQ	Pine Creek 3 at River Mile 3.51	44.9109/-120.385	DEQ
25910-ORDEQ	Pine Creek 5 at River Mile 3.39	44.9014/-120.331	DEQ
26553-ORDEQ	Upper Granite Boulder near Tiger Mine	44.7161/-118.583	DEQ
26556-ORDEQ	Fields Creek	44.3895/-119.309	DEQ
26557-ORDEQ	Tex Creek	44.2783/-119.263	DEQ
26880-ORDEQ	Camas Creek	45.0344/-118.978	DEQ
26881-ORDEQ	Slide Creek	44.711/-118.951	DEQ
26890-ORDEQ	Olive Creek	44.779/-118.453	DEQ
26891-ORDEQ	South Fork John Day River	44.0152/-119.338	DEQ
26902-ORDEQ	Martin Creek	44.9552/-118.55	DEQ
26915-ORDEQ	South Fork Murderers Creek	44.2584/-119.398	DEQ
26918-ORDEQ	Lake Creek	44.857/-119.969	DEQ
26919-ORDEQ	LAYCOCK CR	44.3024/-119.084	DEQ
26926-ORDEQ	Horseshoe Creek	44.7682/-119.91	DEQ
26927-ORDEQ	Oriental Creek	44.9956/-118.726	DEQ
26934-ORDEQ	Ditch Creek	45.0506/-119.351	DEQ
27775-ORDEQ	North Fork Cable Creek	45.0812/-118.757	DEQ
27776-ORDEQ	South Fork Cable Creek	45.0805/-118.76	DEQ
27777-ORDEQ	Camas Creek	45.0523/-118.972	DEQ
27781-ORDEQ	North Fork John Day River #1	45.008/-119.063	DEQ
27782-ORDEQ	North Fork John Day River #2	44.9982/-118.938	DEQ
28207-ORDEQ	Indian Creek at FS Boundary / lower [HEPP]	44.9167/-119.499	DEQ
28209-ORDEQ	Junkens Creek (upper)	44.8368/-118.789	DEQ
28451-ORDEQ	John Day River - Upper Meadow	44.5347/-119.636	DEQ
28452-ORDEQ	John Day River - Picture Gorge	44.5111/-119.621	DEQ
28453-ORDEQ	John Day River - Goose Rock	44.587/-119.642	DEQ
28454-ORDEQ	John Day River above North Fork	44.915/-119.301	DEQ
28455-ORDEQ	North Fork John Day River below Middle Fork	44.9162/-119.318	DEQ
28456-ORDEQ	North Fork John Day River below Wall Creek	44.8822/-119.41	DEQ
28457-ORDEQ	North Fork John Day River upstream of Rudio Creek	44.788/-119.578	DEQ
28462-ORDEQ	Wall Creek at River Mile 1.5 (tributary to North Fork John Day)	44.8955/-119.419	DEQ
28463-ORDEQ	North Fork John Day River above Middle Fork	44.9162/-119.3	DEQ
28464-ORDEQ	North Fork John Day River upstream of Rudio Creek at push-up dam removal site	44.7864/-119.582	DEQ
28874-ORDEQ	North Fork John Day River above Texas Bar Creek	45.0145/-118.849	DEQ

Station ID	Station	Latitude/Longitude	Organization
30381-ORDEQ	South Fork Desolation Creek	44.7916/-118.673	DEQ
30385-ORDEQ	Wray Creek	44.694/-118.688	DEQ
30390-ORDEQ	East Fork Canyon Creek	44.2831/-118.86	DEQ
30396-ORDEQ	North Fork Deardorf	44.3748/-118.447	DEQ
30398-ORDEQ	O Kelly Creek tributary	44.503/-120.334	DEQ
30413-ORDEQ	Middle Fork John Day River	44.7708/-118.877	DEQ
30419-ORDEQ	Deep Canyon Creek	44.9348/-118.905	DEQ
30421-ORDEQ	Canyon Creek	44.2568/-118.731	DEQ
30423-ORDEQ	Granite Creek	44.8071/-118.429	DEQ
30424-ORDEQ	Camp Creek	44.6362/-118.842	DEQ
31983-ORDEQ	John Day River at Clarno Bridge (Hwy 218)	44.9157/-120.47	DEQ
31984-ORDEQ	John Day River at Priest Hole BLM Boat Ramp	44.7389/-120.283	DEQ
31985-ORDEQ	John Day River upstream of Bone Creek	44.7017/-119.647	DEQ
31986-ORDEQ	John Day River at Shady Grove BLM Wayside	44.8116/-119.719	DEQ
31987-ORDEQ	Canyon Creek at John Day City Park	44.4183/-118.957	DEQ
31988-ORDEQ	John Day River at John Day Waste Water Treatment Plant	44.4221/-118.966	DEQ
31989-ORDEQ	John Day River at Trout Farm USFS Campground	44.3056/-118.552	DEQ
31991-ORDEQ	South Fork John Day River at South Fork Quarry	44.4148/-119.541	DEQ
31995-ORDEQ	John Day River at ODFW access bridge	44.4557/-119.445	DEQ
32143-ORDEQ	North Fork John Day River 5 miles upstream of Monument, OR	44.8821/-119.404	DEQ
32567-ORDEQ	South Fork John Day River 0.6 miles DS of Indian Creek, lone W side 24 in dia Ponderosa rd pull off	44.1437/-119.501	DEQ
33653-ORDEQ	Fort Creek at forest boundary (Mountain Creek, Rock Creek, John Day River)	44.4773/-119.924	DEQ
33654-ORDEQ	East Fork Fort Creek at forest boundary (Mountain Creek, Rock Creek, John Day River)	44.4763/-119.901	DEQ
33655-ORDEQ	Tributary to Mac Creek at forest boundary (Mac Creek, Mountain Creek, Rock Creek, John Day River)	44.4753/-119.948	DEQ
33656-ORDEQ	Fry Creek at forest boundary (Mountain Creek, Rock Creek, John Day River)	44.4763/-119.986	DEQ
33658-ORDEQ	Tributary of Basin Creek above forest boundary	44.7126/-119.252	DEQ
33659-ORDEQ	Tributary of Basin Creek near headwaters	44.7024/-119.254	DEQ
33661-ORDEQ	Parrish Creek at River Mile 2 (John Day River)	44.8131/-119.818	DEQ
33662-ORDEQ	Middle Fork John Day at River Mile 56.7	44.6406/-118.641	DEQ
33663-ORDEQ	Middle Fork John Day at River Mile 54.7	44.6514/-118.675	DEQ
33664-ORDEQ	Middle Fork John Day at River Mile 53.3	44.6583/-118.695	DEQ
40096-ORDEQ	Sniption Canyon 322 meters US of mouth	45.1671/-120.316	DEQ
40098-ORDEQ	Dry Fork Thirtymile Ck 0.5 mile above mouth	45.1702/-120.156	DEQ
40099-ORDEQ	Thirtymile CK 100 meters US of bridge	45.0149/-120.087	DEQ
40100-ORDEQ	Thirtymile CK 2 Miles US Sniption	45.1573/-120.313	DEQ
40101-ORDEQ	Condon Canyon at HWY 19	45.1886/-120.184	DEQ
40102-ORDEQ	Lost Valley CK at Bridge	45.0817/-119.983	DEQ
40104-ORDEQ	Thitymile CK 66 meters DS EFK	45.1672/-120.166	DEQ
40105-ORDEQ	Thirtymile CK EFK above bridge	45.1693/-120.158	DEQ
40559-ORDEQ	Thirtymile Creek at Adobe House	45.1631/-120.463	DEQ
41058-ORDEQ	JOHN DAY R TRIB (RM 19.3) 8.5 MILES US OF MOUTH	45.557/-120.502	DEQ
41155-ORDEQ	Pine Hollow at RM 0.9	45.1514/-120.493	DEQ
DEQ Ritter Lower	Middle Fork John Day River upstream of Eightmile Creek	44.8897/-119.17	DEQ
No Station ID	John Day River at Clyde-Holliday State Park	44.4157/-119.09	DEQ

Station ID	Station	Latitude/Longitude	Organization
No Station ID	Diversions between Bone Creek and Shady Grove	44.7957/-119.695	DEQ
No Station ID	North Fork John Day River at Monument, OR	44.7559/-119.649	DEQ
No Station ID	Diversions between S. Fork JDR and ODFW bridge (Stewart McRae diversion location)	44.4661/-119.493	DEQ
No Station ID	Panama Ditch (#14038670)	44.4165/-119.55	DEQ
No Station ID	North Fork John Day River at Baldy Creek	44.9099/-118.318	DEQ
Sunshine MNF	Sunshine Ranger Station (Sunshine MNF)	44.6643/-118.699	DEQ
unfn_356	North Fork John Day River above Granite Creek	44.8661/-118.561	DEQ
No Station ID	John Day River at River Mile 15	45.6193/-120.468	BLM
No Station ID	John Day River above Pine Hollow	45.1493/-120.472	BLM
No Station ID	John Day River near Service Creek	44.7941/-120	BLM
No Station ID	John Day River at Picture Gorge	44.5209/-119.626	BLM
jd_060	Middle Fork John Day River at Ritter	44.9157/-119.3	BLM
jd_070	Jd_071	44.9196/-119.367	BLM
jd_070	Cabin Creek	44.9196/-119.362	BLM
jd_071	Jd_070	44.9471/-119.292	BLM
1029	1029 Desolation Cr Treatment2 BioM DesolationCreek_Treatment2	44.9095/-118.815	CTUIR WQX
1032	1032 Granite Cr Control	44.812/-118.458	CTUIR WQX
1033	1033 Granite Cr Treatment	44.8228/-118.452	CTUIR WQX
1034	1034 Desolation Creek lower site #1	44.99/-118.923	CTUIR WQX
1035	1035 Desolation Creek mid-point site #2	44.9779/-118.894	CTUIR WQX
1036	1036 Desolation Creek upper site #3	44.9415/-118.843	CTUIR WQX
1037	1037 Desolation Cr Control 2	44.8642/-118.771	CTUIR WQX
1052	1052 NF John Day River	44.9992/-118.807	CTUIR WQX
1055	1055 Desolation Creek at Spring Creek	44.9156/-118.82	CTUIR WQX
5011	5011 HWY 244	45.1738/-118.716	CTUIR WQX
5013	5013 Wayside	45.1245/-118.972	CTUIR WQX
5014	5014 Lower Fletcher	45.1293/-118.957	CTUIR WQX
5015	5015 Upper Kelsay	44.9384/-118.748	CTUIR WQX
5017	5017 Lower Kelsay	44.9349/-118.771	CTUIR WQX
5018	5018 Lower Deer	44.8298/-119.402	CTUIR WQX
5019	5019 Upper Deer	44.8204/-119.338	CTUIR WQX
5021	5021 Olive Creek	44.7748/-118.451	CTUIR WQX
5024	5024 Clear Creek	44.7748/-118.451	CTUIR WQX
5025	5025 Upper Beaver	44.7748/-118.451	CTUIR WQX
5026	5026 Lower Beaver	44.7797/-118.457	CTUIR WQX
5027	5027 Middle Kelsay	44.9366/-118.759	CTUIR WQX
5165	5165 Bull Run Creek Upper	44.7798/-118.349	CTUIR WQX
5166	5166 Bull Run Creek Middle	44.7871/-118.377	CTUIR WQX
5167	5167 Bull Run Creek Lower	44.789/-118.388	CTUIR WQX
5169	5169 Granite Creek Upper	44.8215/-118.45	CTUIR WQX
5170	5170 Granite Creek Lower	44.8247/-118.454	CTUIR WQX
No Station ID	John Day River below Dayville	44.475/-119.542	CTWS
No Station ID	John Day River 17 km below Prairie City	44.4185/-118.906	CTWS
No Station ID	John Day River 7.5 km below Prairie City	44.4432/-118.797	CTWS
No Station ID	John Day River at Prairie City	44.4585/-118.71	CTWS
No Station ID	John Day River 0.9 km above Prairie City	44.4592/-118.701	CTWS
No Station ID	John Day River 2 km above Prairie City	44.4575/-118.687	CTWS
No Station ID	John Day River Upstream of Blue Mt. Hot Springs	44.3415/-118.575	CTWS
ctws_104	Dead Cow Creek	44.6024/-118.55	CTWSIR
ctws_13	Middle Fork John Day River at Caribou Creek	44.6207/-118.572	CTWSIR
ctws_21	Granite Boulder Creek	44.6453/-118.655	CTWSIR
ctws_26	Camp Creek	44.6936/-118.797	CTWSIR
ctws_29	Ruby Creek	44.6461/-118.668	CTWSIR

Station ID	Station	Latitude/Longitude	Organization
ctws_31	Middle Fork John Day River at Camp Creek	44.6938/-118.796	CTWSIR
ctws_32	Middle Fork John Day River upstream of Butte Creek	44.6412/-118.639	CTWSIR
ctws_48	Butte Creek	44.6419/-118.651	CTWSIR
ctws_67	Beaver Creek	44.6527/-118.077	CTWSIR
ctws_69	Middle Fork John Day River at Riverside R	44.6461/-118.664	CTWSIR
ctws_70	Middle Fork John Day River upstream of Sunshine Creek	44.66/-118.696	CTWSIR
ctws_73	Middle Fork John Day River at Butte Creek	44.6421/-118.653	CTWSIR
jd_060	Middle Fork John Day River at the mouth	44.9157/-119.3	CTWSIR
mswcd_27	Desolation Creek	44.9943/-118.933	Monument SWCD
mswcd_29	Middle Fork John Day River at Burn Canyon	44.7955/-118.958	Monument SWCD
14039500	S Fk John Day R Nr Dayville, OR	44.4231/-119.541	OWRD
MNF-003	Big CK at 45 BMRD 093314a_LTWT	44.7857/-118.697	USFS
MNF-004	Big Creek BMRD_093223_LTWT	44.7771/-118.839	USFS
MNF-008	Bridge Creek Lower_LTWT	44.5734/-118.507	USFS
MNF-009	Bridge Creek Upper_LTWT	44.5417/-118.539	USFS
MNF-012	Call Creek_Temp_H2O	44.321/-118.556	USFS
MNF-016	Camp H20 Temp	44.6932/-118.796	USFS
MNF-017	CampCreek_Mouth112819a_LTWT	44.6935/-118.797	USFS
MNF-018	Canyon Creek Bndry BMRD 153234a_LTWT	44.2223/-118.859	USFS
MNF-019	Clear Creek Lower_LTWT	44.563/-118.489	USFS
MNF-020	Clear Creek Upper_LTWT	44.5065/-118.481	USFS
MNF-028	Deardorff Creek_LTWT	44.3708/-118.497	USFS
MNF-029	Deer Creek 162709a_LTWT	44.1964/-119.478	USFS
MNF-030	Dry Fork Clear Creek_LTWT	44.5659/-118.465	USFS
MNF-031	East Fork Camp H2O Temp	44.5599/-118.825	USFS
MNF-032	East Fork Canyon Creek 153216a_LTWT	44.2644/-118.879	USFS
MNF-039	John Day River_Cresent_Temp_H2O	44.282/-118.544	USFS
MNF-040	JOHN DAY RIVER_LTWT	44.3405/-118.575	USFS
MNF-042	Lick H2O Temp	44.663/-118.809	USFS
MNF-047	Lunch Creek 3 H2O Temp	44.5156/-118.539	USFS
MNF-048	LUNCH CREEK LOWER_LTWT	44.5383/-118.537	USFS
MNF-049	Lunch Creek Upper_LTWT	44.5348/-118.534	USFS
MNF-052	MFJD_River_Below_Phipps113525a_LTWT	44.5885/-118.449	USFS
MNF-054	Murderers Creek 152811a_LTWT	44.278/-119.325	USFS
MNF-060	NF REYNOLDS CREEK_LTWT	44.4519/-118.516	USFS
MNF-063	Papoose Creek PCRD Temp_H2O	44.5568/-118.402	USFS
MNF-067	REYNOLDS CREEK LOWER_LTWT	44.4167/-118.541	USFS
MNF-068	REYNOLDS CREEK UPPER_LTWT	44.422/-118.514	USFS
MNF-071	SF Bridge Creek PCRD Temp_H2O	44.5349/-118.533	USFS
MNF-077	Squaw Creek 3 PCRD Temp_H2O	44.5276/-118.41	USFS
MNF-078	Squaw Creek MFJD PCRD_LTWT	44.5655/-118.402	USFS
MNF-079	Strawberry Creek Temp_H2O	44.3428/-118.656	USFS
MNF-084	Vinegar Creek 807 Upper_103533a_Temp_H2O	44.701/-118.551	USFS
MNF-092	Bear creek 1_WT	44.722/-118.823	USFS
MNF-093	Bear creek 3_WT	44.731/-118.834	USFS
MNF-094	Big1_2016_WT	44.777/-118.838	USFS
MNF-095	Big1_2017_WT	44.777/-118.838	USFS
MNF-096	Big1_WT	44.777/-118.836	USFS
MNF-097	Big1_WT	44.768/-118.793	USFS
MNF-098	Big2_2015_WT	44.768/-118.793	USFS
MNF-099	Big2_WT	44.469/-118.788	USFS
MNF-101	Camp1_WT	44.691/-118.796	USFS
MNF-102	Camp2_WT	44.663/-118.811	USFS

Station ID	Station	Latitude/Longitude	Organization
MNF-103	Camp3_WT	44.653/-118.827	USFS
MNF-104	Camp4_WT	44.625/-118.859	USFS
MNF-105	Camp7_WT	44.566/-118.842	USFS
MNF-106	CL4098	44.585/-118.503	USFS
MNF-110	Cottonwood1_WT	44.655/-118.846	USFS
MNF-111	Cougar_WT	44.608/-118.829	USFS
MNF-112	Coxie1_WT	44.566/-118.843	USFS
MNF-113	Deadwood_WT	44.767/-118.792	USFS
MNF-114	EastBig_WT	44.771/-118.811	USFS
MNF-115	EFKBig1_2017_WT	44.771/-118.811	USFS
MNF-116	EFKBig2_2016_WT	44.774/-118.809	USFS
MNF-117	EFKBig2_2017_WT	44.774/-118.809	USFS
MNF-118	EFKBig3_2016_WT	44.778/-118.802	USFS
MNF-119	EFKBig3_2017_WT	44.778/-118.802	USFS
MNF-12	Call Creek	44.3296/-118.556	USFS
MNF-120	EFKBig4_2016_WT	44.78/-118.794	USFS
MNF-121	EFKBig4_2017_WT	44.78/-118.794	USFS
MNF-122	EFKBig5_2016_WT	44.787/-118.788	USFS
MNF-123	EFKBig5_2017_WT	44.787/-118.788	USFS
MNF-127	JO3766	44.543/-119.039	USFS
MNF-131	Lick1_WT	44.663/-118.809	USFS
MNF-132	Lick2_WT	44.635/-118.783	USFS
MNF-133	Lick3_WT	44.608/-118.751	USFS
MNF-144	MFJD1_WT	44.723/-118.822	USFS
MNF-145	MFJD2_WT	44.731/-118.827	USFS
MNF-146	MFJD3_WT	44.732/-118.834	USFS
MNF-148	Pizer1_2017_WT	44.775/-118.82	USFS
MNF-149	Pizer2_2016_WT	44.779/-118.812	USFS
MNF-150	Pizer2_2017_WT	44.779/-118.812	USFS
MNF-151	Pizer3_2016_WT	44.782/-118.804	USFS
MNF-152	Pizer3_2017_WT	44.782/-118.804	USFS
MNF-154	Squaw Creek 4 PCRD Temp_H2O	44.517/-118.403	USFS
MNF-155	Squaw Creek 5 PCRD Temp_H2O	44.507/-118.393	USFS
MNF-156	Squaw_BottomProj15_WT	44.535/-118.406	USFS
MNF-157	Squaw_Upstream_of_Private_WT	44.572/-118.403	USFS
MNF-158	SquawCk_ford_WT	44.484/-118.385	USFS
MNF-159	Sulphur_Top_WT	44.628/-118.886	USFS
MNF-160	Sulphur_WT	44.627/-118.859	USFS
MNF-161	Trail_WT	44.598/-118.844	USFS
MNF-163	US Bear_WT	44.722/-118.825	USFS
MNF-164	WFLick_WT	44.634/-118.785	USFS
MNF-165	WFLick1_WT	44.634/-118.785	USFS
MNF-166	WFLick2_WT	44.587/-118.782	USFS
MNF-167	AlsupCr_WT	43.9925/-119.284	USFS
MNF-168	Badger Creek1 103314a_LTWT	44.6926/-118.708	USFS
MNF-169	Badger Creek2 103313aTemp_H2O	44.698/-118.694	USFS
MNF-170	BasinCr_WT	44.266/-119.179	USFS
MNF-171	BearCr_WT	44.532/-119.078	USFS
MNF-172	BeechCr_WT	44.5196/-119.039	USFS
MNF-173	BennettCr_WT	44.6158/-118.648	USFS
MNF-174	Big Boulder Creek Upper 103311a Temp_H2O	44.713/-118.705	USFS
MNF-175	BigRockCr_WT	44.5977/-118.872	USFS
MNF-176	BridgeCreek_2_WT	44.5638/-118.511	USFS
MNF-177	BridgeCreek_3_WT	44.558/-118.525	USFS
MNF-178	BridgeCreek_5_WT	44.5314/-118.576	USFS
MNF-179	ButteCr_WT	44.64/-118.65	USFS
MNF-180	Camp Creek Below_lick_Temp_H2O	44.667/-118.807	USFS
MNF-182	Camp5_WT	44.603/-118.867	USFS

