Modeling Quality Assurance Project Plan for the Southern Willamette Subbasins Temperature Total Maximum Daily Load

December 2021

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Table of Contents

List of Tables

List of Figures

Abbreviations

AWQMS	Ambient Water Quality Monitoring System
BLM	United States Bureau of Land Management
DEQ	Oregon Department of Environmental Quality
DMR	Discharge Monitoring Report
EQC	Oregon Environmental Quality Commission
NCDC	National Climatic Data Center
NPDES	National Pollutant Discharge Elimination System
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
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
TIR	Thermal Infrared Radiometry
TMDL	Total Maximum Daily Load
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USGS	United States Geological Survey
WRIS	Water Rights Information System
WWTP	Waste water treatment plant

1 Introduction

This Quality Assurance Project Plan (QAPP) summarizes the modeling approach to be used for the temperature TMDL replacement project applicable within the Coast Fork Willamette Subbasin (17090002), the McKenzie Subbasin (17090004), the Middle Fork Willamette Subbasin (17090001), and the Upper Willamette Subbasin (17090003). This QAPP project area excludes the Willamette River, Coast Fork Willamette River downstream of Cottage Grove Dam, Fall Creek downstream of Fall Creek Dam, Long Tom River downstream of Fern Ridge Dam, McKenzie River downstream of the South Fork McKenzie River, Middle Fork Willamette River downstream of Dexter Dam, Row River downstream of Dorena Dam, and the South Fork McKenzie River downstream of Cougar Dam. These waterbodies are included in the Willamette River and Major Tributaries QAPP.

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 Southern Willamette Subbasins include several waterbodies listed on the Oregon 2018/2020 Section 303(d) Category 5 list as water quality limited for temperature (Table 1). A TMDL was previously developed for the Southern Willamette Subbasins (DEQ, 2006) but it 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 Southern Willamette Subbasins 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 TMDL 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 Southern Willamette Subbasins do not meet the water quality standards for temperature and are listed as Category 5, water quality limited on Oregon's 2018/2020 Section 303(d) list (Table 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 Southern Willamette Subbasins 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 deg-C (OAR 340-041-0028(4)(f))
- Salmon and Steelhead Spawning: 13.0 deg-C (OAR 340-041-0028(4)(a))
- Core Cold Water Habitat: 16.0 deg-C (OAR 340-041-0028(4)(b))
- Salmon and Trout Rearing and Migration: 18.0 deg-C (OAR 340-041-0028(4)(c))

Where and when the applicable criteria apply are based on the designated fish uses maps in OAR 340-041-0340 Figure 340A and Figure 340B. 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 deg-C (OAR 340-041-0028(12)(b)).

As described in Chapter 1, the U.S. Environmental Protection Agency (USEPA) and State of Oregon (OR) are required to revise the water temperature TMDL for the Southern Willamette Subbasins. In revising the TMDL, all of the allocations will be updated to target the applicable biologically-based numeric criteria (BBNC) and Human Use Allowance (HUA) water quality temperature standards.

Since the issuance of the original TMDL, the extent and number of waterbodies that are identified as water quality limited for temperature has 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 Southern Willamette Subbasins QAPP project area, were obtained from Oregon's 2018/2020 Integrated Report and are summarized in Table 1. The listings are also shown in the HTML interactive map that accompanies this QAPP and referenced in Appendix D.

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 human use allowance 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 development of the TMDL Water Quality Management Plan and evaluate implementation options.

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.
c. Identify under what timeline and where management strategies need to be implemented.

The effort currently described in the QAPP includes use of existing models and the development of new models or new model scenarios.

Table 1: Southern Willamette Subbasins assessment units that are classified as water quality limited category 5 for temperature based on the Section 303(d) 2018/2020 Integrated Report.

Assessment Unit Name	Assessment Unit ID	Year Listed	Use Period
Andy Creek-Fall Creek Watershed	OR_WS_170900010904_02_104219	2018	Year Round
Augusta Creek	OR_SR_1709000403_02_103865	2018	Year Round
Bear Creek-Long Tom River Watershed	OR_WS_170900030109_02_104251	2018	Year Round
Berry Creek Watershed	OR_WS_170900030510_02_104284	2010	Year Round
Bigs Creek-Calapooia River Watershed	OR_WS_170900030302_02_104265	2010	Year Round
Boulder Creek-McKenzie River Watershed	OR_WS_170900040206_02_104310	2018	Year Round
Brice Creek	OR_SR_1709000202_02_103771	2010	Year Round
Buck Creek-Middle Fork Willamette River Watershed	OR_WS_170900010502_02_104200	2010	Year Round
Calapooia River	OR_SR_1709000303_02_103815	2010	Spawning, Year Round
Calapooia River	OR_SR_1709000303_02_103816	2010	Spawning, Year Round
Calapooia River	OR_SR_1709000304_02_103821	2010	Year Round
Camp Creek	OR_SR_1709000407_02_103889	2018	Year Round
Camp Creek Watershed	OR_WS_170900040705_02_104336	2010	Year Round
Cartwright Creek	OR_SR_1709000406_02_103875	2010	Spawning, Year Round
Cedar Creek	OR_SR_1709000407_02_103891	2018	Year Round
Christy Creek	OR_SR_1709000106_02_103722	2010	Spawning, Year Round
Coal Creek Watershed	OR_WS_170900010501_02_104199	2010	Year Round
Cougar Reservoir-South Fork McKenzie River Watershed	OR_WS_170900040307_02_104320	2010	Year Round
Courtney Creek	OR_SR_1709000303_02_103819	2010	Year Round
Coyote Creek	OR_SR_1709000301_02_103796	2010	Year Round

Assessment Unit Name	Assessment Unit ID	Year Listed	Use Period
Dartmouth Creek-North Fork Middle Fork Willamette River Watershed	OR_WS_170900010608_02_104210	2018	Year Round
Deception Creek-Middle Fork Willamette River Watershed	OR_WS_170900010701_02_104211	2010	Year Round
Deer Creek	OR_SR_1709000407_02_103882	2010	Spawning, Year Round
Deer Creek Watershed	OR_WS_170900040205_02_104309	2010	Year Round
Delp Creek-Fall Creek Watershed	OR_WS_170900010901_02_104216	2010	Year Round
Dexter Reservoir-Middle Fork Willamette River Watershed	OR_WS_170900010703_02_104213	2010	Year Round
Dorena Lake	OR_LK_1709000202_02_100705	2010	Year Round
East Fork Deer Creek-McKenzie River Watershed	OR_WS_170900040702_02_104333	2010	Spawning, Year Round
Echo Creek-Middle Fork Willamette River Watershed	OR_WS_170900010106_02_104190	2018	Year Round
Eighth Creek-North Fork Middle Fork Willamette River Watershed	OR_WS_170900010607_02_104209	2010	Year Round
Elk Creek-McKenzie River Watershed	OR_WS_170900040502_02_104326	2010	Year Round
Elk Creek-McKenzie River Watershed	OR_WS_170900040502_02_104326	2018	Spawning
Fall Creek	OR_SR_1709000109_02_103736	2010	Spawning, Year Round
Fall Creek	OR_SR_1709000109_02_103737	2010	Year Round
Fall Creek	OR_SR_1709000109_02_103743	2010	Spawning, Year Round
Fall Creek	OR_SR_1709000109_02_103737	2018	Spawning
Fall Creek Lake	OR_LK_1709000109_02_100701	2010	Year Round
Ferguson Creek	OR_SR_1709000301_02_103790	2018	Year Round
Flat Creek Watershed	OR_WS_170900030603_02_104290	2018	Year Round
Florence Creek-McKenzie River Watershed	OR_WS_170900040209_02_104313	2018	Year Round
French Pete Creek	OR_SR_1709000403_02_103862	2018	Year Round
Gray Creek-Middle Fork Willamette River Watershed	OR_WS_170900010505_02_104202	2010	Year Round
Greasy Creek Watershed	OR_WS_170900030204_02_104256	2018	Year Round
Hackleman Creek-McKenzie River Watershed	OR_WS_170900040202_02_104306	2018	Year Round

Assessment Unit Name	Assessment Unit ID	Year Listed	Use Period
Hands Creek-Calapooia River Watershed	OR_WS_170900030301_02_104264	2010	Spawning, Year Round
Headwaters Mohawk River Watershed	OR_WS_170900040601_02_104327	2010	Year Round
Hehe Creek	OR_SR_1709000109_02_103734	2010	Year Round
Hill Creek-Coast Fork Willamette River Watershed	OR_WS_170900020401_02_104238	2018	Year Round
Hills Creek	OR_SR_1709000102_02_103715	2010	Year Round
Hills Creek	OR_SR_1709000110_02_103749	2010	Year Round
Hills Creek	OR_SR_1709000102_02_103715	2018	Spawning
Horse Creek	OR_SR_1709000401_02_103855	2010	Year Round
Horse Creek	OR_SR_1709000401_02_103856	2010	Year Round
Jont Creek-Luckiamute River Watershed	OR_WS_170900030505_02_104279	2010	Year Round
King Creek-Row River Watershed	OR_WS_170900020204_02_104230	2010	Year Round
Layng Creek	OR_SR_1709000202_02_103765	2010	Year Round
Little Fall Creek	OR_SR_1709000108_02_103730	2010	Spawning, Year Round
Little Luckiamute River	OR_SR_1709000305_02_103822	2010	Year Round
Logan Creek	OR_SR_1709000109_02_103742	2010	Year Round
Lookout Creek	OR_SR_1709000404_02_104571	2010	Year Round
Lost Creek	OR_SR_1709000107_02_103727	2010	Spawning, Year Round
Lost Creek	OR_SR_1709000107_02_103728	2010	Spawning, Year Round
Lost Creek Watershed	OR_WS_170900010702_02_104212	2010	Year Round
Lower Blue River	OR_SR_1709000404_02_104569	2018	Spawning, Year Round
Lower Blue River Watershed	OR_WS_170900040403_02_104324	2018	Year Round
Lower Hills Creek Watershed	OR_WS_170900010202_02_104192	2010	Year Round
Lower Horse Creek Watershed	OR_WS_170900040105_02_104304	2018	Year Round
Lower Oak Creek Watershed	OR_WS_170900030402_02_104273	2010	Year Round
Lower Salmon Creek Watershed	OR_WS_170900010403_02_104198	2010	Year Round
Lower Salt Creek Watershed	OR_WS_170900010303_02_104195	2010	Spawning, Year Round
Luckiamute River	OR_SR_1709000305_02_103829	2010	Year Round
Martin Creek	OR_SR_1709000202_02_103756	2018	Year Round
Marys River	OR_SR_1709000302_02_103804	2010	Year Round
Marys River	OR_SR_1709000302_02_103812	2010	Year Round

Assessment Unit Name	Assessment Unit ID	Year Listed	Use Period
Marys River	OR_SR_1709000302_02_103813	2010	Year Round
Maxfield Creek-Luckiamute River Watershed	OR_WS_170900030503_02_104277	2010	Year Round
McGowan Creek	OR_SR_1709000406_02_103879	2010	Spawning, Year Round
Middle Fork Willamette River	OR_SR_1709000105_02_104579	2010	Year Round
Middle Fork Willamette River	OR_SR_1709000101_02_103713	2018	Year Round
Middle Fork Willamette River	OR_SR_1709000107_02_103725	2018	Spawning, Year Round
Middle Horse Creek Watershed	OR_WS_170900040104_02_104303	2018	Year Round
Middle Salt Creek Watershed	OR_WS_170900010302_02_104194	2010	Year Round
Mill Creek	OR_SR_1709000406_02_103873	2010	Year Round
Mill Creek	OR_SR_1709000406_02_103874	2010	Year Round
Miller Creek	OR_SR_1709000305_02_103825	2010	Year Round
Mohawk River	OR_SR_1709000406_02_103870	2010	Spawning, Year Round
Mohawk River	OR_SR_1709000406_02_103871	2010	Spawning, Year Round
Mohawk River	OR_SR_1709000406_02_103877	2010	Spawning, Year Round
Mosby Creek	OR_SR_1709000201_02_103752	2010	Spawning, Year Round
Muddy Creek	OR_SR_1709000302_02_103806	2010	Year Round
Muddy Creek	OR_SR_1709000306_02_103838	2010	Year Round
North Fork Middle Fork Willamette River	OR_SR_1709000106_02_103721	2010	Spawning, Year Round
North Fork Middle Fork Willamette River	OR_SR_1709000106_02_103723	2010	Year Round
North Fork Pedee Creek	OR_SR_1709000305_02_103828	2010	Year Round
North Fork Winberry Creek	OR_SR_1709000109_02_103738	2010	Year Round
Packard Creek	OR_LK_1709000105_02_100684	2010	Year Round
Packard Creek	OR_SR_1709000105_02_104578	2010	Year Round
Packard Creek-Middle Fork Willamette River Watershed	OR_WS_170900010503_02_104201	2010	Year Round
Pedee Creek-Luckiamute River Watershed	OR_WS_170900030504_02_104278	2018	Year Round
Portland Creek	OR_SR_1709000109_02_103744	2010	Year Round
Portland Creek	OR_SR_1709000109_02_103741	2018	Year Round
Quentin Creek	OR_SR_1709000404_02_104576	2018	Year Round

Assessment Unit Name	Assessment Unit ID	Year Listed	Use Period
Rebel Creek-South Fork McKenzie River Watershed	OR_WS_170900040304_02_104317	2010	Year Round
Ritner Creek	OR_SR_1709000305_02_103833	2010	Year Round
Row River	OR_SR_1709000202_02_103761	2010	Year Round
Row River	OR_SR_1709000202_02_103766	2010	Year Round
Salmon Creek	OR_SR_1709000104_02_103719	2018	Spawning, Year Round
Salt Creek	OR_SR_1709000103_02_103716	2010	Spawning, Year Round
Sharps Creek	OR_SR_1709000202_02_103755	2010	Year Round
Sharps Creek	OR_SR_1709000202_02_103775	2010	Year Round
Sharps Creek	OR_SR_1709000202_02_103776	2010	Year Round
Sharps Creek Watershed	OR_WS_170900020203_02_104229	2010	Year Round
Shotgun Creek	OR_SR_1709000406_02_103872	2010	Year Round
Shotgun Creek-Mohawk River Watershed	OR_WS_170900040602_02_104328	2010	Year Round
Smith River Watershed	OR_WS_170900040203_02_104307	2018	Year Round
Soap Creek	OR_SR_1709000305_02_103832	2010	Year Round
South Fork Winberry Creek	OR_SR_1709000109_02_103745	2010	Year Round
Staley Creek Watershed	OR_WS_170900010105_02_104189	2018	Year Round
Teal Creek	OR_SR_1709000305_02_103824	2018	Year Round
Tumblebug Creek Watershed	OR_WS_170900010102_02_104186	2018	Year Round
Upper Blue River	OR_SR_1709000404_02_104577	2010	Year Round
Upper Blue River	OR_SR_1709000404_02_104574	2018	Year Round
Upper Blue River Watershed	OR_WS_170900040402_02_104323	2018	Year Round
Upper Salmon Creek Watershed	OR_WS_170900010402_02_104197	2010	Year Round
Winberry Creek	OR_SR_1709000109_02_103747	2010	Year Round
Winberry Creek	OR_SR_1709000109_02_103747	2018	Spawning
Winberry Creek Watershed	OR_WS_170900010905_02_104220	2018	Year Round

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 come into 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 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,

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

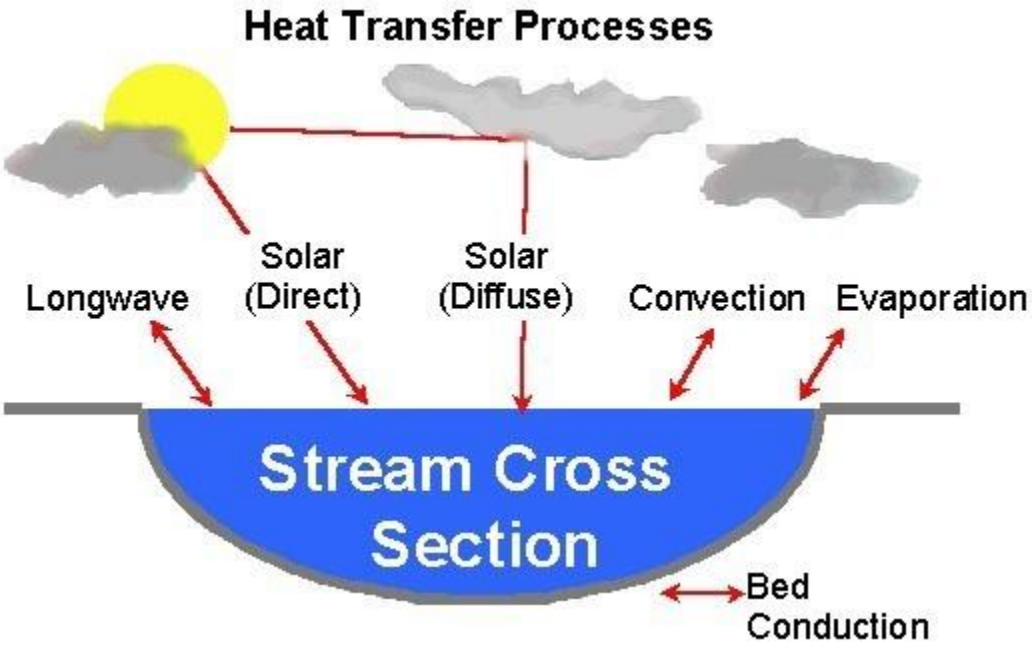

Figure 1: Major heat transfer processes.

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 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 (+/-)

[1]Air/Water convection includes both turbulent and free surface conduction.

Mass transfer relates to 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.

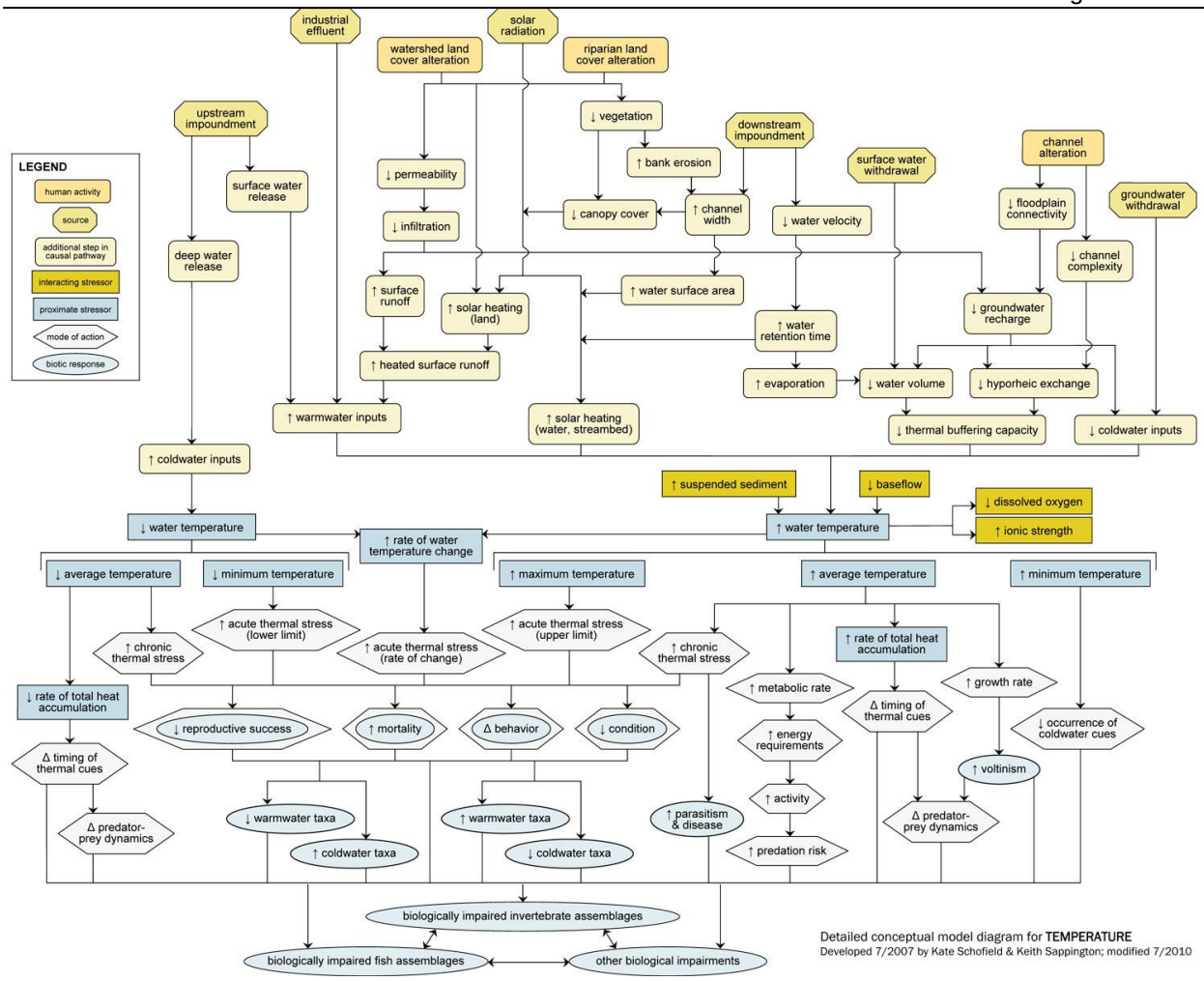

Figure 2: Conceptual diagram that identifies the key processes and variables that drive stream temperature changes and the biological responses (Schofield and Sappington, 2010).

Stream temperature is influenced by both human and natural factors. Figure 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, changes in hyporheic flows and channel connectivity, reductions in cold groundwater inflows, and changes to meteorological conditions, such as those caused by climate change.

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.

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

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 Luckiamute River is water quality limited for temperature. To address this listing in the TMDL, all upstream waterbodies are considered 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 needs for this project and the models that will be used to support the TMDL.

TMDLs also require identification of seasonal variation 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 which 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 deg-C above the applicable criteria, cumulatively at the point of maximum impact. The portion of the human use allowance allocated to each source will be determined in the TMDL with the modeling approach supporting 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 Willamette Basin TMDL and WQMP (DEQ, 2006) were simulated using the computer models (Heat Source version 6 temperature model and Heat Source version 9 shade model). The model extents include some of the main tributaries in the project area that contain or influence primary fish habitat. These models also are tributaries to the series of CE-QUAL-W2 models that are proposed to be used for the Willamette Mainstem and major tributaries temperature TMDL project area. The heat source and CE-QUAL-W2 models will not be linked directly since the model years are different,

but the temperature outputs of the heat source models may be used to develop the boundary conditions temperatures for some of the Wilmette mainstem project area management scenarios.

Site-specific load allocations will be developed for the streams that are simulated. Other streams are 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

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) meets all these model framework needs and 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 chapter 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, sky conditions, cloudiness, relative humidity, and wind speed. Table 36 through Table 40 in Appendix A list the stations where meteorological data available in the Southern Willamette Subbasins, including 292 stations from National Oceanic and Atmospheric Association (NOAA)'s National Climatic Data Center (NCDC), 6 stations from National Interagency Fire Center's Remote Automatic Weather Stations (RAWS), 3 stations from Bureau of Reclamation Cooperative Agricultural Weather Network (AgriMet), 176 stations from University of Utah MesoWest database, and 1 station 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 36 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 Southern Willamette Subbasins (Torgersen et al., 1999, Watershed Sciences, 2003). TIR data is used to characterize the thermal regime of the streams and habitat quality. All streams and the TIR collection dates are summarized in Table 2.

Table 2: Streams and the TIR collection dates in the Southern Willamette Subbasins.

Stream	Survey Extent	Date	Time	Survey Distance
Bear Creek	Mouth to river mile 1.0	2002-07-31	16:25-16:34	1 mi
Big River	Mouth to river mile 7.5	2002-07-21	16:27-16:43	7.5 mi
Deer Creek	Mouth upstream 8.7 km	1999-09-03	16:30 – 16:31	8.7 km
Eagle Creek	Mouth to Wilderness Bnd.	2002-07-31	15:14-15:54	16.5 mi
Mosby Creek	Mouth to headwaters	2002-07-21	15:06-15:52	22 mi

Stream	Survey Extent	Date	Time	Survey Distance
North Fork Eagle Creek	Mouth to river mile 5.0	2002-07-31	16:01-16:20	5 mi
Sharps Creek	Mouth to Rivermile 11.0	2002-07-21	13:44-14:15	11 mi
South Fork McKenzie River	Mouth to Cougar Dam	1999-09-03	16:24 – 16:25	7 km

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 is 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 Quality Matrix for Field Parameters (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 421 locations where continuous stream temperature data were collected in the Southern Willamette Subbasins and the organizations that collected that data in Table 41, and when data were collected at each location in Table 42. The location of these stations is shown in the HTML interactive map that accompanies this QAPP and referenced in Appendix D.

5.4 Stream flow data

Table 43 through Table 45 in Appendix C list the stations where continuous and instantaneous flow volume data were available in the Southern Willamette Subbasins, including 30 stations from USGS, 1 station from OWRD, and 8 stations from DEQ's files. The location of these stations is shown in the HTML interactive map that accompanies this QAPP and 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, 2020).

5.5 Point source discharges

Table 3 identifies all the active individual NPDES permittees in the Southern Willamette Subbasins (including individual MS4 permittees). Table 4 lists the registrants covered under the general NPDES GEN01, GEN03, GEN04, and GEN40 (MS4) permits in the Southern Willamette Subbasins. This group of general permits are 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 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 is not available, DMR data will be utilized to characterize point source discharges. Table 5 lists the current number of registrants for all the other general NPDES permits in the Southern Willamette Subbasins that are not listed in Table 4.

Table 3: Summary of individual NPDES permitted discharges in the Southern Willamette Subbasins.