Station ID	Station	Latitude/Longitude	Organization
MNF-183	Camp6_BMRD_MFJDR_WT	44.5868/-118.871	USFS
MNF-184	Camp8_WT	44.5743/-118.795	USFS
MNF-185	CampAbvShoburg_BMRD_MFJD_WT	44.5816/-118.868	USFS
MNF-186	CampCreek10_BMRD_MFJD_WT	44.5822/-118.868	USFS
MNF-187	CampCreek11_BMRD_MFJD_WT	44.5766/-118.864	USFS
MNF-188	CampCreek12_BMRD_MFJD_WT	44.5766/-118.864	USFS
MNF-189	CampCreek13_BMRD_MFJD_WT	44.5738/-118.861	USFS
MNF-190	CampCreek14_BMRD_MFJD_WT	44.5732/-118.861	USFS
MNF-191	CampCreek15_BMRD_MFJD_WT	44.5731/-118.86	USFS
MNF-192	CampCreek16_BMRD_MFJD_WT	44.5721/-118.858	USFS
MNF-193	CampCreek17_BMRD_MFJD_WT	44.5719/-118.858	USFS
MNF-194	CampCreek18_BMRD_MFJD_WT	44.5717/-118.858	USFS
MNF-195	CampCreek20_BMRD_MFJD_WT	44.5692/-118.85	USFS
MNF-196	CampCreek21_BMRD_MFJD_WT	44.5691/-118.85	USFS
MNF-197	CampCreek22_BMRD_MFJD_WT	44.5664/-118.843	USFS
MNF-198	CampCreek23_BMRD_MFJD_WT	44.5663/-118.843	USFS
MNF-199	CampCreek24_BMRD_MFJD_WT	44.5634/-118.833	USFS
MNF-200	CampCreek6_BMRD_MFJD_2019_WT	44.5973/-118.871	USFS
MNF-201	CampCreek7_BMRD_MFJD_2019_WT	44.5971/-118.871	USFS
MNF-202	CampCreek9_BMRD_MFJD_WT	44.5828/-118.868	USFS
MNF-203	Canyon Creek Above MF BMRD Temp_H2O	44.212/-118.846	USFS
MNF-205	Clear Creek Project- WT	44.5756/-118.491	USFS
MNF-206	ClearCr_WT	44.517/-119.02	USFS
MNF-207	CougarCr_WT	43.9542/-119.266	USFS
MNF-208	Crawford Lower 113525a_Temp_H2O	44.589/-118.446	USFS
MNF-210	DeadInjunCr_WT	44.189/-119.323	USFS
MNF-211	Deadwood Lower BMRD Temp_H2O	44.7675/-118.77	USFS
MNF-212	Deadwood Upper BMRD Temp_H2O	44.7535/-118.712	USFS
MNF-213	DeweyCr_WT	44.1986/-119.449	USFS
MNF-214	DonivanCr_WT	43.9887/-119.3	USFS
MNF-215	DryCr_WT	44.667/-118.7	USFS
MNF-216	DryFork_ClearCr_DF4230_WT	44.5761/-118.491	USFS
MNF-217	EagleCr_WT	44.569/-118.845	USFS
MNF-218	EF Beech_mouth_WT	44.5212/-119.038	USFS
MNF-219	EF_BeechCr_WT	44.512/-118.97	USFS
MNF-220	EnnisCr_3634_WT	44.5328/-119.041	USFS
MNF-221	Fields Creek BMRD 142801a Temp_H2O	44.3888/-119.31	USFS
MNF-223	Granite Boulder Lower_Temp_H2O	44.6468/-118.654	USFS
MNF-224	GraniteBoulderCr_2_WT	44.6758/-118.619	USFS
MNF-225	GrasshopperCr_WT	44.032/-119.267	USFS
MNF-226	GrubCr_WT	44.5054/-118.803	USFS
MNF-227	HogCr_WT	44.5434/-119.038	USFS
MNF-228	Idaho Creek_1_Temp_H2O	44.5825/-118.402	USFS
MNF-229	Idaho Creek_2_Temp_H2O	44.5944/-118.388	USFS
MNF-230	LemonCr_WT	44.68/-118.614	USFS
MNF-232	LittleTrailCr_WT	44.5899/-118.872	USFS
MNF-233	McClellan Ck BMRD 123115a Temp_H2O	44.5204/-118.971	USFS
MNF-234	MFJD River_above_Austin113522a_LTWT	44.6039/-118.483	USFS
MNF-235	MinerCr_WT	44.314/-119.232	USFS
MNF-236	NF_DeerCr_WT	44.1828/-119.335	USFS
MNF-237	NorthFork_BridgeCr_WT	44.5371/-118.563	USFS
MNF-238	RaggedCr_WT	44.651/-118.688	USFS
MNF-239	RubyCr_WT	44.6438/-118.669	USFS
MNF-240	SF Murderers Creek152833a_LTWT	44.2623/-119.37	USFS
MNF-241	SF_DeerCr_WT	44.1825/-119.335	USFS
MNF-242	SF_JohnDayR_WT	43.986/-119.302	USFS
MNF-243	SouthTrib_BridgeCreek_WT	44.5359/-118.556	USFS
MNF-244	SugarCr_WT	44.2929/-119.246	USFS

Station ID	Station	Latitude/Longitude	Organization
MNF-245	Summit Creek Lower BMRD 113528a_LTWT	44.5894/-118.424	USFS
MNF-246	Summit Creek Upper BMRD 113525a_LTWT	44.576/-118.368	USFS
MNF-248	ThompsonCr_WT	44.5148/-118.985	USFS
MNF-249	UpperJohnDayR_WT	44.32/-118.558	USFS
MNF-250	VenatorCr._WT	44.001/-119.282	USFS
MNF-251	Vinegar Ck Lower113520a_LTWT	44.6027/-118.533	USFS
MNF-252	Vinegar Creek Upper 33006_103529b_Temp_H2O	44.673/-118.524	USFS
MNF-253	WestTrib_BridgeCreek_WT	44.5351/-118.589	USFS
MNF-254	Wray Creek 2005 103324a_Temp_H2O	44.6894/-118.695	USFS
MNF-28	Deardorff Creek	44.3779/-118.497	USFS
MNF-6	Reynolds Creek	44.4519/-118.516	USFS
ONF-006	BearCr_bb3406_LTWT	44.5499/-120.441	USFS
ONF-007	BearCrNF_nb3440_LTWT	44.5483/-120.448	USFS
ONF-009	BridgeCrWB_wb4320_WT	44.4909/-120.311	USFS
ONF-011	CottonwoodCr_2301_LTWT	44.4186/-119.639	USFS
ONF-020	DoddsCr_do3940_WT	44.5436/-120.387	USFS
ONF-025	FryCr_1201_LTWT	44.4771/-119.986	USFS
ONF-026	GrantCr_gr3510_LTWT	44.5403/-120.452	USFS
ONF-029	HeflinCr_hl4600_WT	44.5443/-120.387	USFS
ONF-070	Sunflower_3502_WT	44.1828/-119.567	USFS
ONF-071	SunflowerCr_3501_LTWT	44.1726/-119.537	USFS
ONF-082	CottonwoodCrEF_2313_WT	44.4086/-119.642	USFS
ONF-083	BadgerCr_ba4615_LTWT	44.474/-120.117	USFS
ONF-084	BadgerCr_ba4784_WT	44.472/-120.119	USFS
ONF-085	BadgerCr_ba4977_WT	44.4497/-120.12	USFS
ONF-086	FortCr_1401_LTWT	44.477/-119.924	USFS
ONF-087	KeetonCr_1101_WT	44.475/-120.018	USFS
ONF-088	MacCr_1301_WT	44.4773/-119.94	USFS
ONF-089	BridgeCr_br4330_WT	44.491/-120.169	USFS
UmatNF-001	3TrougFB_LTWT	44.9796/-119.514	USFS
UmatNF-002	5MileAtMT_LTWT	45.0726/-118.986	USFS
UmatNF-003	AlderAtMT_LTWT	45.0518/-119.453	USFS
UmatNF-004	BaconAtFB_LTWT	44.9834/-119.489	USFS
UmatNF-005	BattleMT_LTWT	44.857/-118.761	USFS
UmatNF-006	BeemanCr_LTWT	44.8639/-118.772	USFS
UmatNF-008	CamasAtMT_LTWT	45.0109/-118.995	USFS
UmatNF-009	ClearFB_LTWT	44.8133/-118.456	USFS
UmatNF-010	Colvin2_LTWT	44.9934/-119.681	USFS
UmatNF-011	Deso1003_LTWT	44.9705/-118.883	USFS
UmatNF-012	DesoISCO_LTWT	44.9213/-118.829	USFS
UmatNF-014	Ditch2Cr_LTWT	45.026/-119.368	USFS
UmatNF-016	FrazerMT_LTWT	45.1634/-118.644	USFS
UmatNF-018	GranitUp_LTWT	44.8512/-118.397	USFS
UmatNF-019	HenryAtFB_LTWT	44.9396/-119.765	USFS
UmatNF-020	HidaSpgs_LTWT	45.1131/-118.715	USFS
UmatNF-021	HowardMt_LTWT	44.8403/-118.719	USFS
UmatNF-022	IndianFB_LTWT	44.9239/-119.499	USFS
UmatNF-023	IndnALIn_LTWT	44.8456/-118.902	USFS
UmatNF-026	JunknsMT_LTWT	44.8786/-118.781	USFS
UmatNF-027	KahlerAtFB_LTWT	44.9103/-119.704	USFS
UmatNF-028	KelsyAtFB_LTWT	44.9327/-118.783	USFS
UmatNF-029	LightApl_LTWT	44.7521/-118.498	USFS
UmatNF-030	LIndinMT_LTWT	44.8457/-118.904	USFS
UmatNF-031	LKelsyMT_LTWT	44.9341/-118.769	USFS
UmatNF-035	LWall2Sk_LTWT	44.9697/-119.432	USFS
UmatNF-036	LWallBac_LTWT	44.9802/-119.483	USFS
UmatNF-038	MalryAtFB_LTWT	45.0109/-119.289	USFS

Station ID	Station	Latitude/Longitude	Organization
UmatNF-039	MdwbFkgs_LTWT	44.9824/-118.589	USFS
UmatNF-040	MdwbrAtMT_LTWT	44.9933/-118.94	USFS
UmatNF-042	NFDesBEx_LTWT	44.8182/-118.638	USFS
UmatNF-043	NFDeso45_LTWT	44.8212/-118.677	USFS
UmatNF-045	NFDesoMT_LTWT	44.8195/-118.689	USFS
UmatNF-053	Ptams2Rd_LTWT	45.09/-119.22	USFS
UmatNF-054	Ptams3FB_LTWT	45.0053/-119.264	USFS
UmatNF-055	Ptmas4FB_LTWT	44.9794/-119.28	USFS
UmatNF-056	RubyMth_LTWT	44.7751/-118.492	USFS
UmatNF-057	SFDeso45_LTWT	44.8102/-118.683	USFS
UmatNF-058	SFDesoMT_LTWT	44.8195/-118.689	USFS
UmatNF-061	Skookum1_LTWT	45.0515/-119.454	USFS
UmatNF-062	Skookum2_LTWT	44.9709/-119.431	USFS
UmatNF-063	SpongeMT_LTWT	44.8451/-118.736	USFS
UmatNF-064	Swale3Sk_LTWT	44.9979/-119.409	USFS
UmatNF-065	TXBarAtFB_LTWT	45.0306/-118.806	USFS
UmatNF-066	TXBarAtMT_LTWT	45.0157/-118.85	USFS
UmatNF-068	Wall2AtFB_LTWT	44.925/-119.527	USFS
UmatNF-069	Wheel2Cr_LTWT	44.939/-119.855	USFS
UmatNF-070	Wlsn4AWL_LTWT	44.9254/-119.57	USFS
UmatNF-071	10CentCr_LTWT	44.8376/-118.455	USFS
UmatNF-072	AlderWst_LTWT	44.937/-119.878	USFS
UmatNF-073	BackoutM_LTWT	44.867/-118.585	USFS
UmatNF-074	BigCr at MT_LTWT	44.9604/-118.683	USFS
UmatNF-075	BigCrA52_LTWT	45.0112/-118.614	USFS
UmatNF-076	BolognEF_LTWT	44.8454/-119.591	USFS
UmatNF-077	BolognWF_LTWT	44.852/-119.638	USFS
UmatNF-080	BWLWBSpg_LTWT	45.2411/-118.738	USFS
UmatNF-081	BWLWC at MT_LTWT	45.184/-118.753	USFS
UmatNF-082	Cable at MT_LTWT	45.155/-118.84	USFS
UmatNF-083	CamsALan_LTWT	45.189/-118.764	USFS
UmatNF-084	ClearBRu_LTWT	44.774/-118.485	USFS
UmatNF-086	GrnitAtMT_LTWT	44.864/-118.562	USFS
UmatNF-087	HidaChim_LTWT	45.083/-118.607	USFS
UmatNF-088	Lake at MT_LTWT	44.8574/-118.559	USFS
UmatNF-089	Lane at MT_LTWT	45.19/-118.765	USFS
UmatNF-090	LightACC_LTWT	44.7638/-118.497	USFS
UmatNF-091	LWall1OT_LTWT	45.028/-119.525	USFS
UmatNF-092	MdwCrASF_LTWT	44.985/-118.587	USFS
UmatNF-093	NFCable_LTWT	45.06/-118.696	USFS
UmatNF-094	NFCblATV_LTWT	45.0698/-118.723	USFS
UmatNF-095	NFJDaBig_LTWT	44.9601/-118.681	USFS
UmatNF-096	NFJDaGrn_LTWT	44.866/-118.561	USFS
UmatNF-097	Orntl at MT_LTWT	44.9746/-118.73	USFS
UmatNF-098	Orntla55_LTWT	44.9966/-118.726	USFS
UmatNF-099	Owens at FB_LTWT	45.214/-118.835	USFS
UmatNF-100	PoleCAPC_LTWT	45.123/-119.237	USFS
UmatNF-101	PorterCr_LTWT	44.989/-119.653	USFS
UmatNF-102	Ranchria_LTWT	45.177/-118.626	USFS
UmatNF-105	SFCbl at MT_LTWT	45.081/-118.76	USFS
UmatNF-106	SFMDW at MT_LTWT	44.983/-118.586	USFS
UmatNF-109	StahlLwr_LTWT	45.0067/-119.868	USFS
UmatNF-110	StaldrCr_LTWT	45.0428/-119.306	USFS
UmatNF-111	Swale1CR_LTWT	45.0983/-119.376	USFS
UmatNF-113	UpLakeCr_LTWT	44.752/-118.618	USFS
UmatNF-114	Wall1BRd_LTWT	44.932/-119.605	USFS
UmatNF-116	White at FB_LTWT	45.0033/-118.557	USFS
UmatNF-118	Winom at MT_LTWT	44.9764/-118.672	USFS

Station ID	Station	Latitude/Longitude	Organization
UmatNF-119	WinomA52_LTWT	45.0223/-118.635	USFS
UmatNF-121	Wlsn2BBP_LTWT	44.9802/-119.658	USFS
WWNF-008	Beaver.93M.1_WT	44.7738/-118.45	USFS
WWNF-018	Boulder.93C.2_WT	44.8213/-118.407	USFS
WWNF-019	Boulder.93C.5_WT	44.832/-118.375	USFS
WWNF-020	Boundary.93N.1.WT	44.7881/-118.374	USFS
WWNF-023	BullRun.93N.1_WT	44.7867/-118.374	USFS
WWNF-024	BullRun.93O.3_WT	44.7598/-118.324	USFS
WWNF-039	Clear.93M.1_WT	44.7783/-118.452	USFS
WWNF-055	Deep.93O.1.5_WT	44.7857/-118.341	USFS
WWNF-091	Granite.93C.3_LTWT	44.8199/-118.415	USFS
WWNF-092	Granite.93C.5_WT	44.8547/-118.392	USFS
WWNF-143	NFJD.94G.1_LTWT	44.9129/-118.4	USFS
WWNF-144	NFJD.94I.6_LTWT	44.9147/-118.297	USFS
WWNF-151	NTrail.94F.1_WT	44.9657/-118.356	USFS
WWNF-152	Olive.93L.1_WT	44.7379/-118.468	USFS
WWNF-153	Olive.93L.2_WT	44.7311/-118.47	USFS
WWNF-154	Onion.94G.1_WT	44.9/-118.396	USFS
WWNF-163	SFBeaver.93M.1_WT	44.7642/-118.425	USFS
WWNF-174	STrail.94F.1_WT	44.9357/-118.362	USFS
WWNF-205	Beaver.93M.2	44.7592/-118.403	USFS
WWNF-208	Boulder.93C.4	44.8248/-118.393	USFS
WWNF-209	Boundary.93N.2	44.8108/-118.342	USFS
WWNF-212	Crane.94E.2	44.8718/-118.366	USFS
WWNF-214	Deep.93O.2	44.7947/-118.331	USFS
WWNF-261	MiddleTrail.94F.1	44.9462/-118.358	USFS
nfjd_4p5us_of55junct	North Fork John Day River above Camp Creek	44.9845/-118.782	USFS
nfjd_5p2ds_nfjd_rd	North Fork John Day River below Sulphur Gulch	44.9975/-119.075	USFS
unfn_172	Texas Bar Creek	45.0306/-118.806	USFS
unfn_30	Granite Creek	44.8644/-118.562	USFS
unfn_52	North Fork John Day River above Big Creek	44.9602/-118.681	USFS
unfn_53	North Fork John Day River above Camas Creek	45.0097/-118.995	USFS
unfn_56	Otter Creek	44.9785/-118.758	USFS
unfn_6	Backout Creek	44.8674/-118.586	USFS
unfn_62	Potamus Creek	45.0053/-119.264	USFS
unfn_70	Stadler Creek above Mallory	44.9724/-119.284	USFS
unfn_75	Wall Creek	44.925/-119.527	USFS
unfn_9	Big Creek	44.9604/-118.683	USFS
unfo_90	Meadowbrook Creek	44.9934/-118.939	USFS
14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	44.6926/-118.794	USGS
14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	44.7268/-120.302	USGS
14046890	Pine Creek Near Clarno, OR	44.9104/-120.441	USGS

Table B.2: Summary of existing temperature data in the John Day River Basin. Columns Jan – Dec indicates the number of daily maximum temperature results in each month. Data from the DEQ file that are not in the databases were not summarized in the table.

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	MNF-168	Badger Creek1 103314a_LTWT					5	30	31	31	26			
1996	26557-ORDEQ	Tex Creek						9	31	30	30			
1997	26557-ORDEQ	Tex Creek						10	21					
1998	26556-ORDEQ	Fields Creek						21	31	31	30	31	30	3
1999	24461-ORDEQ	North Fork John Day River at River Mile 33.5							17	31	30	18		
1999	24479-ORDEQ	Rock Creek at mouth (tributary to John Day River)						9	31	4				
1999	24480-ORDEQ	Middle Fork John Day River at mouth							17	31	30	18		
1999	24483-ORDEQ	North Fork John Day River at River Mile 16						2	21	31	30	18		
1999	24484-ORDEQ	North Fork John Day River at Lone Pine							8	31	30	18		
1999	24485-ORDEQ	John Day River at River Mile 185.7							5	31	28			
1999	24486-ORDEQ	North Fork John Day River at mouth							5	31	30	18		
1999	24497-ORDEQ	Butte Creek at Bear Hollow Campground (tributary to John Day River)							16	31	30	10		
1999	24498-ORDEQ	Service Creek at Shelton Wayside (tributary to John Day River)							16	31	30	10		
1999	26557-ORDEQ	Tex Creek							18	31	23			
1999	28453-ORDEQ	John Day River - Goose Rock							8	31	28			
1999	28463-ORDEQ	North Fork John Day River above Middle Fork							17	18				
1999	33653-ORDEQ	Fort Creek at forest boundary (Mountain Creek, Rock Creek, John Day River)					6	12		21	26			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	33654-ORDEQ	East Fork Fort Creek at forest boundary (Mountain Creek, Rock Creek, John Day River)								21	26			
1999	33655-ORDEQ	Tributary to Mac Creek at forest boundary (Mac Creek, Mountain Creek, Rock Creek, John Day River)								21	26			
1999	33656-ORDEQ	Fry Creek at forest boundary (Mountain Creek, Rock Creek, John Day River)						1	31	31	26			
1999	33658-ORDEQ	Tributary of Basin Creek above forest boundary						13	21					
1999	33659-ORDEQ	Tributary of Basin Creek near headwaters						13	26					
1999	33661-ORDEQ	Parrish Creek at River Mile 2 (John Day River)							16	31	30	17		
1999	33662-ORDEQ	Middle Fork John Day at River Mile 56.7							27					
1999	33663-ORDEQ	Middle Fork John Day at River Mile 54.7							27					
1999	33664-ORDEQ	Middle Fork John Day at River Mile 53.3							27					
2000	24046-ORDEQ	East Fork Canyon Creek near Mosier Camp (John Day)						1	31	31	12			
2000	24424-ORDEQ	Milk Creek, 1/4 mi upstream from USFS boundary (Bridge, John Day)						7	31	31	13			
2000	24425-ORDEQ	Buck Creek, 1/4 mile upstream from Granite Creek (Granite, North Fork John Day, John Day)						3	31	31	5			
2000	24428-ORDEQ	Hidaway Creek, 1.3 miles on FSR 3154 (Camas, North Fork John Day, John Day)						2	31	31	6			
2000	24429-ORDEQ	Ennis Creek, 1/2 mile upstream from Beach Creek (Beach, John Day)						10	31	31	10			
2000	24431-ORDEQ	North Fork Deer Creek, 260 m downstream of FSR 641 (Deer, SF John Day, John Day)						8	31	22				
2000	24433-ORDEQ	Indian Creek, 0.25 mile on FSR 3990 to pullout (MF John Day, NF John Day, John Day)						4	31	31	5			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	24434-ORDEQ	Clear Creek, 3.2 mile on Clear Creek Road (Middle Fork John Day, John Day)						8	31	31	12			
2000	24435-ORDEQ	Summit Creek, 0.6 mile on FSR 240 (Bridge, John Day)						8	31	31	12			
2000	24439-ORDEQ	North Reynolds Creek, 4.9 mi on FSR 2635 (Reynolds, John Day)						9	31	31	11			
2000	24440-ORDEQ	Clear Creek, 0.1 mile on Clear Creek Road (Middle Fork John Day, John Day)						7	31	31	12			
2000	24444-ORDEQ	Long Creek, 1/4 mile DS of Jugow Creek (MF John Day, NF John Day, John Day)							18	31	13			
2000	24447-ORDEQ	Sponge Creek, 1 mile downstream of Sponge Creek Camp (North Fork John Day, John Day)						24	31	31	12			
2000	24479-ORDEQ	Rock Creek at mouth (tributary to John Day River)					8	30	31	31	13			
2000	24480-ORDEQ	Middle Fork John Day River at mouth						9	31	31	30	12		
2000	24486-ORDEQ	North Fork John Day River at mouth					7	22	31	31	13			
2000	26556-ORDEQ	Fields Creek						15	31	31	28			
2000	27775-ORDEQ	North Fork Cable Creek						17	31	15	27			
2000	27776-ORDEQ	South Fork Cable Creek						16	31	31	27			
2000	27777-ORDEQ	Camas Creek						1	31	31	26			
2000	27781-ORDEQ	North Fork John Day River #1						15	31	31	26			
2000	27782-ORDEQ	North Fork John Day River #2						1	31	31	26			
2000	28207-ORDEQ	Indian Creek at FS Boundary / lower [HEPP]						4	31	31	19			
2000	28209-ORDEQ	Junkens Creek (upper)							4	31	19			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	28451-ORDEQ	John Day River - Upper Meadow					7	30	31	31				
2000	28452-ORDEQ	John Day River - Picture Gorge					8	30	31	31	26			
2000	28453-ORDEQ	John Day River - Goose Rock					7	26	31	31	26			
2000	28454-ORDEQ	John Day River above North Fork					7	26	31	31	30			
2000	28455-ORDEQ	North Fork John Day River below Middle Fork						9	31	31	18			
2000	28456-ORDEQ	North Fork John Day River below Wall Creek					6	12	13	31	30	12		
2000	28457-ORDEQ	North Fork John Day River upstream of Rudio Creek						2	31	31	30	11		
2000	28462-ORDEQ	Wall Creek at River Mile 1.5 (tributary to North Fork John Day)					6	30	31	30				
2000	28463-ORDEQ	North Fork John Day River above Middle Fork						9	31	31	30	12		
2000	28464-ORDEQ	North Fork John Day River upstream of Rudio Creek at push-up dam removal site						2	31	31	30	31		
2001	24426-ORDEQ	Tributary to Strawberry Creek, 1/8 mile upstream from wilderness boundary (Strawberry)					21	29	31	20	2			
2001	25398-ORDEQ	Rush Cr						12	31	13				
2001	25399-ORDEQ	Sunshine Cr					21	30	31	31	11			
2001	25401-ORDEQ	RILEY CR					23	30	31	11				
2001	25403-ORDEQ	ELK CREEK					21	30	31	31	27			
2001	25406-ORDEQ	ONION CREEK					22	30	31	31	11			
2001	25408-ORDEQ	Pine Creek					21	28	7	11	26			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	25412-ORDEQ	Vincent Cr					21	30	31	31	11			
2001	25414-ORDEQ	Graves Creek 3/4 mile upstream from Mallory Creek					23	30	1					
2001	25416-ORDEQ	Bridge Creek WORP98-0768					24	30	31	31	12			
2001	25419-ORDEQ	Fox Creek					22	30	31	31	24			
2001	25430-ORDEQ	Middle Fork John Day River						15	31	31	27			
2001	25433-ORDEQ	DEER CR						17	31	14				
2001	25544-ORDEQ	North Fork John Day River upstream of Desolation Creek					13		7	11	30	29		
2001	25546-ORDEQ	North Fork John Day River upstream of Onion Creek					16	29	31	11	30	30		
2001	25547-ORDEQ	Trail Creek upstream off USFS Road 52 crossing					15	29	31	11	30	30		
2001	25548-ORDEQ	North Trail Creek upstream of confluence with South Trail Creek					15	29	31	11	30	30		
2001	25629-ORDEQ	Beeman							9					
2001	25906-ORDEQ	Pine Creek 1 at River Mile 1.08						22	31	1				
2001	25908-ORDEQ	Pine Creek 3 at River Mile 3.51						10						
2001	25910-ORDEQ	Pine Creek 5 at River Mile 3.39						22	31	11	4			
2001	26553-ORDEQ	Upper Granite Boulder near Tiger Mine							20	31	30	4		
2001	26556-ORDEQ	Fields Creek						24	31	31	30	1		
2001	26557-ORDEQ	Tex Creek						24	31	31	30	1		
2001	27775-ORDEQ	North Fork Cable Creek					17	30	31	31	30	3		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	27776-ORDEQ	South Fork Cable Creek					17	30	31	31	30	3		
2002	24439-ORDEQ	North Reynolds Creek, 4.9 mi on FSR 2635 (Reynolds, John Day)						11	31	31	30	7		
2002	24440-ORDEQ	Clear Creek, 0.1 mile on Clear Creek Road (Middle Fork John Day, John Day)						12	31	31	24			
2002	24444-ORDEQ	Long Creek, 1/4 mile DS of Jugow Creek (MF John Day, NF John Day, John Day)						12	31	31	22			
2002	25417-ORDEQ	Cable Creek, North Fork						10	31	31	23			
2002	26880-ORDEQ	Camas Creek						11	23	31	22			
2002	26881-ORDEQ	Slide Creek							8	31	22			
2002	26890-ORDEQ	Olive Creek						10	31	31	23			
2002	26891-ORDEQ	South Fork John Day River							1	31	30	7		
2002	26902-ORDEQ	Martin Creek							15	31	23			
2002	26915-ORDEQ	South Fork Murderers Creek					2	30	16					
2002	26918-ORDEQ	Lake Creek					8	30	8					
2002	26919-ORDEQ	LAYCOCK CR						12	31	31	24			
2002	26926-ORDEQ	Horseshoe Creek					8	30	31	31	30	2		
2002	26927-ORDEQ	Oriental Creek						10	31	27				
2002	26934-ORDEQ	Ditch Creek							14		13			
2002	WWNF-212	Crane.94E.2							29	31	30	7		
2002	WWNF-214	Deep.93O.2							30	31	30	8		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	WWNF-261	MiddleTrail.94F.1							28	31	30	7		
2003	24435-ORDEQ	Summit Creek, 0.6 mile on FSR 240 (Bridge, John Day)						29	31	31	30			
2003	25399-ORDEQ	Sunshine Cr						29	31	31	29			
2003	25406-ORDEQ	ONION CREEK						29	31	31	30	1		
2003	25412-ORDEQ	Vincent Cr						27	22	31	29			
2003	25417-ORDEQ	Cable Creek, North Fork						29	31	31	30			
2003	26881-ORDEQ	Slide Creek						5	31	24				
2003	26890-ORDEQ	Olive Creek						4	31	25				
2003	30381-ORDEQ	South Fork Desolation Creek					9	30	5					
2003	30385-ORDEQ	Wray Creek							1	31	30	13		
2003	30390-ORDEQ	East Fork Canyon Creek							2	31	30	13		
2003	30396-ORDEQ	North Fork Deardorf					18	30	31	26				
2003	30398-ORDEQ	O Kelly Creek tributary								31	30	15		
2003	30413-ORDEQ	Middle Fork John Day River					15	30	11					
2003	30419-ORDEQ	Deep Canyon Creek						5	31	25				
2003	30421-ORDEQ	Canyon Creek					17	30	28	31	30	13		
2003	30423-ORDEQ	Granite Creek						4	31	25				
2003	30424-ORDEQ	Camp Creek								24	30	2		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	WWNF-143	NFJD.94G.1_LTWT						5	31	31	30	20		
2003	WWNF-144	NFJD.94I.6_LTWT						5	31	31	30	20		
2003	WWNF-151	NTrail.94F.1_WT						5	31	31	30	20		
2003	WWNF-174	STrail.94F.1_WT						5	31	31	30	20		
2003	WWNF-212	Crane.94E.2						5	31	31	30	20		
2003	WWNF-214	Deep.93O.2						6	31	31	30	20		
2003	WWNF-261	MiddleTrail.94F.1						5	31	31	30	20		
2004	10400-ORDEQ	John Day River at Mcdonald Ferry							23	31	11			
2004	11386-ORDEQ	John Day River at Hwy 206								25	1			
2004	14046890	Pine Creek Near Clarno, OR	16	29	31	30	31	30	31	31	30	31	30	31
2004	24479-ORDEQ	Rock Creek at mouth (tributary to John Day River)							17	31	16			
2004	31983-ORDEQ	John Day River at Clarno Bridge (Hwy 218)							19	31	4			
2004	31984-ORDEQ	John Day River at Priest Hole BLM Boat Ramp							19	31	10			
2004	31985-ORDEQ	John Day River upstream of Bone Creek							17	31	3			
2004	31986-ORDEQ	John Day River at Shady Grove BLM Wayside							17	31	16			
2004	31987-ORDEQ	Canyon Creek at John Day City Park							17	31	19			
2004	31988-ORDEQ	John Day River at John Day Waste Water Treatment Plant							17	18	11			
2004	31989-ORDEQ	John Day River at Trout Farm USFS Campground							17	31	10			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	31991-ORDEQ	South Fork John Day River at South Fork Quarry							17	31	30	4		
2004	31995-ORDEQ	John Day River at ODFW access bridge							17	31	30	4		
2004	MNF-008	Bridge Creek Lower_LTWT						3	31	31	30	24		
2004	MNF-009	Bridge Creek Upper_LTWT						3	31	31	30	24		
2004	MNF-017	CampCreek_Mouth112819a_LTWT						21	31	31	30	30	18	
2004	MNF-018	Canyon Creek Bndry BMRD 153234a_LTWT					2	30	31	31	30	7		
2004	MNF-019	Clear Creek Lower_LTWT						3	31	31	30	17		
2004	MNF-020	Clear Creek Upper_LTWT						3	31	31	30	27		
2004	MNF-030	Dry Fork Clear Creek_LTWT						3	31	31	30	27		
2004	MNF-040	JOHN DAY RIVER_LTWT						4	31	31	30	27		
2004	MNF-048	LUNCH CREEK LOWER_LTWT						3	31	31	30	27		
2004	MNF-049	Lunch Creek Upper_LTWT						3	31	31	30	27		
2004	MNF-052	MFJD_River_Below_Phipps113525a_LTWT						21	31	31	30	30	15	
2004	MNF-054	Murderers Creek 152811a_LTWT					2	30	31	31	30	7		
2004	MNF-060	NF REYNOLDS CREEK_LTWT						4	31	31	30	27		
2004	MNF-067	REYNOLDS CREEK LOWER_LTWT						4	31	31	30	27		
2004	MNF-068	REYNOLDS CREEK UPPER_LTWT						4	31	31	30	27		
2004	MNF-078	Squaw Creek MFJD PCRD_LTWT						3	31	31	30	27		
2004	MNF-168	Badger Creek1 103314a_LTWT						21	31	31	30	30	15	
2004	MNF-234	MFJD River_above_Austin113522a_LTWT						21	31	31	30	30	18	
2004	MNF-240	SF Murderers Creek152833a_LTWT					2	30	31	31	30	7		
2004	MNF-245	Summit Creek Lower BMRD 113528a_LTWT						21	31	31	30	30	15	
2004	MNF-246	Summit Creek Upper BMRD 113525a_LTWT						21	31	31	30	30	15	
2004	MNF-251	Vinegar Ck Lower113520a_LTWT						21	31	31	30	30	1	
2004	MNF-252	Vinegar Creek Upper 33006_103529b_Temp_H2O						21	31	31	30	30	15	
2004	ONF-006	BearCr_bb3406_LTWT						12	31	31	30	30	8	