Facility Name (Facility Number)	Latitude/Longitude	Permit Type and Description	Stream River Mile
Alpine Community (100101)	44.3292/-123.354	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Muddy Creek RM 25.6
Arclin (16037)	44.0487/-122.986	NPDES-IW-B16: All facilities not elsewhere classified which dispose of non-process wastewaters	Patterson Slough RM 1.8
ATI Albany Operations (64300)	44.61/-123.106	NPDES-IW-B08: Primary smelting and/or refining - Ferrous and non-ferrous metals not elsewhere classified	Oak Creek RM 1.6
ATI Millersburg Teledyne Wah Chang (87645)	44.6546/-123.063	NPDES-IW-B07: Primary smelting and/or refining - Non-ferrous metals utilizing sand chlorination separation facilities	Truax Creek RM 2
Brownsville STP (11770)	44.409/-122.999	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Calapooia River RM 31.6
Coburg Wastewater Treatment Plant (115851)	44.1167/-123.05	NPDES-DOM-Da: Sewage - less than 1 MGD	Muddy Creek RM 50.7
Coffin Butte Landfill (104176)	44.6992/-123.224	NPDES-IW-B15: All facilities not elsewhere classified which dispose of process wastewater (includes remediated groundwater) - Tier 2 sources	Roadside ditch to Soap Creek tributary RM 4.5
Corvallis Municipal Stormwater, MS4 (113605)	44.5691/-123.274	NPDES-DOM-MS4-2: Municipal Separate Storm Sewer System - Phase II	Multiple discharge locations
Creswell STP (20927)	43.9228/-123.037	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Camas Swale Creek RM 4
Duraflake (97047)	44.667/-123.059	NPDES-IW-B20: Timber and Wood Products - Hardboard, veneer, plywood, particle board, pressboard manufacturing, wood products.	Murder Creek RM 0.6

Facility Name (Facility Number)	Latitude/Longitude	Permit Type and Description	Stream River Mile
Eweb Carmen-Smith (28393)	44.273/-122.05	NPDES-IW-B16: All facilities not elsewhere classified which dispose of non-process wastewaters	McKenzie River RM 82
Foster Farms (97246)	43.9291/-123.027	NPDES-IW-B04: Food/beverage processing - Medium. Flow between 0.1 MGD and 1 MGD, or flow greater than or equal to 1 MGD for less than 180 days/year	Camas Swale Creek RM 3.3
Georgia-Pacific Chemicals Llc (32864)	44.102/-123.17	NPDES-IW-B16: All facilities not elsewhere classified which dispose of non-process wastewaters	Amazon Creek RM 2.7
Gp Millersburg Resin Plant (32650)	44.6643/-123.06	NPDES-IW-B16: All facilities not elsewhere classified which dispose of non-process wastewaters	Murder Creek RM 0.6
Halsey STP (36320)	44.3883/-123.117	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Muddy Creek RM 23
Hull-Oakes Lumber Co. (107228)	44.36/-123.411	NPDES-IW-B19: Timber and Wood Products - Sawmills, log storage, instream log storage.	Oliver Creek RM 4.8
J.h. Baxter & Co., Inc. (6553)	44.0627/-123.154	NPDES-IW-B21: Timber and Wood Products - Wood preserving	Amazon Diversion Canal RM 1.5
Junction City STP (44509)	44.219/-123.23	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Flat Creek RM 9.2
Kingsford Manufacturing Company - Springfield Plant (46000)	44.0633/-122.98	NPDES-IW-B20: Timber and Wood Products - Hardboard, veneer, plywood, particle board, pressboard manufacturing, wood products.	Patterson Slough RM 3.7
Knoll Terrace Mhc (46990)	44.6182/-123.239	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Mountain View Creek RM 0.4
Lane Community College (48854)	44.0091/-123.032	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Russel Creek RM 0.7
Mcfarland Cascade Pole & Lumber Co (54370)	44.1072/-123.175	NPDES-IW-B21: Timber and Wood Products - Wood preserving	Storm Ditch to Amazon Creek RM 1.8
Oakridge STP (62886)	43.7416/-122.492	NPDES-DOM-Da: Sewage - less than 1 MGD	Middle Fork Willamette River RM 39.8

Facility Name (Facility Number)	Latitude/Longitude	Permit Type and Description	Stream River Mile
Philomath WWTP (103468)	44.5159/-123.338	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Marys River RM 10.2
Seneca Sawmill Company (80207)	44.1119/-123.178	NPDES-IW-B19: Timber and Wood Products - Sawmills, log storage, instream log storage.	Ditch to A-1 Amazon Channel RM 7
Sfpp, L.p. (103159)	44.0935/-123.158	NPDES-IW-B15: All facilities not elsewhere classified which dispose of process wastewater (includes remediated groundwater) - Tier 2 sources	Amazon Creek RM 7.9
Sherman Bros. Trucking (36646)	44.28/-123.063	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Little Muddy Creek RM 8
Tangent STP (87425)	44.5531/-123.14	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Calapooia River RM 10.8
Veneta STP (92762)	44.0493/-123.371	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Long Tom River RM 34.9
Westfir STP (94805)	43.759/-122.521	NPDES-DOM-Da: Sewage - less than 1 MGD	N Fk Middle Fk Willamette R RM 1
Willamette Leadership Academy (34040)	43.9948/-123.01	NPDES-DOM-Db: Sewage - less than 1 MGD with discharging lagoons	Wild Hog Creek RM 2

Table 4: Summary of current registrants under the general NPDES GEN01, GEN03, GEN04, and GEN40 (MS4) permits in the Southern Willamette Subbasins.

Facility Name (Facility Number)	Latitude/Longitude	Permit Type and Description	Stream River Mile
BENTON COUNTY MUNICIPAL STORMWATER, MS4 (113609)	44.5833/-123.275	GEN40: 4000 MS4-Phase 2 General Permit – Water Quality NPDES General Permit	Multiple discharge locations
EWEB LEABURG (28391)	44.1013/-122.688	GEN01: Industrial Wastewater; NPDES cooling water	Stream without a name RM 34
EWEB WALTERVILLE (28395)	44.0697/-122.834	GEN01: Industrial Wastewater; NPDES cooling water	Stream without a name RM 21

Facility Name (Facility Number)	Latitude/Longitude	Permit Type and Description	Stream River Mile
FORREST PAINT CO. (100684)	44.0487/-123.129	GEN01: Industrial Wastewater; NPDES cooling water	Amazon Creek RM 17
ODFW - DEXTER PONDS (64450)	43.9167/-122.767	GEN03: Industrial Wastewater; NPDES fish hatcheries	Middle Fork Willamette River RM 15.6
ODFW - WILLAMETTE FISH HATCHERY (64585)	43.7472/-122.445	GEN03: Industrial Wastewater; NPDES fish hatcheries	Unknown RM 0.4
PHILOMATH MUNICIPAL STORMWATER, MS4 (112241)	44.5397/-123.359	GEN40: 4000 MS4-Phase 2 General Permit – Water Quality NPDES General Permit	Multiple discharge locations
REXIUS (9272)	44.1769/-123.082	GEN04: Industrial Wastewater; NPDES log ponds	Dry Muddy Creek RM 5.6
SUNDANCE LUMBER COMPANY, INC. (107401)	44.055/-122.975	GEN01: Industrial Wastewater; NPDES cooling water	Stream without a name RM 14

Table 5: Summary of the current number of registrants for all the other general NPDES permits in the Southern Willamette Subbasins that are not listed in Table 4.

Permit Type and Description	Current Number of Registrants
GEN02: Industrial Wastewater; NPDES filter backwash	7
GEN12A: Stormwater; NPDES sand & gravel mining	25
GEN12C(AGENT): Stormwater; NPDES construction more than 1 acre disturbed ground, issued by agent	16
GEN12C: Stormwater; NPDES construction more than 1 acre disturbed ground	112
GEN12CA: Stormwater; NPDES government agency construction, more than 1 acre disturbed ground	6
GEN12Z: Stormwater; NPDES specific SIC codes	141
GEN17A: Industrial Wastewater; NPDES wash water	6

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 6 lists the locations where effective shade measurements were collected and the effective shade value for August 2014.

Table 6: Effective shade data collected in the Southern Willamette Subbasins.

Station ID	Station	Latitude/Longitude	Effective Shade	Data Source
AMA1	Amazon Creek	44.0141/-123.078	57%	DEQ
AMA2	Amazon Creek	44.0288/-123.084	63%	DEQ
AMA3	Amazon Creek	44.0307/-123.085	53%	DEQ
AMA4	Amazon Creek upstream of Chambers St	44.0423/-123.117	21%	DEQ
AMA5	Amazon Creek	44.0445/-123.125	13%	DEQ
BLU1	Blue River	44.221/-122.263	64%	DEQ
BOU1	Boulder Creek	44.2054/-122.037	92%	DEQ
BUC1	Buck Creek upstream of Railroad tracks	43.7751/-122.526	91%	DEQ
BUC2	Buck Creek downstream of Road	43.7755/-122.526	94%	DEQ
BUT1	Butte Creek 100 feet downstream of bridge	44.4721/-123.06	86%	DEQ
BUT2	Butte Creek 300 feet downstream of bridge	44.4725/-123.06	91%	DEQ
CAL1	Calapooia River at McKercher Park	44.3598/-122.878	33%	DEQ

Station ID	Station	Latitude/Longitude	Effective Shade	Data Source
CAL2	Calapooia River 300 feet upstream of playground downstream end of side channel	44.3917/-122.991	26%	DEQ
CAL3	Calapooia River near mouth	44.6375/-123.112	26%	DEQ
COA1	Coal Creek downstream NF Road 201	43.4947/-122.423	73%	DEQ
COA2	Coal Creek near mouth	43.5045/-122.423	70%	DEQ
COG1	Cogswell Creek	44.121/-122.641	95%	DEQ
COU1	Cougar Creek	44.1388/-122.248	90%	DEQ
DEA1	Deadhorse Creek upstream of road	43.5013/-122.411	95%	DEQ
FIS1	Fish Lake Creek	44.3879/-122.001	93%	DEQ
HOR1	Horse Creek	44.1617/-122.155	71%	DEQ
LAK1	Lake Creek 40 feet north of bridge	44.4261/-123.205	68%	DEQ
LAK2	Lake Creek at first right turn	44.4284/-123.206	68%	DEQ
LAK3	Lake Creek 100 feet upstream of Lake	44.4294/-123.207	56%	DEQ
LIT1	Little Luckiamute River @ George Gerlinger Park	44.8721/-123.469	55%	DEQ
LIT2	Little Luckiamute River upstream Falls	44.8671/-123.439	76%	DEQ
LIT3	Little Luckiamute River downstream of 223 bridge	44.838/-123.365	34%	DEQ
LOO1	Lookout Creek	44.2306/-122.218	22%	DEQ
LOO2	Lookout Creek	44.2092/-122.258	86%	DEQ
LOS1	Lost Creek at Elijah Bristow State Park downstream of bridge	43.9395/-122.844	52%	DEQ
LOS2	Lost Creek at Elijah Bristow State Park	43.9444/-122.847	82%	DEQ
LUC1	Luckiamute River at Helmick State Park	44.7824/-123.237	21%	DEQ
LUC2	Luckiamute River	44.7306/-123.155	3%	DEQ
MAR1	Marys River	44.5375/-123.284	7%	DEQ
MAR2	Mary’s River upstream of railroad bridge	44.5542/-123.269	51%	DEQ
MCK1	McKenzie River	44.3578/-121.995	69%	DEQ
MCK2	McKenzie River	44.355/-121.996	63%	DEQ
MFW1	Middle Fork Willamette River upstream of bridge	43.4977/-122.402	52%	DEQ
MFW2	Middle Fork Willamette River at Campers Flat	43.5006/-122.413	64%	DEQ
MFW3	Middle Fork Willamette River	43.505/-122.423	6%	DEQ
MUD1	Muddy Creek	44.39/-123.302	18%	DEQ
NFM1	North Fork Middle Fork Willamette River	43.7896/-122.462	42%	DEQ

Station ID	Station	Latitude/Longitude	Effective Shade	Data Source
NFM2	North Fork Middle Fork Willamette River	43.7701/-122.487	43%	DEQ
NFM3	North Fork Middle Fork Willamette River	43.7695/-122.488	43%	DEQ
OAK2	Oak Creek	44.5602/-123.289	76%	DEQ
OAK3	Oak Creek 200ft downstream of 30th St Bridge	44.5587/-123.284	89%	DEQ
OAK4	Oak Creek 100 feet upstream of Western Blvd	44.5574/-123.282	96%	DEQ
OWL1	Owl Creek at gate about 0.06 miles from Shotgun Creek Road	44.2685/-122.868	93%	DEQ
RIT1	Ritner Creek at Ritner Creek Park	44.7398/-123.491	89%	DEQ
SEE1	Seeley Creek 50 feet downstream of Seeley Cr Road	44.2587/-122.857	90%	DEQ
SHO1	Shotgun Creek 0.2 miles north of Owl Creek Road	44.2654/-122.877	95%	DEQ
SHO3	Shotgun Creek 30 feet downstream of logjam	44.2508/-122.864	96%	DEQ
SHO4	Shotgun Creek 120 feet upstream of bridge	44.2389/-122.856	96%	DEQ
SHO5	Shotgun Creek at sewage lagoons	44.2258/-122.845	95%	DEQ
SIM1	Simpson Creek downstream of Road 21	43.4962/-122.399	88%	DEQ
SLI1	Slick Creek upstream of road	44.7642/-123.566	94%	DEQ
SNA1	Snake Creek downstream of bridge	43.5404/-122.454	98%	DEQ
SOD3	Sodom Ditch 50 feet north of Boston Mill Dr	44.4618/-123.067	74%	DEQ
TID1	Tidbits Creek	44.2215/-122.265	64%	DEQ
UNT0	Unnamed Tributary of Hills Creek Lake	43.6209/-122.444	97%	DEQ
UNT1	Unnamed Tributary of Coal Creek	43.4881/-122.429	96%	DEQ
UNT2	Unnamed Tributary of Coal Creek	43.4815/-122.438	97%	DEQ
UNTX	Unknown Stream near mouth	43.511/-122.436	97%	DEQ
YOU1	Youngs Creek	43.5113/-122.437	98%	DEQ

6 Model development and calibration

Waterbodies where model development was initiated for the Willamette Basin TMDL and WQMP (DEQ, 2006) are listed in Table 7. 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 7: Waterbodies where a model has already been developed.

Model Version	Model Waterbody
Heat Source version 6 temperature model	Coyote Creek, Luckiamute River, McKenzie River: Upper, Mohawk River, Mosby Creek
Heat Source version 9 shade model solar model	Southern Willamette Subbasins

The setup and calibration for the models listed in Table 7 was completed by DEQ and documented in the Willamette Basin TMDL and WQMP (DEQ, 2006). 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 Chapter 7.2. These models

DEQ will develop effective shade curves for all other waterbodies that were not specifically listed in Table 7. 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 a shade curve plot. The results can also be summarized in a lookup table with additional combinations of vegetation height, density, and buffer width included. Effective shade curves were developed for the original Willamette Basin TMDL and WQMP (DEQ, 2006). 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 6

Table 8 summarizes all of the user entered model inputs required to run Heat Source version 6; and identifies the subset of inputs 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 include upstream and downstream channel elevations, Manning's *n*, and rating curve coefficients *a* and *b* for a power function. 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 hydraulics are often necessary to calibrate the model.

- Meteorology – The meteorological input modified in calibration is wind speed. 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 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 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 8: Summary of model inputs required for Heat Source version 6.

Input Type	Input	Units	Calibration Parameter
General	Model Date	date (mm/dd/yyyy)	NO
General	Longitudinal Stream Sample Distance	meters	NO
General	Number of Tributary Inflow Sites	-	NO
General	Number of Meteorological Data Sites	-	NO
General	Total Longitudinal Distance	meters	NO
General	Stop Distance	meters	NO
General	Latitude	decimal degrees	NO
General	Longitude	decimal degrees	NO
General	Riparian Zone Width	meters	NO
Meteorological Data	Meteorological Data Model Kilometers	kilometers	NO
Meteorological Data	Wind Speed	meters/second	YES

Input Type	Input	Units	Calibration Parameter
Meteorological Data	Relative Humidity	proportion (0-1)	NO
Meteorological Data	Air Temperature	degrees Celsius	NO
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	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	Landcover Code	-	NO
Land Cover Codes	Landcover Height	meters	YES
Land Cover Codes	Canopy Density	proportion (0-1)	YES
Land Cover Codes	Landcover Overhang	meters	YES
Morphology Data	Channel Bed Elevation	meters	NO
Morphology Data	Manning's Roughness Coefficient, n	seconds/meter	YES
Morphology Data	Near-stream Disturbance Zone (NSDZ) Width	meters	NO
Morphology Data	Rating Curve Coefficient, a	unitless	YES
Morphology Data	Rating Curve Coefficient, b	unitless	YES
Morphology Data	Percent Bedrock	proportion (0-1)	NO
Morphology Data	Channel Aspect	degrees	NO
Morphology Data	Channel Incision	meters	NO
Morphology Data	Valley Length (optional)	meters	NO

6.1.2 Heat Source version 9 shade model

The Heat Source version 9 shade module is a sub program within Heat Source version 9 used to model effective shade and solar radiation flux. Heat Source 9 is similar to other versions of heat source, especially for the landcover and morphology related inputs used by the shade module. Table 9 summarizes all of the user entered model inputs required to run the shade module of Heat Source version 9. Table 9 also identifies the subset of inputs 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.

Table 9: Summary of model inputs required for Heat Source version 9.

Input Type	Input	Units	Calibration Parameter
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 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
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	Landcover Ground Elevation	meters	NO
Land Cover Codes	Landcover Name	-	NO
Land Cover Codes	Landcover Code	-	NO
Land Cover Codes	Landcover Height	meters	YES
Land Cover Codes	Canopy Cover	proportion (0-1)	YES

Input Type	Input	Units	Calibration Parameter
Land Cover Codes	Landcover Overhang	meters	YES
Morphology Data	Stream Kilometers	kilometers	NO
Morphology Data	Channel Bed Elevation	meters	NO

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 increase, 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 10 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 have been summarized in the boundary conditions and tributary inputs tables in the sections of model inputs in the current Chapter 6.

Table 10: 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 that have an incomplete record or no data may be parameterized using data from a neighboring or nearby location where data is 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).

Method	Possible Parameters	Description
Mass balance	Tributary temperature and flow	On main stem 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 (Ries et al., 2017; Risley, 2009; Gianfagna, 2015). For example, if the watershed area upstream of a gaged tributary is 10 square kilometers, and the watershed area of an ungaged tributary is 5, 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.
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.

Method	Possible Parameters	Description
GIS Data	Channel position, Channel width, Landcover, 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 landcover 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 aspect. 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 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.

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 a 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 Willamette Basin TMDL and WQMP (DEQ, 2006). 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 different sets 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 Willamette Basin TMDL and WQMP (DEQ, 2006). The other model inputs are the same as what is described in Table 11.

- Effective shade lookup tables: Model input values to be used for the lookup tables are described in Table 11.

Table 11: 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)

Model Input	Value Range
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 Coyote Creek

The Coyote Creek model is a temperature model developed using Heat Source 6.5.1. The model was developed by DEQ.

6.4.1 Model domain

The extent of the model domain is Coyote Creek from Gillespie Corners to the mouth at the Fern Ridge Reservoir. 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 30 meters. Outputs are generated every 100 meters. The model time step (*dt*) is 1 minute and outputs are generated every hour.

A *dx* of 30 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 along the Coyote Creek include increases in solar radiation loading from the disturbance or removal of near-stream vegetation, reductions to the stream flow rate or volume, and background sources (DEQ, 2006). 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 the model scenarios.

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

The majority land uses along the Coyote Creek are agriculture and emergent herbaceous wetlands accounting for about 88 percent of the near-stream area. Table 12 summarizes all the land uses within 100 meters of the digitized Coyote Creek 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 12: Summary of land uses within 100 meters of the digitized Coyote Creek centerline based on the 2016 National Land Cover Database (Yang et al 2018).

2016 NLCD Land Cover	Acres	Percent of Total Acres
Hay/Pasture	702.5	45.5
Emergent Herbaceous Wetlands	658.1	42.7
Woody Wetlands	93.0	6
Developed, Open Space	47.1	3.1
Evergreen Forest	18.5	1.2
Mixed Forest	9.3	0.6
Developed, Low Intensity	6.2	0.4
Shrub/Scrub	3.1	0.2
Developed, Medium Intensity	2.4	0.2
Herbaceous	2.4	0.2
Cultivated Crops	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 13).

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 13 summarizes the potential designated management agencies and responsible persons along the Coyote Creek model extent.

Table 13: Summary of potential designated management agencies (DMAs) or responsible persons within 100 meters of the digitized Coyote Creek centerline.

DMA or Responsible Person	Acres	Percent of Total Acres
Oregon Department of Agriculture	950.6	60
Oregon Department of Forestry - Private Forestland	263.9	16.7
U.S. Army Corps of Engineers	153.2	9.7
Lane County	114.9	7.3
Oregon Department of Fish and Wildlife	75.7	4.8
Oregon Department of Transportation	23.2	1.5
Port of Coos Bay	1.9	0.1
U.S. Bureau of Land Management	1.1	0.1

6.4.4 Time frame of simulation

The model period is for a single day: July 11, 2002.

6.4.5 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, 2006), the model user guide or in Section 6 and Section 7 of this document.

6.4.6 Model inputs

Table 14 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 14: Boundary condition and tributary inputs to the existing Coyote Creek Heat Source model.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Coyote Creek at Gillespie (25627-ORDEQ)	0	Boundary Condition	Water Temperature	DEQ	The data are not in AWQMS.
Coyote Creek at Gillespie (25627-ORDEQ)	0	Boundary Condition	Flow	DEQ	
Spencer Creek	26365	Tributary	Flow	DEQ	
Spencer Creek	26365	Tributary	Water Temperature	DEQ	
KEUG - Eugene Airport	0, 3931.92, 19141.44	Meteorological	Wind Speed	NCDC	Wind speed reduced by 75%.
KEUG - Eugene Airport	25603.2, 32918.4	Meteorological	Wind Speed	NCDC	Wind speed reduced by 90%.
KEUG - Eugene Airport	0, 3931.92, 19141.44, 25603.2, 32918.4	Meteorological	Air Temperature, Relative Humidity	NCDC	

Hourly meteorology inputs into the model include air temperature, 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 15. The model location in the table below describes the distance of each input from the most upstream model node. Effective shade

model calibrations sites are summarized in Table 6. The model inputs and parameters that are expected to be modified to improve model fit are described in Section 6.1.

Table 15: Calibration sites and parameters used in the existing Coyote Creek Heat Source model.

Model Location Name (Station ID)	Model Location (meters)	Calibration Parameter	Data Source
Coyote Creek Centrell Rd (10150-ORDEQ)	32918.40	Water Temperature	DEQ
Coyote Creek Petzold Rd (10151-ORDEQ)	25603.20	Water Temperature, Flow, Effective Shade	DEQ
Coyote Creek Crow Rd (11148-ORDEQ)	19141.44	Water Temperature, Flow, Effective Shade	DEQ
Coyote Creek at Powell Rd (25626-ORDEQ)	3931.92	Water Temperature, Flow, Effective Shade	DEQ
Coyote Creek at Gillespie (25627-ORDEQ)	0	Effective Shade	DEQ

6.5 Luckiamute River

The Luckiamute River model is a temperature model developed using Heat Source 6.5.1. The model was developed by DEQ.

6.5.1 Model domain

The extent of the model domain is the Luckiamute River from mouth to river mile 57. 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 30 meters. Outputs are generated every 100 meters. The model time step (*dt*) is 1 minute and outputs are generated every hour.

A *dx* of 30 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 along the Luckiamute River include increases in solar radiation loading from the disturbance or removal of near-stream vegetation, and background sources (DEQ, 2006). 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 the model scenarios.

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

The majority land uses along the Luckiamute River are forestry and agriculture accounting for about 81 percent of the near-stream area. Table 16 summarizes all the land uses within 100 meters of the digitized

Luckiamute 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 16: Summary of land uses within 100 meters of the digitized Luckiamute River centerline based on the 2016 National Land Cover Database (Yang et al 2018).

2016 NLCD Land Cover	Acres	Percent of Total Acres
Woody Wetlands	1195.8	27.5
Hay/Pasture	794.6	18.3
Emergent Herbaceous Wetlands	579.8	13.3
Mixed Forest	525.1	12.1
Cultivated Crops	517.3	11.9
Evergreen Forest	347.4	8
Developed, Open Space	222.8	5.1
Shrub/Scrub	74.7	1.7
Deciduous Forest	51.2	1.2
Developed, Low Intensity	25.6	0.6
Herbaceous	15.6	0.4
Barren Land	0.4	<0.05
Developed, Medium Intensity	0.2	<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 17).

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 17 summarizes the potential designated management agencies and responsible persons along the Luckiamute River model extent.

Table 17: Summary of potential designated management agencies (DMAs) or responsible persons within 100 meters of the digitized Luckiamute River centerline.

DMA or Responsible Person	Acres	Percent of Total Acres
Oregon Department of Agriculture	2817.3	61.8
Oregon Department of Forestry - Private Forestland	1170.3	25.7
Polk County	242.5	5.3
Oregon Parks and Recreation Department	180.8	4
U.S. Bureau of Land Management	60.0	1.3
Benton County	38.2	0.8

DMA or Responsible Person	Acres	Percent of Total Acres
Oregon Department of Fish and Wildlife	21.2	0.5
Oregon Department of Transportation	19.7	0.4
Oregon Department of State Lands - Waterway	4.5	0.1
Oregon Department of Forestry - State Forestland	1.2	<0.05
Portland & Western Railroad	1.2	<0.05
State of Oregon	0.2	<0.05
Bonneville Power Administration	0.1	<0.05

6.5.4 Time frame of simulation

The model period is for a single day: August 12, 2001.

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, 2006), the model user guide or in Section 6 and Section 7 of this document.

6.5.6 Model inputs

Table 18 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 18: Boundary condition and tributary inputs to the existing Luckiamute River Heat Source model.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Luckiamute River at Road 1430 crossing (Roadmile 3) (25494-ORDEQ)	0	Boundary Condition	Water Temperature	DEQ	
Luckiamute River at Road 1430 crossing (Roadmile 3) (25494-ORDEQ)	0	Boundary Condition	Flow	DEQ	
Soap Creek at Buena Vista Rd. (Trib to Luckiamute RM 2.31) (25474-ORDEQ)	87843.36	Tributary	Flow	Derived data. DEQ	Data noted as estimated.
Little Luckiamute River at Elkins Rd. (Trib to Luckiamute RM 18.2) (11114-ORDEQ)	60868.56	Tributary	Flow	DEQ	
McTimmonds Creek at State HWY 223 (Trib to Luckiamute RM 27.7) (25478-ORDEQ)	44256.96	Tributary	Flow	Derived data. DEQ	Data noted as estimated.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Pedee Creek at Kings Highway (Trib to Luckiamute RM 30.2) (25481-ORDEQ)	40172.64	Tributary	Flow	DEQ	
Ritner Creek at Ritner Wayside (Trib to Luckiamute RM 31.2) (25482-ORDEQ)	38496.24	Tributary	Flow	DEQ	
Maxfield Creek at HWY 223 (Trib to Luckiamute RM 34.0) (25484-ORDEQ)	33985.2	Tributary	Flow	DEQ	
Price Creek at HWY 223 (Trib to Luckiamute RM 35.2) (25485-ORDEQ)	32034.48	Tributary	Flow	DEQ	
Slick Creek at Mouth (Trib to Luckiamute RM 48.6) (25489-ORDEQ)	9723.12	Tributary	Flow	DEQ	
Rock Pit Creek at Mouth (trib to Luckiamute RM 49.8) (25491-ORDEQ)	7559.04	Tributary	Flow	DEQ	
Miller Creek at Mouth (Trib to Luckiamute RM 50.5) (25492-ORDEQ)	6522.72	Tributary	Flow	DEQ	
Soap Creek at Buena Vista Rd. (Trib to Luckiamute RM 2.31) (25474-ORDEQ)	87843.36	Tributary	Water Temperature	DEQ	
Little Luckiamute River at Elkins Rd. (Trib to Luckiamute RM 18.2) (11114-ORDEQ)	60868.56	Tributary	Water Temperature	DEQ	
McTimmonds Creek at State HWY 223 (Trib to Luckiamute RM 27.7) (25478-ORDEQ)	44256.96	Tributary	Water Temperature	DEQ	
Pedee Creek at Kings Highway (Trib to Luckiamute RM 30.2) (25481-ORDEQ)	40172.64	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Ritner Creek at Ritner Wayside (Trib to Luckiamute RM 31.2) (25482-ORDEQ)	38496.24	Tributary	Water Temperature	DEQ	Data not in AWQMS.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Maxfield Creek at HWY 223 (Trib to Luckiamute RM 34.0) (25484-ORDEQ)	33985.2	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Price Creek at HWY 223 (Trib to Luckiamute RM 35.2) (25485-ORDEQ)	32034.48	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Slick Creek at Mouth (Trib to Luckiamute RM 48.6) (25489-ORDEQ)	9723.12	Tributary	Water Temperature	DEQ	
Rock Pit Creek at Mouth (trib to Luckiamute RM 49.8) (25491-ORDEQ)	7559.04	Tributary	Water Temperature	DEQ	
Miller Creek at Mouth (Trib to Luckiamute RM 50.5) (25492-ORDEQ)	6522.72	Tributary	Water Temperature	DEQ	
crvo - Corvallis	0, 4023.36, 8107.68, 13807.44, 18867.12, 26395.68, 38465.76, 41635.68, 51389.28, 68884.8, 82296, 87904.32	Meteorological	Wind Speed	Oregon AgriMet Weather Station	25% of observed wind speed applied.
crvo - Corvallis	0, 4023.36, 8107.68, 13807.44, 18867.12, 26395.68, 38465.76, 41635.68, 51389.28, 68884.8, 82296, 87904.32	Meteorological	Air Temperature, Relative Humidity	Oregon AgriMet Weather Station	

Hourly meteorology inputs into the model include air temperature, 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 19. The model location in the table below describes the distance of each input from the most upstream model node. Effective shade model calibrations sites are summarized in Table 6. The model inputs and parameters that are expected to be modified to improve model fit are described in Section 6.1.

Table 19: Calibration sites and parameters used in the existing Luckiamute River Heat Source model.

Model Location Name (Station ID)	Model Location (meters)	Calibration Parameter	Data Source
Luckiamute River at Lower Bridge (Buena Vista Rd.) (10658-ORDEQ)	87904.32	Water Temperature	DEQ
Luckiamute River at Corvallis Rd. (25475-ORDEQ)	82296.00	Water Temperature	DEQ
Luckiamute River at Helmick State Park (10659-ORDEQ)	68884.80	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River at Airlie Rd. Bridge (25477-ORDEQ)	51389.28	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River at Ira Hooker Rd. (25480-ORDEQ)	41635.68	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River just upstream Ritner Creek (25483-ORDEQ)	38465.76	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River at Hoskins (11111-ORDEQ)	26395.68	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River at Gaging Site (25486-ORDEQ)	18867.12	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River at Boise Roadmile 1 (25488-ORDEQ)	13807.44	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River at Boise Roadmile 4 (25490-ORDEQ)	8107.68	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River at Road 1440 crossing (25493-ORDEQ)	4023.36	Water Temperature, Flow, Effective Shade	DEQ
Luckiamute River at Road 1430 crossing (Roadmile 3) (25494-ORDEQ)	0	Effective Shade	DEQ

6.6 McKenzie River: Upper

The McKenzie River: Upper model is a temperature model developed using Heat Source 6.0. The model was developed by DEQ.

6.6.1 Model domain

The extent of the model domain is the McKenzie River from Olallie Campground to the confluence of Quartz 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 30 meters. Outputs are generated every 100 meters. The model time step (*dt*) is 1 minute and outputs are generated every hour.

A *dx* of 30 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 along the upper portion of the McKenzie River include increases in solar radiation loading from the disturbance or removal of near-stream vegetation, and background sources (DEQ, 2006). 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 the model scenarios.

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

The majority land use along the upper portion of the McKenzie River is forestry accounting for about 89 percent of the near-stream area. Table 20 summarizes all the land uses within 100 meters of the digitized upper portion of the McKenzie 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 20: Summary of land uses within 100 meters of the digitized centerline of the upper portion of the McKenzie River based on the 2016 National Land Cover Database (Yang et al 2018).

2016 NLCD Land Cover	Acres	Percent of Total Acres
Evergreen Forest	1545.0	79.7
Developed, Open Space	185.3	9.6
Mixed Forest	79.4	4.1
Woody Wetlands	44.3	2.3
Shrub/Scrub	34.9	1.8
Developed, Low Intensity	20.9	1.1
Herbaceous	12.2	0.6
Deciduous Forest	9.6	0.5
Hay/Pasture	4.0	0.2
Developed, Medium Intensity	2.0	0.1
Emergent Herbaceous Wetlands	0.7	<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 21).

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 21 summarizes the potential designated management agencies and responsible persons along the upper portion of the McKenzie River model extent.

Table 21: Summary of potential designated management agencies (DMAs) or responsible persons within 100 meters of the digitized centerline of the upper portion of the McKenzie River.

DMA or Responsible Person	Acres	Percent of Total Acres
U.S. Forest Service	1200.1	51.4
Lane County	346.1	14.8
Oregon Department of State Lands - Waterway	314.8	13.5
Oregon Department of Forestry - Private Forestland	204.0	8.7
Oregon Department of Transportation	171.4	7.3
U.S. Government	69.9	3
Oregon Department of State Lands	13.8	0.6
U.S. Department of Agriculture	9.5	0.4
Bonneville Power Administration	3.2	0.1
U.S. Bureau of Land Management	1.3	0.1
Oregon Department of Fish and Wildlife	0.2	<0.05
U.S. Army Corps of Engineers	0.1	<0.05

6.6.4 Time frame of simulation

The model period is for a single day: September 03, 1999.

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, 2006), the model user guide or in Section 6 and Section 7 of this document.

6.6.6 Model inputs

Table 22 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 22: Boundary condition and tributary inputs to the Heat Source model for the upper portion of the McKenzie River.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
McKenzie River at Olallie (RM 75.43)	0	Boundary Condition	Water Temperature	DEQ	Increased temp 1.5 deg-C to match TIR.
McKenzie River at Olallie (RM 75.43)	0	Boundary Condition	Flow	Derived data.	Estimated based on nearby USGS gage.
Blue River	38857	Tributary	Flow	Derived data.	Estimated based on nearby USGS gage.
South Fork McKenzie River	33184	Tributary	Flow	Derived data.	Estimated based on nearby USGS gage.
East Fork Horse Creek	22112.5	Tributary	Flow	USFS	Measurement in Horse Creek
Groundwater (warm)	16012.5	Tributary	Flow	Derived data.	Estimated.
Groundwater (warm)	13999.5	Tributary	Flow	Derived data.	Estimated.
Deer Creek	3203	Tributary	Flow	Derived data.	Estimated based on nearby USGS gage.
Blue River	38857	Tributary	Water Temperature	Derived data.	Estimated 1 degree warmer than South Fork Mckenzie temp data.
South Fork McKenzie River	33184	Tributary	Water Temperature	DEQ	
East Fork Horse Creek	22112.5	Tributary	Water Temperature	Derived data.	Estimated 1 degree warmer than South Fork Mckenzie temp data.
Groundwater (warm)	16012.5	Tributary	Water Temperature	Derived data.	Estimated 1 degree warmer than South Fork Mckenzie temp data.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Groundwater (warm)	13999.5	Tributary	Water Temperature	Derived data.	Estimated 1 degree warmer than South Fork Mckenzie temp data.
Deer Creek	3203	Tributary	Water Temperature	DEQ	
HJA, H.J. Andrews Experimental Forest Meteorological Station	0, 9699, 18818.5, 43157.5	Meteorological	Air Temperature, Relative Humidity, Wind Speed	DEQ	

Hourly meteorology inputs into the model include air temperature, 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.

6.6.7 Model calibration

The expected model calibration sites and data sources are summarized in Table 23. The model location in the table below describes the distance of each input from the most upstream model node. Effective shade model calibrations sites are summarized in Table 6. The model inputs and parameters that are expected to be modified to improve model fit are described in Section 6.1.

Table 23: Calibration sites and parameters used in the Heat Source model for the upper portion of the McKenzie River.

Model Location Name (Station ID)	Model Location (meters)	Calibration Parameter	Data Source
McKenzie River at Quartz Creek Bridge	43157.5	Water Temperature	DEQ
McKenzie River at McKenzie Bridge (14159000)	18818.5	Water Temperature	USGS
McKenzie River at Belknap Springs Resort (14158850)	9699.0	Water Temperature	USGS

6.7 Mohawk River

The Mohawk River model is a temperature model developed using Heat Source 6.5.1. The model was developed by DEQ.

6.7.1 Model domain

The extent of the model domain is the Mohawk River from the mouth to river mile 25.4. The model extent is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

6.7.2 Spatial and temporal resolution

The model input spatial resolution (*dx*) is 30 meters. Outputs are generated every 100 meters. The model time step (*dt*) is 1 minute and outputs are generated every hour.

A *dx* of 30 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.

6.7.3 Source characteristics

The primary sources of thermal loading contributing to temperatures exceedances along the Mohawk River include increases in solar radiation loading from the disturbance or removal of near-stream vegetation, reductions to the stream flow rate or volume, and background sources (DEQ, 2006). 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 the model scenarios.

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

The majority land uses along the Mohawk River are forestry and agriculture accounting for about 86 percent of the near-stream area. Table 24 summarizes all the land uses within 100 meters of the digitized Mohawk 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 24: Summary of land uses within 100 meters of the digitized Mohawk River centerline based on the 2016 National Land Cover Database (Yang et al 2018).

2016 NLCD Land Cover	Acres	Percent of Total Acres
Hay/Pasture	728.3	37.9
Evergreen Forest	711.0	37
Developed, Open Space	159.5	8.3
Woody Wetlands	82.5	4.3
Emergent Herbaceous Wetlands	69.8	3.6
Shrub/Scrub	61.6	3.2
Mixed Forest	49.1	2.6
Developed, Low Intensity	28.5	1.5
Herbaceous	21.8	1.1
Deciduous Forest	4.7	0.2
Developed, Medium Intensity	3.1	0.2
Cultivated Crops	0.7	<0.05
Developed, High Intensity	0.2	<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 25).

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 25 summarizes the potential designated management agencies and responsible persons along the Mohawk River model extent.

Table 25: Summary of potential designated management agencies (DMAs) or responsible persons within 100 meters of the digitized Mohawk River centerline.

DMA or Responsible Person	Acres	Percent of Total Acres
Lane County	834.5	40.7
Oregon Department of Agriculture	565.1	27.6
Oregon Department of Forestry - Private Forestland	565.0	27.6
Oregon Department of State Lands - Waterway	55.0	2.7
U.S. Bureau of Land Management	30.5	1.5
U.S. Government	0.2	<0.05

6.7.4 Time frame of simulation

The model period is for a single day: August 09, 2001.

6.7.5 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, 2006), the model user guide or in Section 6 and Section 7 of this document.

6.7.6 Model inputs

Table 26 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 26: Boundary condition and tributary inputs to the existing Mohawk River Heat Source model.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Mohawk River on East Street (25608-ORDEQ)	0	Boundary Condition	Water Temperature	DEQ	Data not in AWQMS.
Mohawk River on East Street (25608-ORDEQ)	0	Boundary Condition	Flow	DEQ	

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
McGowan Creek	27553.92	Tributary	Flow	DEQ	
Parsons Creek	22372.32	Tributary	Flow	DEQ	
Cartwright Creek	20604.48	Tributary	Flow	DEQ	
Mill Creek	17647.92	Tributary	Flow	DEQ	
Cash Creek	15453.36	Tributary	Flow	DEQ	
Shotgun Creek	14386.56	Tributary	Flow	DEQ	
Unnamed Creek at model meter 5821.68	5821.68	Tributary	Flow	DEQ	
McGowan Creek	27553.92	Tributary	Water Temperature	DEQ	
Parsons Creek (25499-ORDEQ)	22372.32	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Cartwright Creek (25500-ORDEQ)	20604.48	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Mill Creek (25501-ORDEQ)	17647.92	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Cash Creek (25503-ORDEQ)	15453.36	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Shotgun Creek (25504-ORDEQ)	14386.56	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Unnamed Creek at model meter 5821.68 (25506-ORDEQ)	5821.68	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Eugene Airport (KEUG)	0, 2956.56, 5242.56, 16154.4, 20299.68, 26730.96, 34259.52, 37338	Meteorological	Air Temperature, Relative Humidity, Wind Speed	NCDC	

Hourly meteorology inputs into the model include air temperature, 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

6.7.7 Model calibration

The expected model calibration sites and data sources are summarized in Table 27. The model location in the table below describes the distance of each input from the most upstream model node. Effective shade model calibrations sites are summarized in Table 6. The model inputs and parameters that are expected to be modified to improve model fit are described in Section 6.1.

Table 27: Calibration sites and parameters used in the existing Mohawk River Heat Source model.

Model Location Name (Station ID)	Model Location (meters)	Calibration Parameter	Data Source
Mohawk River at Hill Road (10663-ORDEQ)	37338.00	Water Temperature, Flow, Effective Shade	DEQ
Mohawk River at Old Mohawk Road (25496-ORDEQ)	34259.52	Water Temperature, Flow, Effective Shade	DEQ
Mohawk River at Sunderman Road (25498-ORDEQ)	26730.96	Water Temperature, Flow, Effective Shade	DEQ
Mohawk River at Wendling Road (22654-ORDEQ)	20299.68	Water Temperature, Flow, Effective Shade	DEQ
Mohawk River at Paschelke Road (25502-ORDEQ)	16154.40	Water Temperature, Flow, Effective Shade	DEQ
Mohawk River at WEYCO Gate (22651-ORDEQ)	5242.56	Water Temperature, Flow, Effective Shade	DEQ
Mohawk River at WEYCO shop (25607-ORDEQ)	2956.56	Water Temperature, Flow, Flow, Effective Shade	DEQ
Mohawk River on East Street (25608-ORDEQ)	0	Effective Shade	DEQ

6.8 Mosby Creek

The Mosby Creek model is a temperature model developed using Heat Source 6.5.1. The model was developed by DEQ.

6.8.1 Model domain

The extent of the model domain is Mosby Creek from the confluence of the East and West Forks to the confluence with the Row River. The model extent is shown in the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

6.8.2 Spatial and temporal resolution

The model input spatial resolution (*dx*) is 30 meters. Outputs are generated every 100 meters. The model time step (*dt*) is 1 minute and outputs are generated every hour.

A *dx* of 30 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.

6.8.3 Source characteristics

The primary sources of thermal loading contributing to temperatures exceedances along the Mosby Creek include increases in solar radiation loading from the disturbance or removal of near-stream vegetation, and background sources (DEQ, 2006). 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 the model scenarios.

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

The majority land use along the Mosby Creek is forestry accounting for about 87 percent of the near-stream area. Table 28 summarizes all the land uses within 100 meters of the digitized Mosby Creek 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 28: Summary of land uses within 100 meters of the digitized Mosby Creek centerline based on the 2016 National Land Cover Database (Yang et al 2018).

2016 NLCD Land Cover	Acres	Percent of Total Acres
Evergreen Forest	890.9	51.1
Herbaceous	266.9	15.3
Mixed Forest	152.8	8.8
Shrub/Scrub	147.4	8.5
Hay/Pasture	135.2	7.8
Developed, Open Space	57.6	3.3
Woody Wetlands	55.2	3.2
Developed, Low Intensity	14.9	0.9
Emergent Herbaceous Wetlands	10.9	0.6
Deciduous Forest	8.9	0.5
Developed, Medium Intensity	1.6	0.1
Developed, High Intensity	0.2	<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 29).

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 29 summarizes the potential designated management agencies and responsible persons along the Mosby Creek model extent.

Table 29: Summary of potential designated management agencies (DMAs) or responsible persons within 100 meters of the digitized Mosby Creek centerline.

DMA or Responsible Person	Acres	Percent of Total Acres
Oregon Department of Forestry - Private Forestland	1361.9	74.6
Lane County	289.5	15.9
Oregon Department of Agriculture	116.8	6.4
U.S. Bureau of Land Management	53.2	2.9

DMA or Responsible Person	Acres	Percent of Total Acres
Oregon Department of State Lands - Waterway	2.4	0.1
City of Cottage Grove	1.0	0.1
Bonneville Power Administration	0.1	<0.05

6.8.4 Time frame of simulation

The model period is for a single day: July 21, 2002.

6.8.5 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, 2006), the model user guide or in Section 6 and Section 7 of this document.

6.8.6 Model inputs

Table 30 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 30: Boundary condition and tributary inputs to the existing Mosby Creek Heat Source model.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Mosby Creek Above West Fork Mosby Creek (28102-ORDEQ)	0	Boundary Condition	Water Temperature	BLM	Data not in AWQMS.
Mosby Creek Above West Fork Mosby Creek (28102-ORDEQ)	0	Boundary Condition	Flow	DEQ	
Carolina Creek	34350.96	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance
Unnamed Creek at model meter 26883.36	26883.36	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance
Perkins Creek	26548.08	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance
Kennedy Creek	23652.48	Tributary	Flow	DEQ	
Smith Creek	23622	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Short Creek	20878.8	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance
Rock Creek	17160.24	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance
Palmer Creek	15849.6	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance
Cedar Creek (Spring 1)	13716	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance
Stell Creek	11582.4	Tributary	Flow	DEQ	
Big Dry Creek	9906	Tributary	Flow	DEQ	
Lilly Creek	2926.08	Tributary	Flow	Derived data.	Derived using TIR and flow mass balance
Miles Creek	2225.04	Tributary	Flow	DEQ	
Carolina Creek	34350.96	Tributary	Water Temperature	DEQ	
Unnamed Creek at model meter 26883.36	26883.36	Tributary	Water Temperature	DEQ	
Perkins Creek (17090002_PE1235)	26548.08	Tributary	Water Temperature	BLM	Data not in AWQMS.
Kennedy Creek	23652.48	Tributary	Water Temperature	DEQ	
Smith Creek	23622	Tributary	Water Temperature	DEQ	
Short Creek	20878.8	Tributary	Water Temperature	DEQ	
Rock Creek	17160.24	Tributary	Water Temperature	DEQ	
Palmer Creek	15849.6	Tributary	Water Temperature	DEQ	
Cedar Creek (Spring 1) (17090002_CE1060)	13716	Tributary	Water Temperature	BLM	Data not in AWQMS.
Stell Creek (17090002_ST1120)	11582.4	Tributary	Water Temperature	BLM	Constant temperature of 16.1.

Model Location Name (Station ID)	Model Location (meters)	Input Type	Model Input	Data Source	Note
Big Dry Creek (17090002_BD1160)	9906	Tributary	Water Temperature	BLM	Data not in AWQMS.
Lilly Creek (17090002_LI1380)	2926.08	Tributary	Water Temperature	BLM	Data not in AWQMS.
Miles Creek	2225.04	Tributary	Water Temperature	DEQ	Data not in AWQMS.
Eugene Airport (KEUG)	0, 13594.08, 26365.2, 33497.52, 33771.84	Meteorological	Air Temperature, Relative Humidity, Wind Speed	NCDC	

Hourly meteorology inputs into the model include air temperature, 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.

6.8.7 Model calibration

The expected model calibration sites and data sources are summarized in Table 31. The model location in the table below describes the distance of each input from the most upstream model node. Effective shade model calibrations sites are summarized in Table 6. The model inputs and parameters that are expected to be modified to improve model fit are described in Section 6.1.

Table 31: Calibration sites and parameters used in the existing Mosby Creek Heat Source model.

Model Location Name (Station ID)	Model Location (meters)	Calibration Parameter	Data Source
Mosby Creek below Row River Trail (28103-ORDEQ)	33771.84	Water Temperature	BLM
Mosby Creek at Layng Road (30368-ORDEQ)	33497.52	Water Temperature, Flow, Effective Shade	DEQ
Mosby Creek at Blue Mountain Park (upstream Perkins Creek) (28799-ORDEQ)	26365.2	Water Temperature	DEQ
Mosby Creek Above Cedar Creek (28101-ORDEQ)	13594.08	Water Temperature, Flow, Effective Shade	BLM
Mosby Creek Above West Fork Mosby Creek (28102-ORDEQ)	0	Effective Shade	DEQ
Model extent	Model extent	Water Temperature (TIR)	Watershed Sciences (2003)

6.9 Southern Willamette Subbasins

Between 2014 and 2018 DEQ developed a shade model for streams in the southern portion of the Willamette Basin. The primary purpose of these models were to characterize the status of effective shade on project area streams and the gap between the current shade and the TMDL effective shade targets identified in the Willamette Basin TMDL (ODEQ, 2006). Results were stratified by Designated Management Agencies and HUC10 and HUC12 watersheds and subwatetersheds. 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. The modeling results were used by DEQ evaluate status of TMDL implementation by designated management agencies. The results of this modeling effort will be documented and included in the updated TMDL.

6.9.1 Model domain

Effective shade was modeled along all streams mapped in the National Hydrography Dataset high resolution v2.2 database where LiDAR data was available in the Middle Fork Willamette (17090001), Coast Fork Willamette (17090002), Upper Willamette (17090003), McKenzie (17090004), North Santiam (17090005), and South Santiam (17090006) Subbasins. All these subbains are located in the southern half of the Willamette Basin (170900). The model extent is shown in Figure 3 in addition to the HTML interactive map that accompanies this QAPP and is referenced in Appendix D.

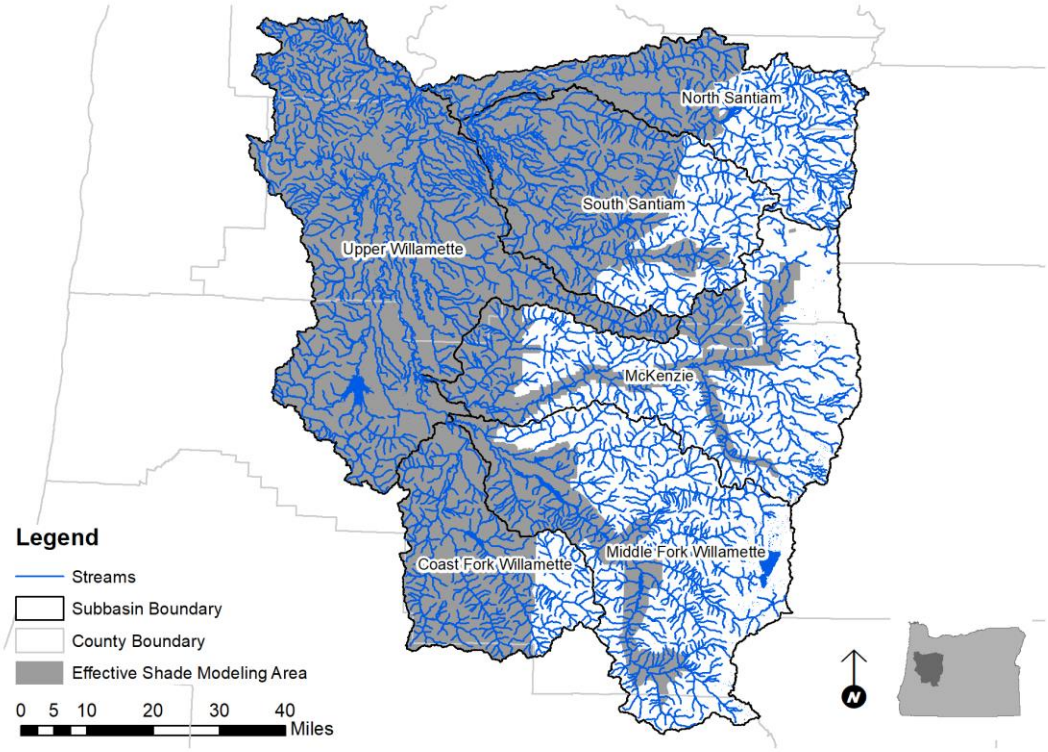

Figure 3: Effective shade and solar flux modeling area in the southern portion of the Willamette Basin (170900).

6.9.2 Spatial and temporal resolution

The model input spatial resolution (*dx*) is 200 meters. Outputs are generated every 200 meters. The model time step (*dt*) is 1 minute and outputs are generated every hour.

A *dx* of 200 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.

6.9.3 Source characteristics

The primary purpose of the Southern Willamette Subbasin models were to characterize the status of effective shade on waterbodies and the gap between the current shade and the TMDL effective shade targets identified in the Willamette Basin TMDL (ODEQ, 2006). Effective shade is a surrogate for solar radiation loading caused by the disturbance or removal of near-stream vegetation. Other potential sources of thermal loading were not evaluated by this model.

The results of the modeling indicate that agricultural areas regulated by the Oregon Department of Agriculture have the largest number of assessed stream miles (1,853 miles out of a total of 3,459 assessed

stream miles, which is about 54 percent) with effective shade that is greater than 50 percentage points below the TMDL shade target. Private non-federal forestlands regulated by the Oregon Department of Forestry has the second largest number of assessed streams miles in this category at 1,260 stream miles out of 5,994 total assessed miles (21 percent). The Oregon Department of Agriculture and Oregon Department of Forestry have the largest number of stream miles that they regulate compared to other designated management agencies. Most cities have fewer stream miles in their jurisdiction but have much higher proportion of effective shade that is greater than 50 percentage points below the TMDL shade target. For example, all the stream miles assessed in the cities of Halsey and Harrisburg (1.2 and 0.5 stream miles respectively) have effective shade that is greater than 50 percentage points below the TMDL shade target. On the opposite end of the spectrum, the federal forestlands managed by the Bureau of Land Management only have 3 percent of the assessed steam miles (41.7 miles out of 1658.5 miles) with effective shade that is greater than 50 percentage points below the TMDL shade target. BLM had the third highest number of assessed stream miles. Most of the federal forestlands managed by the USFS were not evaluated because of the lack of LiDAR.

The Long Tom Watershed (1709000301) overall had the largest amount of assessed stream miles (372 miles out of 1,113 miles total, which is about 33 percent) with effective shade that is greater than 50 percentage points below the TMDL shade target.

6.9.4 Time frame of simulation

The model period is for a single day: August 15, 2014.

6.9.5 Important assumptions

There are three important assumptions made during the modeling effort. The first is that the model is setup to assume no cloud cover. This is done to isolate the solar radiation flux blocked by vegetation and topography only. The other two assumptions relate to how the effective shade targets were derived from the site potential vegetation types and the location of the stream as derived from the National Hydrography Dataset.

The site potential vegetation scenario represents the effective shade under restored vegetation conditions and is the primary basis for the TMDL load allocation (ODEQ 2006). The site potential vegetation described in the TMDL is the type and mix of vegetation that is assumed to be restored in any given location and is the basis for the TMDL effective shade targets. The type and mix of restored vegetation that occurs in any given location is primarily based upon on the geomorphic mapping unit and the mix of forest, savanna, and prairie. In order to calculate the effective shade targets across the project area, the appropriate type of site potential vegetation needed to be spatially mapped. To complete this task, python scripts were developed to process a raster layer of the geomorphic units into site potential vegetation codes following the process laid out in the TMDL (ODEQ 2006). Two modifications to the approach needed to be made for the Southern Willamette project. Both modifications relate to the two land cover classes for water: open water and general water.

General water are areas which include natural river channels, lakes, ponds, or wetland areas. Under the site potential vegetation scenario these features continued to stay as water. The 2006 effort mapped these areas using aerial photos and digitized them into a landcover feature class only for the streams that were modeled. The landcover class code used for general water was 3011. For this project general water features needed to be mapped across the entire study area. The National Wetland Inventory (USFWS, 2004) and the National Hydrography Dataset high resolution v2.2 databases contain extensive inventories of water features. These features were incorporated into the geomorphic raster. The assumption is that

these spatial data features accurately capture most large river channels, lakes, ponds, or wetland areas that would be classified as "general water".