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	ONF-011	CottonwoodCr_2301_LTWT							16	31	30	23		
2004	ONF-083	BadgerCr_ba4615_LTWT						4	31	31	30	6		
2004	ONF-084	BadgerCr_ba4784_WT						4	31	31	30	6		
2004	ONF-086	FortCr_1401_LTWT						7	31	10				
2004	ONF-087	KeetonCr_1101_WT							31	31	15			
2004	ONF-088	MacCr_1301_WT						7	31	31	15			
2004	ONF-089	BridgeCr_br4330_WT						4	31	31	30	7		
2004	UmatNF-001	3TrougFB_LTWT					18	30	31	31	13			
2004	UmatNF-003	AlderAtMT_LTWT						13	31	31	19			
2004	UmatNF-004	BaconAtFB_LTWT				21	31	30	31	31	13			
2004	UmatNF-008	CamasAtMT_LTWT						14	31	31	28			
2004	UmatNF-009	ClearFB_LTWT							4	31	30	12		
2004	UmatNF-010	Colvin2_LTWT					27	30	31	31	30	14		
2004	UmatNF-014	Ditch2Cr_LTWT						12	31	31	22			
2004	UmatNF-016	FrazerMT_LTWT					26	30	31	31	26			
2004	UmatNF-019	HenryAtFB_LTWT					27	30	31	31	30	5		
2004	UmatNF-020	HidaSpgs_LTWT						14	31	31	30	11		
2004	UmatNF-022	IndianFB_LTWT				19	31	30	31	31	30	14		
2004	UmatNF-023	IndnALIn_LTWT					17	30	31	31	28			
2004	UmatNF-027	KahlerAtFB_LTWT					27	30	31	31	30	5		
2004	UmatNF-030	LIndinMT_LTWT					17	30	31	31	28			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	UmatNF-035	LWall2Sk_LTWT					18	30	31	31	13			
2004	UmatNF-038	MalryAtFB_LTWT						12	31	31	22			
2004	UmatNF-040	MdwbrAtMT_LTWT					18	30	31	31	30	5		
2004	UmatNF-053	Ptams2Rd_LTWT						13	31	31	22			
2004	UmatNF-054	Ptams3FB_LTWT						12	31	31	22			
2004	UmatNF-061	Skookum1_LTWT						13	31	31	19			
2004	UmatNF-062	Skookum2_LTWT					18	30	31	31	13			
2004	UmatNF-064	Swale3Sk_LTWT						13	31	31	19			
2004	UmatNF-065	TXBarAtFB_LTWT					17	30	31	31	27			
2004	UmatNF-066	TXBarAtMT_LTWT					17	30	30	20	27			
2004	UmatNF-068	Wall2AtFB_LTWT					25	30	31	31	30	14		
2004	UmatNF-069	Wheel2Cr_LTWT					27	30	31	31	30	5		
2004	UmatNF-070	Wlsn4AWL_LTWT					25	30	31	31	30	13		
2004	UmatNF-071	10CentCr_LTWT							31	31	30	12		
2004	UmatNF-072	AlderWst_LTWT					27	30	31	31	30	5		
2004	UmatNF-073	BackoutM_LTWT							31	31	30	24		
2004	UmatNF-074	BigCr at MT_LTWT						5	31	31	27			
2004	UmatNF-075	BigCrA52_LTWT					24	30	31	31	30	13		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	UmatNF-076	BolognEF_LTWT					25	30	31	31	30	5		
2004	UmatNF-077	BolognWF_LTWT					25	30	31	31	30	5		
2004	UmatNF-080	BWLWBSpg_LTWT					26	30	1					
2004	UmatNF-081	BWLWC at MT_LTWT					26	30	24					
2004	UmatNF-082	Cable at MT_LTWT					26	30	31	31	27			
2004	UmatNF-083	CamsALan_LTWT					26	30	31	31	27			
2004	UmatNF-084	ClearBRu_LTWT							31	31	30	12		
2004	UmatNF-086	GrnitAtMT_LTWT							31	31	30	24		
2004	UmatNF-087	HidaChim_LTWT						14	31	31	30	11		
2004	UmatNF-088	Lake at MT_LTWT							31	31	30	24		
2004	UmatNF-090	LightACC_LTWT							31	31	30	12		
2004	UmatNF-091	LWall1OT_LTWT				3	31	30	31	31	13			
2004	UmatNF-092	MdwCrASF_LTWT						8	31	31	30	13		
2004	UmatNF-094	NFCblATV_LTWT						14	31	31	30	11		
2004	UmatNF-095	NFJDaBig_LTWT						5	31	31	27			
2004	UmatNF-096	NFJDaGrn_LTWT							31	31	30	24		
2004	UmatNF-097	Orntl at MT_LTWT						5	31	31	27			
2004	UmatNF-098	Orntla55_LTWT							30	31	28			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	UmatNF-099	Owens at FB_LTWT						14	31	31	26			
2004	UmatNF-100	PoleCAPC_LTWT						13	31	31	26			
2004	UmatNF-101	PorterCr_LTWT					31	30	31	31	30	17		
2004	UmatNF-102	Ranchria_LTWT						26	31	31	26			
2004	UmatNF-105	SFCbl at MT_LTWT						14	31	31	30	13		
2004	UmatNF-106	SFMDW at MT_LTWT						8	31	31	30	13		
2004	UmatNF-109	StahlLwr_LTWT					27	30	31	31	30	5		
2004	UmatNF-110	StaldrCr_LTWT					26	30	31	31	22			
2004	UmatNF-111	Swale1CR_LTWT					26	30	31	31	26			
2004	UmatNF-113	UpLakeCr_LTWT							31	31	30	12		
2004	UmatNF-114	Wall1BRd_LTWT					25	30	31	31	30	13		
2004	UmatNF-116	White at FB_LTWT						13	31	31	30	13		
2004	UmatNF-118	Winom at MT_LTWT						5	31	31	27			
2004	UmatNF-119	WinomA52_LTWT						13	31	31	30	13		
2004	UmatNF-121	Wlsn2BBP_LTWT					25	30	31	31	30	13		
2005	14046890	Pine Creek Near Clarno, OR	31	28	17	10	30	29	31	29	29	31	30	31
2005	32567-ORDEQ	South Fork John Day River 0.6 miles DS of Indian Creek, lone W side 24 in dia Ponderosa rd pull off									5			
2005	MNF-003	Big CK at 45 BMRD 093314a_LTWT						14	31	31	30	24		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	MNF-004	Big Creek BMRD_093223_LTWT						7	31	31	30	26		
2005	MNF-008	Bridge Creek Lower_LTWT							31	31	30	24		
2005	MNF-009	Bridge Creek Upper_LTWT							31	31	30	24		
2005	MNF-017	CampCreek_Mouth112819a_LTWT						4	31	31	30	29		
2005	MNF-018	Canyon Creek Bndry BMRD 153234a_LTWT						15	31	31	29			
2005	MNF-019	Clear Creek Lower_LTWT							31	31	30	24		
2005	MNF-020	Clear Creek Upper_LTWT							31	31	30	24		
2005	MNF-028	Deardorff Creek_LTWT						1	31	31	30	23		
2005	MNF-040	JOHN DAY RIVER_LTWT						1	31	31	30	23		
2005	MNF-048	LUNCH CREEK LOWER_LTWT							31	31	30	24		
2005	MNF-049	Lunch Creek Upper_LTWT							31	31	30	24		
2005	MNF-052	MFJD_River_Below_Phipps113525a_LTWT						20	31	31	30	25		
2005	MNF-054	Murderers Creek 152811a_LTWT						15	31	31	29			
2005	MNF-132	Lick2_WT						5	31	31	30	26		
2005	MNF-169	Badger Creek2 103313aTemp_H2O							30	31	30	26		
2005	MNF-174	Big Boulder Creek Upper 103311a Temp_H2O							30	31	30	26		
2005	MNF-180	Camp Creek Below_lick_Temp_H2O							31	31	30	26		
2005	MNF-203	Canyon Creek Above MF BMRD Temp_H2O						15	31	31	29			
2005	MNF-208	Crawford Lower 113525a_Temp_H2O						20	15					
2005	MNF-211	Deadwood Lower BMRD Temp_H2O						7	31	31	30	26		
2005	MNF-212	Deadwood Upper BMRD Temp_H2O						14	31	20				
2005	MNF-221	Fields Creek BMRD 142801a Temp_H2O						15	31	31	29			
2005	MNF-223	Granite Boulder Lower_Temp_H2O						5	31	31	30	29		
2005	MNF-234	MFJD River_above_Austin113522a_LTWT						20	31	31	30	25		
2005	MNF-240	SF Murderers Creek152833a_LTWT						15	31	31	29			
2005	MNF-246	Summit Creek Upper BMRD 113525a_LTWT						20	31	31	30	25		
2005	MNF-251	Vinegar Ck Lower113520a_LTWT						20	31	31	30	26		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	MNF-252	Vinegar Creek Upper 33006_103529b_Temp_H2O						20	31	31	30	25		
2005	MNF-254	Wray Creek 2005 103324a_Temp_H2O							30	31	30	26		
2005	ONF-011	CottonwoodCr_2301_LTWT						14	31	31	18			
2005	ONF-025	FryCr_1201_LTWT						23	31	31	6			
2005	ONF-082	CottonwoodCrEF_2313_WT						14	31	31	18			
2005	ONF-083	BadgerCr_ba4615_LTWT						9	31	31	29			
2005	ONF-085	BadgerCr_ba4977_WT						9	31	31	29			
2005	ONF-086	FortCr_1401_LTWT					3	30	31	31	12			
2005	UmatNF-003	AlderAtMT_LTWT					7	30	31	31	19			
2005	UmatNF-004	BaconAtFB_LTWT						27	31	31	14			
2005	UmatNF-008	CamasAtMT_LTWT						6	31	31	21			
2005	UmatNF-009	ClearFB_LTWT						8	31	31	20			
2005	UmatNF-010	Colvin2_LTWT					21	30	31	31	27			
2005	UmatNF-014	Ditch2Cr_LTWT						21	31	31	6			
2005	UmatNF-016	FrazerMT_LTWT						27	31	31	18			
2005	UmatNF-019	HenryAtFB_LTWT					28	30	31	31	27			
2005	UmatNF-020	HidaSpgs_LTWT						22	31	31	19			
2005	UmatNF-022	IndianFB_LTWT				8	31	30	31	31	28			
2005	UmatNF-023	IndnALIn_LTWT						7	31	31	12			
2005	UmatNF-027	KahlerAtFB_LTWT					21	30	31	31	27			
2005	UmatNF-030	LIndinMT_LTWT						7	31	31	12			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	UmatNF-035	LWall2Sk_LTWT						27	21					
2005	UmatNF-038	MalryAtFB_LTWT						21	31	31	6			
2005	UmatNF-039	MdwbFkgs_LTWT						8	31	31	20			
2005	UmatNF-040	MdwbrAtMT_LTWT						22	31	31	12			
2005	UmatNF-053	Ptams2Rd_LTWT					6	30	31	31	6			
2005	UmatNF-054	Ptams3FB_LTWT						21	31	31	6			
2005	UmatNF-061	Skookum1_LTWT					7	30	31	31	19			
2005	UmatNF-062	Skookum2_LTWT						27	31	31	14			
2005	UmatNF-064	Swale3Sk_LTWT					7	28						
2005	UmatNF-065	TXBarAtFB_LTWT						23	31	31	19			
2005	UmatNF-066	TXBarAtMT_LTWT						23	31	31	19			
2005	UmatNF-068	Wall2AtFB_LTWT					21	30	31	31	28			
2005	UmatNF-069	Wheel2Cr_LTWT					21	30	31	31	27			
2005	UmatNF-070	Wlsn4AWL_LTWT					21	30	31	31	28			
2005	UmatNF-071	10CentCr_LTWT						8	31	31	20			
2005	UmatNF-074	BigCr at MT_LTWT						13	31	31	21			
2005	UmatNF-076	BolognEF_LTWT					28	30	31	31	28			
2005	UmatNF-077	BolognWF_LTWT					28	30	31	31	28			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	UmatNF-081	BWLWC at MT_LTWT						27	31	19	19			
2005	UmatNF-082	Cable at MT_LTWT						22	31	31	19			
2005	UmatNF-083	CamsALan_LTWT						22	31	31	19			
2005	UmatNF-084	ClearBRu_LTWT						8	31	31	27			
2005	UmatNF-086	GrnitAtMT_LTWT							31	31	30	17		
2005	UmatNF-087	HidaChim_LTWT						20	31	31	26			
2005	UmatNF-088	Lake at MT_LTWT							31	31	30	17		
2005	UmatNF-089	Lane at MT_LTWT						27	31	31	18			
2005	UmatNF-090	LightACC_LTWT						8	31	31	27			
2005	UmatNF-093	NFCable_LTWT						22	31	31	26			
2005	UmatNF-095	NFJDaBig_LTWT						13	31	31	21			
2005	UmatNF-096	NFJDaGrn_LTWT							31	31	30	17		
2005	UmatNF-097	Orntl at MT_LTWT						13	31	31	21			
2005	UmatNF-098	Orntla55_LTWT						6	31	31	19			
2005	UmatNF-099	Owens at FB_LTWT						2	31	31	26			
2005	UmatNF-100	PoleCAPC_LTWT					7	30	17					
2005	UmatNF-105	SFCbl at MT_LTWT						20	31	31	26			
2005	UmatNF-109	StahlLwr_LTWT					21	30	31	31	27			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	UmatNF-110	StaldrCr_LTWT					6	30	31	31	6			
2005	UmatNF-113	UpLakeCr_LTWT							22	31	30	30	30	31
2005	UmatNF-118	Winom at MT_LTWT						13	31	31	21			
2005	WWNF-019	Boulder.93C.5_WT							51*	60*	57*	23		
2005	WWNF-020	Boundary.93N.1.WT						1	31	31	3			
2005	WWNF-024	BullRun.93O.3_WT						2	46*	53*	4			
2005	WWNF-055	Deep.93O.1.5_WT						1	31	31	30	12		
2005	WWNF-091	Granite.93C.3_LTWT							49*	52*	4			
2005	WWNF-092	Granite.93C.5_WT						1	41*	44*	47*	20		
2005	WWNF-143	NFJD.94G.1_LTWT						1	41*	43*	40*	22		
2005	WWNF-144	NFJD.94I.6_LTWT						1	43*	48*	48*	28		
2005	WWNF-154	Onion.94G.1_WT							31	31	30	17		
2005	WWNF-208	Boulder.93C.4						1	34*	37*	4			
2005	WWNF-209	Boundary.93N.2						2	41*	44*	4			
2005	WWNF-212	Crane.94E.2						1	31	31	30	17		
2005	WWNF-214	Deep.93O.2						2	55*	54*	5			
2005	WWNF-261	MiddleTrail.94F.1						1	54*	54*	46*	24		
2006	11017-ORDEQ	North Fork John Day River at Kimberly				6								

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	11020-ORDEQ	South Fork John Day River at Dayville				6								
2006	11479-ORDEQ	John Day River upstream of Dayville				6								
2006	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR								14	30	31	30	31
2006	14046890	Pine Creek Near Clarno, OR	31	28	31	30	29	28	31	28	28	31	30	31
2006	28452-ORDEQ	John Day River - Picture Gorge				6								
2006	31988-ORDEQ	John Day River at John Day Waste Water Treatment Plant				5								
2006	31989-ORDEQ	John Day River at Trout Farm USFS Campground				2								
2006	31995-ORDEQ	John Day River at ODFW access bridge				2								
2006	32143-ORDEQ	North Fork John Day River 5 miles upstream of Monument, OR				6								
2006	MNF-008	Bridge Creek Lower_LTWT							25	31	30	17		
2006	MNF-009	Bridge Creek Upper_LTWT							25	31	30	17		
2006	MNF-019	Clear Creek Lower_LTWT							25	31	30	17		
2006	MNF-020	Clear Creek Upper_LTWT							25	31	30	17		
2006	MNF-028	Deardorff Creek_LTWT							30	31	30	16		
2006	MNF-040	JOHN DAY RIVER_LTWT						30	31	31	30	16		
2006	MNF-048	LUNCH CREEK LOWER_LTWT							25	31	30	17		
2006	MNF-060	NF REYNOLDS CREEK_LTWT							25	31	30	17		
2006	MNF-067	REYNOLDS CREEK LOWER_LTWT							25	31	30	17		
2006	ONF-083	BadgerCr_ba4615_LTWT						1	31	31	30	5		
2006	ONF-085	BadgerCr_ba4977_WT						1	31	31	29			
2006	UmatNF-003	AlderAtMT_LTWT						14	31	31	30	1		
2006	UmatNF-004	BaconAtFB_LTWT						10	31	31	25			
2006	UmatNF-008	CamasAtMT_LTWT						1	31	31	30	10		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	UmatNF-009	ClearFB_LTWT							31	31	19			
2006	UmatNF-010	Colvin2_LTWT					15	30	30	31	20			
2006	UmatNF-014	Ditch2Cr_LTWT						9	31	31	19			
2006	UmatNF-016	FrazerMT_LTWT						21	31	31	30	2		
2006	UmatNF-019	HenryAtFB_LTWT					14	30	31	31	18			
2006	UmatNF-020	HidaSpgs_LTWT						21	31	31	30	30	2	
2006	UmatNF-022	IndianFB_LTWT					15	30	31	31	18			
2006	UmatNF-023	IndnALIn_LTWT						2	31	31	30	3		
2006	UmatNF-027	KahlerAtFB_LTWT					15	30	31	31	20			
2006	UmatNF-030	LIndinMT_LTWT						2	31	31	30	3		
2006	UmatNF-035	LWall2Sk_LTWT						10	31	31	25			
2006	UmatNF-038	MalryAtFB_LTWT						9	31	31	19			
2006	UmatNF-039	MdwbFkgs_LTWT						14	31	31	19			
2006	UmatNF-040	MdwbrAtMT_LTWT						2	31	31	30	10		
2006	UmatNF-053	Ptams2Rd_LTWT						14	31	31	19			
2006	UmatNF-054	Ptams3FB_LTWT						9	31	31	19			
2006	UmatNF-061	Skookum1_LTWT						14	31	31	30	1		
2006	UmatNF-062	Skookum2_LTWT						10	31	31	25			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	UmatNF-064	Swale3Sk_LTWT						14	31	31	30	1		
2006	UmatNF-065	TXBarAtFB_LTWT						15	31	31	30	10		
2006	UmatNF-066	TXBarAtMT_LTWT						15	31	31	30	3		
2006	UmatNF-068	Wall2AtFB_LTWT					15	30	31	31	18			
2006	UmatNF-069	Wheel2Cr_LTWT					14	30	31	31	18			
2006	UmatNF-070	Wlsn4AWL_LTWT					15	30	31	31	20			
2006	UmatNF-071	10CentCr_LTWT							31	31	25			
2006	UmatNF-072	AlderWst_LTWT					14	30	31	31	18			
2006	UmatNF-074	BigCr at MT_LTWT						2	31	31	30	11		
2006	UmatNF-076	BolognEF_LTWT					15	30	31	31	18			
2006	UmatNF-077	BolognWF_LTWT					15	30	31	31	18			
2006	UmatNF-081	BWLWC at MT_LTWT						21	31	13				
2006	UmatNF-082	Cable at MT_LTWT						21	31	31	30	17		
2006	UmatNF-083	CamsALan_LTWT						21	31	31	30	2		
2006	UmatNF-084	ClearBRu_LTWT							31	31	19			
2006	UmatNF-086	GrnitAtMT_LTWT							31	31	25			
2006	UmatNF-087	HidaChim_LTWT						14	31	31	30	9		
2006	UmatNF-088	Lake at MT_LTWT							31	31	25			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	UmatNF-089	Lane at MT_LTWT						21	31	31	30	2		
2006	UmatNF-090	LightACC_LTWT							31	31	19			
2006	UmatNF-093	NFCable_LTWT						21	31	31	30	9		
2006	UmatNF-095	NFJDaBig_LTWT						2	31	31	18			
2006	UmatNF-096	NFJDaGrn_LTWT							31	31	25			
2006	UmatNF-097	Orntl at MT_LTWT							24	31	18			
2006	UmatNF-098	Orntla55_LTWT							24	31	30	3		
2006	UmatNF-099	Owens at FB_LTWT						14	31	31	24			
2006	UmatNF-100	PoleCAPC_LTWT						29	31	31	19			
2006	UmatNF-105	SFCbl at MT_LTWT							31	31	30	30	5	
2006	UmatNF-109	StahlLwr_LTWT					19	30	31	31	18			
2006	UmatNF-110	StaldrCr_LTWT						14	31	31	19			
2006	UmatNF-113	UpLakeCr_LTWT	31	28	31	29	29							
2006	UmatNF-118	Winom at MT_LTWT						2	31	31	30	11		
2006	WWNF-008	Beaver.93M.1_WT							35*	48*	46*	25		
2006	WWNF-039	Clear.93M.1_WT							19	31	30	17		
2006	WWNF-152	Olive.93L.1_WT							20	33*	34*	14		
2006	WWNF-153	Olive.93L.2_WT							21	34*	33*	13		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	WWNF-163	SFBeaver.93M.1_WT							19	31	30	17		
2006	WWNF-205	Beaver.93M.2							20	37*	37*	20		
2007	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14046890	Pine Creek Near Clarno, OR	22	28	31	30	31	30	31	31	30	31	30	31
2007	MNF-008	Bridge Creek Lower_LTWT						24	31	31	30	31	14	
2007	MNF-017	CampCreek_Mouth112819a_LTWT						18	31	31	30	25		
2007	MNF-018	Canyon Creek Bndry BMRD 153234a_LTWT						9	31	31	30	24		
2007	MNF-019	Clear Creek Lower_LTWT						24	31	31	30	24		
2007	MNF-020	Clear Creek Upper_LTWT						23	31	31	30	27		
2007	MNF-028	Deardorff Creek_LTWT						22	31	31	30	31	14	
2007	MNF-030	Dry Fork Clear Creek_LTWT						24	31	6				
2007	MNF-032	East Fork Canyon Creek 153216a_LTWT						6	31	31	30	31	4	
2007	MNF-039	John Day River_Cresent_Temp_H2O						24	31	31	30	28		
2007	MNF-040	JOHN DAY RIVER_LTWT						24	31	31	30	31		
2007	MNF-048	LUNCH CREEK LOWER_LTWT						24	31	31	30	7		
2007	MNF-049	Lunch Creek Upper_LTWT						24	31	31	30	7		
2007	MNF-054	Murderers Creek 152811a_LTWT						16	31	31	30	31	4	
2007	MNF-060	NF REYNOLDS CREEK_LTWT						24	31	31	30	31		
2007	MNF-067	REYNOLDS CREEK LOWER_LTWT						24	31	31	30	31		
2007	MNF-068	REYNOLDS CREEK UPPER_LTWT						24	31	31	30	31		
2007	MNF-084	Vinegar Creek 807 Upper_103533a_Temp_H2O						8	31	31	30	7		
2007	UmatNF-003	AlderAtMT_LTWT					7	30	31	31	30	9		
2007	UmatNF-004	BaconAtFB_LTWT					1	30	31	31	25			
2007	UmatNF-008	CamasAtMT_LTWT						25	31	31	30	14		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	UmatNF-009	ClearFB_LTWT						25	31	31	30	14		
2007	UmatNF-010	Colvin2_LTWT					6	30	31	31	30	10		
2007	UmatNF-016	FrazerMT_LTWT					14	30	31	31	30	8		
2007	UmatNF-019	HenryAtFB_LTWT					6	30	31	31	30	10		
2007	UmatNF-020	HidaSpgs_LTWT					14	30	31	31	30	8		
2007	UmatNF-022	IndianFB_LTWT					6	30	31	31	30	10		
2007	UmatNF-023	IndnALln_LTWT						23	31	31	30	10		
2007	UmatNF-027	KahlerAtFB_LTWT					6	30	31	31	30	10		
2007	UmatNF-030	LIndinMT_LTWT						24	31	31	30	10		
2007	UmatNF-039	MdwbFkgs_LTWT						25	31	31	30	14		
2007	UmatNF-040	MdwbrAtMT_LTWT					15	30	31	31	30	10		
2007	UmatNF-054	Ptams3FB_LTWT						29	31	31	24			
2007	UmatNF-062	Skookum2_LTWT					1	30	31	31	25			
2007	UmatNF-064	Swale3Sk_LTWT					7	30	31	31	30	9		
2007	UmatNF-065	TXBarAtFB_LTWT					15	30	31	31	30	8		
2007	UmatNF-066	TXBarAtMT_LTWT					15	30	31	31	30	8		
2007	UmatNF-068	Wall2AtFB_LTWT					6	30	31	31	30	10		
2007	UmatNF-070	Wlsn4AWL_LTWT					6	30	31	31	30	10		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	MNF-003	Big CK at 45 BMRD 093314a_LTWT							20	31	30	22		
2008	MNF-008	Bridge Creek Lower_LTWT						4	31	31	30	4		
2008	MNF-009	Bridge Creek Upper_LTWT						4	31	31	30	4		
2008	MNF-018	Canyon Creek Bndry BMRD 153234a_LTWT							23	31	30	31	6	
2008	MNF-019	Clear Creek Lower_LTWT						4	31	31	30	4		
2008	MNF-020	Clear Creek Upper_LTWT						4	31	31	30	4		
2008	MNF-028	Deardorff Creek_LTWT						1	31	31	30	31	5	
2008	MNF-029	Deer Creek 162709a_LTWT							29	31	30	14		
2008	MNF-030	Dry Fork Clear Creek_LTWT						4	31	31	30	4		
2008	MNF-032	East Fork Canyon Creek 153216a_LTWT							23	31	30	31	6	
2008	MNF-039	John Day River_Cresent_Temp_H2O						3	31	31	30	31	5	
2008	MNF-040	JOHN DAY RIVER_LTWT						3	31	31	30	31		
2008	MNF-048	LUNCH CREEK LOWER_LTWT						4	31	31	30	4		
2008	MNF-049	Lunch Creek Upper_LTWT						4	31	31	30	4		
2008	MNF-052	MFJD_River_Below_Phipps113525a_LTWT							24	31	30	28		
2008	MNF-067	REYNOLDS CREEK LOWER_LTWT						1	31	31	30	31		
2008	MNF-068	REYNOLDS CREEK UPPER_LTWT						2	31	31	30	31	5	
2008	MNF-084	Vinegar Creek 807 Upper_103533a_Temp_H2O							15	31	30	22		
2008	UmatNF-001	3TrougFB_LTWT						13	31	31	30	13		
2008	UmatNF-003	AlderAtMT_LTWT						16	38*	39*	35*	33*		
2008	UmatNF-004	BaconAtFB_LTWT						22	45*	50*	49*	20		
2008	UmatNF-005	BattleMT_LTWT						4	31	31	23			
2008	UmatNF-006	BeemanCr_LTWT							29	31	23			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	UmatNF-009	ClearFB_LTWT							28	31	30	31	3	
2008	UmatNF-010	Colvin2_LTWT					27	41*	39*	44*	39*	44*		
2008	UmatNF-016	FrazerMT_LTWT						6	31	31	24			
2008	UmatNF-019	HenryAtFB_LTWT					16	30	31	31	30	26		
2008	UmatNF-020	HidaSpgs_LTWT						7	40*	52*	42*			
2008	UmatNF-022	IndianFB_LTWT						40*	44*	53*	47*	38*		
2008	UmatNF-026	JunknsMT_LTWT							29	31	23			
2008	UmatNF-035	LWall2Sk_LTWT						18	41*	49*	45*	22		
2008	UmatNF-039	MdwbFkgs_LTWT							31	51*	37*			
2008	UmatNF-040	MdwbrAtMT_LTWT						6	53*	53*	51*	9		
2008	UmatNF-042	NFDesBEx_LTWT							29	31	23			
2008	UmatNF-045	NFDesoMT_LTWT							29	31	23			
2008	UmatNF-058	SFDesoMT_LTWT							29	31	23			
2008	UmatNF-062	Skookum2_LTWT						13	31	31	30	13		
2008	UmatNF-063	SpongeMT_LTWT						4	31	31	23			
2008	UmatNF-064	Swale3Sk_LTWT						16	44*	39*	35*	31		
2008	UmatNF-065	TXBarAtFB_LTWT						5	47*	53*	37*			
2008	UmatNF-066	TXBarAtMT_LTWT						5	45*	56*	39*			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	UmatNF-068	Wall2AtFB_LTWT						49*	45*	36*	38*	37*		
2008	UmatNF-070	Wlsn4AWL_LTWT					25	42*	49*	61*	59*	35*		
2008	WWNF-008	Beaver.93M.1_WT							34*	47*	41*	22		
2008	WWNF-039	Clear.93M.1_WT							30	40*	38*	22		
2008	WWNF-152	Olive.93L.1_WT							29	37*	32*	25		
2008	WWNF-153	Olive.93L.2_WT							29	36*	31	21		
2008	WWNF-163	SFBeaver.93M.1_WT							26	31	30	15		
2009	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	12	30	31	30	31
2009	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	MNF-008	Bridge Creek Lower_LTWT						15	31	31	30	31	2	
2009	MNF-009	Bridge Creek Upper_LTWT						16	31	31	30	31	1	
2009	MNF-019	Clear Creek Lower_LTWT						16	31	31	30	31	1	
2009	MNF-020	Clear Creek Upper_LTWT						16	31	31	30	31	1	
2009	MNF-028	Deardorff Creek_LTWT						7	31	31	30	31	3	
2009	MNF-030	Dry Fork Clear Creek_LTWT						16	31	31	30	31	2	
2009	MNF-040	JOHN DAY RIVER_LTWT						8	31	31	30	31	2	
2009	MNF-048	LUNCH CREEK LOWER_LTWT						16	31	31	30	31	2	
2009	MNF-049	Lunch Creek Upper_LTWT						16	31	31	30	31	2	
2009	MNF-054	Murderers Creek 152811a_LTWT						27						
2009	MNF-060	NF REYNOLDS CREEK_LTWT						15	31	31	30	31	2	
2009	MNF-067	REYNOLDS CREEK LOWER_LTWT						15	31	31	30	31	2	
2009	MNF-068	REYNOLDS CREEK UPPER_LTWT						15	31	31	30	31	2	
2009	MNF-078	Squaw Creek MFJD PCRD_LTWT						15	31	19				
2009	UmatNF-001	3TrougFB_LTWT						39*	36*	40*	44*	9		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	UmatNF-002	5MileAtMT_LTWT							50*	58*	52*	46*	9	
2009	UmatNF-003	AlderAtMT_LTWT						25	16					
2009	UmatNF-004	BaconAtFB_LTWT						44*	45*	53*	56*	11		
2009	UmatNF-005	BattleMT_LTWT							31	31	30			
2009	UmatNF-006	BeemanCr_LTWT							31	31	30	31	3	
2009	UmatNF-008	CamasAtMT_LTWT							52*	53*	45*	53*	9	
2009	UmatNF-009	ClearFB_LTWT							29	31	30	31	4	
2009	UmatNF-010	Colvin2_LTWT							10	44*	38*	8		
2009	UmatNF-014	Ditch2Cr_LTWT						29	49*	57*	57*	24		
2009	UmatNF-016	FrazerMT_LTWT						19	38*	42*	43*	40*	3	
2009	UmatNF-019	HenryAtFB_LTWT					9	29	31	31	30	13		
2009	UmatNF-020	HidaSpgs_LTWT						20	41*	45*	45*	48*	3	
2009	UmatNF-021	HowardMt_LTWT							31	31	30	31	3	
2009	UmatNF-022	IndianFB_LTWT					7	39*	38*	40*	39*	17		
2009	UmatNF-026	JunknsMT_LTWT							31	31	30	31	3	
2009	UmatNF-028	KelsyAtFB_LTWT						15	31	31	30	31	3	
2009	UmatNF-035	LWall2Sk_LTWT						44*	40*	41*	45*	11		
2009	UmatNF-038	MalryAtFB_LTWT							44*	50*	46*	12		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	UmatNF-040	MdwbrAtMT_LTWT							55*	58*	52*	56*	5	
2009	UmatNF-043	NFDeso45_LTWT							31	31	30	28		
2009	UmatNF-045	NFDesoMT_LTWT							31	31	30	28		
2009	UmatNF-054	Ptams3FB_LTWT							33*	37*	39*	8		
2009	UmatNF-057	SFDeso45_LTWT							31	31	30	28		
2009	UmatNF-058	SFDesoMT_LTWT							31	31	30	1		
2009	UmatNF-062	Skookum2_LTWT						27	31	31	30	6		
2009	UmatNF-063	SpongeMT_LTWT							31	31	30	28		
2009	UmatNF-064	Swale3Sk_LTWT						26	46*	51*	54*	20		
2009	UmatNF-065	TXBarAtFB_LTWT						29	51*	53*	52*	46*	4	
2009	UmatNF-066	TXBarAtMT_LTWT						20	40*	47*	52*	46*	4	
2009	UmatNF-068	Wall2AtFB_LTWT					11	50*	40*	47*	43*	19		
2009	UmatNF-070	WIsn4AWL_LTWT					5	30	31	31	30	13		
2010	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	24
2010	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	MNF-004	Big Creek BMRD_093223_LTWT							30	31	30	24		
2010	MNF-008	Bridge Creek Lower_LTWT							24	31	30	5		
2010	MNF-009	Bridge Creek Upper_LTWT							24	31	30	5		
2010	MNF-017	CampCreek_Mouth112819a_LTWT							30	31	30	24		
2010	MNF-019	Clear Creek Lower_LTWT							24	31	30	5		
2010	MNF-020	Clear Creek Upper_LTWT							24	31	30	5		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	MNF-028	Deardorff Creek_LTWT							25	31	30	31	7	
2010	MNF-030	Dry Fork Clear Creek_LTWT							24	31	30	5		
2010	MNF-039	John Day River_Cresent_Temp_H2O							25	31	30	31	7	
2010	MNF-040	JOHN DAY RIVER_LTWT							25	31	30	31	7	
2010	MNF-048	LUNCH CREEK LOWER_LTWT							24	31	30	5		
2010	MNF-049	Lunch Creek Upper_LTWT							24	31	30	5		
2010	MNF-052	MFJD_River_Below_Phipps113525a_LTWT							30	31	30	24		
2010	MNF-054	Murderers Creek 152811a_LTWT						1	31	31	30	14		
2010	MNF-060	NF REYNOLDS CREEK_LTWT							25	31	30	12		
2010	MNF-067	REYNOLDS CREEK LOWER_LTWT							24	31	30	13		
2010	MNF-068	REYNOLDS CREEK UPPER_LTWT							25	31	30	12		
2010	UmatNF-001	3TrougFB_LTWT					20	42*	40*	38*	33*	6		
2010	UmatNF-004	BaconAtFB_LTWT					20	40*	47*	40*	53*	5		
2010	UmatNF-006	BeemanCr_LTWT						8	31	31	30	21		
2010	UmatNF-008	CamasAtMT_LTWT					3	30	16					
2010	UmatNF-009	ClearFB_LTWT						4	31	31	30	26		
2010	UmatNF-010	Colvin2_LTWT					41*	45*	38*	43*	20			
2010	UmatNF-014	Ditch2Cr_LTWT					29	44*	39*	51*	36*			
2010	UmatNF-016	FrazerMT_LTWT					4	37*	36*	39*	37*	35*		
2010	UmatNF-019	HenryAtFB_LTWT					5	30	31	31	15			
2010	UmatNF-020	HidaSpgs_LTWT						10	37*	42*	41*	9		
2010	UmatNF-021	HowardMt_LTWT						8	31	31	30	21		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	UmatNF-022	IndianFB_LTWT					21	41*	34*	38*	27			
2010	UmatNF-026	JunknsMT_LTWT						8	31	31	30	21		
2010	UmatNF-027	KahlerAtFB_LTWT					27	30	17					
2010	UmatNF-028	KelsyAtFB_LTWT						7	31	31	30	21		
2010	UmatNF-031	LKelsyMT_LTWT						7	31	31	30	21		
2010	UmatNF-035	LWall2Sk_LTWT					19	45*	38*	44*	45*	7		
2010	UmatNF-038	MalryAtFB_LTWT							31	45*	32*			
2010	UmatNF-039	MdwbFkgs_LTWT						7	51*	49*	45*	30		
2010	UmatNF-040	MdwbrAtMT_LTWT					3	30	31	31	30	6		
2010	UmatNF-043	NFDeso45_LTWT						8	31	31	30	20		
2010	UmatNF-054	Ptams3FB_LTWT							32*	33*	24			
2010	UmatNF-057	SFDeso45_LTWT						8	31	31	30	20		
2010	UmatNF-062	Skookum2_LTWT					25	56*	38*	43*	37*	7		
2010	UmatNF-063	SpongeMT_LTWT						8	31	31	30	21		
2010	UmatNF-064	Swale3Sk_LTWT					18	25						
2010	UmatNF-065	TXBarAtFB_LTWT						14	46*	48*	45*	34*		
2010	UmatNF-066	TXBarAtMT_LTWT						12	48*	46*	40*	31		
2010	UmatNF-068	Wall2AtFB_LTWT					28	55*	47*	48*	23			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	UmatNF-070	Wlsn4AWL_LTWT					10	43*	37*	57*	42*			
2011	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	MNF-008	Bridge Creek Lower_LTWT							25	31	30	31	2	
2011	MNF-009	Bridge Creek Upper_LTWT							25	31	30	31	1	
2011	MNF-019	Clear Creek Lower_LTWT							25	31	30	31	1	
2011	MNF-020	Clear Creek Upper_LTWT							25	31	30	31	1	
2011	MNF-028	Deardorff Creek_LTWT							25	31	30	31		
2011	MNF-030	Dry Fork Clear Creek_LTWT							25	31	30	31	1	
2011	MNF-047	Lunch Creek 3 H2O Temp							25	31	30	31	1	
2011	MNF-048	LUNCH CREEK LOWER_LTWT							25	31	30	31	1	
2011	MNF-060	NF REYNOLDS CREEK_LTWT							25	31	30	18		
2011	MNF-067	REYNOLDS CREEK LOWER_LTWT							25	31	30	18		
2011	MNF-068	REYNOLDS CREEK UPPER_LTWT							25	31	30	18		
2011	MNF-078	Squaw Creek MFJD PCRD_LTWT							25	31	30	31	1	
2011	UmatNF-001	3TrougFB_LTWT						21	39*	38*	38*	19		
2011	UmatNF-003	AlderAtMT_LTWT						22	37*	38*	45*	27		
2011	UmatNF-004	BaconAtFB_LTWT						20	38*	48*	45*	18		
2011	UmatNF-005	BattleMT_LTWT							23	31	30	19		
2011	UmatNF-008	CamasAtMT_LTWT						6	47*	50*	39*	45*		
2011	UmatNF-010	Colvin2_LTWT					3	42*	38*	41*	40*	40*	8	
2011	UmatNF-014	Ditch2Cr_LTWT						1	41*	58*	55*	16		
2011	UmatNF-018	GranitUp_LTWT							31	45*	44*	26		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	UmatNF-020	HidaSpgs_LTWT							33*	43*	40*	47*	9	
2011	UmatNF-021	HowardMt_LTWT							23	31	30	27		
2011	UmatNF-022	IndianFB_LTWT							39*	34*	36*	42*	26	
2011	UmatNF-023	IndnALln_LTWT						5	31	18				
2011	UmatNF-026	JunknsMT_LTWT							23	31	30	19		
2011	UmatNF-028	KelsyAtFB_LTWT						6	31	31	30	27		
2011	UmatNF-029	LightApl_LTWT							28	32*	34*	25		
2011	UmatNF-035	LWall2Sk_LTWT						24	42*	42*	42*	19		
2011	UmatNF-038	MalryAtFB_LTWT						20	33*	45*	43*	8		
2011	UmatNF-039	MdwbFkgs_LTWT							22	31	30	26		
2011	UmatNF-040	MdwbrAtMT_LTWT						8	57*	53*	53*	11		
2011	UmatNF-043	NFDeso45_LTWT							23	31	30	27		
2011	UmatNF-053	Ptams2Rd_LTWT						2	37*	52*	41*	44*		
2011	UmatNF-056	RubyMth_LTWT							23	31	18			
2011	UmatNF-057	SFDeso45_LTWT							23	31	30	27		
2011	UmatNF-062	Skookum2_LTWT						28	42*	45*	35*	17		
2011	UmatNF-064	Swale3Sk_LTWT						23	42*	45*	48*	16		
2011	UmatNF-065	TXBarAtFB_LTWT						7	45*	42*	47*	12		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	UmatNF-070	Wlsn4AWL_LTWT							30	31	30	31	16	
2012	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	MNF-008	Bridge Creek Lower_LTWT						30	31	31	30	31	14	
2012	MNF-009	Bridge Creek Upper_LTWT						30	31	31	30	31	14	
2012	MNF-019	Clear Creek Lower_LTWT						30	31	31	30	31	14	
2012	MNF-020	Clear Creek Upper_LTWT						30	31	31	30	31	14	
2012	MNF-028	Deardorff Creek_LTWT					1	30	31	31	30	31	7	
2012	MNF-040	JOHN DAY RIVER_LTWT					1	30	31	31	30	31	14	
2012	MNF-047	Lunch Creek 3 H2O Temp						30	31	31	30	31	14	
2012	MNF-048	LUNCH CREEK LOWER_LTWT						30	31	31	30	31	14	
2012	MNF-060	NF REYNOLDS CREEK_LTWT						30	31	31	30	31	14	
2012	MNF-067	REYNOLDS CREEK LOWER_LTWT						30	31	31	30	31	14	
2012	MNF-068	REYNOLDS CREEK UPPER_LTWT						30	31	31	30	31	14	
2012	ONF-006	BearCr_bb3406_LTWT						5	31	31	30	31	30	31
2012	ONF-007	BearCrNF_nb3440_LTWT						24	31	31	22			
2012	ONF-020	DoddsCr_do3940_WT					1	30	31	31	30	31	30	31
2012	ONF-026	GrantCr_gr3510_LTWT						5	31	31	30	31	30	31
2012	UmatNF-001	3TrougFB_LTWT							38*	44*	45*	17		
2012	UmatNF-003	AlderAtMT_LTWT						24	41*	56*	51*	14		
2012	UmatNF-004	BaconAtFB_LTWT							37*	51*	54*	17		
2012	UmatNF-005	BattleMT_LTWT						2	31	31	30	3		
2012	UmatNF-006	BeemanCr_LTWT						2	31	31	30	1		
2012	UmatNF-008	CamasAtMT_LTWT						16	52*	47*	42*	38*		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	UmatNF-010	Colvin2_LTWT						1	43*	54*	50*	45*		
2012	UmatNF-014	Ditch2Cr_LTWT						6	49*	57*	55*	41*		
2012	UmatNF-018	GranitUp_LTWT						4	41*	47*	14			
2012	UmatNF-020	HidaSpgs_LTWT						11	38*	48*	50*	40*		
2012	UmatNF-021	HowardMt_LTWT						2	31	31	30	31	6	
2012	UmatNF-022	IndianFB_LTWT							24	52*	54*	39*		
2012	UmatNF-026	JunknsMT_LTWT						2	31	31	30	31	1	
2012	UmatNF-027	KahlerAtFB_LTWT							21	31	30	27		
2012	UmatNF-028	KelsyAtFB_LTWT							18	31	25			
2012	UmatNF-029	LightApl_LTWT						4	34*	36*	13			
2012	UmatNF-035	LWall2Sk_LTWT							35*	48*	43*	14		
2012	UmatNF-038	MalryAtFB_LTWT						24	36*	43*	54*	4		
2012	UmatNF-039	MdwbFkgs_LTWT						12	44*	37*	39*	21		
2012	UmatNF-040	MdwbrAtMT_LTWT						7	54*	56*	50*	20		
2012	UmatNF-053	Ptams2Rd_LTWT						5	31	31	30	24		
2012	UmatNF-055	Ptmas4FB_LTWT						17	31	31	30	2		
2012	UmatNF-056	RubyMth_LTWT						5	49*	16				
2012	UmatNF-057	SFDeso45_LTWT						3	31	31	10			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	UmatNF-062	Skookum2_LTWT							27	31	30	10		
2012	UmatNF-064	Swale3Sk_LTWT						22	48*	45*	50*	13		
2012	UmatNF-065	TXBarAtFB_LTWT						14	50*	56*	53*	39*		
2012	UmatNF-069	Wheel2Cr_LTWT							21	31	30	27		
2012	UmatNF-070	Wlsn4AWL_LTWT							21	31	30	24		
2013	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	MNF-008	Bridge Creek Lower_LTWT					22	30	31	31	30	18		
2013	MNF-009	Bridge Creek Upper_LTWT					22	30	31	31	30	18		
2013	MNF-019	Clear Creek Lower_LTWT					22	30	31	31	30	18		
2013	MNF-020	Clear Creek Upper_LTWT					22	30	31	31	30	18		
2013	MNF-028	Deardorff Creek_LTWT					17	30	31	31	30	19		
2013	MNF-030	Dry Fork Clear Creek_LTWT					22	30	26					
2013	MNF-040	JOHN DAY RIVER_LTWT					23	30	31	31	29			
2013	MNF-047	Lunch Creek 3 H2O Temp					22	30	31	31	30	18		
2013	MNF-048	LUNCH CREEK LOWER_LTWT					22	30	31	31	30	18		
2013	MNF-060	NF REYNOLDS CREEK_LTWT					9	30	31	31	29			
2013	MNF-067	REYNOLDS CREEK LOWER_LTWT					9	30	31	31	29			
2013	MNF-068	REYNOLDS CREEK UPPER_LTWT					9	30	31	31	29			
2013	MNF-078	Squaw Creek MFJD PCRD_LTWT					22	30	19					
2013	MNF-092	Bear creek 1_WT							21	31	30	16		
2013	MNF-093	Bear creek 3_WT							20	31	30	16		
2013	MNF-096	Big1_WT							23	31	30	16		
2013	MNF-097	Big1_WT							23	31	30	16		
2013	MNF-099	Big2_WT							23	31	30	16		
2013	MNF-113	Deadwood_WT							29	31	30	16		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	MNF-114	EastBig_WT								26	30	16		
2013	MNF-144	MFJD1_WT							21	31	30	13		
2013	MNF-145	MFJD2_WT							20	31	30	13		
2013	MNF-146	MFJD3_WT							20	31	30	16		
2013	MNF-163	US Bear_WT							21	31	30	16		
2013	ONF-006	BearCr_bb3406_LTWT	31	28	31	30	31	30	31	31	30	31	30	31
2013	ONF-007	BearCrNF_nb3440_LTWT	31	28	31	30	30	16						
2013	ONF-009	BridgeCrWB_wb4320_WT						6	31	31	30	31	29	31
2013	ONF-020	DoddsCr_do3940_WT	31	28	31	30	31	29	31	31	30	31	30	31
2013	ONF-026	GrantCr_gr3510_LTWT	31	28	31	30	31	29	31	31	30	31	30	31
2013	UmatNF-001	3TrougFB_LTWT					25	39*	39*	35*	39*	30		
2013	UmatNF-003	AlderAtMT_LTWT					27	41*	49*	49*	47*	31		
2013	UmatNF-004	BaconAtFB_LTWT					24	34*	39*	50*	48*	31		
2013	UmatNF-005	BattleMT_LTWT						26	31	31	30	23		
2013	UmatNF-006	BeemanCr_LTWT						26	31	31	30	23		
2013	UmatNF-008	CamasAtMT_LTWT						45*	52*	44*	43*	37*		
2013	UmatNF-010	Colvin2_LTWT				3	40*	38*	43*	41*	43*	35*		
2013	UmatNF-014	Ditch2Cr_LTWT					22	40*	45*	46*	45*			
2013	UmatNF-018	GranitUp_LTWT					2	38*	51*	43*	42*	31		
2013	UmatNF-020	HidaSpgs_LTWT						31	41*	46*	42*	46*	14	
2013	UmatNF-021	HowardMt_LTWT					2	30	31	31	30	23		
2013	UmatNF-022	IndianFB_LTWT				3	37*	35*	45*	54*	50*	29		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	UmatNF-026	JunknsMT_LTWT						26	31	31	30	23		
2013	UmatNF-028	KelsyAtFB_LTWT						30	31	31	30	23		
2013	UmatNF-029	LightApl_LTWT					2	36*	34*	35*	41*	26		
2013	UmatNF-035	LWall2Sk_LTWT					24	44*	47*	51*	45*	31		
2013	UmatNF-039	MdwbFkgs_LTWT						32*	46*	36*	44*	50*	6	
2013	UmatNF-040	MdwbrAtMT_LTWT						48*	59*	53*	53*	57*	10	