The National Wetland Inventory's classification system (FGDC, 2013) allowed the removal of most anthropogenic related water areas such as impounded reservoirs and gravel mining ponds. Waters classified as Lacustrine (L), Palustrine (P), Marine (M), or Estuarine (E) that are not forested (FO), scrub/shrub (SS), diked/impounded (h), a spoil (s), or excavated (x) were coded as general water. Forested and scrub/shrub classes were removed because they have emergent or overhanging vegetation. The NHD channel areas were used to map the riverine reaches because in some areas it was a little more accurate than NWI where the channel has migrated in recent years, mostly in portions of the Willamette River.

Open water (code 2000) are areas representing the ACOE reservoirs within the boundaries of the original geomorphic feature class and other anthropogenic related water areas that did not meet the criteria for general water. Under the classification rules for site potential vegetation these areas were treated as prairie or savanna vegetation types. In the upland forest zone impounded reservoirs were not mapped. They were classified as upland forest (code 1900). The intent was that these site potential vegetation types would be present along the natural unimpouned channel (rather than actually present in the river channel). The reservoirs areas were not modeled so no effort was made to map the location of the where the water channel would be located in a natural (unimpounded) scenario.

Mapping the natural channel within impoundments requires additional analysis and attention and is beyond the scope of this project. Therefore, impounded lakes and reservoirs and areas classified as open waters in the geomorphic layer will be treated the same as general water (no change). Just as was done in other scenarios, stream nodes in these areas will be removed from the analysis and excluded when calculating watershed effective shade.

The second assumption relates to the spatial location of the stream. The 2006 TMDL effort mapped the modeled stream "centerlines" using aerial photos. For this project, it was not possible to digitize every stream in the project area. Instead, the stream location was determined using the National Hydrography Dataset high resolution v2.2 database. The stream locations in this version of NHD were primarily digitized from aerial photographs using a similar method that DEQ used for the TMDL. In places where the stream is masked by forest cover, it is often hard to "see" the stream channel and this can result in the digitized line not always matching the true location of the stream. For the TMDL project, DEQ considered remapping the stream locations by modeling the flow path using the LiDAR bare earth DEMs. This approach has shown to improve accuracy. The limitation with this approach is that it requires significant effort to identify and correct the DEM in places where road culverts occur. Because of the large project area and number of road crossings, it was determined that remapping the stream locations will require an effort and timeline that likely does not align with the project schedule or available resources. As a result, in forested areas where the stream is not visible, the effective shade results may characterize areas adjacent to the stream. The limitation will be included in the TMDL documentation.

6.9.6 Model inputs

The model inputs to the model include Lidar derived vegetation heights and stream position (latitude and longitude) derived from the NHD flowlines.

6.9.7 Model calibration

The model was calibrated primarily by comparing the model effective shade predictions to the field measured effective shade values summarized in Table 32. To improve the calibration results global

changes to the canopy cover parameter were made iteratively. Canopy cover was the only calibration parameter. The final calibrated canopy cover value was 0.80 (80%). Other calibration parameters identified in Section 6.2 (landcover height and landcover overhang) were determined directly from LiDAR and were not adjusted. If it is determined that the model calibration needs to be modified to improve model fit the same three calibration parameters described in Section 6.1 will be candidates for adjustment.

Table 32: Calibration sites and parameters used in the existing Southern Willamette Subbasins Heat Source model.

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
Luckiamute River (LUC2)	12.8	Effective Shade	DEQ
Coal Creek near the mouth (COA2)	12.6	Effective Shade	DEQ
Middle Fork Willamette River at Campers Flat (MFW2)	12.4	Effective Shade	DEQ
Middle Fork Willamette River (MFW3)	12.2	Effective Shade	DEQ
Unnamed Tributary of Hills Creek Lake (UNT0)	12.0	Effective Shade	DEQ
Unnamed Tributary of Coal Creek (UNT2)	11.8	Effective Shade	DEQ
Unnamed Tributary of Coal Creek (UNT1)	11.6	Effective Shade	DEQ
Coal Creek downstream NF Road 201 (COA1)	11.4	Effective Shade	DEQ
Simpson Creek downstream of Road 21 (SIM1)	11.2	Effective Shade	DEQ
Snake Creek downstream of bridge (SNA1)	11.0	Effective Shade	DEQ
Deadhorse Creek upstream of road (DEA1)	10.8	Effective Shade	DEQ
Unknown Stream near the mouth (What Creek?) (UNTX)	10.6	Effective Shade	DEQ
Youngs Creek (YOU1)	10.4	Effective Shade	DEQ
Buck Creek downstream of Road (BUC2)	10.2	Effective Shade	DEQ
Buck Creek upstream of Railroad tracks (BUC1)	10.0	Effective Shade	DEQ
North Fork Middle Fork Willamette River (NFM3)	9.8	Effective Shade	DEQ
North Fork Middle Fork Willamette River (NFM2)	9.6	Effective Shade	DEQ
North Fork Middle Fork Willamette River (NFM1)	9.4	Effective Shade	DEQ
Lost Creek at Elijah Bristow State Park downstream of bridge (LOS1)	9.2	Effective Shade	DEQ
Lost Creek at Elijah Bristow State Park (LOS2)	9.0	Effective Shade	DEQ
Middle Fork Willamette River upstream of bridge (MFW1)	8.8	Effective Shade	DEQ
Cougar Creek (COU1)	8.6	Effective Shade	DEQ

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
McKenzie River (MCK2)	8.4	Effective Shade	DEQ
McKenzie River (MCK1)	8.2	Effective Shade	DEQ
Lookout Creek (LOO2)	8.0	Effective Shade	DEQ
Blue River (BLU1)	7.8	Effective Shade	DEQ
Cogswell Creek (COG1)	7.6	Effective Shade	DEQ
Shotgun Creek at sewage lagoons (SHO5)	7.4	Effective Shade	DEQ
Shotgun Creek 0.2 miles north of Owl Creek Road (SHO1)	7.2	Effective Shade	DEQ
Seeley Creek 50 feet downstream of Seeley Cr Road (SEE1)	7.0	Effective Shade	DEQ
Amazon Creek upstream of Chambers St (AMA4)	6.8	Effective Shade	DEQ
Amazon Creek (AMA5)	6.6	Effective Shade	DEQ
Amazon Creek (AMA3)	6.4	Effective Shade	DEQ
Amazon Creek (AMA2)	6.2	Effective Shade	DEQ
Amazon Creek (AMA1)	6.0	Effective Shade	DEQ
Calapooia River 300 feet upstream of playground downstream end of side channel (CAL2)	5.8	Effective Shade	DEQ
Muddy Creek (MUD2)	5.6	Effective Shade	DEQ
Muddy Creek (MUD1)	5.4	Effective Shade	DEQ
Marys River (MAR1)	5.2	Effective Shade	DEQ
Luckiamute River at Helmick State Park (LUC1)	5.0	Effective Shade	DEQ
Ritner Creek at Ritner Creek Park (RIT1)	4.8	Effective Shade	DEQ
Little Luckiamute River at George Gerlinger Park (LIT1)	4.6	Effective Shade	DEQ
Calapooia River at McKercher Park (CAL1)	4.4	Effective Shade	DEQ
Sodom Ditch 50 feet north of Boston Mill Dr (SOD3)	4.2	Effective Shade	DEQ
Calapooia River near the mouth (CAL3)	4.0	Effective Shade	DEQ
Mary's River upstream of railroad bridge (MAR2)	3.8	Effective Shade	DEQ
Little Luckiamute River downstream of 223 bridge (LIT3)	3.6	Effective Shade	DEQ
Oak Creek 200ft downstream of 30th St Bridge (OAK3)	3.4	Effective Shade	DEQ
Oak Creek 100 feet upstream of Western Blvd (OAK4)	3.2	Effective Shade	DEQ

Model Location Name (Station ID)	Model Location (kilometers)	Calibration Parameter	Data Source
Oak Creek (OAK2)	3.0	Effective Shade	DEQ
Slick Creek upstream of road (SLI1)	2.8	Effective Shade	DEQ
Butte Creek 300 feet downstream of bridge (BUT2)	2.6	Effective Shade	DEQ
Butte Creek 100 feet downstream of bridge (BUT1)	2.4	Effective Shade	DEQ
Lake Creek 100 feet upstream of Lake (LAK3)	2.2	Effective Shade	DEQ
Lake Creek at first right turn (LAK2)	2.0	Effective Shade	DEQ
Lake Creek 40 feet north of bridge (LAK1)	1.8	Effective Shade	DEQ
Little Luckiamute River upstream Falls (LIT2)	1.6	Effective Shade	DEQ
Fish Lake Creek (FIS1)	1.4	Effective Shade	DEQ
Horse Creek (HOR1)	1.2	Effective Shade	DEQ
Lookout Creek (LOO1)	1.0	Effective Shade	DEQ
Shotgun Creek 120 feet upstream of bridge (SHO4)	0.8	Effective Shade	DEQ
Shotgun Creek 30 feet downstream of logjam (SHO3)	0.6	Effective Shade	DEQ
Owl Creek at gate about 0.06 miles from Shotgun Creek Road (OWL1)	0.4	Effective Shade	DEQ
Tidbits Creek (TID1)	0.2	Effective Shade	DEQ
Boulder Creek (BOU1)	0.0	Effective Shade	DEQ

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 landcover (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, 2020), USEPA's methods (EPA, 1983), USGS's published techniques of water-resources investigations, the USGS National Field Manual, 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 Data Quality Matrix for Field Parameters (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 deg-C and absolute precision 2.0 deg-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 value 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.

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

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 or 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 advisory group 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 the current conditions and other 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 was 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 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, restored stream flow, improvements to channel morphology, and potentially elements of the climate scenario. 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.

10.2 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:

- Restoring streamside vegetation 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 Willamette Basin TMDL and WQMP (DEQ, 2006).
- 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.

10.3 Protected vegetation

This scenario is specific to the shade models and evaluates the effective shade response from only streamside vegetation along the stream that is currently protected by statue, rule, ordinance, or some other approved management plan (voluntary or regulatory). The purpose of this scenario is to determine the amount of effective shade contributed by streamside vegetation in unprotected areas and if existing management strategies are sufficient to achieve allocations and surrogate measure effective shade targets. This scenario may be a subset of the TMDL implementation scenario. The amount of effective shade contributed by streamside vegetation in unprotected areas is evaluated by comparing this scenario to the current condition model. Attainment of the effective shade targets and allocations assigned to riparian management nonpoint sources are evaluated by comparing this scenario to the background model scenario. Elements of this scenario or scenarios may include:

- Identifying streamside vegetation areas along the model extent that are protected and will not be removed. The exact definition of a protected area will be determined during the TMDL process.
- Model inputs for land cover height, density, and overhang outside protected areas will be set to zero.
- Model inputs for land cover height, density, and overhang inside protected areas will be set to current conditions.
- All other model inputs will be the same as the current condition model.

10.4 Restored 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 from restoration actions on tributaries. The stream temperature warming or cooling contributed by removal of streamside vegetation on tributaries is evaluated by comparing this scenario to the current condition model. Assumptions and methods used to estimate restored tributary conditions will be documented in the TMDL. Elements of this scenario or scenarios may include:

- Tributary inputs will be set to reflect restored temperature and flow conditions. The tributary flow will reflect maintaining all currently permitted water withdrawals as instream flow.

- All other model inputs will be the same as the current condition model.

10.6 Climate

This scenario evaluates the stream temperature response from changes in air temperature and relative humidity connected to human caused changes to global or micro climate conditions. Warming or cooling from climate related impacts will be 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:

- Model inputs for air temperature and relative humidity may be modified to reflect potential conditions or conditions without climate change impacts assuming enough information exists that would allow downscaling to the site specific conditions in model extent.
- Model inputs for groundwater or stream flow may also be modified if sufficient information exists that would allow downscaling to the site specific conditions in model extent.
- All other model inputs will be the same as the current condition model.

10.7 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 locations where improvements to channel morphology are needed. The location of channel morphology projects will be determined during the TMDL process.
- 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.

10.8 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.

10.9 TMDL wasteload allocations

This scenario evaluates stream temperature warming or cooling from the TMDL wasteload allocations. These scenarios will be compared to the background model scenario to evaluate attainment of the human use allowance 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.

10.10 TMDL implementation plans

This set of scenarios evaluate the stream temperature response from proposed or existing DMA and responsible person management plans, TMDL implementation plans, or rules. These scenarios will be compared to the background model scenario to evaluate attainment of the human use allowance allocations or surrogate measures. It is likely that multiple model scenarios will be developed evaluating a single implementation plan or multiple implementation plans together. Assumptions and methods used to develop this scenario will be documented in the TMDL. Elements of this scenario or scenarios may include:

- Modifying streamside vegetation, instream flow, and/or channel morphology to reflect the proposed or existing implementation plan. Translating the plan elements to the modeled landscape conditions will be determined during the TMDL process.
- Model inputs for land cover height, density, overhang, boundary condition flow and temperature, channel width, bank angle, Manning's *n*, porosity, percent hyporheic flow, and hyporheic zone thickness, may be modified.
- All other model inputs will be the same as the current calibrated model.

DEQ may also rely upon the results of relevant studies, reports, or published articles to supplement the model scenario; or as the primary source of information for locations or situations where the model results are not applicable.

11 Project organization

11.1 Project team/roles

Project roles and responsibilities are described in Table 33.

Table 33: The roles and responsibilities of each team member involved in the temperature TMDL replacement project.

Name	Position	Role and Responsibilities
Jennifer Wigal	Deputy 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 WQ Director 6. Review project status 7. Manage resistance 8. Ensure communication with employees affected by changes 9. Provide forum to listen to concerns
Gene Foster	Manager, Watershed Management, Oregon DEQ	Manager 1. Review and approve team work products 2. Communicate progress to other managers 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

Name	Position	Role and Responsibilities
		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
Jim Bloom	Senior Water Quality Analyst, Watershed Management, Oregon DEQ	1. Develop and configure models 2. Perform model calibration/evaluation 3. Run model scenarios 4. Analyze and interpret model results 5. Write TMDL 6. Participate and present at TMDL public meetings 7. Respond to public comments
Erin Costello	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
David Fairbarin	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

Name	Position	Role and Responsibilities
		meetings 8. Respond to public comments
Yuan Grund	Water Quality Analyst, Watershed Management, Oregon DEQ	1. Write QAPP 2. Perform data evaluation 3. Run model scenarios 4. Analyze and interpret model results
Priscilla Woolverton	Basin Coordinator, Oregon DEQ	1. Review QAPP and TMDL 2. Write WQMP 3. TMDL Advisory Committee coordinator 4. Participate and present at TMDL public meetings 5. Respond to public comments
Chris Moore	DEQ QAPP Officer, Oregon DEQ	Review QAPP
Dianne Lloyd	Oregon Department of Justice	Legal Counsel
Rob Burkhardt	Water Quality Specialist, Oregon DEQ	Project team point of contact to NPDES permit program and permittees Review wasteload allocations
Tetra Tech	Contractor	TMDL development support
Claire Schary	EPA Region 10	Non-technical TMDL reviewer
Ben Cope	EPA Region 10 QAPP Officer for Modeling Projects	EPA Modeling Lead 1. Review QAPPs 2. Review EPA Contractor work products
Jayshika Ramrakha	EPA Region 10 EPA Task Order Manager	Direct EPA Contractor
TMDL Advisory Committee	Each TMDL will have a local, public advisory committee	1. Participate in TMDL Advisory Committee Meetings 2. Provide input to DEQ on TMDL and WQMP elements

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 project schedule for the Southern Willamette Subbasins TMDL 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 will generally occur between January 2020 through the end of August 2022. In this phase most of the planning and technical work occurs. 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 Ambient Water Quality Monitoring System database (AWQMS).

Task P2 Develop modeling Quality Assurance Project Plans (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. This task is a follow-up to Task P2. Gathering of new data and completion of new technical work described in the modeling QAPPs.

TMDL and WQMP development phase

The TMDL and WQMP development phase is scheduled to begin in 2022 with USEPA's final agency action approving or disapproving of the TMDL no later than January 15, 2024. In this phase, the draft TMDL and WQMP documents will be written; a TMDL 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, revise the TMDL and WQMP as necessary, and issue 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 (https://www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Tools.aspx).

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 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", "Models", and "Meetings". 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, NPDES effluent data, field sheets, photos, monitoring metadata, sampling project plans, or other documentation. The data should be organized by parameter and data source if possible.

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.

Meetings: All documents produced for external meetings including agendas, presentations, posters, and meeting handouts. Material for each meeting will be saved in a subfolder organized by date and meeting type. For example the folder name for the first meeting of the TMDL advisory group would be "2022-08-15 Temperature AG 1". Draft documents and final documents will be clearly identified and ideally saved in separate folders.

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.

- Public Comment Draft:
  - 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
  - Signed TMDL order (both Word and PDF)
  - 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 34.

Table 34: 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

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 35: QAPP revision history.

Revision	Date	Changes	Editor
1.0	12/09/2021	New QAPP	R. Michie

Appendix A Meteorology data summary

Table 36: Meteorological stations and data available in the National Climatic Data Center (NCDC) database in the Southern Willamette Subbasins.

Station ID	Station	Latitude/Longitude
20015969	WILLAMETTE PASS	43.5852/-122.999
20015980	BLACKBUTTE 1 N	43.5942/-123.071
20015995	HILLS CREEK DAM	43.7117/-122.426
20015996	DISSTON 1 NE LAYING CREEK	43.7/-122.75
20015998	COTTAGE GROVE DAM	43.7167/-123.05
20016008	OAKRIDGE FISH HATCHERY	43.7428/-122.443
20016011	DORENA DAM	43.7833/-122.967
20016012	COTTAGE GROVE 1 NNE	43.8078/-123.049
20016036	LOOKOUT POINT DAM	43.9167/-122.767
20016043	EUGENE	44.05/-123.1
20016064	NOTI 1 NW	44.0667/-123.467
20016067	COUGAR DAM	44.1333/-122.25
20016069	LEABURG 1 SW	44.1/-122.683
20016070	SPRINGFIELD 4 NE	44.0928/-122.956
20016073	EUGENE WSO AIRPORT	44.1167/-123.217
20016074	FERN RIDGE DAM	44.1167/-123.3
20016079	MC KENZIE BRIDGER S	44.1781/-122.116
20016081	MARCOLA	44.1717/-122.862
20016093	HARRISBURG	44.2667/-123.167
20016097	BELKNAP SPRINGS 8N	44.2833/-122.033
20016104	HOLLEY	44.3525/-122.784
20016115	SANTIAM JUNCTION	44.4356/-121.943
20016139	CORVALLIS	44.5/-123.283
20016141	CORVALLIS WATER BUREAU	44.5086/-123.458
20016164	ALBANY TELEMARK	44.6389/-123.106
20016166	CORVALLIS STATE UNIV	44.6333/-123.2
20016167	WREN	44.6/-123.417
20016168	SUMMIT	44.6333/-123.583
20016201	SUVER TELEMETERING	44.7833/-123.233
20016220	FALLS CITY NO 2	44.85/-123.433
20016221	FALLS CITY 2 SSW	44.8358/-123.452

Station ID	Station	Latitude/Longitude
20016320	REX 1 S	44.3033/-122.913
30014684	CORVALLIS 10 SSW	44.4185/-123.326
30015346	COBURG	44.1319/-123.07
30015787	SPRINGFIELD 8.3 NNE	44.1603/-122.902
30016716	SPRINGFIELD 2.2 NNW	44.0831/-122.99
30017243	EUGENE 5 ESE	44.0017/-123.009
30017888	EUGENE 4.0 SE	44.0093/-123.06
30017931	ALBANY 3.8 NW	44.6593/-123.138
30018163	EUGENE 3.2 NNE	44.0975/-123.094
30018552	CORVALLIS 3.5 E	44.5682/-123.205
30018803	SPRINGFIELD 1.4 E	44.0505/-122.948
30018877	MARCOLA 0.5 S	44.1686/-122.858
30019606	SPRINGFIELD 10.1E	44.0626/-122.773
30019844	ELMIRA 1.1 NNW	44.0828/-123.362
30020296	EUGENE 3 SW	44.0214/-123.156
30020522	COBURG 0.3 W	44.1386/-123.066
30020944	PHILOMATH 1.9 WSW	44.5323/-123.395
30021338	SPRINGFIELD 3.3 E	44.0549/-122.912
30022174	PLEASANT HILL 3 SE	43.9499/-122.885
30022377	EUGENE 4.5 NNW	44.1106/-123.154
30022614	CRESWELL 3.2 NE	43.9336/-122.959
30022655	OAKRIDGE 4.6 NE	43.7997/-122.416
30022909	PHILOMATH 1.1 E	44.5361/-123.339
30023194	SPRINGFIELD 2.7 W	44.058/-123.03
30023880	COTTAGE GROVE 2.6E	43.8031/-123.003
30024073	COTTAGE GROVE 7.4S	43.6906/-123.058
30024447	SPRINGFIELD 2.8 W	44.0528/-123.033
30024673	CORVALLIS 0.6 ENE	44.5745/-123.265
30024689	EUGENE 2.6 N	44.09/-123.115
30025621	BLODGETT 0.6 ENE	44.6013/-123.509
30025952	EUGENE 5.9 SW	43.9925/-123.196
30026753	CORVALLIS 2 SSW	44.539/-123.293
30026866	ALBANY 0.5 NE	44.623/-123.085
30027189	SPRINGFIELD 10.0NNE	44.189/-122.91
30027509	CORVALLIS 3 WNW	44.5795/-123.336
30027753	LEBANON 1.1 WNW	44.5417/-122.924
30027757	SPRINGFIELD 2.9 W	44.0511/-123.036

Station ID	Station	Latitude/Longitude
30027807	SPRINGFIELD 2.4 SW	44.0397/-123.022
30028698	MONROE 3.1 WNW	44.3303/-123.359
30029018	SPRINGFIELD 6.4 E	44.039/-122.85
30029043	MONROE 5.7 WNW	44.3337/-123.406
30029922	EUGENE 3.2 N	44.099/-123.122
30030198	EUGENE 3.6 S	44.0021/-123.099
30032044	CORVALLIS 4.0 NNE	44.6225/-123.238
30032329	EUGENE 2.2 NE	44.0721/-123.076
30032607	EUGENE 4.6 WSW	44.0259/-123.195
30032646	PHILOMATH 1.6 NE	44.558/-123.337
30032881	CORVALLIS 9.6 SW	44.463/-123.398
30033126	DEXTER 1 W	43.9172/-122.824
30033451	EUGENE 5.8 SSE	43.9799/-123.054
30034040	JUNCTION CITY 9.8SW	44.1221/-123.351
30035914	COTTAGE GROVE 2.7E	43.7933/-123.002
30036298	LEBANON 1.4 SSW	44.5164/-122.917
30036470	EUGENE 3.6 WNW	44.0786/-123.176
30036631	EUGENE 2.5 SW	44.0231/-123.14
30037089	EUGENE 3.2 SW	44.0094/-123.132
30037432	ELMIRA 1 W	44.0922/-123.351
30037697	SANTA CLARA 1.1 NNW	44.13/-123.139
30037825	PHILOMATH 4.8 NNW	44.5991/-123.408
30037840	SPRINGFIELD 7.5 NNE	44.1514/-122.911
30038080	CORVALLIS 2.1 NW	44.5936/-123.305
30038890	CORVALLIS 1.9 SSE	44.5464/-123.259
30039205	NORTH ALBANY 2.7NW	44.6911/-123.148
30039442	CRESWELL 1 SE	43.9064/-123.008
30039811	ALBANY 0.5 SE	44.611/-123.085
30039881	LEABURG 2 E	44.1131/-122.648
30040015	CORVALLIS 6.7 N	44.6673/-123.28
30040315	LOWELL 2.6 WNW	43.9408/-122.823
30040656	VENETA 0.7 S	44.0378/-123.351
30041046	SPRINGFIELD 1.3 N	44.0717/-122.981
30041343	COTTAGE GROVE 6.8SSE	43.7088/-122.981
30041768	SPRINGFIELD 1.1 WNW	44.0583/-122.998
30042264	CORVALLIS 0.2 E	44.5715/-123.271
30042328	CORVALLIS 2.3 NW	44.5961/-123.307

Station ID	Station	Latitude/Longitude
30042630	MCKENZIE BRIDGE 1N	44.1783/-122.162
30043389	EUGENE 2.6 ENE	44.0706/-123.066
30043550	VENETA 1 E	44.0481/-123.329
30043950	EUGENE 3.6 SSE	44.0042/-123.093
30044169	SPRINGFIELD 0.9 NW	44.0628/-122.99
30044366	RIVER ROAD 0.7 NW	44.0918/-123.142
30044561	CORVALLIS 1.5 NW	44.5867/-123.298
30045093	SPRINGFIELD 1.5 SE	44.0344/-122.958
30045249	SPRINGFIELD 1.8 WNW	44.0662/-123.008
30046570	EUGENE 2.5 NE	44.0807/-123.081
30048234	VENETA 2.5 N	44.084/-123.351
30048318	ALBANY 3.6 NW	44.6545/-123.141
30048684	SPRINGFIELD 2.9 E	44.0508/-122.919
30048790	SPRINGFIELD 2.1 WNW	44.0684/-123.014
30049390	CORVALLIS 8.4 SSW	44.4562/-123.334
30049643	ELMIRA 2.4 WNW	44.0732/-123.402
30049753	LOWELL 1 SE	43.9197/-122.778
30050020	EUGENE 2.9 SSE	44.0144/-123.091
30051280	CORVALLIS 2.2 NW	44.5947/-123.306
30051506	EUGENE 2 SSE	44.0261/-123.098
30051571	EUGENE 2.5 ENE	44.0686/-123.066
30051732	CORVALLIS 8.7 SW	44.4743/-123.389
30051862	COBURG 1.4 NNW	44.1567/-123.069
30051920	EUGENE 3.9 SSE	44.0047/-123.071
30052262	CRESWELL 3 N	43.9533/-123.026
30052359	SPRINGFIELD 5.9 NNE	44.1261/-122.914
30053029	COTTAGE GROVE 7.7S	43.6867/-123.05
30053194	BROWNSVILLE 3.0 NW	44.4187/-123.03
30054042	EUGENE 4.3 SSE	44.0003/-123.068
30055173	CRESWELL 2.4 N	43.9533/-123.017
30056838	EUGENE 1.9 SSW	44.0265/-123.125
30057298	EUGENE 2.4 NNW	44.0831/-123.135
30057382	PLEASANT HILL 1 S	43.9675/-122.945
30057597	EUGENE 1.3 NNW	44.0744/-123.117
30057770	EUGENE 3.5 ESE	44.0268/-123.051
30057883	SWEET HOME 5.0 SW	44.3486/-122.771
30059288	EUGENE 1.3 SSW	44.0356/-123.124

Station ID	Station	Latitude/Longitude
30059970	MONMOUTH 12.1 WSW	44.7701/-123.448
30060240	EUGENE 4.3 NNW	44.1117/-123.138
30061014	CORVALLIS 4.2 W	44.5797/-123.343
30061093	EUGENE 2.7	44.1088/-123.27
30062165	COBURG 0.3 SSW	44.1342/-123.062
30063874	SPRINGFIELD 2.9 ESE	44.0433/-122.92
30063916	CORVALLIS 2.7 SSW	44.5374/-123.304
30064247	EUGENE 1.3 SE	44.0381/-123.096
30064477	SPRINGFIELD 3.9 E	44.0492/-122.898
30064599	OAKRIDGE 0.7 SE	43.741/-122.46
30064620	SPRINGFIELD 2.1 NW	44.0708/-123.012
30064714	CRESWELL 0.4 SE	43.9147/-123.012
30064921	CORVALLIS 2.5 NE	44.5994/-123.246
30065311	EUGENE 2.4 S	44.0181/-123.118
30065961	SPRINGFIELD 1.6 N	44.0756/-122.981
30066870	EUGENE 1.5 NNE	44.072/-123.098
30066908	EUGENE 4 SSE	44.0047/-123.07
30067148	PHILOMATH 7.0 NNW	44.6286/-123.431
30067412	SPRINGFIELD 2 WSW	44.0481/-123.002
30068824	EUGENE 3.9 SE	44.0103/-123.062
30069621	DEXTER 4.7 SSE	43.8511/-122.792
30069876	EUGENE 2.8 NW	44.0697/-123.164
30069971	EUGENE 1.5 NNW	44.0733/-123.124
30070116	EUGENE 2.4 NNE	44.0845/-123.092
30074481	FIELDS OREGON	43.6806/-122.302
30074547	PEBBLE OREGON	44.2333/-121.983
30074692	BRUSH CREEK OREGON	44.2844/-122.849
30074842	HAWLEY BUTTE OREGON	43.7139/-122.835
30075183	SUGARLOAF OREGON	43.6728/-122.656
30075187	SALT CREEK FALLS	43.61/-122.12
30075222	EMIGRANT OREGON	43.4675/-122.218
30075421	TROUT CREEK OREGON	44.1111/-122.575
30075489	HOLLAND MEADOWS	43.67/-122.57
30075641	ROARING RIVER	43.9/-122.03
30075750	MOO CAMP - LOWELL OREGON	43.9333/-122.583
30075871	SANTIAM JCT.	44.44/-121.95
30075886	FINELY NWR OREGON	44.4183/-123.325

Station ID	Station	Latitude/Longitude
30076340	MCKENZIE	44.21/-121.87
30076495	HOGG PASS	44.42/-121.86
30076568	RAILROAD OVERPASS	43.66/-122.21
30076805	BROWNSVILLE 5.2 S	44.3178/-122.983
30078418	CORVALLIS 2.2 WSW	44.5587/-123.316
30078451	FALLS CITY 0.3 E	44.8665/-123.43
30078524	ALBANY 3.1 NNW	44.6553/-123.126
30078824	PHILOMATH 6.1 WSW	44.493/-123.463
30078965	PHILOMATH 4.6 SW	44.4878/-123.414
30079009	CORVALLIS 3.8 WNW	44.597/-123.345
30079074	CORVALLIS 7.8 NNE	44.6797/-123.23
30079081	CORVALLIS 3.1 NNW	44.6139/-123.297
30079086	ALBANY 2.5 WSW	44.5996/-123.137
30079104	ALBANY 3.2 NW	44.6462/-123.143
30079115	COTTAGE GROVE 7.4SSE	43.706/-122.979
30079196	ALBANY 2.7 NE	44.6454/-123.055
30079204	ALBANY 2.1 S	44.5873/-123.096
30079264	CORVALLIS 5.2 NNE	44.6411/-123.238
30079359	BLODGETT 2.1 NNE	44.6261/-123.514
30079366	ALBANY 1.1 SSE	44.6022/-123.084
30079369	ALBANY 4.9 NNE	44.6844/-123.064
30079400	CORVALLIS 0.4 ENE	44.5726/-123.269
30079401	ALBANY 0.7 NE	44.6232/-123.079
30079449	ALBANY 1.3 W	44.6138/-123.118
30079457	CORVALLIS 3.6 WNW	44.5882/-123.344
30079460	CORVALLIS 9.7 SW	44.4731/-123.418
30079478	LEBANON 5.2 SSE	44.4628/-122.875
30079484	CORVALLIS 6.5 N	44.6644/-123.292
30079497	ALBANY 4.5 NW	44.6706/-123.143
30079524	EUGENE 6.5 ESE	44.0045/-123
30082601	PHILOMATH 11.0 NNW	44.6924/-123.423
30083518	EUGENE 2.7 ESE	44.0336/-123.065
30083700	COTTAGE GROVE 7.0SSE	43.7121/-122.979
30083968	EUGENE 3.4 NE	44.0845/-123.059
30084194	CORVALLIS 2.7 SSE	44.5326/-123.262
30084771	ELMIRA 3.9 WNW	44.0826/-123.431
30084823	TOAD CREEK FOREST	44.4263/-122.033

Station ID	Station	Latitude/Longitude
30084825	TOAD CREEK OPEN	44.4259/-122.022
30084826	WESTERN ECOLOGY DIVISION	44.5655/-123.294
30084827	TINGEY NATIONAL FOREST	44.5657/-123.293
30084904	ALBANY 5.4 NNW	44.6827/-123.15
30091941	KINGS VALLEY .3 SSE	44.7021/-123.43
30094411	PHILOMATH 7.0 SW	44.4691/-123.459
30094433	MONMOUTH 6.3 S	44.7591/-123.232
30094438	CORVALLIS 5.0 NNE	44.6412/-123.255
30094667	ALBANY 5.0 WSW	44.5834/-123.182
30094737	EUGENE 1.9 SSE	44.0274/-123.1
30094894	CORVALLIS 1.7 SW	44.5514/-123.296
30094945	SWEET HOME 6.8 S	44.3031/-122.692
30094947	CORVALLIS 2.4 SSE	44.5399/-123.256
30101005	SMITH RIDGE	44.3/-122.04
30101008	COTTAGE GROVE 2.3N	43.8303/-123.055
30101437	CORVALLIS 1.5 NNW	44.5889/-123.294
30101477	COTTAGE GROVE 0.2ESE	43.7961/-123.052
30101778	BEAR GRASS	44.33/-122.09
30102326	MONROE 0.5 SE	44.3107/-123.293
30102961	NIMROD 0.3 SSW	44.1099/-122.425
30103584	CORVALLIS 8.3 SSW	44.4591/-123.338
30103780	SPRINGFIELD 2.8 SW	44.0283/-123.023
30103926	EUGENE 2.1 NNW	44.083/-123.122
30107090	ALBANY 2.9 N	44.6585/-123.087
30107192	CORVALLIS 1.8 NNW	44.595/-123.289
30107470	MONROE 1.4 W	44.3148/-123.326
30107605	PHILOMATH 1.0 WNW	44.5478/-123.376
30107643	BROWNSVILLE 0.1 SE	44.392/-122.98
30107703	MONROE 2.5 WNW	44.3308/-123.345
30107748	CORVALLIS 1.9 NW	44.5882/-123.307
30108032	SHEDD 1.9 NW	44.4766/-123.143
30108894	EUGENE 3.0 SSE	44.0128/-123.092
30109344	CORVALLIS 1.0 E	44.5737/-123.255
30110184	CORVALLIS 1.2 NNE	44.5876/-123.268
30111686	MONMOUTH 11.7 SW	44.7124/-123.366
30111694	TANGENT 0.7 NW	44.5586/-123.117
30111900	LEBANON 6.1 S	44.4468/-122.9

Station ID	Station	Latitude/Longitude
30111962	JUNCTION CITY 8.6SW	44.1324/-123.329
30112481	CORVALLIS 0.9 NE	44.5791/-123.262
30112526	CORVALLIS 1.6 NW	44.5874/-123.298
30112529	EUGENE 4.7 NNW	44.1168/-123.143
30112567	EUGENE 0.8 SW	44.0449/-123.123
30112589	CORVALLIS 3.2 N	44.6178/-123.282
30112592	PHILOMATH 4.9 NW	44.5988/-123.412
30112635	JUNCTION CITY 7.3WNW	44.2444/-123.347
30112707	HARRISBURG 0.4 SSE	44.2638/-123.161
30112811	OAKRIDGE 0.5 E	43.748/-122.463
30112902	EUGENE 2.3 SW	44.027/-123.141
30112903	JUNCTION CITY 8.8SW	44.14/-123.345
30112920	SWEET HOME 8.1 SW	44.3266/-122.829
30113054	BLODGETT 0.5 SW	44.5908/-123.529
30113201	CORVALLIS 4.6 N	44.6364/-123.262
30113338	ALBANY 7.0 NNW	44.7122/-123.142
30114258	CORVALLIS 1.6 SSW	44.5513/-123.293
30115405	LEBANON 1.8 NNW	44.5595/-122.919
30116606	CORVALLIS 3.4 W	44.5796/-123.344
30118440	SPRINGFIELD 1.6 NW	44.0675/-123.002
30118824	EUGENE 4.9 NNW	44.1222/-123.132
30120318	LEBANON 1.1 SSW	44.5207/-122.913
30120400	VENETA 2.1 ENE	44.0603/-123.313
30120533	EUGENE 12.7 SSW	43.8958/-123.246
30120894	CORVALLIS 0.5 WNW	44.5729/-123.287
30120960	ALBANY 4.7 NW	44.672/-123.149
30122879	SPRINGFIELD 1.4 WNW	44.0602/-123.004
30122989	EUGENE 1.8 NNE	44.0756/-123.094
30123082	CORVALLIS 1.4 N	44.5916/-123.271
30123127	EUGENE 2.2 SSW	44.0228/-123.127
30123435	JUNCTION CITY 8.6W	44.2211/-123.377
30123503	EUGENE 1.0 SE	44.0418/-123.099
30123507	PHILOMATH 7.5 SW	44.4734/-123.476
30123595	EUGENE 0.6 S	44.0449/-123.112
30123790	EUGENE 3.1 SE	44.0183/-123.073
30123833	SPRINGFIELD 3.5 W	44.0518/-123.047
30124301	ELMIRA 1.5 N	44.09/-123.353

Station ID	Station	Latitude/Longitude
30125238	EUGENE 2.8 SSE	44.0153/-123.09
KEUG	EUGENE AIRPORT	44.1278/-123.221

Table 37: Meteorological stations and data, including humidity, precipitation, temperature, wind direction, and wind speed, available in the Remote Automatic Weather Station (RAWS) database in the Southern Willamette Subbasins.

Station ID	Station	Latitude/Longitude	Agency
orOGEL	GELLATLY	44.6078/-123.475	S&PF
orOGRN	GREEN MOUNTAIN	43.7253/-122.806	S&PF
orOOAA	OAKRIDGE AIRPORT	43.75/-122.467	
orOTTM	TUFTI MOUNTAIN	43.6758/-122.383	
orOWLK	WALDO LAKE	43.7333/-122	
orOWLL	WILLOW CREEK	44.0289/-123.174	BLM

Table 38: Meteorological stations and data, including air temperature, precipitation, relative humidity and wind, available in the USBR AgriMet database in the Southern Willamette Subbasins.

Station ID	Station	Latitude/Longitude
CRVO	CORVALLIS, OREGON AGRIMET WEATHER STATION	44.6342/-123.19
HCKO	HILLS CREEK DAM WEATHER STATION, OREGON	43.7097/-122.424
LKPO	LOOKOUT POINT DAM WEATHER STATION, OREGON	43.9167/-122.753

Table 39: Meteorological stations and data, including air temperature, precipitation, relative humidity, wind speed and wind direction, available in the MesoWest database in the Southern Willamette Subbasins.

Station ID	Station	Latitude/Longitude
1951P	ROSEWOLD	43.9948/-122.996
1953P	WESTFIR ROAD	43.7567/-122.504
1954P	LASATER - EUGENE - OREGON	44.0257/-123.127
1957P	LRAPA-LOWELL FD	43.9228/-122.782
1958P	LRAPA-VENETA	44.0467/-123.357
1959P	LRAPA - COTTAGE GROVE SOUTH	43.7795/-123.06
1960P	LRAPA - THURSTON	44.04/-122.895
1965P	LRAPA-MADISON MS	44.1163/-123.121
1966P	LRAPA-EMERALD PARK	44.0844/-123.141
1967P	LRAPA-AMAZON PARK 2	44.0257/-123.084
1968P	LRAPA-OFFICE OUTSIDE	44.0463/-123.012
1969P	LRAPA - COTTAGE GROVE	43.7997/-123.053
1976P	LRAPA-WESTMORELAND	44.0331/-123.112

Station ID	Station	Latitude/Longitude
1977P	LRAPA - FRIENDLY	44.0298/-123.103
1978P	LRAPA-MCBETH RD.	43.9712/-123.137
1980P	83686 HAWKS WAY	43.9374/-122.932
1981P	LRAPA-AMAZON PARK	44.0264/-123.084
1993P	LRAPA-GUY LEE ELEMENTARY	44.0698/-123.039
1994P	LRAPA-CENTENNIAL ELEMENTARY	44.0573/-123.041
1995P	LRAPA-CRESWELL HS	43.9237/-123.029
1996P	LRAPA-BETHEL	44.0673/-123.141
1997P	LRAPA-WALTERVILLE ELEMENTARY	44.0789/-122.761
1999P	LRAPA-SAGINAW	43.8347/-123.035
2000P	LRAPA-EDGEWOOD ELEMENTARY	44.0066/-123.085
2002P	LRAPA-SOUTH EUGENE HS	44.0384/-123.087
2003P	LRAPA-CHURCHILL HS	44.0395/-123.152
2004P	LRAPA-SHELDON HS	44.0821/-123.076
2005P	LRAPA-NORTH EUGENE HS	44.0943/-123.135
2006P	LRAPA-MCKENZIE BRIDGE	44.1701/-122.161
2007P	LRAPA-4J FACILITIES	44.0557/-123.104
2008P	LRAPA-MCKENZIE SCHOOLS	44.1521/-122.362
2009P	LRAPA-TWIN OAKS ELEMENTARY	43.994/-123.175
2010P	LRAPA-GILHAM ELEMENTARY	44.0997/-123.076
2011P	LRAPA-THURSTON HS	44.0483/-122.924
2012P	LRAPA-AGNES STEWART MS	44.0371/-122.982
2013P	LRAPA-ELMIRA HS	44.0738/-123.359
2014P	LRAPA-SPRINGFIELD HS	44.0534/-123.013
2016P	THE COLLEGIAN PA-II-SD QUALITY SENSOR	44.0399/-123.081
2036P	FERGUSON RD & TURNBOW LN	44.2444/-123.346
2061P	BOULDER’S FARM	44.7582/-123.441
2064P	LOWELL - OR	43.9179/-122.781
2085P	LRAPA-FERN RIDGE LIBRARY OUTDOOR	44.0469/-123.352
2086P	LRAPA-SIERRA STREET	44.0678/-123.15
2093P	PPPM-CRESCENT PARK	44.0959/-123.053
2108P	LRAPA-OAKRIDGE 3	43.7443/-122.481
2111P	PPPM-HENDRICKS HALL	44.044/-123.075
2575P	LRAPA-OAKRIDGE CITY HALL	43.7475/-122.457
2995P	PPPM-AUTZEN	44.0585/-123.071
3137P	NEARBY NATURE	44.0539/-123.074
3461P	CHAPARRAL HOME	44.5835/-123.361

Station ID	Station	Latitude/Longitude
3606P	LRAPA-N DANEBO AVE	44.066/-123.178
3663P	PPPM - WALTON	44.044/-123.071
3764P	VOLCANOLOGY - 1	44.0128/-123.099
3835P	LRAPA-WESTFIR OUTSIDE	43.7573/-122.504
3884P	EURO-ASIAN AUTOMOTIVE	44.571/-123.26
3963P	LRAPA-BERNTZEN RD.	44.0721/-123.158
3968P	LRAPA-NOAH ST.	44.091/-123.167
4004P	LRAPA-ELGIN AVE OUTSIDE	43.7443/-122.475
4036P	LRAPA-MARSHALL AVE	44.0748/-123.179
4054P	LRAPA-E COMMERCIAL OUTSIDE	43.7471/-122.465
A4199	CORVALLIS - CIRCLE BLVD.	44.5884/-123.267
A4210	EUGENE - HIGHWAY 99	44.0672/-123.141
A4211	EUGENE - AMAZON PARK	44.0263/-123.084
A4212	SPRINGFIELD CITY HALL	44.0467/-123.018
A4213	OAKRIDGE - WILLAMETTE ACTIVITY CENTER	43.7444/-122.481
A4214	COTTAGE GROVE CITY SHOPS	43.7995/-123.054
A4215	ALBANY - CALAPOOIA SCHOOL	44.6157/-123.091
A4496	EUGENE - WILKES DR.	44.1158/-123.121
A4686	SAGINAW - DELIGHT VALLEY SCHOOL	43.8345/-123.035
AP080	K9AZZ-10 VIDA	44.145/-122.588
AR115	EUGENE EUGENE	44.0555/-123.085
AR232	KC7RJK-2 EUGENE	44.1089/-123.149
AR662	PATSY EDDYVILLE/CLAINE HILL	44.6135/-123.65
AR754	KA8ZGM CORVALLIS	44.597/-123.254
AR802	AC7TK-2 EUGENE	44.0817/-123.064
AT272	KN1X EUGENE	44.0271/-123.123
AT600	WA7GL-10 MONROE	44.3198/-123.311
AT795	KD7VMY PHILOMATH	44.5253/-123.417
AU344	AL7HY COTTAGE GROVE	43.7358/-122.99
AU669	K7ZQU-7 SANTIAM PASS	44.4128/-121.864
AV562	WX7HS EUGENE	44.0327/-123.135
BPMAR	MARY’S PEAK	44.5043/-123.552
BRUO3	BRUSH CREEK	44.2843/-122.849
C2645	CW2645 EUGENE	44.0373/-123.066
C3067	CW3067 EUGENE	44.0678/-123.06
C4896	CW4896 WALTERVILLE	44.07/-122.83
C5709	CW5709 CORVALLIS	44.5513/-123.291

Station ID	Station	Latitude/Longitude
C7901	CW7901 SPRINGFIELD	44.022/-122.873
C9669	CW9669 SPRINGFIELD	44.0512/-123.036
C9822	CW9822 DALLAS	44.8599/-123.342
COOPBELO3	BELKNAP SPRINGS	44.29/-122.04
COOPCGWO3	COUGAR DAM PRECIP	44.13/-122.24
COOPCTGO3	COTTAGE GROVE	43.81/-123.05
COOPCVOO3	CORVALLIS STATE UNIVERSITY	44.63/-123.19
COOPDODO3	DORENA DAM CO-OP STN	43.78/-122.96
COOPEUG	EUGENE-MAHLON SWEET ARPT	44.12/-123.21
COOPFACO3	FALLS CITY 2SSW	44.84/-123.45
COOPFRIO3	FERN RIDGE DAM WX STN	44.12/-123.31
COOPHOLO3	HOLLEY, OR CO-OP	44.35/-122.78
COOPLEAO3	LEABURG	44.1/-122.69
COOPLPWO3	LOOKOUT POINT DAM NWS PRECIP GAGE	43.91/-122.76
COOPMKRO3	MCKENZIE BRIDGE RS	44.18/-122.12
COOPOKRO3	FISH HATCHERY	43.74/-122.44
CSTO3	CASCADE SUMMIT	43.5904/-122.06
CVSO3	USCRN SITE NEAR CORVALLIS 10SSW	44.4186/-123.326
D1439	DW1439 EUGENE	43.9422/-123.217
D1899	DW1899 CORVALLIS	44.668/-123.268
D2249	DW2249 LEBANON	44.5268/-122.94
D4122	DW4122 EUGENE	44.0958/-123.054
D5719	DW5719 JUNCTION CITY	44.1822/-123.305
D6099	DW6099 CORVALLIS	44.6035/-123.234
D6797	DW6797 STARKSBORO	43.9659/-122.777
D7442	DW7442 PHILOMATH	44.5477/-123.369
D9430	DW9430 ALBANY	44.645/-123.115
D9755	DW9755 EUGENE	44.0832/-123.197
D9913	DW9913 CHESHIRE	44.1862/-123.287
DEXO3	MIDDLE FORK WILLAMETTE RIVER NEAR DEXTER	43.9458/-122.836
E1169	EW1169 EUGENE	44.0078/-123.037
E3027	EW3027 EUGENE	44.0122/-123.082
E3072	EW3072 CORVALLIS	44.5832/-123.284
E3HAL	HALSEY/CENTRAL LINN HS	44.389/-123.085
E4275	EW4275 SPRINGFIELD	44.0674/-122.842
E4613	EW4613 PHILOMATH	44.5013/-123.354
E7153	EW7153 MONROE	44.3008/-123.363

Station ID	Station	Latitude/Longitude
E7764	EW7764 CORVALLIS	44.596/-123.297
E8510	EW8510 PHILOMATH	44.498/-123.438
E8614	EW8614 COTTAGE GROVE	43.7875/-123.072
E9866	EW9866 CORVALLIS	44.58/-123.353
E9977	EW9977 JUNCTION CITY	44.2445/-123.346
EMFO3	EMIGRANT	43.4831/-122.23
F0489	FW0489 EUGENE	44.0251/-123.127
F0777	FW0777 CORVALLIS	44.63/-123.275
F1067	FW1067 SHEDD	44.4/-123.1
F2405	FW2405 EUGENE	44.0255/-123.052
F3088	FW3088 EUGENE	44.0252/-123.151
F4621	FW4621 LEBANON	44.5035/-122.923
F5449	FW5449 EUGENE	44.0767/-123.201
F5734	FW5734 SPRINGFIELD	44.141/-122.916
F6274	FW6274 EUGENE	44.0326/-123.135
F7191	FW7191 CORVALLIS	44.5652/-123.244
F7270	FW7270 BROWNSVILLE	44.3487/-122.875
F8055	FW8055 EUGENE	44.0132/-123.079
FEFO3	FIELDS	43.6805/-122.302
FLCO3	FALLS CITY	44.8775/-123.461
HGNO3	MT HAGAN WEATHER STATION NEAR FINN ROCK	44.1389/-122.411
K77S	HOBBY FIELD AIRPORT	43.9308/-123.007
NATHX	NATH OAKRIDGE	43.7941/-122.411
NS063	CLAY CREEK 1	44.0219/-123.211
OD108	I5 NB AT WILLAMETTE RIVER BRIDGE MP191.79	44.039/-123.048
OD110	US20 EB AT SANTIAM PASS MP80	44.4214/-121.855
OD120	OR58 EB AT SALT CREEK TUNNEL MP55.95	43.617/-122.136
OD139	US20 AT DUDLEE HILL MP39	44.5936/-123.526
OD140	US20 WB AT SANTIAM JCT MP74.8	44.4363/-121.938
OD145	OR126 EB AT WALTON MP36.05	44.0536/-123.533
OD148	I5 NB AT OR34 MP228.11	44.5561/-123.061
OD150	OR34 EB AT PEORIA RD MP1.18	44.5637/-123.235
OD159	OR126 EB AT MCKENZIE MP47.14	44.1728/-122.227
ODA04	LEBANON	44.5361/-122.923
ODA05	SOUTH CORVALLIS (LLEWELLYN ROAD)	44.4775/-123.304
ODA06	BROWNSVILLE	44.3931/-122.985
ODA07	HALSEY	44.3897/-123.087

Station ID	Station	Latitude/Longitude
ODA10	CRESWELL AIRPORT	43.9265/-123.006
ODT50	US20 EB AT TOMBSTONE SUMMIT MP 63.64	44.3955/-122.142
PEFO3	PEBBLE	44.2367/-121.995
SGFO3	SUGARLOAF	43.6636/-122.629
TCFO3	TROUT CREEK	44.1111/-122.577
TR496	EUGENE PORTABLE	43.9008/-122.031
TT483	MCKENZIE PORTABLE	44.1595/-122.253
UP433	WSTFIR	43.7593/-122.512
UR044	ABRNAT	43.6063/-122.112
UR045	ALFORD	44.3326/-123.108
UR054	MINNOW	43.8779/-122.703
UR055	NATRON	44.031/-122.934
UR059	SHEDD	44.4912/-123.108
UR060	SWAIN	44.1493/-123.183
UR389	MCCRED	43.7222/-122.337

Table 40: Meteorological data provided to DEQ from the various sources for the Southern Willamette Subbasins.

Source	Latitude/Longitude	Available Data
HJA, H.J. ANDREWS EXPERIMENTAL FOREST METEOROLOGICAL STATION, DEQ		Air Temperature, Relative Humidity, Wind Speed

Appendix B Continuous stream temperature data summary

Table 41: Continuous temperature monitoring stations in the Southern Willamette Subbasins currently available in public databases and DEQ files.