2013	UmatNF-043	NFDeso45_LTWT					2	30	31	31	30	23		
2013	UmatNF-053	Ptams2Rd_LTWT					14	30	29	31	29			
2013	UmatNF-056	RubyMth_LTWT					2	44*	49*	44*	42*	39*		
2013	UmatNF-057	SFDeso45_LTWT					2	30	31	31	30	23		
2013	UmatNF-062	Skookum2_LTWT					15	30	31	31	30	21		
2013	UmatNF-064	Swale3Sk_LTWT					26	40*	52*	45*	42*	26		
2013	UmatNF-065	TXBarAtFB_LTWT						42*	53*	51*	49*	49*	6	
2013	UmatNF-070	Wlsn4AWL_LTWT				3	43*	39*	48*	45*	46*	27		
2014	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	MNF-012	Call Creek_Temp_H2O						23	31	31	4			
2014	MNF-101	Camp1_WT							15	31	16			
2014	MNF-102	Camp2_WT							15	31	16			
2014	MNF-103	Camp3_WT							15	31	16			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	MNF-104	Camp4_WT							13	31	21			
2014	MNF-105	Camp7_WT							15	31	16			
2014	MNF-110	Cottonwood1_WT							15	31	16			
2014	MNF-111	Cougar_WT							13	31	21			
2014	MNF-112	Coxie1_WT							30	61*	37*			
2014	MNF-131	Lick1_WT							15	31	16			
2014	MNF-132	Lick2_WT							15	31	16			
2014	MNF-133	Lick3_WT							15	31	16			
2014	MNF-159	Sulphur_Top_WT							15	31	16			
2014	MNF-160	Sulphur_WT							13	31	21			
2014	MNF-161	Trail_WT							13	31	21			
2014	MNF-164	WFLick_WT							15	31	16			
2014	MNF-165	WFLick1_WT							15	31	16			
2014	MNF-166	WFLick2_WT							15	31	16			
2014	MNF-167	AlsupCr_WT							7	31	30	1		
2014	MNF-173	BennettCr_WT							23	31	30	7		
2014	MNF-175	BigRockCr_WT						20	31	31	28			
2014	MNF-179	ButteCr_WT							23	31	30	7		
2014	MNF-182	Camp5_WT							12	31	21			
2014	MNF-183	Camp6_BMRD_MFJDR_WT							13	31	21			
2014	MNF-184	Camp8_WT							14	31	16			
2014	MNF-185	CampAbvShoburg_BMRD_MFJD_WT							13	31	21			
2014	MNF-206	ClearCr_WT						19	8					
2014	MNF-207	CougarCr_WT							7	31	20	1		
2014	MNF-214	DonivanCr_WT							7	31	30	1		
2014	MNF-215	DryCr_WT						19	31	31	28			
2014	MNF-217	EagleCr_WT						20	31	31	28			
2014	MNF-218	EF Beech_mouth_WT						19	31	31	30	5		
2014	MNF-219	EF_BeechCr_WT						19	31	31	30	5		
2014	MNF-223	Granite Boulder Lower_Temp_H2O						19	31	31	30	7		
2014	MNF-224	GraniteBoulderCr_2_WT						19	31	31	30	7		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	MNF-225	GrasshopperCr_WT							7	31	30	8		
2014	MNF-226	GrubCr_WT						19	31	31	30	5		
2014	MNF-230	LemonCr_WT						19	31	31	30	7		
2014	MNF-232	LittleTrailCr_WT						20	31	31	28			
2014	MNF-233	McClellan Ck BMRD 123115a Temp_H2O						19	31	31	30	5		
2014	MNF-238	RaggedCr_WT						19	31	31	28			
2014	MNF-239	RubyCr_WT						19	31	31	28			
2014	MNF-242	SF_JohnDayR_WT							7	31	30	1		
2014	MNF-248	ThompsonCr_WT						19	1					
2014	MNF-249	UpperJohnDayR_WT						23	31	31	30	8		
2014	MNF-250	VenatorCr._WT							7	31	30	1		
2014	ONF-006	BearCr_bb3406_LTWT	31	28	31	30	31	30	31	31	30	31	30	31
2014	ONF-009	BridgeCrWB_wb4320_WT	31	28	30	30	31	29	31	31	30	31	29	31
2014	ONF-020	DoddsCr_do3940_WT	31	28	31	30	31	10						
2014	ONF-026	GrantCr_gr3510_LTWT	31	28	31	30	31	4						
2014	ONF-070	Sunflower_3502_WT						4	31	22	7	31	29	31
2014	UmatNF-001	3TrougFB_LTWT					44*	41*	43*	42*	41*	9		
2014	UmatNF-003	AlderAtMT_LTWT					31	38*	51*	53*	49*	26		
2014	UmatNF-004	BaconAtFB_LTWT					49*	35*	41*	52*	54*	11		
2014	UmatNF-005	BattleMT_LTWT						18	31	31	30	22		
2014	UmatNF-006	BeemanCr_LTWT						18	31	31	30	20		
2014	UmatNF-008	CamasAtMT_LTWT					2	54*	51*	43*	39*	36*		
2014	UmatNF-010	Colvin2_LTWT				21	31	30	31	31	30	27		
2014	UmatNF-014	Ditch2Cr_LTWT					21	39*	45*	52*	57*	34*		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	UmatNF-018	GranitUp_LTWT						27	45*	44*	41*	31		
2014	UmatNF-020	HidaSpgs_LTWT					2	43*	42*	42*	44*	41*	5	
2014	UmatNF-021	HowardMt_LTWT						18	31	31	30	22		
2014	UmatNF-022	IndianFB_LTWT				24	41*	37*	38*	46*	48*	38*		
2014	UmatNF-023	IndnALIn_LTWT						18	31	31	30	23		
2014	UmatNF-026	JunknsMT_LTWT						18	31	31	30	20		
2014	UmatNF-027	KahlerAtFB_LTWT				21	31	30	31	31	30	27		
2014	UmatNF-029	LightApl_LTWT						25	36*	40*	38*	26		
2014	UmatNF-030	LIndinMT_LTWT						18	31	31	30	23		
2014	UmatNF-035	LWall2Sk_LTWT						5	47*	42*	47*	9		
2014	UmatNF-036	LWallBac_LTWT						48*	46*	49*	55*	12		
2014	UmatNF-039	MdwbFkgs_LTWT						30	47*	50*	41*	33*		
2014	UmatNF-040	MdwbrAtMT_LTWT					2	57*	59*	60*	57*	38*		
2014	UmatNF-043	NFDeso45_LTWT						18	31	31	30	21		
2014	UmatNF-053	Ptams2Rd_LTWT					15	30	31	31	30	28		
2014	UmatNF-056	RubyMth_LTWT						31	50*	43*	38*	35*		
2014	UmatNF-061	Skookum1_LTWT						44*	40*	48*	45*	30		
2014	UmatNF-062	Skookum2_LTWT						4	31	31	30	6		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	UmatNF-065	TXBarAtFB_LTWT						33*	51*	54*	53*	31		
2014	UmatNF-069	Wheel2Cr_LTWT				21	31	30	31	31	30	27		
2014	UmatNF-070	WIsn4AWL_LTWT				21	31	30	31	31	30	27		
2015	1029	1029 Desolation Cr Treatment2 BioM DesolationCreek_Treatment2										31	30	31
2015	1032	1032 Granite Cr Control	31	28	31	30	31	30	31	31	1	31	30	31
2015	1033	1033 Granite Cr Treatment	31	28	31	30	31	30	31	31		31	30	31
2015	1034	1034 Desolation Creek lower site #1										9	30	31
2015	1035	1035 Desolation Creek mid-point site #2										9	30	31
2015	1036	1036 Desolation Creek upper site #3										9	30	31
2015	1037	1037 Desolation Cr Control 2										31	30	31
2015	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR									19	31	30	31
2015	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	MNF-009	Bridge Creek Upper_LTWT					2	30	31	31	22			
2015	MNF-012	Call Creek_Temp_H2O						21	31	31	22			
2015	MNF-019	Clear Creek Lower_LTWT					11	30	31	31	13			
2015	MNF-020	Clear Creek Upper_LTWT					11	30	31	31	13			
2015	MNF-030	Dry Fork Clear Creek_LTWT					11	30	31	31	6			
2015	MNF-039	John Day River_Cresent_Temp_H2O						21	31	31	22			
2015	MNF-040	JOHN DAY RIVER_LTWT					11	30	31	31	20			
2015	MNF-047	Lunch Creek 3 H2O Temp					11	30	31	31	22			
2015	MNF-048	LUNCH CREEK LOWER_LTWT					2	30	31	31	22			
2015	MNF-060	NF REYNOLDS CREEK_LTWT					2	30	31	31	22			
2015	MNF-063	Papoose Creek PCRD Temp_H2O					11	30	31	31	6			
2015	MNF-067	REYNOLDS CREEK LOWER_LTWT					2	30	31	31	22			
2015	MNF-068	REYNOLDS CREEK UPPER_LTWT					2	30	31	31	22			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	MNF-071	SF Bridge Creek PCRD Temp_H2O					2	30	31	31	22			
2015	MNF-077	Squaw Creek 3 PCRD Temp_H2O				2	31	30	31	31	27			
2015	MNF-078	Squaw Creek MFJD PCRD_LTWT					10	22						
2015	MNF-079	Strawberry Creek Temp_H2O					1	30	31	31	21			
2015	MNF-096	Big1_WT							16	31	28			
2015	MNF-097	Big1_WT							16	31	28			
2015	MNF-098	Big2_2015_WT							16	31	28			
2015	ONF-006	BearCr_bb3406_LTWT	31	28	31	30	31	29	31	31	30	31	29	31
2015	ONF-009	BridgeCrWB_wb4320_WT	31	28	30	30	31	29	31	31	30	31	29	31
2015	ONF-029	HeflinCr_hl4600_WT						8	31	31	30	31	30	31
2015	ONF-070	Sunflower_3502_WT	31	28	30	30	31	29	31	31	30	31	29	31
2015	ONF-071	SunflowerCr_3501_LTWT							30	31	30	31	29	31
2015	UmatNF-001	3TrougFB_LTWT				13	46*	38*	45*	43*	41*	10		
2015	UmatNF-003	AlderAtMT_LTWT					30	48*	46*	48*	44*	23		
2015	UmatNF-004	BaconAtFB_LTWT				12	39*	43*	48*	49*	48*	10		
2015	UmatNF-005	BattleMT_LTWT						26	31	31	30	31	11	
2015	UmatNF-006	BeemanCr_LTWT						15	31	31	30	27		
2015	UmatNF-008	CamasAtMT_LTWT						38*	45*	47*	42*	32*		
2015	UmatNF-010	Colvin2_LTWT					32*	42*	41*	45*	55*	24		
2015	UmatNF-012	DesoISCO_LTWT						26	31	31	30	21		
2015	UmatNF-014	Ditch2Cr_LTWT					28	38*	52*	53*	57*	34*		
2015	UmatNF-018	GranitUp_LTWT						37*	48*	46*	44*	46*	3	
2015	UmatNF-021	HowardMt_LTWT						26	31	31	30	27		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	UmatNF-022	IndianFB_LTWT				20	39*	36*	37*	52*	52*	10		
2015	UmatNF-023	IndnALIn_LTWT						24	31	31	30	27		
2015	UmatNF-026	JunknsMT_LTWT						15	31	31	30	27		
2015	UmatNF-027	KahlerAtFB_LTWT					23	30	31	31	30	18		
2015	UmatNF-028	KelsyAtFB_LTWT						25	31	31	30	27		
2015	UmatNF-029	LightApl_LTWT						35*	43*	45*	36*	44*	3	
2015	UmatNF-030	LIndinMT_LTWT						24	31	31	30	27		
2015	UmatNF-036	LWallBac_LTWT				12	47*	54*	54*	57*	56*	14		
2015	UmatNF-039	MdwbFkgs_LTWT						4	46*	42*	44*	47*	8	
2015	UmatNF-040	MdwbrAtMT_LTWT						45*	53*	57*	53*	37*		
2015	UmatNF-043	NFDeso45_LTWT						27	31	31	30	27		
2015	UmatNF-053	Ptams2Rd_LTWT					25	30	31	31	30	20		
2015	UmatNF-056	RubyMth_LTWT						37*	51*	52*	44*	50*	3	
2015	UmatNF-057	SFDeso45_LTWT						27	31	31	30	27		
2015	UmatNF-061	Skookum1_LTWT					36*	43*	44*	52*	43*	21		
2015	UmatNF-064	Swale3Sk_LTWT					33*	43*	49*	55*	50*	24		
2015	UmatNF-065	TXBarAtFB_LTWT						29	50*	52*	50*	50*	9	
2015	UmatNF-069	Wheel2Cr_LTWT					23	30	31	31	30	18		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	UmatNF-070	Wlsn4AWL_LTWT					23	30	31	31	30	18		
2016	1029	1029 Desolation Cr Treatment2 BioM DesolationCreek_Treatment2	31	29	31	30	31	30	31	31	30	31	30	31
2016	1032	1032 Granite Cr Control	31	29	31	30	31	30	31	31	8	31	30	31
2016	1033	1033 Granite Cr Treatment	31	29	31	30	31	30	31	31	8	31	30	31
2016	1034	1034 Desolation Creek lower site #1	31	29	31	30	31	30	25			31	30	31
2016	1035	1035 Desolation Creek mid-point site #2	31	29	31	30	31	30	25			31	30	31
2016	1036	1036 Desolation Creek upper site #3	31	29	31	30	31	30	25			31	30	31
2016	1037	1037 Desolation Cr Control 2	31	29	31	30	31	30	31	31	29	31	30	31
2016	1055	1055 Desolation Creek at Spring Creek										31	30	31
2016	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	29	31	30	29	30	31	31	30	31	30	31
2016	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	MNF-009	Bridge Creek Upper_LTWT						28	31	31	28			
2016	MNF-012	Call Creek_Temp_H2O						23	31	31	30	3		
2016	MNF-016	Camp H20 Temp						27	31	31	30	3		
2016	MNF-019	Clear Creek Lower_LTWT						28	31	31	28			
2016	MNF-020	Clear Creek Upper_LTWT						28	31	31	28			
2016	MNF-028	Deardorff Creek_LTWT						28	31	31	28			
2016	MNF-030	Dry Fork Clear Creek_LTWT						27	29					
2016	MNF-031	East Fork Camp H2O Temp						24	31	31	30	3		
2016	MNF-039	John Day River_Cresent_Temp_H2O						23	31	31	30	3		
2016	MNF-040	JOHN DAY RIVER_LTWT						23	31	31	30	3		
2016	MNF-042	Lick H2O Temp						27	31	31	30	3		
2016	MNF-047	Lunch Creek 3 H2O Temp						28	31	31	28			
2016	MNF-048	LUNCH CREEK LOWER_LTWT					12	30	31	31	28			
2016	MNF-060	NF REYNOLDS CREEK_LTWT						23	31	31	28			
2016	MNF-063	Papoose Creek PCRD Temp_H2O						27	31	31	28			
2016	MNF-067	REYNOLDS CREEK LOWER_LTWT						28	31	31	28			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	MNF-068	REYNOLDS CREEK UPPER_LTWT						23	31	31	28			
2016	MNF-071	SF Bridge Creek PCRD Temp_H2O						28	31	31	28			
2016	MNF-077	Squaw Creek 3 PCRD Temp_H2O						28	31	31	28			
2016	MNF-078	Squaw Creek MFJD PCRD_LTWT						27	20					
2016	MNF-079	Strawberry Creek Temp_H2O						19	31	31	27			
2016	MNF-094	Big1_2016_WT							24	31	30	31	14	
2016	MNF-116	EFKBig2_2016_WT							20	31	30	31	14	
2016	MNF-118	EFKBig3_2016_WT							24	31	30	31	14	
2016	MNF-120	EFKBig4_2016_WT							20	31	30	31	14	
2016	MNF-122	EFKBig5_2016_WT							24	31	30	31	14	
2016	MNF-149	Pizer2_2016_WT							20	31	30	31	11	
2016	MNF-151	Pizer3_2016_WT							24	31	30	31	14	
2016	MNF-156	Squaw_BottomProj15_WT						24	31	12				
2016	MNF-158	SquawCk_ford_WT						23	31	31	28			
2016	ONF-006	BearCr_bb3406_LTWT	31	29	30	30	30	30	31	31	30	31	29	31
2016	ONF-007	BearCrNF_nb3440_LTWT					14	30	31	31	30	31	29	31
2016	ONF-009	BridgeCrWB_wb4320_WT	31	29	30	30	29	30	31	31	30	31	29	31
2016	ONF-020	DoddsCr_do3940_WT					14	30	31	31	30	31	29	31
2016	ONF-026	GrantCr_gr3510_LTWT					14	30	31	31	30	31	29	31
2016	ONF-029	HeflinCr_hl4600_WT	31	29	31	30	16	8	31	31	30	31	29	31
2016	ONF-070	Sunflower_3502_WT	31	29	30	30	24							
2016	ONF-071	SunflowerCr_3501_LTWT	31	29	30	30	24	21	31	31	30	31	29	31
2016	UmatNF-001	3TrougFB_LTWT				6	41*	42*	43*	43*	50*	30		
2016	UmatNF-003	AlderAtMT_LTWT					27	47*	53*	48*	53*	31		
2016	UmatNF-004	BaconAtFB_LTWT				5	42*	41*	39*	50*	51*	31		
2016	UmatNF-005	BattleMT_LTWT					8	30	31	31	30	19		
2016	UmatNF-006	BeemanCr_LTWT					8	30	31	31	30	19		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	UmatNF-008	CamasAtMT_LTWT					27	48*	49*	36*	43*	28		
2016	UmatNF-010	Colvin2_LTWT				1	31	30	22		29	16		
2016	UmatNF-011	Deso1003_LTWT					8	30	31	31	13			
2016	UmatNF-012	DesoISCO_LTWT					8	30	31	31	30	19		
2016	UmatNF-014	Ditch2Cr_LTWT					26	43*	52*	48*	56*	41*		
2016	UmatNF-018	GranitUp_LTWT						42*	45*	44*	30			
2016	UmatNF-020	HidaSpgs_LTWT					29	43*	46*	48*	50*	45*	4	
2016	UmatNF-021	HowardMt_LTWT					8	30	31	31	30	19		
2016	UmatNF-022	IndianFB_LTWT				17	40*	38*	36*	49*	47*	26		
2016	UmatNF-023	IndnALIn_LTWT					20	30	31	31	30	24		
2016	UmatNF-026	JunknsMT_LTWT					8	30	31	31	30	19		
2016	UmatNF-027	KahlerAtFB_LTWT				1	31	30	31	31	30	16		
2016	UmatNF-028	KelsyAtFB_LTWT					21	30	31	31	30	19		
2016	UmatNF-029	LightApl_LTWT						35*	42*	45*	24			
2016	UmatNF-030	LIndinMT_LTWT					20	30	31	31	30	24		
2016	UmatNF-036	LWallBac_LTWT				6	46*	56*	59*	55*	57*	32*		
2016	UmatNF-039	MdwbFkgs_LTWT					19	24						
2016	UmatNF-040	MdwbrAtMT_LTWT					19	30	31	31	30	19		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	UmatNF-053	Ptams2Rd_LTWT					20	30	31	31	30	23		
2016	UmatNF-056	RubyMth_LTWT						43*	57*	44*	26			
2016	UmatNF-057	SFDeso45_LTWT						28	31	31	30	5		
2016	UmatNF-061	Skookum1_LTWT					37*	50*	44*	49*	47*	31		
2016	UmatNF-064	Swale3Sk_LTWT					29	47*	43*	50*	50*	29		
2016	UmatNF-065	TXBarAtFB_LTWT					30	50*	51*	52*	50*	37*		
2016	UmatNF-069	Wheel2Cr_LTWT				1	31	30	31	31	30	16		
2016	UmatNF-070	Wlsn4AWL_LTWT					21	30	31	22				
2016	WWNF-008	Beaver.93M.1_WT						32*	52*	40*	55*	30		
2016	WWNF-018	Boulder.93C.2_WT						10	44*	43*	54*	26		
2016	WWNF-019	Boulder.93C.5_WT						17	62*	60*	59*	31		
2016	WWNF-020	Boundary.93N.1.WT						33*	47*	48*	52*	26		
2016	WWNF-023	BullRun.93N.1_WT						22	31	31	30	17		
2016	WWNF-024	BullRun.93O.3_WT						18	31	31	30	16		
2016	WWNF-039	Clear.93M.1_WT						30	41*	14				
2016	WWNF-055	Deep.93O.1.5_WT						31	44*	41*	50*	28		
2016	WWNF-091	Granite.93C.3_LTWT						37*	60*	51*	54*	26		
2016	WWNF-092	Granite.93C.5_WT						42*	54*	46*	56*	27		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	WWNF-143	NFJD.94G.1_LTWT						24	48*	45*	44*	25		
2016	WWNF-144	NFJD.94I.6_LTWT						22	50*	52*	57*	29		
2016	WWNF-151	NTrail.94F.1_WT						21	49*	42*	48*	24		
2016	WWNF-152	Olive.93L.1_WT						27	37*	34*	39*	26		
2016	WWNF-154	Onion.94G.1_WT						19	38*	35*	44*	25		
2016	WWNF-174	STrail.94F.1_WT						20	47*	40*	48*	26		
2017	1029	1029 Desolation Cr Treatment2 BioM DesolationCreek_Treatment2	31	28	31	30	31	30	31	31	27	31	30	31
2017	1032	1032 Granite Cr Control	31	28	31	30	11					31	30	31
2017	1033	1033 Granite Cr Treatment	31	28	31	30	31	30	31	31	18	31	30	31
2017	1034	1034 Desolation Creek lower site #1	31	28	31	30	31	30	31	31	27			
2017	1035	1035 Desolation Creek mid-point site #2	31	28	31	30	31	30	31	31	27	31	30	31
2017	1036	1036 Desolation Creek upper site #3	31	28	31	30	31	30	31	31	27	31	30	31
2017	1037	1037 Desolation Cr Control 2	31	28	31	30	31	30	31	30		31	30	31
2017	1055	1055 Desolation Creek at Spring Creek	31	28	31	30	31	30	31	31	27	31	30	31
2017	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	21	30	30	31	30	31	31	30	31	30	31
2017	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	5011	5011 HWY 244						24	31	31	30			
2017	5013	5013 Wayside						24	31	31	30			
2017	5014	5014 Lower Fletcher						24	31	31	30			
2017	5015	5015 Upper Kelsay						24	31	31	30			
2017	5017	5017 Lower Kelsay						24	31	31	30			
2017	5018	5018 Lower Deer						24	31	31	30			
2017	5019	5019 Upper Deer						24	31	31	30			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	5021	5021 Olive Creek						24	31	31	30			
2017	5024	5024 Clear Creek						24	31	31	30			
2017	5025	5025 Upper Beaver						24	31	31	30			
2017	5026	5026 Lower Beaver						24	31	31	30			
2017	5027	5027 Middle Kelsay						24	31	31	30			
2017	5165	5165 Bull Run Creek Upper						24	31	31	30			
2017	5166	5166 Bull Run Creek Middle						24	31	31	30			
2017	5167	5167 Bull Run Creek Lower						24	31	31	30			
2017	5169	5169 Granite Creek Upper						24	31	31	30			
2017	5170	5170 Granite Creek Lower						24	31	31	30			
2017	MNF-009	Bridge Creek Upper_LTWT					16	30	31	31	30	1		
2017	MNF-012	Call Creek_Temp_H2O					13	30	31	31	30	11		
2017	MNF-019	Clear Creek Lower_LTWT					16	30	31	31	30	1		
2017	MNF-020	Clear Creek Upper_LTWT					16	30	31	31	30	1		
2017	MNF-028	Deardorff Creek_LTWT					9	30	31	31	30	11		
2017	MNF-030	Dry Fork Clear Creek_LTWT					16	30	31	23				
2017	MNF-039	John Day River_Cresent_Temp_H2O					13	30	31	31	30	11		
2017	MNF-040	JOHN DAY RIVER_LTWT					13	30	31	31	30	11		
2017	MNF-047	Lunch Creek 3 H2O Temp					16	30	31	31	30	1		
2017	MNF-048	LUNCH CREEK LOWER_LTWT					16	30	31	31	30	1		
2017	MNF-060	NF REYNOLDS CREEK_LTWT					12	30	31	31	30	11		
2017	MNF-063	Papoose Creek PCRD Temp_H2O					16	30	31	31	30	1		
2017	MNF-067	REYNOLDS CREEK LOWER_LTWT					12	30	31	31	30	11		
2017	MNF-068	REYNOLDS CREEK UPPER_LTWT					12	30	31	31	30	11		
2017	MNF-071	SF Bridge Creek PCRD Temp_H2O					16	30	31	31	30	1		
2017	MNF-077	Squaw Creek 3 PCRD Temp_H2O					16	30	31	31	30	1		
2017	MNF-078	Squaw Creek MFJD PCRD_LTWT					15	30	31	25				
2017	MNF-095	Big1_2017_WT						10	31	31	30	4		
2017	MNF-106	CL4098						24	31	31	26			
2017	MNF-115	EFKBig1_2017_WT					20	30	31	31	30	31	20	
2017	MNF-117	EFKBig2_2017_WT						9	31	31	30	1		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	MNF-119	EFKBig3_2017_WT						9	31	31	30	1		
2017	MNF-121	EFKBig4_2017_WT						8	31	31	30	4		
2017	MNF-123	EFKBig5_2017_WT						8	31	31	30	4		
2017	MNF-127	JO3766						24	31	31	27			
2017	MNF-148	Pizer1_2017_WT					20	30	31	31	30	31	18	
2017	MNF-150	Pizer2_2017_WT						9	31	31	30	1		
2017	MNF-152	Pizer3_2017_WT						9	31	31	30	1		
2017	MNF-154	Squaw Creek 4 PCRD Temp_H2O					16	30	5					
2017	MNF-155	Squaw Creek 5 PCRD Temp_H2O					16	30	22					
2017	MNF-156	Squaw_BottomProj15_WT					16	30	31	31	30	1		
2017	MNF-157	Squaw_Upstream_of_Private_WT					16	30	31	31	30	1		
2017	MNF-158	SquawCk_ford_WT					16	30	31	31	30	1		
2017	MNF-216	DryFork_ClearCr_DF4230_WT						23	31	31	20			
2017	MNF-220	EnnisCr_3634_WT						23	31	31	15			
2017	MNF-242	SF_JohnDayR_WT						1	31	31	30	1		
2017	ONF-006	BearCr_bb3406_LTWT	31	28	30	30	29	30	31	31	30	31	29	31
2017	ONF-007	BearCrNF_nb3440_LTWT	31	28	30	30	29	30	31	31	30	31	29	31
2017	ONF-009	BridgeCrWB_wb4320_WT	31	28	30	30	29	30	31	31	30	31	29	31
2017	ONF-020	DoddsCr_do3940_WT	31	28	30	30	29	30	31	31	30	31	29	31
2017	ONF-026	GrantCr_gr3510_LTWT	31	28	30	30	29	30	31	31	30	31	29	31
2017	ONF-029	HeflinCr_hl4600_WT	31	28	30	30	25	30	31	31	30	31	29	31
2017	ONF-071	SunflowerCr_3501_LTWT	31	28	30	30	12							
2017	UmatNF-001	3TrougFB_LTWT					7	30	31	31	13			
2017	UmatNF-003	AlderAtMT_LTWT						30	31	31	12			
2017	UmatNF-004	BaconAtFB_LTWT					7	30	31	31	13			
2017	UmatNF-008	CamasAtMT_LTWT						14	31	31	30	4		
2017	UmatNF-010	Colvin2_LTWT					12	30	21	31	17			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	UmatNF-014	Ditch2Cr_LTWT						28	31	31	12			
2017	UmatNF-018	GranitUp_LTWT						1	31	31	30	2		
2017	UmatNF-020	HidaSpgs_LTWT							19	31	30	12		
2017	UmatNF-022	IndianFB_LTWT					12	30	31	31	17			
2017	UmatNF-023	IndnALIn_LTWT						17	31	31	30	11		
2017	UmatNF-027	KahlerAtFB_LTWT					12	30	31	31	17			
2017	UmatNF-029	LightApl_LTWT						1	31	31	30	2		
2017	UmatNF-030	LIndinMT_LTWT						17	31	31	30	11		
2017	UmatNF-036	LWallBac_LTWT					7	30	31	31	13			
2017	UmatNF-039	MdwbFkgs_LTWT						9	31	31	30	2		
2017	UmatNF-040	MdwbrAtMT_LTWT						9	31	31	30	5		
2017	UmatNF-053	Ptams2Rd_LTWT						29	31	31	12			
2017	UmatNF-056	RubyMth_LTWT						1	31	31	30	2		
2017	UmatNF-061	Skookum1_LTWT						30	31	31	12			
2017	UmatNF-064	Swale3Sk_LTWT						30	31	31	12			
2017	UmatNF-065	TXBarAtFB_LTWT						9	31	31	30	16		
2017	UmatNF-069	Wheel2Cr_LTWT					12	30	31	31	17			
2017	UmatNF-070	Wlsn4AWL_LTWT					12	30	31	31	17			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	WWNF-008	Beaver.93M.1_WT						7	51*	48*	58*	10		
2017	WWNF-018	Boulder.93C.2_WT						8	39*	59*	59*	10		
2017	WWNF-020	Boundary.93N.1.WT						9	42*	42*	46*	7		
2017	WWNF-023	BullRun.93N.1_WT						6	31	31	30	4		
2017	WWNF-024	BullRun.93O.3_WT						5	31	31	30	4		
2017	WWNF-039	Clear.93M.1_WT						9	42*	45*	49*	7		
2017	WWNF-055	Deep.93O.1.5_WT						8	38*	45*	51*	7		
2017	WWNF-092	Granite.93C.5_WT						9	47*	51*	58*	8		
2017	WWNF-152	Olive.93L.1_WT						9	34*	37*	39*	5		
2017	WWNF-154	Onion.94G.1_WT						10	37*	37*	39*	7		
2017	WWNF-163	SFBeaver.93M.1_WT						6	31	31	30	5		
2018	1029	1029 Desolation Cr Treatment2 BioM DesolationCreek_Treatment2	31	28	31	30	31	30	31	31	17	31	30	31
2018	1032	1032 Granite Cr Control	31	28	31	30	31	30	31	31	28	31	30	31
2018	1033	1033 Granite Cr Treatment	31	28	31	30	31	30	31	31	10	31	30	31
2018	1035	1035 Desolation Creek mid-point site #2	31	28	31	30	31	30	31	31	30	14		
2018	1036	1036 Desolation Creek upper site #3	31	28	31	30	31	30	31	31	30	14		
2018	1037	1037 Desolation Cr Control 2	31	28	31	30	31	30	31	31	17	31	30	31
2018	1055	1055 Desolation Creek at Spring Creek	31	28	31	30	31	30	31	31	30	15		
2018	14039500	S Fk John Day R Nr Dayville, OR										31	30	31
2018	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	28	29	30	31	30	31	31	30	31	30	31
2018	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	MNF-009	Bridge Creek Upper_LTWT					9	30	31	31	16			
2018	MNF-012	Call Creek_Temp_H2O					16	30	31	31	30	22		
2018	MNF-019	Clear Creek Lower_LTWT					8	30	31	31	30	24		
2018	MNF-020	Clear Creek Upper_LTWT					8	30	31	31	17			
2018	MNF-028	Deardorff Creek_LTWT						24	31	31	30	31		
2018	MNF-030	Dry Fork Clear Creek_LTWT					8	30	31	9				
2018	MNF-039	John Day River_Cresent_Temp_H2O					16	30	31	31	30	22		
2018	MNF-040	JOHN DAY RIVER_LTWT					16	30	31	31	30	22		
2018	MNF-047	Lunch Creek 3 H2O Temp					9	30	31	31	16			
2018	MNF-048	LUNCH CREEK LOWER_LTWT					9	30	31	31	17			
2018	MNF-060	NF REYNOLDS CREEK_LTWT					9	30	31	31	30	31		
2018	MNF-063	Papoose Creek PCRD Temp_H2O					8	30	31	31	30	31	14	
2018	MNF-067	REYNOLDS CREEK LOWER_LTWT					9	30	31	31	30	31	17	
2018	MNF-068	REYNOLDS CREEK UPPER_LTWT					9	30	31	31	30	31		
2018	MNF-071	SF Bridge Creek PCRD Temp_H2O					9	30	31	31	16			
2018	MNF-077	Squaw Creek 3 PCRD Temp_H2O					8	30	31	31	30	31	14	
2018	MNF-078	Squaw Creek MFJD PCRD_LTWT					8	30	25					
2018	MNF-079	Strawberry Creek Temp_H2O					21	30	31	31	30	31	4	
2018	MNF-127	JO3766						23	31	31	30	1		
2018	MNF-155	Squaw Creek 5 PCRD Temp_H2O					8	30	13					
2018	MNF-156	Squaw_BottomProj15_WT					8	30	31	31	30			
2018	MNF-157	Squaw_Upstream_of_Private_WT						24	11					
2018	MNF-158	SquawCk_ford_WT					8	30	31	31	30	31	14	
2018	MNF-170	BasinCr_WT						30	31	16				
2018	MNF-171	BearCr_WT						23	31	31	30	1		
2018	MNF-172	BeechCr_WT						23	31	31	30	1		
2018	MNF-176	BridgeCreek_2_WT					16	30	31	31	30	31	6	
2018	MNF-177	BridgeCreek_3_WT					16	30	31	31	30	31	19	
2018	MNF-178	BridgeCreek_5_WT					16	30	31	31	30	31	18	
2018	MNF-210	DeadInjunCr_WT						30	19					