Station ID	Station	Latitude/Longitude	Organization
10150-ORDEQ	Coyote Creek Centrell Rd	44.0416/-123.268	DEQ
10151-ORDEQ	Coyote Creek Petzold Rd	44.0046/-123.27	DEQ
10658-ORDEQ	Luckiamute River at Lower Bridge	44.7302/-123.162	DEQ
10659-ORDEQ	Luckiamute River at Helmick State Park	44.7828/-123.235	DEQ
10663-ORDEQ	Mohawk River at Hill Road	44.0923/-122.959	DEQ
11111-ORDEQ	Luckiamute River at Hoskins	44.6817/-123.468	DEQ
11114-ORDEQ	Little Luckiamute River at Elkins Rd. (Trib to Luckiamute RM 18.2)	44.7972/-123.292	DEQ
11118-ORDEQ	Teal Creek at Gardner Road (Falls City)	44.8415/-123.396	DEQ
11137-ORDEQ	Ferguson Creek at Territorial Road	44.2476/-123.287	DEQ
11138-ORDEQ	Bear Creek at Territorial Hwy (Junction City)	44.2186/-123.287	DEQ
11148-ORDEQ	Coyote Creek Crow Rd	43.9872/-123.311	DEQ
12552-ORDEQ	McKenzie River at Mckenzie Bridge	44.1741/-122.161	DEQ
21839-ORDEQ	King Creek at River Mile 0.24	43.7397/-122.891	DEQ
22651-ORDEQ	Mohawk River at WEYCO Gate	44.2542/-122.756	DEQ
22654-ORDEQ	Mohawk River at Wendling Road	44.1729/-122.854	DEQ
23856-ORDEQ	Rebel Creek tributary at River Mile 0.40 (McKenzie, Willamette)	44.0231/-122.146	DEQ
23859-ORDEQ	Ferguson Creek at River Mile 8.4, at Ferguson Road (Long Tom, Willamette)	44.2655/-123.394	DEQ
23926-ORDEQ	French Pete Creek, 0.8 mile upstream from FSR 1931 crossing (South Fork McKenzie, McKenzie)	44.0419/-122.195	DEQ
25270-ORDEQ	Amazon Creek, tributary to Long Tom River, at High Pass Road	44.2151/-123.25	DEQ
25367-ORDEQ	Amazon Creek at Danebo Avenue, Eugene (drains to Fern Ridge Reservoir)	44.049/-123.178	DEQ
25369-ORDEQ	Cedar Creek, tributary to Elk Creek, at River Mile 4.5	44.0671/-123.528	DEQ
25371-ORDEQ	Long Tom River at Hwy 126	44.0518/-123.372	DEQ
25372-ORDEQ	Elk Creek, tributary to Long Tom River, at Crow-Vaughan Road near Noti	44.0558/-123.451	DEQ

Station ID	Station	Latitude/Longitude	Organization
25459-ORDEQ	Brush Creek at Courtney Creek Road	44.3544/-122.861	DEQ
25464-ORDEQ	Washout Creek at mouth	44.2645/-122.557	DEQ
25474-ORDEQ	Soap Creek at Buena Vista Rd. (Trib to Luckiamute RM 2.31)	44.7264/-123.163	DEQ
25475-ORDEQ	Luckiamute River at Corvallis Rd.	44.7567/-123.181	DEQ
25477-ORDEQ	Luckiamute River at Airlie Rd. Bridge	44.7761/-123.343	DEQ
25478-ORDEQ	McTimmonds Creek at State HWY 223 (Trib to Luckiamute RM 27.7)	44.7601/-123.411	DEQ
25480-ORDEQ	Luckiamute River at Ira Hooker Road	44.7465/-123.416	DEQ
25481-ORDEQ	Pedee Creek at Kings Highway	44.7445/-123.439	DEQ
25482-ORDEQ	Ritner Creek at Ritner Wayside	44.7282/-123.442	DEQ
25483-ORDEQ	Luckiamute River just upstream Ritner Creek	44.7281/-123.441	DEQ
25484-ORDEQ	Maxfield Creek at Hwy 223	44.6948/-123.432	DEQ
25485-ORDEQ	Price Creek at Hwy 223	44.6858/-123.434	DEQ
25486-ORDEQ	Luckiamute River at Gaging Site	44.6817/-123.468	DEQ
25488-ORDEQ	Luckiamute River at Boise Roadmile 1	44.7476/-123.533	DEQ
25489-ORDEQ	Slick Creek at Mouth (Trib to Luckiamute RM 48.6)	44.7625/-123.567	DEQ
25490-ORDEQ	Luckiamute River at Boise Roadmile 4	44.7717/-123.58	DEQ
25491-ORDEQ	Rock Pit Creek at Mouth (trib to Luckiamute RM 49.8)	44.7727/-123.585	DEQ
25492-ORDEQ	Miller Creek at Mouth (Trib to Luckiamute RM 50.5)	44.7762/-123.597	DEQ
25493-ORDEQ	Luckiamute River at Road 1440 crossing	44.794/-123.592	DEQ
25494-ORDEQ	Luckiamute River at Road 1430 crossing (Road Mile 3)	44.8158/-123.567	DEQ
25496-ORDEQ	Mohawk River at Old Mohawk Road	44.1042/-122.94	DEQ
25498-ORDEQ	Mohawk River at Sunderman Road	44.1414/-122.907	DEQ
25502-ORDEQ	Mohawk River at Paschelke Road	44.2014/-122.837	DEQ
25607-ORDEQ	Mohawk River at WEYCO shop	44.2587/-122.732	DEQ
25608-ORDEQ	Mohawk River on East Street	44.248/-122.704	DEQ
25626-ORDEQ	Coyote Creek at Powell Rd	43.925/-123.271	DEQ
25627-ORDEQ	Coyote Creek at Gillespie	43.9081/-123.25	DEQ
25772-ORDEQ	Long Tom River at Alderwood State Park at footbridge	44.1546/-123.423	DEQ
25773-ORDEQ	Coyote Creek at mouth near Franklin Road	44.1533/-123.291	DEQ

Station ID	Station	Latitude/Longitude	Organization
25808-ORDEQ	Lost Creek near 38404 Dexter Road, Dexter (River Mile 1.6), Middle Fork Willamette	43.929/-122.842	DEQ
25809-ORDEQ	Lost Creek downstream of Guiley Creek	43.8512/-122.795	DEQ
25811-ORDEQ	Lost Creek at River Mile 11.7	43.8171/-122.757	DEQ
26624-ORDEQ	Lost Creek at River Mile 7.8 (Willamette, Middle Fork Willamette)	43.8567/-122.801	DEQ
26625-ORDEQ	Lost Creek at headwaters, 5.5 meters up Bear Boulevard (Willamette, Middle Fork Willamette)	43.8011/-122.766	DEQ
26626-ORDEQ	Lost Creek downstream of Wagner Creek (Willamette, Middle Fork Willamette)	43.9038/-122.824	DEQ
26627-ORDEQ	Lost Creek at mouth, Elijah Bristow Stata Park (Willamette, Middle Fork Willamette)	43.9492/-122.849	DEQ
26628-ORDEQ	Lost Creek at Elijah Bristow State Park, pond at property line (Willamette, Middle Fork,Willamette)	43.9404/-122.844	DEQ
26629-ORDEQ	Lost Creek at Lost Creek Road (Willamette, Middle Fork, Willamette)	43.8821/-122.816	DEQ
26746-ORDEQ	Mosby Creek near mouth (tributary to Row River, to Coast Fork Willamette)	43.7818/-123.018	DEQ
26771-ORDEQ	Coyote Creet at Cantrell Road above Fern Ridge Reservoir	44.0416/-123.268	DEQ
27966-ORDEQ	Fall at headwater	43.9996/-122.342	DEQ
27967-ORDEQ	Fall above Delp	43.9929/-122.376	DEQ
27968-ORDEQ	Fall at Road 1828	43.982/-122.501	DEQ
27970-ORDEQ	Delp at mouth	43.9924/-122.376	DEQ
27971-ORDEQ	Logan at mouth	43.9573/-122.48	DEQ
27972-ORDEQ	Portland above Logan	43.9551/-122.48	DEQ
27973-ORDEQ	Hehe Creek at mouth	43.984/-122.468	DEQ
27974-ORDEQ	Hills Creek at Road 5875	43.6542/-122.32	DEQ
27976-ORDEQ	Pinto Creek at Road 23	43.5828/-122.186	DEQ
27980-ORDEQ	Juniper Creek at mouth	43.6396/-122.307	DEQ
27981-ORDEQ	Mike Creek at mouth	43.6611/-122.332	DEQ
27983-ORDEQ	Buckhead Creek at 5821	43.7752/-122.526	DEQ
27987-ORDEQ	Gold Creek at mouth	43.5931/-122.459	DEQ
27989-ORDEQ	Snake R at mouth (MID FK Willamette R)	43.5412/-122.452	DEQ
27990-ORDEQ	Indian at mouth	43.5167/-122.449	DEQ

Station ID	Station	Latitude/Longitude	Organization
27991-ORDEQ	Coal Creek at mouth	43.5045/-122.423	DEQ
27992-ORDEQ	MFW at Road 2127	43.5397/-122.448	DEQ
27993-ORDEQ	Eighth at mouth	43.8341/-122.401	DEQ
27994-ORDEQ	Christy at mouth	43.8808/-122.385	DEQ
27995-ORDEQ	Chalk at mouth	43.8705/-122.401	DEQ
27996-ORDEQ	McKinley at mouth	43.8638/-122.411	DEQ
27997-ORDEQ	Hammer at mouth	43.8586/-122.413	DEQ
27998-ORDEQ	NF MFW at Road 1919	43.8418/-122.405	DEQ
27999-ORDEQ	High at mouth	43.8385/-122.406	DEQ
28000-ORDEQ	Huckleberry at mouth	43.8155/-122.41	DEQ
28001-ORDEQ	NFMFW at Road 1912	43.8028/-122.437	DEQ
28002-ORDEQ	NFMFW at Road 1910	43.7891/-122.462	DEQ
28003-ORDEQ	NFMFW at mouth	43.758/-122.525	DEQ
28005-ORDEQ	Eagle Creek at mouth	43.6777/-122.244	DEQ
28006-ORDEQ	Salt Creek above Eagle Creek	43.6769/-122.243	DEQ
28007-ORDEQ	Salt Creek at Road 5875	43.7002/-122.282	DEQ
28008-ORDEQ	Sugar Creek at mouth	43.7208/-122.337	DEQ
28009-ORDEQ	Sage Creek at mouth	43.7213/-122.34	DEQ
28011-ORDEQ	South Fork Winberry River at mouth	43.9004/-122.62	DEQ
28012-ORDEQ	South Fork Winberry River below Monterica	43.8668/-122.585	DEQ
28013-ORDEQ	Winberry at USFS Boundary	43.9018/-122.627	DEQ
28088-ORDEQ	Hills Creek	43.9942/-122.809	DEQ
28089-ORDEQ	Anthony Creek	43.8743/-122.861	DEQ
28091-ORDEQ	Guiley Creek	43.8372/-122.794	DEQ
28092-ORDEQ	Little Falls Creek 2	43.9858/-122.726	DEQ
28093-ORDEQ	Lost Creek	43.9925/-122.779	DEQ
28094-ORDEQ	Middle Creek	43.8674/-122.822	DEQ
28097-ORDEQ	King Creek lower #3 (Perkins D.M sale)	43.7159/-122.911	DEQ
28098-ORDEQ	King Creek- lower station #1	43.7191/-122.907	DEQ
28099-ORDEQ	King Creek upper stream #1	43.7138/-122.912	DEQ
28100-ORDEQ	King Creek stream #6	43.7098/-122.917	DEQ
28103-ORDEQ	Mosby Creek below Row River Trail	43.7788/-123.007	DEQ
28104-ORDEQ	Row River above Hawley Creek	43.7045/-122.855	DEQ
28105-ORDEQ	Row River above Sharps Creek	43.695/-122.835	DEQ
28108-ORDEQ	Bear Creek	44.1328/-122.483	DEQ
28109-ORDEQ	Cartwright Creek	44.1719/-122.831	DEQ

Station ID	Station	Latitude/Longitude	Organization
28110-ORDEQ	Cedar Creek - tributary	44.039/-122.833	DEQ
28111-ORDEQ	Camp Creek	44.1218/-122.788	DEQ
28112-ORDEQ	Cogswell Creek	44.1386/-123.489	DEQ
28113-ORDEQ	Cash Creek	44.214/-122.85	DEQ
28114-ORDEQ	Deer Creek	44.1092/-122.455	DEQ
28115-ORDEQ	Finn Creek	44.1687/-122.623	DEQ
28116-ORDEQ	McGowan Creek	44.1521/-122.951	DEQ
28117-ORDEQ	Seeley Creek	44.2508/-122.863	DEQ
28118-ORDEQ	Shotgun Creek #2	44.2261/-122.845	DEQ
28119-ORDEQ	Shotgun Creek #1	44.2644/-122.877	DEQ
28278-ORDEQ	Lost Creek at River Mile 9.4 (Willamette, Middle Fork Willamette)	43.8431/-122.78	DEQ
28503-ORDEQ	Horse Creek at junction of Horse Creek and King Roads (TRIB to McKenzie River at RM 67.2)	44.1606/-122.161	DEQ
28505-ORDEQ	McKenzie River at Dearborn Island, upstream of South Fork McKenzie River	44.1684/-122.24	DEQ
28608-ORDEQ	Middle Fork Willamette River below Hills Creek Reservoir	43.7207/-122.438	DEQ
28613-ORDEQ	Row River above Dorena Reservoir	43.7357/-122.874	DEQ
28614-ORDEQ	Coast Fork Willamette River above Cottage Grove Reservoir at London and Raisor Roads	43.6637/-123.077	DEQ
28699-ORDEQ	North Fork of Middle Fork Willamette River, upstream of Road 1926	43.8845/-122.362	DEQ
28709-ORDEQ	Deadwood Creek at mouth (TRIB to Coal Creek at RM 4.9 to MF Willamette R at RM 61.3)	43.4404/-122.424	DEQ
28775-ORDEQ	Little Muddy Creek at Nixon Road (tributary to Muddy Creek)	44.352/-123.141	DEQ
28777-ORDEQ	LT Muddy Creek at Belts and Diamond Hill Dr (TRIB to Muddy CR RM 27.7 Rbank Willamette RM 132.6)	44.2802/-123.059	DEQ
28779-ORDEQ	Dry Muddy Creek at Dale Rd (TRIB to Muddy Creek at RM 40.9, to right bank Willamette R at RM 132.6)	44.2378/-123.111	DEQ
28780-ORDEQ	Muddy Creek at Dale Road (tributary to Willamette River at River Mile 132.6)	44.2415/-123.098	DEQ
28799-ORDEQ	Mosby Creek at Blue Mountain Park (upstream Perkins Creek)	43.7278/-122.977	DEQ
29455-ORDEQ	Miller Creek at River Mile 0.5	44.7769/-123.6	DEQ

Station ID	Station	Latitude/Longitude	Organization
29647-ORDEQ	Middle Fork Willamette River above Hills Creek Reservoir at River Mile 53.9	43.6076/-122.451	DEQ
30368-ORDEQ	Mosby Creek at Layng Road	43.7779/-122.004	DEQ
30500-ORDEQ	Middle Fork Willamette River upstream of Fir Creek (above Hills Creek Reservoir)	43.5536/-122.461	DEQ
30501-ORDEQ	Middle Fork Willamette River just below Lookout Point Dam	43.9142/-122.757	DEQ
30502-ORDEQ	Middle Fork Willamette River near Black Canyon Park, River Mile 33.3	43.8067/-122.559	DEQ
30529-ORDEQ	Long Tom River at River Mile 53.8	44.1773/-123.449	DEQ
30532-ORDEQ	Gosage Creek (tributary to Goodman, to MFW 26.2)	43.8444/-122.682	DEQ
30533-ORDEQ	Little Fall Creek at River Mile 7.6	43.9925/-122.694	DEQ
30534-ORDEQ	Lost Creek at River Mile 9.3 (tributary to MFW 13.5)	43.8425/-122.782	DEQ
30535-ORDEQ	Drury Creek at River Mile 2.9 (tributary to Mohawk River at River Mile 17.0)	44.2622/-122.832	DEQ
30536-ORDEQ	Owl Creek near mouth (TRIB to Shotgun River at RM 4.55, to Mohawk River at RM 15.5)	44.2631/-122.877	DEQ
30638-ORDEQ	Mosby Creek at Laying Road (TRIB to Row, RM 3.8, to CF Willamette RM 20.8)	43.7781/-123.005	DEQ
31333-ORDEQ	Beaver Creek above Powell Road (Coyote Creek, Long Tom, Willamette)	43.9216/-123.278	DEQ
32645-ORDEQ	Davidson Creek at River Mile 0.05 (Ferguson Creek, Long Tom River, Upper Willamette)	44.2635/-123.396	DEQ
32646-ORDEQ	Doak Creek at Jackson-Marlow Road (Coyote Creek, Long Tom River, Upper Willamette)	43.9009/-123.237	DEQ
32647-ORDEQ	Fox Hollow Creek at River Mile 5.2 (Coyote Creek, Long Tom River, Upper Willamette)	43.9417/-123.181	DEQ
32648-ORDEQ	Coyote Creek at Hamm Road, River Mile 24 (Long Tom River, Upper Willamette)	43.9036/-123.178	DEQ
32649-ORDEQ	Owens Creek at High Pass Rd near Templeton Rd, RM 4.23 (Bear Crk, Long Tom R, Upper Willamette)	44.2203/-123.373	DEQ

Station ID	Station	Latitude/Longitude	Organization
32650-ORDEQ	Poodle Creek at River Mile 3.14 near Allison (Long Tom River, Upper Willamette)	44.0968/-123.469	DEQ
32651-ORDEQ	Owens Creek at RM 3.96 off High Pass Rd ~ 0.3 miles D/S Lavell Rd (Bear Crk to Long Tom R)	44.2195/-123.367	DEQ
32652-ORDEQ	Coyote Creek at Hamm Road bridge above Jackson Creek RM 21.7 (Long Tom River, Upper Willamette)	43.8846/-123.214	DEQ
32653-ORDEQ	Turnbow Creek at High Pass Road, RM 0.88 (Owens Creek, Bear Creek, Long Tom R., Upper Willamette)	44.2231/-123.346	DEQ
32654-ORDEQ	Booker Creek at Hwy 126, River Mile 0.27 (Elk Creek, Long Tom River, Upper Willamette)	44.072/-123.524	DEQ
32655-ORDEQ	Owens Creek at RM 3.86 off High Pass Rd, ~ 0.4 miles D/S Lavell Rd (Bear Crk to Long Tom R)	44.2192/-123.365	DEQ
32656-ORDEQ	Ferguson Creek at River Mile 7.7 (Long Tom River, Upper Willamette)	44.255/-123.381	DEQ
32657-ORDEQ	Bear Creek at River Mile 0.69 (Ferguson Creek, Long Tom River, Upper Willamette)	44.2213/-123.278	DEQ
32658-ORDEQ	Bear Creek at River Mile 0.5 (Coyote Creek, Long Tom River, Upper Willamette)	43.9083/-123.274	DEQ
32659-ORDEQ	Bear Creek at River Mile 0.57 (Ferguson Creek, Long Tom River, Upper Willamette)	44.2217/-123.276	DEQ
33506-ORDEQ	Periwinkle Creek	44.6105/-123.062	DEQ
33519-ORDEQ	Jackson Creek	44.6138/-123.276	DEQ
33521-ORDEQ	Dunawi Creek	44.5503/-123.292	DEQ
33744-ORDEQ	Lost Creek at headwaters, Mount June, 10.9 miles from Bear Boulevard (Willamette)	43.7988/-122.708	DEQ
33858-ORDEQ	Lukiamute River	44.7599/-123.378	DEQ
33915-ORDEQ	Maxfield Creek at River Mile 2.6 at Maxfield Creek Road (Luckiamute, Willamette)	44.6988/-123.392	DEQ
33951-ORDEQ	Willamette River Middle Fork at river mile 54.4	43.5911/-122.456	DEQ
33952-ORDEQ	Horse Creek at river mile 7.0	44.155/-122.084	DEQ

Station ID	Station	Latitude/Longitude	Organization
34489-ORDEQ	Q Street Canal, 75 feet u/s of Dynea outfall	44.0536/-122.986	DEQ
34490-ORDEQ	Q Street Canal, 30 feet d/s of Dynea outfall (concrete pipe near concrete structure)	44.0539/-122.986	DEQ
34491-ORDEQ	Q Street Canal, 50 feet u/s of Pierce Channel mouth	44.0616/-122.996	DEQ
34492-ORDEQ	Q Street Canal, mouth of Pierce Channel	44.0616/-122.997	DEQ
34496-ORDEQ	Q Street Canal, 10 feet u/s of fish barrier	44.0626/-123.041	DEQ
34498-ORDEQ	Q Street Canal, mouth of Canoe Channel	44.0585/-123.077	DEQ
34499-ORDEQ	Q Street Canal, Alton Baker Parkway spillway near Willamette River	44.0569/-123.083	DEQ
34513-ORDEQ	Q Street Canal, 30 feet d/s of Asphalt Composting Company bridge	44.0542/-122.986	DEQ
37300-ORDEQ	Gettings Cr at Sears Rd	43.8366/-123.025	DEQ
39446-ORDEQ	Flat Cr US Junction City outfall (RM 9.5)	44.2183/-123.23	DEQ
39447-ORDEQ	Flat Cr at Ferguson Rd (RM 6.7)	44.2533/-123.242	DEQ
39448-ORDEQ	Flat Cr at 99W (RM 5.2)	44.27/-123.235	DEQ
39449-ORDEQ	Flat Cr at Old River Rd (RM 2.5)	44.2955/-123.239	DEQ
39450-ORDEQ	Flat Cr at Cox Butte Rd (RM 8.0)	44.237/-123.235	DEQ
40071-ORDEQ	Brush Creek at Brush Creek Rd bridge	44.3499/-122.849	DEQ
40072-ORDEQ	Brush Creek 0.75 MI ABV Brush Creek Rd bridge	44.3399/-122.84	DEQ
40073-ORDEQ	Ferguson Creek 0.1 miles upstream of Eber Creek confluence	44.2533/-123.375	DEQ
40087-ORDEQ	Ferguson Creek SFK at RM 0.48	44.2463/-123.379	DEQ
40088-ORDEQ	Ferguson Ck 270 Meters DS SFK Mouth	44.2485/-123.368	DEQ
40089-ORDEQ	Ferguson CK 0.1 Miles DS of Territorial RD	44.2478/-123.285	DEQ
40090-ORDEQ	Turnbow Creek 0.6 miles US of Owens Creek confluence	44.2184/-123.341	DEQ
40091-ORDEQ	Owen’s CK 0.3 miles US of Turnbow CK confluence	44.2132/-123.341	DEQ
40092-ORDEQ	Owens Ck US of Bear CK confluence	44.1944/-123.307	DEQ
40094-ORDEQ	Gettings CK 60 yds DS of crossing	43.8474/-123.017	DEQ
40109-ORDEQ	Unnamed stream at RM 0.41	43.8567/-122.986	DEQ
40371-ORDEQ	Gettings Creek North Fork DS of Witcher Gateway Rd	43.8367/-123.014	DEQ
40513-ORDEQ	Plunkett Creek just upstream of Highway 223	44.6527/-123.427	DEQ

Station ID	Station	Latitude/Longitude	Organization
40514-ORDEQ	Maxfield Creek about 1000 ft upstream of Highway 223	44.6929/-123.421	DEQ
40515-ORDEQ	Maxfield Creek near Pit Rd.	44.6963/-123.401	DEQ
40517-ORDEQ	South Fork Pedee Creek about 900 ft upstream of Pedee Creek Road	44.7731/-123.452	DEQ
40522-ORDEQ	Woods Creek just upstream of Price Creek Road	44.6834/-123.432	DEQ
40523-ORDEQ	North Fork Pedee Creek just upstream of Pedee Creek Road	44.7749/-123.449	DEQ
40524-ORDEQ	Grant Creek at Frost Road culvert	44.8391/-123.41	DEQ
40525-ORDEQ	Price Creek just downstream of 90-degree bend in Pit Road	44.6777/-123.411	DEQ
40526-ORDEQ	Teal Creek at Frost Road bridge	44.8512/-123.429	DEQ
40527-ORDEQ	Ritner Creek about 1000 ft upstream of Highway 223	44.7297/-123.448	DEQ
40528-ORDEQ	Ritner Creek at upstream end of county park	44.7402/-123.493	DEQ
40529-ORDEQ	Ritner Creek at Gage Road culvert	44.7432/-123.505	DEQ
40530-ORDEQ	Maxfield Creek at most downstream bridge on Maxfield Creek Rd.	44.6942/-123.41	DEQ
40531-ORDEQ	Maxfield Creek just upstream of Luckiamute R	44.6987/-123.438	DEQ
17090002_BD1160	Big Dry Creek		BLM
17090002_CE1060	Cedar Creek (Spring 1)		BLM
17090002_LI1380	Lilly Creek		BLM
17090002_PE1235	Perkins Creek		BLM
17090002_ST1120	Stell Creek		BLM
28101-ORDEQ	Mosby Creek Above Cedar Creek	43.6486/-122.92	BLM
28102-ORDEQ	Mosby Creek Above West Fork Mosby Creek	43.5551/-122.85	BLM
25499-ORDEQ	Parsons Creek	44.1691/-122.877	DEQ
25500-ORDEQ	Cartwright Creek	44.1712/-122.857	DEQ
25501-ORDEQ	Mill Creek	44.1884/-122.834	DEQ
25503-ORDEQ	Cash Creek	44.2059/-122.833	DEQ
25504-ORDEQ	Shotgun Creek	44.2128/-122.829	DEQ
25506-ORDEQ	Unnamed Creek at model meter 5821.68	44.2537/-122.763	DEQ
No Station ID	Spencer Creek		DEQ
No Station ID	McKenzie River at Olallie (RM 75.43)		DEQ
No Station ID	McKenzie River at Quartz Creek Bridge		DEQ
No Station ID	Deer Creek		DEQ

Station ID	Station	Latitude/Longitude	Organization
No Station ID	South Fork McKenzie River		DEQ
No Station ID	McGowan Creek		DEQ
No Station ID	Miles Creek		DEQ
No Station ID	Palmer Creek		DEQ
No Station ID	Rock Creek		DEQ
No Station ID	Short Creek		DEQ
No Station ID	Smith Creek		DEQ
No Station ID	Kennedy Creek		DEQ
No Station ID	Unnamed Creek at model meter 26883.36		DEQ
No Station ID	Carolina Creek		DEQ
SNF-040	2120	44.5177/-123.5	USFS
SNF-041	2121	44.5184/-123.5	USFS
SNF-042	2122	44.5208/-123.498	USFS
SNF-043	2123	44.5249/-123.488	USFS
SNF-044	2124	44.525/-123.481	USFS
SNF-045	2125	44.5126/-123.46	USFS
SNF-046	2126	44.5116/-123.462	USFS
SNF-047	2127	44.5024/-123.47	USFS
SNF-048	2128	44.5005/-123.44	USFS
SNF-049	2129	44.5004/-123.482	USFS
SNF-050	2130	44.508/-123.454	USFS
SNF-051	2131	44.5211/-123.48	USFS
SNF-052	2132	44.5093/-123.455	USFS
SNF-053	2133	44.5053/-123.515	USFS
SNF-054	2134	44.5253/-123.492	USFS
SNF-055	2136	44.5248/-123.492	USFS
SNF-063	2160	44.5287/-123.496	USFS
SNF-067	2164	44.5263/-123.494	USFS
SNF-068	2165	44.5263/-123.494	USFS
SNF-069	2166	44.5075/-123.453	USFS
SNF-070	2167	44.5078/-123.452	USFS
SNF-072	2170	44.5155/-123.474	USFS
UmpNF-008	Brice Creek abv Champion Creek WT	43.6403/-122.657	USFS
UmpNF-009	Brice Creek abv Crawfish Creek WT	43.6644/-122.698	USFS
UmpNF-010	Brice Creek at the mouth WT	43.7033/-122.771	USFS
UmpNF-011	Brice Creek below Adams Creek_LTWT	43.6727/-122.731	USFS

Station ID	Station	Latitude/Longitude	Organization
UmpNF-020	China Creek blw Saddle Camp Creek WT	43.5369/-122.727	USFS
UmpNF-043	Grass Creek at the mouth WT	43.62/-122.583	USFS
UmpNF-054	Layng Creek above Prather Creek_LTWT	43.7069/-122.741	USFS
UmpNF-055	Layng Creek above Silverstairs Creek WT	43.7168/-122.63	USFS
UmpNF-056	Layng Creek abv Brice Creek WT	43.7036/-122.77	USFS
UmpNF-057	Layng Creek abv Dinner Creek WT	43.7176/-122.717	USFS
UmpNF-058	Layng Creek abv Harvey Creek WT	43.7284/-122.687	USFS
UmpNF-059	Layng Creek abv Herman Creek WT	43.7386/-122.668	USFS
UmpNF-063	Martin Creek at the mouth WT	43.5857/-122.746	USFS
UmpNF-069	Row River above Sharps Creek LTWT	43.6955/-122.837	USFS
UmpNF-070	Sharps Creek above Staples Creek LTWT	43.6293/-122.779	USFS
UmpNF-071	Sharps Creek abv Martin Creek WT	43.5859/-122.746	USFS
UmpNF-072	Sharps Creek at the Mouth LTWT	43.6954/-122.838	USFS
UmpNF-073	Sharps Creek at the Quarry LTWT	43.6823/-122.837	USFS
UmpNF-086	Alex Creek at Road 1790 WT	43.73/-122.632	USFS
UmpNF-088	Herman Creek at mouth WT	43.7387/-122.668	USFS
UmpNF-089	Junetta Creek WT	43.7328/-122.695	USFS
UmpNF-091	Patterson Creek at mouth WT	43.739/-122.663	USFS
WNF-001	Anderson_WT	44.2637/-122.042	USFS
WNF-002	AndyCreekAtMouth_Temp	43.9709/-122.538	USFS
WNF-003	Augusta_upper_WT	43.9244/-122.146	USFS
WNF-004	AugustaAbv1927240_WT	43.9242/-122.146	USFS
WNF-005	AugustaMouth_WT	43.983/-122.176	USFS
WNF-009	Boulder_WT	44.2043/-122.039	USFS
WNF-012	Budworm_WT	44.2592/-122.064	USFS
WNF-016	Castle_WT	44.12/-122.037	USFS
WNF-017	ChristyCreekBelowLowell_LTWT	43.9343/-122.279	USFS
WNF-018	ClarkCreek_LTWT	43.9726/-122.581	USFS
WNF-019	CoalCreekAtMFTrailBridge_LTWT	43.5/-122.421	USFS
WNF-020	CoalCreekBelow200Bridge_LTWT	43.4947/-122.423	USFS
WNF-021	Cone_WT	44.1611/-122.365	USFS
WNF-022	Cook_WT	44.2515/-122.233	USFS
WNF-023	Cougar_WT	44.1386/-122.248	USFS
WNF-024	DeerAbvBudworm_WT	44.26/-122.064	USFS