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	MNF-213	DeweyCr_WT						23	31	31	30			
2018	MNF-227	HogCr_WT						23	31	31	30	1		
2018	MNF-228	Idaho Creek_1_Temp_H2O					16	30	31	31	30	31	7	
2018	MNF-229	Idaho Creek_2_Temp_H2O					16	30	31	31	30	31	19	
2018	MNF-234	MFJD River_above_Austin113522a_LTWT					16	30	31	31	30	31	19	
2018	MNF-236	NF_DeerCr_WT						30	31	31	30			
2018	MNF-237	NorthFork_BridgeCr_WT					16	30	31	31	30	31	19	
2018	MNF-241	SF_DeerCr_WT						30	31	31	30			
2018	MNF-242	SF_JohnDayR_WT					5	30	31	31	30	1		
2018	MNF-243	SouthTrib_BridgeCreek_WT					16	30	31	31	30	31	7	
2018	MNF-244	SugarCr_WT						30	31	31	30			
2018	MNF-246	Summit Creek Upper BMRD 113525a_LTWT					16	30	31	31	30	31	19	
2018	MNF-253	WestTrib_BridgeCreek_WT					16	30	31	31	30	31	18	
2018	ONF-006	BearCr_bb3406_LTWT	31	28	30	30	22							
2018	ONF-007	BearCrNF_nb3440_LTWT	31	28	30	30	22							
2018	ONF-009	BridgeCrWB_wb4320_WT	31	28	30	30	23							
2018	ONF-020	DoddsCr_do3940_WT	31	28	30	30	22							
2018	ONF-026	GrantCr_gr3510_LTWT	31	28	30	30	22							
2018	ONF-029	HeflinCr_hl4600_WT	31	28	30	30	23							
2018	ONF-071	SunflowerCr_3501_LTWT						25	31	20	9	31	29	31
2018	UmatNF-001	3TrougFB_LTWT						2	31	31	30			
2018	UmatNF-003	AlderAtMT_LTWT						15	31	31	26			
2018	UmatNF-004	BaconAtFB_LTWT						2	31	31	26			
2018	UmatNF-008	CamasAtMT_LTWT					13	30	31	31	30	1		
2018	UmatNF-010	Colvin2_LTWT				12	31	30	31	29	25			
2018	UmatNF-014	Ditch2Cr_LTWT						1	31	31	25			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	UmatNF-018	GranitUp_LTWT						11	31	31	30	12		
2018	UmatNF-020	HidaSpgs_LTWT					6	30	31	31	23			
2018	UmatNF-022	IndianFB_LTWT				11	31	30	31	31	30	9		
2018	UmatNF-023	IndnALln_LTWT					15	30	31	31	30	4		
2018	UmatNF-027	KahlerAtFB_LTWT				11	31	30	31	31	25			
2018	UmatNF-029	LightApl_LTWT						11	31	31	30	11		
2018	UmatNF-030	LIndinMT_LTWT					15	30	31	31	30	4		
2018	UmatNF-036	LWallBac_LTWT						1	31	31	27			
2018	UmatNF-039	MdwbFkgs_LTWT					13	30	23					
2018	UmatNF-040	MdwbrAtMT_LTWT					13	30	31	31	24			
2018	UmatNF-053	Ptams2Rd_LTWT				4	31	30	31	31	30	31	29	11
2018	UmatNF-056	RubyMth_LTWT						11	31	31	30	11		
2018	UmatNF-061	Skookum1_LTWT						15	31	31	26			
2018	UmatNF-064	Swale3Sk_LTWT							15					
2018	UmatNF-065	TXBarAtFB_LTWT					13	30	31	31	30	2		
2018	UmatNF-069	Wheel2Cr_LTWT				11	31	30	31	31	24			
2018	UmatNF-070	WIsn4AWL_LTWT				4	31	30	31	31	30	9		
2019	1029	1029 Desolation Cr Treatment2 BioM DesolationCreek_Treatment2	31	28	31	30	31	30	31	20		31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	1032	1032 Granite Cr Control	31	28	31	30	31	30	31	31	30	30	30	31
2019	1033	1033 Granite Cr Treatment	31	28	31	30	31	30	31	31	30	30	30	31
2019	1037	1037 Desolation Cr Control 2	31	28	31	30	31	30	31	25		31	30	31
2019	1052	1052 NF John Day River										24	30	31
2019	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	10	30	31	30	31
2019	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14046890	Pine Creek Near Clarno, OR	31	27	31	30	31	30	31	31	30	31	30	31
2019	40096-ORDEQ	Sniption Canyon 322 meters US of mouth						2	31	31	30	31		
2019	40098-ORDEQ	Dry Fork Thirtymile Ck 0.5 mile above mouth						5	31	31	30	31		
2019	40099-ORDEQ	Thirtymile CK 100 meters US of bridge						5	31	31	30	31		
2019	40100-ORDEQ	Thirtymile CK 2 Miles US Sniption						2	31	31	30	31		
2019	40101-ORDEQ	Condon Canyon at HWY 19						2	31	31	30	31		
2019	40102-ORDEQ	Lost Valley CK at Bridge						5	31	31	30	31		
2019	40104-ORDEQ	Thitymile CK 66 meters DS EFK						5	31	31	30	31		
2019	40105-ORDEQ	Thirtymile CK EFK above bridge						5	31	31	30	31		
2019	40559-ORDEQ	Thirtymile Creek at Adobe House						5	31	31	30	31		
2019	MNF-009	Bridge Creek Upper_LTWT					1	30	31	31	30	16		
2019	MNF-012	Call Creek_Temp_H2O					22	30	31	31	29			
2019	MNF-017	CampCreek_Mouth112819a_LTWT							1	31	30	31	29	31
2019	MNF-019	Clear Creek Lower_LTWT					1	30	31	31	30	6		
2019	MNF-020	Clear Creek Upper_LTWT					1	30	31	31	30	16		
2019	MNF-028	Deardorff Creek_LTWT						24	31	31	30	7		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	MNF-030	Dry Fork Clear Creek_LTWT					1	30	31	31	30	16		
2019	MNF-039	John Day River_Cresent_Temp_H2O					22	30	31	31	30	2		
2019	MNF-040	JOHN DAY RIVER_LTWT					22	30	31	31	29			
2019	MNF-047	Lunch Creek 3 H2O Temp					1	30	31	31	30	16		
2019	MNF-048	LUNCH CREEK LOWER_LTWT					1	30	31	31	30	16		
2019	MNF-060	NF REYNOLDS CREEK_LTWT					1	30	31	31	30	7		
2019	MNF-063	Papoose Creek PCRD Temp_H2O					2	30	31	31	30	16		
2019	MNF-067	REYNOLDS CREEK LOWER_LTWT					1	30	31	31	30	7		
2019	MNF-068	REYNOLDS CREEK UPPER_LTWT					1	30	31	31	30	7		
2019	MNF-071	SF Bridge Creek PCRD Temp_H2O					1	30	31	31	30	16		
2019	MNF-077	Squaw Creek 3 PCRD Temp_H2O					1	30	31	31	30	16		
2019	MNF-078	Squaw Creek MFJD PCRD_LTWT					1	30	31	27				
2019	MNF-079	Strawberry Creek Temp_H2O					1	30	18					
2019	MNF-155	Squaw Creek 5 PCRD Temp_H2O					2	30	29					
2019	MNF-156	Squaw_BottomProj15_WT					2	30	31	31	30	16		
2019	MNF-157	Squaw_Upstream_of_Private_WT					1	30	31	3				
2019	MNF-183	Camp6_BMRD_MFJDR_WT							15	31	30	31	29	31
2019	MNF-186	CampCreek10_BMRD_MFJD_WT							15	31	30	31	29	31
2019	MNF-187	CampCreek11_BMRD_MFJD_WT							1	31	30	31	29	31
2019	MNF-188	CampCreek12_BMRD_MFJD_WT							1	31	30	31	29	31
2019	MNF-189	CampCreek13_BMRD_MFJD_WT							1	31	30	31	29	31
2019	MNF-190	CampCreek14_BMRD_MFJD_WT							1	31	30	31	29	31
2019	MNF-191	CampCreek15_BMRD_MFJD_WT							1	31	30	31	29	31
2019	MNF-192	CampCreek16_BMRD_MFJD_WT							15	31	30	31	29	31
2019	MNF-193	CampCreek17_BMRD_MFJD_WT							15	31	30	31	29	31
2019	MNF-194	CampCreek18_BMRD_MFJD_WT							15	31	30	31	29	31
2019	MNF-195	CampCreek20_BMRD_MFJD_WT							1	31	30	31	29	31
2019	MNF-196	CampCreek21_BMRD_MFJD_WT							1	31	30	31	29	31
2019	MNF-197	CampCreek22_BMRD_MFJD_WT							15	31	30	31	29	31
2019	MNF-198	CampCreek23_BMRD_MFJD_WT							15	31	30	31	29	31
2019	MNF-199	CampCreek24_BMRD_MFJD_WT							15	31	30	31	29	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	MNF-200	CampCreek6_BMRD_MFJD_2019_WT							15	31	30	31	29	31
2019	MNF-201	CampCreek7_BMRD_MFJD_2019_WT							15	31	30	31	29	31
2019	MNF-202	CampCreek9_BMRD_MFJD_WT							15	31	30	31	29	31
2019	MNF-205	Clear Creek Project- WT						4	31	31	30	6		
2019	MNF-213	DeweyCr_WT					2	30	31	31	30	10		
2019	MNF-235	MinerCr_WT							21	31	30	17		
2019	MNF-236	NF_DeerCr_WT					14	30	31	31	30	10		
2019	MNF-241	SF_DeerCr_WT					14	30	31	31	30	10		
2019	MNF-242	SF_JohnDayR_WT						30	31	24				
2019	ONF-071	SunflowerCr_3501_LTWT	31	28	30	30	31	12						
2019	UmatNF-003	AlderAtMT_LTWT							22	31	30	31	12	
2019	UmatNF-004	BaconAtFB_LTWT							22	31	30	31	6	
2019	UmatNF-008	CamasAtMT_LTWT							28	31	30	17		
2019	UmatNF-010	Colvin2_LTWT							28	31	30	31	5	
2019	UmatNF-018	GranitUp_LTWT						25	31	31	30	21		
2019	UmatNF-020	HidaSpgs_LTWT					2	30	31	31	30	24		
2019	UmatNF-022	IndianFB_LTWT						19	31	31	30	31	6	
2019	UmatNF-023	IndnALIn_LTWT					23	30	31	31	30	22		
2019	UmatNF-029	LightApl_LTWT						25	31	31	30	21		
2019	UmatNF-030	LIndinMT_LTWT					23	30	31	31	30	22		
2019	UmatNF-036	LWallBac_LTWT							22	31	30	31	6	
2019	UmatNF-039	MdwbFkgs_LTWT						10	31	31	30	22		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	UmatNF-040	MdwbrAtMT_LTWT					1	30	31	31	30	22		
2019	UmatNF-053	Ptams2Rd_LTWT						19	31	31	30	31	12	
2019	UmatNF-056	RubyMth_LTWT							20	31	30	21		
2019	UmatNF-061	Skookum1_LTWT							22	31	30	31	12	
2019	UmatNF-065	TXBarAtFB_LTWT						10	31	31	30	23		
2019	UmatNF-069	Wheel2Cr_LTWT							28	31	30	31	5	
2020	1029	1029 Desolation Cr Treatment2 BioM DesolationCreek_Treatment2	31	29	31	30	31	30	31	31	30			
2020	1032	1032 Granite Cr Control	31	29	31	30	31	30	31	31	30			
2020	1033	1033 Granite Cr Treatment	31	29	31	30	31	30	31	31	30			
2020	1037	1037 Desolation Cr Control 2	31	29	31	30	31	30	31	31	30			
2020	1052	1052 NF John Day River	31	29	31	30	31	30	26					
2020	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	41058-ORDEQ	JOHN DAY R TRIB (RM 19.3) 8.5 MILES US OF MOUTH					31	30	31	31	30	14		
2020	41155-ORDEQ	Pine Hollow at RM 0.9					10	30	31	14				
2020	MNF-017	CampCreek_Mouth112819a_LTWT	30	29	30	30	31	22						
2020	MNF-183	Camp6_BMRD_MFJDR_WT	30	29	30	30	31	22						
2020	MNF-186	CampCreek10_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-187	CampCreek11_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-188	CampCreek12_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-189	CampCreek13_BMRD_MFJD_WT	30	29	30	30	31	22						