Station ID	Station	Latitude/Longitude	Organization
WNF-025	DeerNearMouth_LTWT	44.2417/-122.059	USFS
WNF-026	DeerPowerlines_LTWT	44.2466/-122.06	USFS
WNF-029	EastForkSouthForkSec17_WT	44.099/-122.123	USFS
WNF-030	EchoCreek_LTWT	43.49/-122.343	USFS
WNF-031	EighthCreek	43.8345/-122.399	USFS
WNF-032	EighthCreek_Mouth_LTWT	43.8346/-122.399	USFS
WNF-033	ElkNorth_WT	44.1559/-122.371	USFS
WNF-034	ElkSouthAbvMouth_WT	43.9474/-122.039	USFS
WNF-035	ElkSouthWilderness_WT	43.9302/-122.012	USFS
WNF-036	FallCreek _above Hehe_LTWT	43.984/-122.467	USFS
WNF-037	FallCreek_1821_LTWT	43.9733/-122.571	USFS
WNF-038	FallCreek_1828_LTWT	43.9819/-122.5	USFS
WNF-039	FallCreek_AtPortlandCreek_LTWT	43.9736/-122.524	USFS
WNF-040	FallCreek_FSboundary_LTWT	43.9644/-122.619	USFS
WNF-041	FallCreekTrib_1816-178_LTWT	43.9685/-122.59	USFS
WNF-042	Florence	44.1879/-122.184	USFS
WNF-043	FrenchPete_WT	44.0422/-122.206	USFS
WNF-044	Glen_WT	44.1879/-122.151	USFS
WNF-045	Grasshopper_WT	43.9345/-122.168	USFS
WNF-046	HardyRd204_WT	44.0355/-122.204	USFS
WNF-047	HardyRd225_WT	44.0115/-122.226	USFS
WNF-048	HeHe Creek_Mouth_LTWT	43.9848/-122.467	USFS
WNF-049	HillsCreek_USGS_LTWT	43.6817/-122.371	USFS
WNF-050	HorseAbvSeparation_WT	44.1239/-122.037	USFS
WNF-051	HorseBlwSeparation_WT	44.127/-122.039	USFS
WNF-052	HorseBridge2638_LTWT	44.1622/-122.155	USFS
WNF-053	HorseWilderness_WT	44.0769/-122.019	USFS
WNF-054	HuckleberryCreek_LTWT	43.8146/-122.409	USFS
WNF-055	Ikenick_WT	44.3826/-122.005	USFS
WNF-056	Indian_WT	44.0177/-122.3	USFS
WNF-057	King_WT	44.1607/-122.17	USFS
WNF-058	KinkCreekHeadwaters_WT	44.3063/-121.977	USFS
WNF-060	LittleFallCreekDownstream_LTWT	44.0123/-122.625	USFS
WNF-061	LittleFallCreekUpstream_LTWT	44.0422/-122.574	USFS
WNF-062	Lytle_WT	44.027/-122.308	USFS
WNF-063	MacCreek_LTWT	43.4977/-122.312	USFS
WNF-064	Mann_WT	44.2952/-122.171	USFS

Station ID	Station	Latitude/Longitude	Organization
WNF-065	MapleCreek_LTWT	43.4892/-122.395	USFS
WNF-066	McKenzieAbvTrailbridge_LTWT	44.286/-122.038	USFS
WNF-067	McKenzieBlwTrailbridge_LTWT	44.2683/-122.051	USFS
WNF-068	McKenzieSpawning_WT	44.2693/-122.051	USFS
WNF-069	MFW_BelowStaley_LTWT	43.4878/-122.376	USFS
WNF-070	MFW_SandPrairie_LTWT	43.5943/-122.459	USFS
WNF-072	MiddleForkAtPaddysValley_LTWT	43.4422/-122.192	USFS
WNF-073	Mona_WT	44.2086/-122.264	USFS
WNF-077	NF_1919_LTWT	43.84/-122.406	USFS
WNF-078	NF_1925_LTWT	43.8796/-122.386	USFS
WNF-079	NF_Confl_LTWT	43.7588/-122.521	USFS
WNF-080	NFQuartz_WT	44.1866/-122.312	USFS
WNF-083	Ore_WT	44.2341/-122.277	USFS
WNF-086	Pasture_WT	44.1221/-122.038	USFS
WNF-087	PineCreek_LTWT	43.5544/-122.457	USFS
WNF-088	Portland Creek_Mouth_LTWT	43.9727/-122.525	USFS
WNF-089	Pothole_WT	44.0878/-122.022	USFS
WNF-090	Powers_WT	44.19/-122.142	USFS
WNF-092	Quartz_North_WT	44.1866/-122.312	USFS
WNF-093	QuartzSouth_WT	44.0419/-122.315	USFS
WNF-095	Quentin_WT	44.26/-122.217	USFS
WNF-096	Rebel_WT	44.0129/-122.173	USFS
WNF-097	Ridge_WT	44.0561/-122.221	USFS
WNF-098	Roaring_mouth_WT	43.9559/-122.087	USFS
WNF-099	SalmonCreek_Mouth_LTWT	43.7408/-122.458	USFS
WNF-100	SaltCreek_Mouth_LTWT	43.7258/-122.438	USFS
WNF-101	Scott_WT	44.1949/-122.043	USFS
WNF-102	Separation_mouth_WT	44.1247/-122.036	USFS
WNF-104	SFMckenzie_below_RoaringR_WT	43.9558/-122.091	USFS
WNF-105	SFMcKenzie_Rd1927_WT	43.9871/-122.176	USFS
WNF-106	SFMcKenzie_Rd1980_WT	44.0369/-122.202	USFS
WNF-107	SFMcKenzie_Wilderness_WT	43.9527/-122.018	USFS
WNF-109	Simmonds_WT	44.1694/-122.339	USFS
WNF-110	SimpsonCreek_LTWT	43.4958/-122.399	USFS
WNF-112	Smith_AbvSmithRes_WT	44.3348/-122.048	USFS
WNF-113	Smith_AbvTrailBridgeRes_WT	44.2808/-122.051	USFS
WNF-114	Smith_BlwSmithRes_WT	44.3046/-122.048	USFS

Station ID	Station	Latitude/Longitude	Organization
WNF-118	StaleyCreekDownstream_LTWT	43.4866/-122.386	USFS
WNF-119	StaleyCreekUpstream_LTWT	43.4655/-122.369	USFS
WNF-120	Starr_mouth_WT	43.988/-122.176	USFS
WNF-121	Tidbits_WT	44.2333/-122.278	USFS
WNF-122	TimberCreek_LTWT	43.9716/-122.577	USFS
WNF-124	TumblebugCreek_LTWT	43.48/-122.256	USFS
WNF-127	Walker_WT	44.1027/-122.219	USFS
WNF-128	WinberryCreek_Mouth_LTWT	43.902/-122.627	USFS
WNF-129	Wolf_WT	44.2951/-122.171	USFS
WNF-130	YoungsCreek_LTWT	43.5113/-122.437	USFS
WNF-133	BuckCreek_LTWT	43.594/-122.454	USFS
WNF-135	Calapooia River	44.236/-122.384	USFS
WNF-137	CoalCreekAtMouth_LTWT	43.504/-122.423	USFS
WNF-140	Kink_WT	44.2957/-122.027	USFS
WNF-141	Lost_WT	44.1623/-122.024	USFS
WNF-144	McKenzieRangerStation_WT	44.1806/-122.117	USFS
WNF-146	MillForestBoundary_WT	44.19/-122.224	USFS
WNF-147	MillHwy126_WT	44.17/-122.243	USFS
WNF-152	Olallie_WT	44.259/-122.039	USFS
WNF-158	SalmonBelowBlack_LTWT	43.7897/-122.275	USFS
WNF-160	Sweetwater_WT	44.2797/-122.044	USFS
WNF-161	WhiteBranch_WT	44.164/-121.965	USFS
14144800	Middle Fork Willamette River Nr Oakridge, OR	43.6018/-122.458	USGS
14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	43.6804/-122.371	USGS
14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	43.721/-122.438	USGS
14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	43.7568/-122.505	USGS
14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	43.8012/-122.561	USGS
14150290	Fall Creek Above North Fork, Near Lowell, OR	43.9672/-122.63	USGS
14150800	Winberry Creek Near Lowell,OR	43.9143/-122.689	USGS
14152500	Coast Fork Willamette At London, OR	43.6415/-123.086	USGS
14154500	Row River Above Pitcher Creek, Near Dorena, OR	43.736/-122.873	USGS

Station ID	Station	Latitude/Longitude	Organization
14158500	Mckenzie River At Outlet Of Clear Lake, OR	44.361/-121.996	USGS
14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	44.2864/-122.037	USGS
14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	44.3346/-122.047	USGS
14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs	44.2899/-122.049	USGS
14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	44.2679/-122.05	USGS
14158980	Lost Creek Near Mckenzie Bridge, OR	44.184/-122.06	USGS
14159000	Mckenzie R At Mckenzie Bridge, OReg.	44.179/-122.13	USGS
14159100	Horse Creek Near Mckenzie Bridge, OR	44.1623/-122.153	USGS
14159110	Mckenzie River Above South Fork, Near Rainbow, OR	44.1664/-122.257	USGS
14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	44.0471/-122.218	USGS
14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	44.2179/-122.265	USGS
14161500	Lookout Creek Near Blue River, OR	44.2096/-122.257	USGS
14164550	Camp Crk At Camp Crk Rd Bridge, Nr Springfield, OR	44.0707/-122.885	USGS
14164700	Cedar Creek At Springfield, OR	44.0593/-122.92	USGS
14173500	Calapooia River At Albany, OR	44.6207/-123.129	USGS

Table 42: Summary of existing temperature data in the Southern Willamette Subbasins. Columns Jan – Dec indicate the number of daily maximum temperature results in each month. Data from the DEQs 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
1990	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	27						
1990	14173500	Calapooia River At Albany, OR	31	28	31	30	31	30	31	31	30			
1991	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	15	28	31	30	31	30	31	31	30	31	30	31
1992	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR							31	31	30	31	28	31
1992	14158980	Lost Creek Near Mckenzie Bridge, OR							31	31	30	31	30	31
1992	14159000	Mckenzie R At Mckenzie Bridge, OReg.						4	31	31	30	23		
1992	14159100	Horse Creek Near Mckenzie Bridge, OR						12	31	31	30	28		20
1993	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	10	15	31	30	31
1993	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30			
1993	14158980	Lost Creek Near Mckenzie Bridge, OR	31	28	31	30	31	30	31	31	30			
1993	14159000	Mckenzie R At Mckenzie Bridge, OReg.	17	17	5	30	31	30	31	31	30			
1993	14159100	Horse Creek Near Mckenzie Bridge, OR	28	28	20				12	31	30			
1994	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	27		26
1996	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	27	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	14		11	30	31	30	31	31	30			
1999	25809-ORDEQ	Lost Creek downstream of Guiley Creek						17	31	31	30	31	8	
1999	25811-ORDEQ	Lost Creek at River Mile 11.7						17	31	31	30	31	8	
1999	26626-ORDEQ	Lost Creek downstream of Wagner Creek (Willamette, Middle Fork Willamette)						16	31	31	30	13		
1999	26627-ORDEQ	Lost Creek at mouth, Elijah Bristow Stata Park (Willamette, Middle Fork Willamette)						16	31	23				
1999	26628-ORDEQ	Lost Creek at Elijah Bristow State Park, pond at property line (Willamette, Middle Fork,Willamette)							31	31	30	31	10	
1999	26629-ORDEQ	Lost Creek at Lost Creek Road (Willamette, Middle Fork, Willamette)						18	31	31	30	31	13	
1999	33744-ORDEQ	Lost Creek at headwaters, Mount June, 10.9 miles from Bear Boulevard (Willamette)						17	31	31	30	31	8	
2000	11137-ORDEQ	Ferguson Creek at Territorial Road							31	31	30	2		
2000	11138-ORDEQ	Bear Creek at Territorial Hwy (Junction City)						3	28	31	30	2		
2000	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR												30
2000	23859-ORDEQ	Ferguson Creek at River Mile 8.4, at Ferguson Road (Long Tom, Willamette)							31	31	30	2		
2000	23926-ORDEQ	French Pete Creek, 0.8 mile upstream from FSR 1931 crossing (South Fork McKenzie, McKenzie)						15	31	31	17			
2000	25270-ORDEQ	Amazon Creek, tributary to Long Tom River, at High Pass Road							31	31	30	2		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	25367-ORDEQ	Amazon Creek at Danebo Avenue, Eugene (drains to Fern Ridge Reservoir)							31	31	26			
2000	25369-ORDEQ	Cedar Creek, tributary to Elk Creek, at River Mile 4.5						3	31	31	30	1		
2000	25371-ORDEQ	Long Tom River at Hwy 126						3	31	31	30	1		
2000	25372-ORDEQ	Elk Creek, tributary to Long Tom River, at Crow-Vaughan Road near Noti						3	31	31	30	1		
2000	25772-ORDEQ	Long Tom River at Alderwood State Park at footbridge						3	31	31	30	1		
2000	25773-ORDEQ	Coyote Creek at mouth near Franklin Road								21	30	31	18	
2000	25808-ORDEQ	Lost Creek near 38404 Dexter Road, Dexter (River Mile 1.6), Middle Fork Willamette							24	31	30	31	30	8
2000	25809-ORDEQ	Lost Creek downstream of Guiley Creek							18	31	30	31	30	8
2000	25811-ORDEQ	Lost Creek at River Mile 11.7							18	31	30	31	30	28
2000	26624-ORDEQ	Lost Creek at River Mile 7.8 (Willamette, Middle Fork Willamette)							18	31	30	31	30	28
2000	26626-ORDEQ	Lost Creek downstream of Wagner Creek (Willamette, Middle Fork Willamette)							24	31	30	31	19	
2000	26627-ORDEQ	Lost Creek at mouth, Elijah Bristow Stata Park (Willamette, Middle Fork Willamette)						12	31	31	30	31	30	28
2000	26628-ORDEQ	Lost Creek at Elijah Bristow State Park, pond at property line (Willamette, Middle Fork,Willamette)							5	31	30	31	30	8
2000	26629-ORDEQ	Lost Creek at Lost Creek Road (Willamette, Middle Fork, Willamette)							24	31	30	31	19	