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	MNF-190	CampCreek14_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-191	CampCreek15_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-192	CampCreek16_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-193	CampCreek17_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-194	CampCreek18_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-195	CampCreek20_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-196	CampCreek21_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-197	CampCreek22_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-198	CampCreek23_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-199	CampCreek24_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-200	CampCreek6_BMRD_MFJD_2019_WT	30	29	30	30	31	22						
2020	MNF-201	CampCreek7_BMRD_MFJD_2019_WT	30	29	30	30	31	22						
2020	MNF-202	CampCreek9_BMRD_MFJD_WT	30	29	30	30	31	22						
2020	MNF-242	SF_JohnDayR_WT						28	31	31	29			

* Some stations have more daily maximum results than the number of days in the month due to multiple probes being deployed at the same location or due to duplicate entries in AWQMS. These data are not proposed to support the modeling so we did not investigate these specific situations further.

Appendix C Stream flow data summary

Table C.1: Continuous flow measurements available from the USGS flow gaging stations in the John Day River Basin.

Station ID	Station	Latitude/Longitude
14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	44.35794/-118.5761
14038530	John Day River Near John Day, OR	44.41849/-118.9063
14040600	Mountain Creek Near Mitchell,OR	44.53486/-120.0303
14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	44.69262/-118.7943
14044000	Middle Fork John Day River At Ritter, OR	44.88876/-119.1414
14046000	North Fork John Day River At Monument, OR	44.81376/-119.4317
14046500	John Day River At Service Creek, OR	44.79375/-120.0067
14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	44.7268/-120.302
14046890	Pine Creek Near Clarno, OR	44.91041/-120.4409
14047380	Lone Rock Creek Near Lonerock, OR.	45.09152/-119.8872
14048000	John Day River At Mcdonald Ferry, OR	45.58763/-120.4095

Table C.2: Continuous flow measurements available from the OWRD flow gaging stations in the John Day River Basin.

Station ID	Station	Latitude/Longitude
14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	44.3416/-118.657
14038560	Canyon Cr At Thissels Ranch Nr Canyon City, OR	44.2565/-118.925
14038625	Canyon Cr At Canyon City, OR	44.3839/-118.95
14039380	Murderers Cr Nr Dayville, OR	44.3164/-119.535
14039500	S Fk John Day R Nr Dayville, OR	44.4231/-119.541
14040500	John Day R At Picture Gorge, Nr Dayville, OR	44.5205/-119.625
14042500	Camas Cr Nr Ukiah, OR	45.157/-118.821
14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR	45.1956/-119.211
14047100	Butte Cr Nr Fossil, OR	44.9538/-120.136
No Station ID	Enterprise drain return flow	44.4164/-119.057

Table C.3: Instantaneous flow measurements by DEQ and others in the John Day River Basin.

Station ID	Station	Latitude/Longitude	Data Source
31984-ORDEQ	John Day River at Priest Hole BLM Boat Ramp	44.7389/-120.283	DEQ
31985-ORDEQ	John Day River upstream of Bone Creek	44.7017/-119.647	DEQ
31986-ORDEQ	John Day River at Shady Grove BLM Wayside	44.8116/-119.719	DEQ
31995-ORDEQ	John Day River at ODFW Bridge above Dayville	44.4557/-119.445	DEQ
No Station ID	0.1 Mile Above Granite Creek	44.866/-118.561	DEQ
No Station ID	0.3 Mile Below Sulphur Creek	44.9841/-118.781	DEQ
No Station ID	0.4 Mile above Hwy 395 Bridge	44.9982/-118.942	DEQ
No Station ID	2.5 Miles Below Clarno Bridge (4 km below)	44.9498/-120.484	DEQ
No Station ID	250 Feet Below Baldy Creek	44.9095/-118.319	DEQ
No Station ID	5.2 Mile Below Camas Creek	44.9977/-119.075	DEQ
No Station ID	50 Feet Below Oriental Creek	44.9758/-118.729	DEQ
No Station ID	Above Trail Creek (USFS)	44.913/-118.4	DEQ
No Station ID	CTWSIR Property above Prairie City, river mile 264	44.4591/-118.695	DEQ
No Station ID	Clyde Holliday State Park 0.1 Miles Above Amphitheater	44.4154/-119.088	DEQ
No Station ID	Middle Fork John Day River Above Big Boulder Creek	44.6397/-118.628	DEQ
No Station ID	Middle Fork John Day River Above Cole Canyon	44.7296/-118.843	DEQ
No Station ID	Middle Fork John Day River Model Upper Boundary	44.5969/-118.493	DEQ
No Station ID	Middle Fork John Day River Ritter Gage	44.8889/-119.14	DEQ
No Station ID	Middle Fork John Day River at Hwy 395	44.8367/-119.025	DEQ
No Station ID	Middle Fork John Day River at the mouth	44.9159/-119.302	DEQ
Trout Farm	John Day River headwaters	44.3054/-118.552	DEQ

Table C.4: Summary of existing flow data in the John Day River Basin. Columns Jan – Dec indicate the number of daily mean flow results in each month.

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1990	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14040600	Mountain Creek Near Mitchell,OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1990	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14047380	Lone Rock Creek Near Lonerock, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1990	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14040600	Mountain Creek Near Mitchell,OR	31	28	31	30	31	30	31	31	30			
1991	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14047380	Lone Rock Creek Near Lonerock, OR.	31	28	31	30	31	30	31	31	29			
1991	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
1992	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14038530	John Day River Near John Day, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	16		31	30	31
1992	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14042500	Camas Cr Nr Ukiah, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR			5	30	4							
1992	14044000	Middle Fork John Day River At Ritter, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14046000	North Fork John Day River At Monument, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14046500	John Day River At Service Creek, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14047100	Butte Cr Nr Fossil, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14048000	John Day River At Mcdonald Ferry, OR	31	29	31	30	31	30	31	31	30	31	30	31
1993	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1993	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	15	1	1
1993	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR						27	31	3				
1993	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	29			
1994	14039380	Murderers Cr Nr Dayville, OR	20	28	31	30	31	30	31	31	30	31	30	31
1994	14039500	S Fk John Day R Nr Dayville, OR	2	1	1	2	2	1	2	1	2	31	30	31
1994	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				30	31	30	8					
1994	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30			
1995	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				28	31	30	31	1				
1995	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
1996	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR										31	30	31
1996	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14038530	John Day River Near John Day, OR					25	30	31	31	30	31	30	31
1996	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14042500	Camas Cr Nr Ukiah, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				27	8	27	2					
1996	14044000	Middle Fork John Day River At Ritter, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14046000	North Fork John Day River At Monument, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14046500	John Day River At Service Creek, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14047100	Butte Cr Nr Fossil, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14048000	John Day River At Mcdonald Ferry, OR	31	29	31	30	31	30	31	31	30			
1997	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14039500	S Fk John Day R Nr Dayville, OR									8	31	30	31
1997	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR					25	30	2					
1997	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14048000	John Day River At Mcdonald Ferry, OR										31	30	31
1998	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14039380	Murderers Cr Nr Dayville, OR					31	30	31	31	30	31	30	31
1998	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30			
1998	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				30	31							
1998	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	29	31	30	31
1999	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				15	24	30	15					
1999	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2000	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	29	31	30	31	30	31	31	29			
2000	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14038530	John Day River Near John Day, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14039380	Murderers Cr Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14042500	Camas Cr Nr Ukiah, OR										31	30	31
2000	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				26	31	28						
2000	14044000	Middle Fork John Day River At Ritter, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14046000	North Fork John Day River At Monument, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14046500	John Day River At Service Creek, OR	31	29	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	14047100	Butte Cr Nr Fossil, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14048000	John Day River At Mcdonald Ferry, OR	31	29	31	30	31	30	31	31	30	31	30	31
2001	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR					31	16						
2001	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR										31	30	31
2002	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				8	31	19						
2002	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	23	27	30	31	30	31	31	30	31	30	31
2003	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				29	31	12						
2003	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14046890	Pine Creek Near Clarno, OR										31	30	31
2003	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	14		21
2003	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2004	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	29	31	29	31	30	31	31	29	31	30	31
2004	14038530	John Day River Near John Day, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14039380	Murderers Cr Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14042500	Camas Cr Nr Ukiah, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				29	31	30	7					
2004	14044000	Middle Fork John Day River At Ritter, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14046000	North Fork John Day River At Monument, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14046500	John Day River At Service Creek, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14047100	Butte Cr Nr Fossil, OR				4	31	30	31	31	30	31	28	9
2004	14048000	John Day River At Mcdonald Ferry, OR	31	29	31	30	31	30	31	31	30	31	30	31
2005	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	25		20	30	31	30	31	31	30	31	30	31
2005	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				29	31	22						
2005	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14047100	Butte Cr Nr Fossil, OR	10	28	31	30	31	30	31	31	30	31	30	31
2005	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				28	31	30	7					
2006	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR			17	30	31	30	31	31	30	31	30	31
2006	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				28	31	1						
2007	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	23	30	31	31	30	31	30	31
2007	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2008	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14038530	John Day River Near John Day, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14039380	Murderers Cr Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14042500	Camas Cr Nr Ukiah, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR						7	9					
2008	14044000	Middle Fork John Day River At Ritter, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14046000	North Fork John Day River At Monument, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14046500	John Day River At Service Creek, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14047100	Butte Cr Nr Fossil, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14048000	John Day River At Mcdonald Ferry, OR	31	29	31	30	31	30	31	31	30	31	30	31
2009	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				22	31	29						
2009	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				30	31	30	13					
2010	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR						11	31	15	2			
2011	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR										31	30	31
2011	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2012	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14038530	John Day River Near John Day, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14039380	Murderers Cr Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14042500	Camas Cr Nr Ukiah, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR					30	30	27	2				
2012	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14044000	Middle Fork John Day River At Ritter, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14046000	North Fork John Day River At Monument, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14046500	John Day River At Service Creek, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14047100	Butte Cr Nr Fossil, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14048000	John Day River At Mcdonald Ferry, OR	31	29	31	30	31	30	31	31	30	31	30	31
2013	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR	31	28	31	30	31	30	31	31	30	31		
2013	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14038625	Canyon Cr At Canyon City, OR								4	30	31	30	31
2013	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				20	31	30	31					
2013	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR				30	31	30	31	31	30			
2014	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14038625	Canyon Cr At Canyon City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				14	31	30	31	15				
2014	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR				30	31	30	31	31	30			
2015	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14038625	Canyon Cr At Canyon City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				30	31	30	31	25				
2015	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2016	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR				30	31	30	31	31	30			
2016	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14038530	John Day River Near John Day, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14038560	Canyon Cr At Thissels Ranch Nr Canyon City, OR	11	29	31	30	31	30	31	31	30	31	30	31
2016	14038625	Canyon Cr At Canyon City, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14039380	Murderers Cr Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14042500	Camas Cr Nr Ukiah, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				27	31	30	31	21				
2016	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14044000	Middle Fork John Day River At Ritter, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14046000	North Fork John Day River At Monument, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14046500	John Day River At Service Creek, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14047100	Butte Cr Nr Fossil, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14048000	John Day River At Mcdonald Ferry, OR	31	29	31	30	31	30	31	31	30	31	30	31
2017	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR				30	31	30	31	31	30	31	6	
2017	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	14038560	Canyon Cr At Thissels Ranch Nr Canyon City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14038625	Canyon Cr At Canyon City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR					16	30	31	14				
2017	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR			2	30	31	30	31	31	30	14		
2018	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14038560	Canyon Cr At Thissels Ranch Nr Canyon City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14038625	Canyon Cr At Canyon City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				5	31	29						
2018	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR		7	31	30	31	30	31	31	30	31	13	
2019	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14038530	John Day River Near John Day, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14038560	Canyon Cr At Thissels Ranch Nr Canyon City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14038625	Canyon Cr At Canyon City, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14039380	Murderers Cr Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14039500	S Fk John Day R Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14042500	Camas Cr Nr Ukiah, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR					12	30	15					
2019	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14044000	Middle Fork John Day River At Ritter, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14046000	North Fork John Day River At Monument, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14046500	John Day River At Service Creek, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	28	31	30	31	30	31	31	30	31	29	31
2019	14046890	Pine Creek Near Clarno, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14047100	Butte Cr Nr Fossil, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14048000	John Day River At Mcdonald Ferry, OR	31	28	31	30	31	30	31	31	30	31	30	31
2020	14036860	John Day R At Blue Mtn Hot Spgs Nr Prairie City,OR			11	30	31	30	31	31	28	7		
2020	14037500	Strawberry Cr Ab Slide Cr Nr Prairie City, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14038530	John Day River Near John Day, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14038560	Canyon Cr At Thissels Ranch Nr Canyon City, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14038625	Canyon Cr At Canyon City, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14039380	Murderers Cr Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14039500	S Fk John Day R Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14040500	John Day R At Picture Gorge, Nr Dayville, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14042500	Camas Cr Nr Ukiah, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14043700	Fivemile Cr Div To Butter Cr Nr Gurdane, OR				22	31	30	5					
2020	14043840	Mf John Day River Abv Camp Creek, Nr Galena, OR	31	29	31	30	31	30	31	31	30	31	29	30

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	14044000	Middle Fork John Day River At Ritter, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14046000	North Fork John Day River At Monument, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14046500	John Day River At Service Creek, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14046778	Bridge Cr Abv Coyote Canyon Nr Mitchell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14046890	Pine Creek Near Clarno, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14047100	Butte Cr Nr Fossil, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14048000	John Day River At Mcdonald Ferry, OR	31	29	31	30	31	30	31	31	30	31	30	31

Appendix D HTML map

DEQ prepared an interactive HTML map to display relevant information described in this QAPP. The map will be posted to DEQ's website alongside this QAPP and saved in same location as the QAPP in DEQ's files. The interactive map contains the following layers and location information:

1. OpenStreetMap base map.
2. TMDL project scope, including all waters of the state in the project area.
3. The extent of existing calibrated models described in this QAPP.
4. The extent of newly proposed calibrated models described in this QAPP, if applicable.
5. The location of model calibration sites, including temperature, flow, and effective shade monitoring sites.
6. The location of temperature monitoring used for model boundary conditions and tributary inputs.
7. The location of flow monitoring locations used for model boundary conditions and tributary inputs.
8. Available continuous stream temperature monitoring locations, organizations that collected that data, and the count of days per month for each year when temperature data are available.
9. Available stream flow monitoring locations, organizations that collected that data, and the count of days per month for each year when flow data are available.
10. The location of meteorological monitoring locations and the source of the data.
11. The location of active individual NPDES permitted facilities, the permit type, DEQ file number, EPA permit number, outfall number, location, and associated Assessment Unit (AU) ID.
12. The locations of current registrants covered under the general NPDES GEN01, GEN02, GEN03, GEN04, GEN05, GEN19, or GEN40 (MS4) permits, DEQ file number and permit number, permit type, and outfall information.
13. Eight-digit hydrologic unit boundaries (HUC8 Subbasins).
14. Ten-digit hydrologic unit boundaries (HUC10 Watersheds).
15. Twelve-digit hydrologic unit boundaries (HUC12 Subwatersheds).
16. 2022 303(d) Integrated Report status category for temperature.
17. Fish use designations depicted in OAR 340-041-0170 Figure 170A

18. Salmon and Steelhead spawning use extent and period depicted in OAR 340-041-0170 Figure 170B.
19. Land ownership or jurisdiction in the project area.
20. USGS hydro cache base map that represents hydrologic information of the National Hydrography Dataset (NHD).
21. 2017 and 2018 one foot Oregon Statewide Imagery Program (OSIP) aerial imagery.