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	28089-ORDEQ	Anthony Creek						2	31	15				
2000	28091-ORDEQ	Guiley Creek						2	31	8				
2000	28093-ORDEQ	Lost Creek						2	31	7				
2000	28094-ORDEQ	Middle Creek						2	31	8				
2000	28103-ORDEQ	Mosby Creek below Row River Trail								1	28			
2000	28104-ORDEQ	Row River above Hawley Creek								1	28			
2000	28105-ORDEQ	Row River above Sharps Creek						10	31	31	28			
2000	28110-ORDEQ	Cedar Creek - tributary							16	31	5			
2000	28111-ORDEQ	Camp Creek							16	31	6			
2000	28112-ORDEQ	Cogswell Creek							16	31	5			
2000	28113-ORDEQ	Cash Creek							25	24				
2000	28114-ORDEQ	Deer Creek							19	16				
2000	28115-ORDEQ	Finn Creek							16	31	5			
2000	28116-ORDEQ	McGowan Creek							25	31	6			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	28117-ORDEQ	Seeley Creek							25	23				
2000	28118-ORDEQ	Shotgun Creek #2							25	24				
2000	28278-ORDEQ	Lost Creek at River Mile 9.4 (Willamette, Middle Fork Willamette)								28	30	31	30	28
2000	28699-ORDEQ	North Fork of Middle Fork Willamette River, upstream of Road 1926							20	31	30	30		
2000	28709-ORDEQ	Deadwood Creek at mouth (TRIB to Coal Creek at RM 4.9 to MF Willamette R at RM 61.3)							20	31	30	31		
2000	29455-ORDEQ	Miller Creek at River Mile 0.5							19	31	24			
2000	29647-ORDEQ	Middle Fork Willamette River above Hills Creek Reservoir at River Mile 53.9						15	31	31	17			
2001	12552-ORDEQ	McKenzie River at Mckenzie Bridge						9	31	31	20			
2001	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	27	31	30	31	30	31	29	30	31	30	31
2001	25464-ORDEQ	Washout Creek at mouth						25	31	31	24			
2001	25480-ORDEQ	Luckiamute River at Ira Hooker Road								20	16			
2001	25481-ORDEQ	Pedee Creek at Kings Highway								20	16			
2001	25494-ORDEQ	Luckiamute River at Road 1430 crossing (Road Mile 3)							20	31	23			
2001	25809-ORDEQ	Lost Creek downstream of Guiley Creek						7	31	31	30	25		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	26624-ORDEQ	Lost Creek at River Mile 7.8 (Willamette, Middle Fork Willamette)						7	31	31	30	25		
2001	26625-ORDEQ	Lost Creek at headwaters, 5.5 meters up Bear Boulevard (Willamette, Middle Fork Willamette)						10	31	31	30	25		
2001	26627-ORDEQ	Lost Creek at mouth, Elijah Bristow Stata Park (Willamette, Middle Fork Willamette)	5											
2001	26628-ORDEQ	Lost Creek at Elijah Bristow State Park, pond at property line (Willamette, Middle Fork,Willamette)						7	31	31	30	23		
2001	26746-ORDEQ	Mosby Creek near mouth (tributary to Row River, to Coast Fork Willamette)							1	31	30	31	5	
2001	26771-ORDEQ	Coyote Creet at Cantrell Road above Fern Ridge Reservoir					1	30	31	31	30	31	5	
2001	27966-ORDEQ	Fall at headwater						19	31	31	30	16		
2001	27967-ORDEQ	Fall above Delp						19	31	31	30	16		
2001	27968-ORDEQ	Fall at Road 1828						18	31	31	30	16		
2001	27970-ORDEQ	Delp at mouth						19	31	31	30	16		
2001	27971-ORDEQ	Logan at mouth						19	31	31	30	16		
2001	27972-ORDEQ	Portland above Logan						19	31	31	30	16		
2001	27973-ORDEQ	Hehe Creek at mouth						19	31	31	30	16		
2001	27974-ORDEQ	Hills Creek at Road 5875						27	31	31	30	1		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	27976-ORDEQ	Pinto Creek at Road 23						28	31	31	30	1		
2001	27980-ORDEQ	Juniper Creek at mouth						28	31	31	30	1		
2001	27981-ORDEQ	Mike Creek at mouth						27	31	31	30	1		
2001	27983-ORDEQ	Buckhead Creek at 5821						24	31	31	30			
2001	27987-ORDEQ	Gold Creek at mouth						25	31	31	30			
2001	27989-ORDEQ	Snake R at mouth (MID FK Willamette R)						22	31	31	30			
2001	27990-ORDEQ	Indian at mouth						25	31	31	30			
2001	27991-ORDEQ	Coal Creek at mouth						26	31	31	30			
2001	27992-ORDEQ	MFW at Road 2127						25	31	31	30			
2001	27993-ORDEQ	Eighth at mouth						24	31	31	30	1		
2001	27994-ORDEQ	Christy at mouth						22	31	31	30			
2001	27995-ORDEQ	Chalk at mouth						16	31	31	30	1		
2001	27996-ORDEQ	McKinley at mouth						23	31	31	30	1		
2001	27997-ORDEQ	Hammer at mouth						22	31	31	30	1		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	27998-ORDEQ	NF MFW at Road 1919						24	31	31	30	15		
2001	27999-ORDEQ	High at mouth						16	31	31	30	23		
2001	28000-ORDEQ	Huckleberry at mouth						24	31	31	30	1		
2001	28001-ORDEQ	NFMFW at Road 1912						22	31	31	30	15		
2001	28002-ORDEQ	NFMFW at Road 1910						24	31	31	30	15		
2001	28003-ORDEQ	NFMFW at mouth						24	31	31	30	23		
2001	28005-ORDEQ	Eagle Creek at mouth						30	31	31	30			
2001	28006-ORDEQ	Salt Creek above Eagle Creek						28	31	31	30			
2001	28007-ORDEQ	Salt Creek at Road 5875						28	31	31	30			
2001	28008-ORDEQ	Sugar Creek at mouth						30	31	31	30			
2001	28009-ORDEQ	Sage Creek at mouth						28	31	31	30			
2001	28011-ORDEQ	South Fork Winberry River at mouth						18	31	31	30	16		
2001	28012-ORDEQ	South Fork Winberry River below Monterica						18	31	31	30	17		
2001	28013-ORDEQ	Winberry at USFS Boundary						18	31	31	30	17		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	28097-ORDEQ	King Creek lower #3 (Perkins D.M sale)						11	31	31	30	2		
2001	28098-ORDEQ	King Creek- lower station #1						11	31	31	30	2		
2001	28099-ORDEQ	King Creek upper stream #1						11	31	31	30	2		
2001	28100-ORDEQ	King Creek stream #6						11	31	31	30	2		
2001	28103-ORDEQ	Mosby Creek below Row River Trail						9	31	31	30	2		
2001	28105-ORDEQ	Row River above Sharps Creek						9	31	31	30	2		
2001	28108-ORDEQ	Bear Creek						25	31	31	12			
2001	28109-ORDEQ	Cartwright Creek						29	31	31	9			
2001	28111-ORDEQ	Camp Creek						25	31	31	12			
2001	28113-ORDEQ	Cash Creek						29	31	31	9			
2001	28114-ORDEQ	Deer Creek						25	31	31	12			
2001	28115-ORDEQ	Finn Creek						25	31	31	12			
2001	28116-ORDEQ	McGowan Creek						29	31	31	9			
2001	28117-ORDEQ	Seeley Creek						25	31	31	9			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	28118-ORDEQ	Shotgun Creek #2						29	31	31	9			
2001	28119-ORDEQ	Shotgun Creek #1						25	31	31	9			
2001	28278-ORDEQ	Lost Creek at River Mile 9.4 (Willamette, Middle Fork Willamette)	7					8	31	31	30	25		
2001	28503-ORDEQ	Horse Creek at junction of Horse Creek and King Roads (TRIB to McKenzie River at RM 67.2)						9	31	31	20			
2001	28505-ORDEQ	McKenzie River at Dearborn Island, upstream of South Fork McKenzie River						9	31	31	20			
2001	29455-ORDEQ	Miller Creek at River Mile 0.5							5	31	24			
2001	30529-ORDEQ	Long Tom River at River Mile 53.8						29	31	31	24			
2001	30535-ORDEQ	Drury Creek at River Mile 2.9 (tributary to Mohawk River at River Mile 17.0)							29	31	9			
2001	30536-ORDEQ	Owl Creek near mouth (TRIB to Shotgun River at RM 4.55, to Mohawk River at RM 15.5)							29	31	9			
2001	33744-ORDEQ	Lost Creek at headwaters, Mount June, 10.9 miles from Bear Boulevard (Willamette)						10	31	31	30	25		
2002	10658-ORDEQ	Luckiamute River at Lower Bridge						17	17					
2002	12552-ORDEQ	McKenzie River at Mckenzie Bridge				9	31	30	31	31	8			
2002	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	23856-ORDEQ	Rebel Creek tributary at River Mile 0.40 (McKenzie, Willamette)					6	30	31	31	30	2		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	25494-ORDEQ	Luckiamute River at Road 1430 crossing (Road Mile 3)							22	31	19			
2002	28088-ORDEQ	Hills Creek							29	31	2			
2002	28089-ORDEQ	Anthony Creek						4	31	31	2			
2002	28091-ORDEQ	Guiley Creek						4	31	31	2			
2002	28092-ORDEQ	Little Falls Creek 2						4	31	31	2			
2002	28094-ORDEQ	Middle Creek						4	31	31	2			
2002	28108-ORDEQ	Bear Creek						11	31	31	3			
2002	28109-ORDEQ	Cartwright Creek							28	31	3			
2002	28111-ORDEQ	Camp Creek							28	31	3			
2002	28114-ORDEQ	Deer Creek						11	31	31	3			
2002	28115-ORDEQ	Finn Creek							28	31	3			
2002	28117-ORDEQ	Seeley Creek							22	31	3			
2002	28118-ORDEQ	Shotgun Creek #2							22	31	3			
2002	28119-ORDEQ	Shotgun Creek #1							22	31	3			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	28503-ORDEQ	Horse Creek at junction of Horse Creek and King Roads (TRIB to McKenzie River at RM 67.2)				9	31	30	31	31	8			
2002	28505-ORDEQ	McKenzie River at Dearborn Island, upstream of South Fork McKenzie River				9	31	30	31	31	8			
2002	28608-ORDEQ	Middle Fork Willamette River below Hills Creek Reservoir						29	31	31	8			
2002	28613-ORDEQ	Row River above Dorena Reservoir				9	31	30	31	31	8			
2002	28614-ORDEQ	Coast Fork Willamette River above Cottage Grove Reservoir at London and Raisor Roads				9	31	30	31	31	8			
2002	28775-ORDEQ	Little Muddy Creek at Nixon Road (tributary to Muddy Creek)							20	31	9			
2002	28777-ORDEQ	LT Muddy Creek at Belts and Diamond Hill Dr (TRIB to Muddy CR RM 27.7 Rbank Willamette RM 132.6)					10	30	31	31	9			
2002	28779-ORDEQ	Dry Muddy Creek at Dale Rd (TRIB to Muddy Creek at RM 40.9, to right bank Willamette R at RM 132.6)					9	30	31	31	10			
2002	28780-ORDEQ	Muddy Creek at Dale Road (tributary to Willamette River at River Mile 132.6)					10	30	29					
2002	29455-ORDEQ	Miller Creek at River Mile 0.5							20	29	19			
2002	30500-ORDEQ	Middle Fork Willamette River upstream of Fir Creek (above Hills Creek Reservoir)				10	31	24	17	31	8			
2002	30501-ORDEQ	Middle Fork Willamette River just below Lookout Point Dam				9	31	30	31	31	8			
2002	30502-ORDEQ	Middle Fork Willamette River near Black Canyon Park, River Mile 33.3									21	4		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	30529-ORDEQ	Long Tom River at River Mile 53.8						6	31	31	29			
2002	30532-ORDEQ	Gosage Creek (tributary to Goodman, to MFW 26.2)						4	31	31	2			
2002	30533-ORDEQ	Little Fall Creek at River Mile 7.6						4	31	31	2			
2002	30534-ORDEQ	Lost Creek at River Mile 9.3 (tributary to MFW 13.5)						4	31	31	2			
2002	30536-ORDEQ	Owl Creek near mouth (TRIB to Shotgun River at RM 4.55, to Mohawk River at RM 15.5)							22	31	3			
2002	30638-ORDEQ	Mosby Creek at Laying Road (TRIB to Row, RM 3.8, to CF Willamette RM 20.8)						10	31	31	9			
2002	WNF-152	Olallie_WT							29	31	30	30	30	31
2003	14159110	Mckenzie River Above South Fork, Near Rainbow, OR	2	28	24	30	31	30	31	31	30	31	30	31
2003	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	25
2003	WNF-001	Anderson_WT												14
2003	WNF-152	Olallie_WT	31	28	31	29	31	30	31	31	30	30	30	31
2004	14159110	Mckenzie River Above South Fork, Near Rainbow, OR	31	24	22	30	31	25	24	31	30	31	30	31
2004	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	21839-ORDEQ	King Creek at River Mile 0.24						13	31	31	14			
2004	25367-ORDEQ	Amazon Creek at Danebo Avenue, Eugene (drains to Fern Ridge Reservoir)					6	30	31	31	30	20		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	31333-ORDEQ	Beaver Creek above Powell Road (Coyote Creek, Long Tom, Willamette)							2	31	30	20		
2004	32645-ORDEQ	Davidson Creek at River Mile 0.05 (Ferguson Creek, Long Tom River, Upper Willamette)								25				
2004	32646-ORDEQ	Doak Creek at Jackson-Marlow Road (Coyote Creek, Long Tom River, Upper Willamette)							25	31				
2004	32647-ORDEQ	Fox Hollow Creek at River Mile 5.2 (Coyote Creek, Long Tom River, Upper Willamette)							25	31	30	20		
2004	32648-ORDEQ	Coyote Creek at Hamm Road, River Mile 24 (Long Tom River, Upper Willamette)							2	31	30	20		
2004	32649-ORDEQ	Owens Creek at High Pass Rd near Templeton Rd, RM 4.23 (Bear Crk, Long Tom R, Upper Willamette)								25	30	21		
2004	32650-ORDEQ	Poodle Creek at River Mile 3.14 near Allison (Long Tom River, Upper Willamette)							30	31	30	31	30	15
2004	32651-ORDEQ	Owens Creek at RM 3.96 off High Pass Rd ~ 0.3 miles D/S Lavell Rd (Bear Crk to Long Tom R)								26	30	21		
2004	32652-ORDEQ	Coyote Creek at Hamm Road bridge above Jackson Creek RM 21.7 (Long Tom River, Upper Willamette)							25	31	30	20		
2004	32653-ORDEQ	Turnbow Creek at High Pass Road, RM 0.88 (Owens Creek, Bear Creek, Long Tom R., Upper Willamette)							29	31	30	21		
2004	32654-ORDEQ	Booker Creek at Hwy 126, River Mile 0.27 (Elk Creek, Long Tom River, Upper Willamette)								19	30	21		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	32655-ORDEQ	Owens Creek at RM 3.86 off High Pass Rd, ~ 0.4 miles D/S Lavell Rd (Bear Crk to Long Tom R)								26	30	21		
2004	32656-ORDEQ	Ferguson Creek at River Mile 7.7 (Long Tom River, Upper Willamette)								25	30	21		
2004	32657-ORDEQ	Bear Creek at River Mile 0.69 (Ferguson Creek, Long Tom River, Upper Willamette)							29	31	30	21		
2004	32658-ORDEQ	Bear Creek at River Mile 0.5 (Coyote Creek, Long Tom River, Upper Willamette)							25	31	30	20		
2004	32659-ORDEQ	Bear Creek at River Mile 0.57 (Ferguson Creek, Long Tom River, Upper Willamette)							29	31	30	21		
2004	UmpNF-008	Brice Creek abv Champion Creek WT						12	31	31	14			
2004	UmpNF-009	Brice Creek abv Crawfish Creek WT						12	31	31	14			
2004	UmpNF-010	Brice Creek at the mouth WT						13	31	31	14			
2004	UmpNF-011	Brice Creek below Adams Creek_LTWT						11	31	31	13			
2004	UmpNF-020	China Creek blw Saddle Camp Creek WT						13	31	31	14			
2004	UmpNF-043	Grass Creek at the mouth WT						12	31	31	14			
2004	UmpNF-054	Layng Creek above Prather Creek_LTWT						11	31	31	13			
2004	UmpNF-056	Layng Creek abv Brice Creek WT						12	31	31	14			
2004	UmpNF-057	Layng Creek abv Dinner Creek WT						13	31	31	14			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	UmpNF-063	Martin Creek at the mouth WT						13	31	31	14			
2004	UmpNF-069	Row River above Sharps Creek LTWT						13	31	31	14			
2004	UmpNF-070	Sharps Creek above Staples Creek LTWT						13	31	31	14			
2004	UmpNF-071	Sharps Creek abv Martin Creek WT						13	31	31	14			
2004	UmpNF-072	Sharps Creek at the Mouth LTWT						13	31	31	14			
2004	UmpNF-073	Sharps Creek at the Quarry LTWT						13	31	31	14			
2004	WNF-001	Anderson_WT	31	29	31	29	31	30	31	31	30	30	30	31
2004	WNF-009	Boulder_WT						29	31	31	14			
2004	WNF-021	Cone_WT						27	31	31	19			
2004	WNF-026	DeerPowerlines_LTWT						29	31	31	14			
2004	WNF-036	FallCreek _above Hehe_LTWT						23	31	31	20			
2004	WNF-037	FallCreek_1821_LTWT						21	21	26	20			
2004	WNF-038	FallCreek_1828_LTWT						28	31	31	20			
2004	WNF-040	FallCreek_FSboundary_LTWT						22	31	31	20			
2004	WNF-056	Indian_WT					12	30	31	31	22			
2004	WNF-066	McKenzieAbvTrailbridge_LTWT					12	30	31	31	14			
2004	WNF-067	McKenzieBlwTrailbridge_LTWT					12	30	31	31	14			
2004	WNF-088	Portland Creek_Mouth_LTWT						28	31	31	20			
2004	WNF-093	QuartzSouth_WT						17	31	31	22			
2004	WNF-112	Smith_AbvSmithRes_WT					11	30	31	31	13			
2004	WNF-113	Smith_AbvTrailBridgeRes_WT						18	31	31	14			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	WNF-114	Smith_BlwSmithRes_WT						17	31	31	14			
2004	WNF-128	WinberryCreek_Mouth_LTWT						22	31	31	19			
2004	WNF-141	Lost_WT						28	31	31	19			
2004	WNF-144	McKenzieRangerStation_WT						28	31	31	14			
2004	WNF-146	MillForestBoundary_WT						26	31	31	20			
2004	WNF-147	MillHwy126_WT						26	31	31	20			
2004	WNF-152	Olallie_WT	31	29	31	29	31	30	31	31	8			
2004	WNF-161	WhiteBranch_WT						24	31	31	19			
2005	14159110	Mckenzie River Above South Fork, Near Rainbow, OR	31	28	31	30	31	30	31	31	30	31	30	18
2005	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	21839-ORDEQ	King Creek at River Mile 0.24						7	31	1	18			
2005	SNF-040	2120						20	31	31	30	20		
2005	SNF-041	2121						20	31	31	30	20		
2005	SNF-044	2124						20	31	31	30	20		
2005	SNF-045	2125						20	31	31	30	20		
2005	SNF-046	2126						20	31	31	30	20		
2005	SNF-047	2127						20	31	31	30	20		
2005	UmpNF-008	Brice Creek abv Champion Creek WT						9	31	31	21			
2005	UmpNF-009	Brice Creek abv Crawfish Creek WT						9	31	31	21			
2005	UmpNF-010	Brice Creek at the mouth WT						9	31	31	21			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	UmpNF-011	Brice Creek below Adams Creek_LTWT						9	31	31	21			
2005	UmpNF-020	China Creek blw Saddle Camp Creek WT						7	31	31	26			
2005	UmpNF-043	Grass Creek at the mouth WT						9	31	31	21			
2005	UmpNF-054	Layng Creek above Prather Creek_LTWT						8	31	31	20			
2005	UmpNF-056	Layng Creek abv Brice Creek WT								29	21			
2005	UmpNF-057	Layng Creek abv Dinner Creek WT						9	31	31	21			
2005	UmpNF-063	Martin Creek at the mouth WT						6	31	31	26			
2005	UmpNF-069	Row River above Sharps Creek LTWT						6	31	31	26			
2005	UmpNF-070	Sharps Creek above Staples Creek LTWT						6	31	31	26			
2005	UmpNF-071	Sharps Creek abv Martin Creek WT						6	31	31	26			
2005	UmpNF-072	Sharps Creek at the Mouth LTWT						6	31	31	26			
2005	UmpNF-073	Sharps Creek at the Quarry LTWT						6	31	31	26			
2005	WNF-001	Anderson_WT	31	15										
2005	WNF-009	Boulder_WT					18	30	31	31	28			
2005	WNF-021	Cone_WT					20	30	31	31	28			
2005	WNF-025	DeerNearMouth_LTWT					18	30	31	31	30	18		
2005	WNF-026	DeerPowerlines_LTWT					18	30	31	31	27			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	WNF-037	FallCreek_1821_LTWT						27	31	31	30			
2005	WNF-038	FallCreek_1828_LTWT						28	31	31	30	2		
2005	WNF-039	FallCreek_AtPortlandCreek_LTWT						25	31	31	28			
2005	WNF-040	FallCreek_FSboundary_LTWT						9	31	31	8			
2005	WNF-048	HeHe Creek_Mouth_LTWT						28	31	31	28			
2005	WNF-066	McKenzieAbvTrailbridge_LTWT					18	30	31	31	30	2		
2005	WNF-067	McKenzieBlwTrailbridge_LTWT					18	30	31	31	30	2		
2005	WNF-093	QuartzSouth_WT						21	31	31	30	2		
2005	WNF-101	Scott_WT					17	30	31	31	28			
2005	WNF-112	Smith_AbvSmithRes_WT						24	31	31	28			
2005	WNF-113	Smith_AbvTrailBridgeRes_WT					17	30	31	31	30	2		
2005	WNF-114	Smith_BlwSmithRes_WT						22	31	31	30	2		
2005	WNF-122	TimberCreek_LTWT						27	31	31	30			
2005	WNF-141	Lost_WT					17	30	31	31	28			
2005	WNF-144	McKenzieRangerStation_WT					14	30	31	31	30	24		
2005	WNF-146	MillForestBoundary_WT					14	30	31	31	30	3		
2005	WNF-147	MillHwy126_WT					14	30	31	31	30	3		
2005	WNF-161	WhiteBranch_WT						23	31	31	27			
2006	14159110	Mckenzie River Above South Fork, Near Rainbow, OR	4	28	31	30	31	30	31	31	30			
2006	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	33506-ORDEQ	Periwinkle Creek							20	31	30	2		
2006	33519-ORDEQ	Jackson Creek							20	31	30	2		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	33521-ORDEQ	Dunawi Creek							21	31	30	2		
2006	33858-ORDEQ	Lukiamute River								23	30	3		
2006	33951-ORDEQ	Willamette River Middle Fork at river mile 54.4								24	30	1		
2006	33952-ORDEQ	Horse Creek at river mile 7.0								23	30	1		
2006	UmpNF-008	Brice Creek abv Champion Creek WT						6	31	31	19			
2006	UmpNF-009	Brice Creek abv Crawfish Creek WT						6	31	31	19			
2006	UmpNF-010	Brice Creek at the mouth WT						6	31	31	18			
2006	UmpNF-011	Brice Creek below Adams Creek_LTWT							30	31	19			
2006	UmpNF-020	China Creek blw Saddle Camp Creek WT						13	31	31	19			
2006	UmpNF-043	Grass Creek at the mouth WT						6	31	31	19			
2006	UmpNF-054	Layng Creek above Prather Creek_LTWT						1	31	31	18			
2006	UmpNF-056	Layng Creek abv Brice Creek WT						6	31	31	18			
2006	UmpNF-057	Layng Creek abv Dinner Creek WT						1	31	31	18			
2006	UmpNF-063	Martin Creek at the mouth WT						13	31	31	19			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	UmpNF-069	Row River above Sharps Creek LTWT						13	31	31	19			
2006	UmpNF-070	Sharps Creek above Staples Creek LTWT						13	31	31	19			
2006	UmpNF-071	Sharps Creek abv Martin Creek WT						13	31	31	19			
2006	UmpNF-073	Sharps Creek at the Quarry LTWT						13	31	31	19			
2006	WNF-009	Boulder_WT						22	31	31	19			
2006	WNF-021	Cone_WT						24	31	31	21			
2006	WNF-026	DeerPowerlines_LTWT						25	31	31	18			
2006	WNF-036	FallCreek _above Hehe_LTWT						15	31	31	30	9		
2006	WNF-037	FallCreek_1821_LTWT						15	31	31	30	9		
2006	WNF-038	FallCreek_1828_LTWT						10	31	31	30			
2006	WNF-040	FallCreek_FSboundary_LTWT						15	31	31	30	9		
2006	WNF-048	HeHe Creek_Mouth_LTWT						15	31	31	30			
2006	WNF-066	McKenzieAbvTrailbridge_LTWT						22	31	31	18			
2006	WNF-067	McKenzieBlwTrailbridge_LTWT						22	31	31	19			
2006	WNF-088	Portland Creek_Mouth_LTWT						15	31	31	30	9		
2006	WNF-093	QuartzSouth_WT						23	31	31	14			
2006	WNF-101	Scott_WT						21	31	31	19			
2006	WNF-112	Smith_AbvSmithRes_WT						21	31	31	12			
2006	WNF-113	Smith_AbvTrailBridgeRes_WT						21	31	31	13			
2006	WNF-114	Smith_BlwSmithRes_WT						21	31	31	13			
2006	WNF-122	TimberCreek_LTWT						10	31	31	13			
2006	WNF-128	WinberryCreek_Mouth_LTWT						10	31	31	13			
2006	WNF-144	McKenzieRangerStation_WT						27	31	31	30	2		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	WNF-146	MillForestBoundary_WT						27	31	31	17			
2006	WNF-147	MillHwy126_WT						27	31	31	17			
2006	WNF-161	WhiteBranch_WT						21	31	31	19			
2007	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	34489-ORDEQ	Q Street Canal, 75 feet u/s of Dynea outfall							15	14				
2007	34490-ORDEQ	Q Street Canal, 30 feet d/s of Dynea outfall (concrete pipe near concrete structure)							15	31	30	29		
2007	34491-ORDEQ	Q Street Canal, 50 feet u/s of Pierce Channel mouth							15	31	30	29		
2007	34492-ORDEQ	Q Street Canal, mouth of Pierce Channel							15	31	30	29		
2007	34496-ORDEQ	Q Street Canal, 10 feet u/s of fish barrier							15	31	30	29		
2007	34498-ORDEQ	Q Street Canal, mouth of Canoe Channel							15	31	30	29		
2007	34499-ORDEQ	Q Street Canal, Alton Baker Parkway spillway near Willamette River							15	31	30	29		
2007	34513-ORDEQ	Q Street Canal, 30 feet d/s of Asphalt Composting Company bridge							15	34*	32*	31		
2007	UmpNF-008	Brice Creek abv Champion Creek WT						10	31	31	23			
2007	UmpNF-009	Brice Creek abv Crawfish Creek WT						10	31	31	23			
2007	UmpNF-010	Brice Creek at the mouth WT						11	31	31	18			
2007	UmpNF-011	Brice Creek below Adams Creek_LTWT						10	31	31	18			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	UmpNF-020	China Creek blw Saddle Camp Creek WT						10	31	31	23			
2007	UmpNF-043	Grass Creek at the mouth WT						10	31	31	23			
2007	UmpNF-054	Layng Creek above Prather Creek_LTWT						11	31	31	18			
2007	UmpNF-056	Layng Creek abv Brice Creek WT						11	31	31	18			
2007	UmpNF-063	Martin Creek at the mouth WT						10	31	31	23			
2007	UmpNF-069	Row River above Sharps Creek LTWT						10	31	31	23			
2007	UmpNF-070	Sharps Creek above Staples Creek LTWT						10	31	31	23			
2007	UmpNF-071	Sharps Creek abv Martin Creek WT						10	31	31	23			
2007	UmpNF-072	Sharps Creek at the Mouth LTWT						10	31	31	23			
2007	UmpNF-073	Sharps Creek at the Quarry LTWT						10	31	31	23			
2007	WNF-021	Cone_WT						26	31	31	18			
2007	WNF-025	DeerNearMouth_LTWT					1	30	31	31	20			
2007	WNF-026	DeerPowerlines_LTWT					1	30	31	31	20			
2007	WNF-033	ElkNorth_WT						26	31	31	18			
2007	WNF-036	FallCreek _above Hehe_LTWT						8	31	31	4			
2007	WNF-037	FallCreek_1821_LTWT						8	31	31	30	9		
2007	WNF-038	FallCreek_1828_LTWT						7	31	31	30	6		
2007	WNF-039	FallCreek_AtPortlandCreek_LTWT						7	31	31	30	9		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	WNF-066	McKenzieAbvTrailbridge_LTWT					2	30	31	31	19			
2007	WNF-067	McKenzieBlwTrailbridge_LTWT					2	30	31	31	20			
2007	WNF-070	MFW_SandPrairie_LTWT						7	31	31	30	2		
2007	WNF-093	QuartzSouth_WT						24	31	31	18			
2007	WNF-101	Scott_WT						30	31	31	18			
2007	WNF-112	Smith_AbvSmithRes_WT						24	31	31	19			
2007	WNF-113	Smith_AbvTrailBridgeRes_WT						21	31	31	19			
2007	WNF-114	Smith_BlwSmithRes_WT						23	31	31	19			
2007	WNF-122	TimberCreek_LTWT						8	31	31	30	9		
2007	WNF-128	WinberryCreek_Mouth_LTWT						8	31	31	30	9		
2007	WNF-141	Lost_WT					1	30	31	31	20			
2007	WNF-146	MillForestBoundary_WT						24	31	31	18			
2007	WNF-147	MillHwy126_WT						24	31	31	18			
2007	WNF-161	WhiteBranch_WT					1	30	31	31	20			
2008	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR										31	30	31
2008	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.											17	31
2008	14150800	Winberry Creek Near Lowell,OR											18	31
2008	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR										9	30	10
2008	UmpNF-008	Brice Creek abv Champion Creek WT						4	31	31	15			
2008	UmpNF-009	Brice Creek abv Crawfish Creek WT						4	31	31	15			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	UmpNF-010	Brice Creek at the mouth WT						4	31	31	25			
2008	UmpNF-011	Brice Creek below Adams Creek_LTWT						5	31	31	15			
2008	UmpNF-020	China Creek blw Saddle Camp Creek WT						4	31	31	15			
2008	UmpNF-043	Grass Creek at the mouth WT						4	31	31	15			
2008	UmpNF-054	Layng Creek above Prather Creek_LTWT						6	31	31	24			
2008	UmpNF-056	Layng Creek abv Brice Creek WT						4	31	31	25			
2008	UmpNF-063	Martin Creek at the mouth WT						4	31	31	15			
2008	UmpNF-070	Sharps Creek above Staples Creek LTWT						4	31	31	15			
2008	UmpNF-071	Sharps Creek abv Martin Creek WT						4	31	31	15			
2008	UmpNF-072	Sharps Creek at the Mouth LTWT						4	31	31	15			
2008	UmpNF-073	Sharps Creek at the Quarry LTWT						4	31	31	15			
2008	WNF-003	Augusta_upper_WT							22	31	13			
2008	WNF-004	AugustaAbv1927240_WT							22	31	14			
2008	WNF-005	AugustaMouth_WT							22	31	14			
2008	WNF-016	Castle_WT							21	31	15			
2008	WNF-017	ChristyCreekBelowLowell_LTWT						6	31	31	30	6		
2008	WNF-021	Cone_WT							20	31	14			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	WNF-022	Cook_WT							20	31	18			
2008	WNF-025	DeerNearMouth_LTWT							23	31	16			
2008	WNF-026	DeerPowerlines_LTWT							23	31	16			
2008	WNF-031	EighthCreek						6	31	31	30	7		
2008	WNF-032	EighthCreek_Mouth_LTWT						6	31	31	30	7		
2008	WNF-033	ElkNorth_WT							20	31	14			
2008	WNF-034	ElkSouthAbvMouth_WT							22	31	14			
2008	WNF-035	ElkSouthWilderness_WT							22	31	14			
2008	WNF-036	FallCreek _above Hehe_LTWT						4	31	31	30	8		
2008	WNF-037	FallCreek_1821_LTWT						4	31	31	30	8		
2008	WNF-038	FallCreek_1828_LTWT						4	31	31	30	7		
2008	WNF-042	Florence							20	31	15			
2008	WNF-043	FrenchPete_WT							22	31	14			
2008	WNF-044	Glen_WT							20	31	7			
2008	WNF-045	Grasshopper_WT							22	31	14			
2008	WNF-048	HeHe Creek_Mouth_LTWT						4	31	31	30	7		
2008	WNF-049	HillsCreek_USGS_LTWT						6	31	31	30	7		
2008	WNF-051	HorseBlwSeparation_WT							21	31	15			
2008	WNF-052	HorseBridge2638_LTWT							23	31	15			
2008	WNF-053	HorseWilderness_WT							21	31	15			
2008	WNF-054	HuckleberryCreek_LTWT						6	31	31	30	7		
2008	WNF-057	King_WT							23	31	15			
2008	WNF-064	Mann_WT							20	31	10			
2008	WNF-066	McKenzieAbvTrailbridge_LTWT							23	31	16			
2008	WNF-067	McKenzieBlwTrailbridge_LTWT							23	31	16			
2008	WNF-068	McKenzieSpawning_WT							23	31	16			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	WNF-069	MFW_BelowStaley_LTWT						6	31	31	30	7		
2008	WNF-077	NF_1919_LTWT						6	31	31	30	7		
2008	WNF-078	NF_1925_LTWT						6	31	31	30	7		
2008	WNF-079	NF_Confl_LTWT						6	31	31	30	7		
2008	WNF-083	Ore_WT							20	31	15			
2008	WNF-086	Pasture_WT							21	31	15			
2008	WNF-088	Portland Creek_Mouth_LTWT						4	31	31	30	8		
2008	WNF-089	Pothole_WT							21	31	15			
2008	WNF-090	Powers_WT							20	2				
2008	WNF-095	Quentin_WT							20	31	18			
2008	WNF-096	Rebel_WT							22	31	14			
2008	WNF-098	Roaring_mouth_WT							22	31	14			
2008	WNF-100	SaltCreek_Mouth_LTWT						6	31	31	30			
2008	WNF-102	Separation_mouth_WT							21	31	15			
2008	WNF-104	SFMckenzie_below_RoaringR_WT							22	31	14			
2008	WNF-105	SFMcKenzie_Rd1927_WT							22	31	14			
2008	WNF-107	SFMcKenzie_Wilderness_WT							22	31	14			
2008	WNF-112	Smith_AbvSmithRes_WT							23	31	16			
2008	WNF-113	Smith_AbvTrailBridgeRes_WT							23	31	16			
2008	WNF-114	Smith_BlwSmithRes_WT							22	5				
2008	WNF-121	Tidbits_WT							20	31	15			
2008	WNF-122	TimberCreek_LTWT						4	31	31	30	7		
2008	WNF-127	Walker_WT							22	31	14			
2008	WNF-128	WinberryCreek_Mouth_LTWT						3	31	31	30	8		
2008	WNF-129	Wolf_WT							20	31	10			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2009	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14154500	Row River Above Pitcher Creek, Near Dorena, OR								25	30	31	30	31
2009	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR						20	31	31	30	31	30	31
2009	UmpNF-008	Brice Creek abv Champion Creek WT						5	31	31	14			
2009	UmpNF-009	Brice Creek abv Crawfish Creek WT						5	31	31	14			
2009	UmpNF-010	Brice Creek at the mouth WT						7	31	31	14			
2009	UmpNF-011	Brice Creek below Adams Creek_LTWT						6	31	31	14			
2009	UmpNF-020	China Creek blw Saddle Camp Creek WT						6	31	31	14			
2009	UmpNF-043	Grass Creek at the mouth WT						5	31	31	14			
2009	UmpNF-054	Layng Creek above Prather Creek_LTWT						8	31	31	21			
2009	UmpNF-056	Layng Creek abv Brice Creek WT						7	31	31	14			
2009	UmpNF-063	Martin Creek at the mouth WT						6	31	31	14			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	UmpNF-069	Row River above Sharps Creek LTWT						6	31	31	14			
2009	UmpNF-070	Sharps Creek above Staples Creek LTWT						6	31	31	14			
2009	UmpNF-071	Sharps Creek abv Martin Creek WT						6	31	31	14			
2009	UmpNF-072	Sharps Creek at the Mouth LTWT						6	31	31	14			
2009	UmpNF-073	Sharps Creek at the Quarry LTWT						6	31	31	14			
2009	WNF-004	AugustaAbv1927240_WT						14	31	31	30	6		
2009	WNF-005	AugustaMouth_WT						14	31	31	30	6		
2009	WNF-016	Castle_WT						19	31	31	29			
2009	WNF-017	ChristyCreekBelowLowell_LTWT							24	31	30	13		
2009	WNF-021	Cone_WT						14	31	31	30	5		
2009	WNF-025	DeerNearMouth_LTWT						13	31	31	30	5		
2009	WNF-026	DeerPowerlines_LTWT						13	31	31	30	5		
2009	WNF-031	EighthCreek							24	31	30	13		
2009	WNF-032	EighthCreek_Mouth_LTWT							24	31	30			
2009	WNF-033	ElkNorth_WT						14	31	31	30	5		
2009	WNF-034	ElkSouthAbvMouth_WT						14	31	31	30	6		
2009	WNF-035	ElkSouthWilderness_WT						19	31	31	30	6		
2009	WNF-036	FallCreek _above Hehe_LTWT							24	31	30	4		
2009	WNF-037	FallCreek_1821_LTWT							25	31	30	4		
2009	WNF-038	FallCreek_1828_LTWT							25	31	30			
2009	WNF-039	FallCreek_AtPortlandCreek_LTWT							25	31	30			
2009	WNF-040	FallCreek_FSboundary_LTWT							25	31	30	4		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	WNF-042	Florence						15	31	31	30	6		
2009	WNF-043	FrenchPete_WT						19	31	31	30	6		
2009	WNF-044	Glen_WT						15	31	31	30	6		
2009	WNF-045	Grasshopper_WT						14	31	31	30	6		
2009	WNF-048	HeHe Creek_Mouth_LTWT							25	31	30	4		
2009	WNF-049	HillsCreek_USGS_LTWT							23	31	30	12		
2009	WNF-050	HorseAbvSeparation_WT						15	31	31	29			
2009	WNF-052	HorseBridge2638_LTWT						13	31	31	29			
2009	WNF-053	HorseWilderness_WT						19	31	31	29			
2009	WNF-054	HuckleberryCreek_LTWT							24	31	30	13		
2009	WNF-055	Ikenick_WT						13	31	31				
2009	WNF-057	King_WT						12	31	31	29			
2009	WNF-064	Mann_WT						13	31	31	20			
2009	WNF-066	McKenzieAbvTrailbridge_LTWT						12	31	31	30	5		
2009	WNF-067	McKenzieBlwTrailbridge_LTWT						12	14					
2009	WNF-068	McKenzieSpawning_WT						12	14					
2009	WNF-069	MFW_BelowStaley_LTWT							23	31	30	12		
2009	WNF-077	NF_1919_LTWT							23	31	30	14		
2009	WNF-078	NF_1925_LTWT							22	31	30	13		
2009	WNF-079	NF_Confl_LTWT							23	31	30	12		
2009	WNF-083	Ore_WT						19	31	31	29			
2009	WNF-086	Pasture_WT						19	31	31	29			
2009	WNF-088	Portland Creek_Mouth_LTWT							25	31	30	4		
2009	WNF-089	Pothole_WT						19	31	31	29			
2009	WNF-090	Powers_WT						19	31	31	29			
2009	WNF-095	Quentin_WT						9	31	31	30	5		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	WNF-096	Rebel_WT						19	31	31	28			
2009	WNF-098	Roaring_mouth_WT						14	31	31	30	6		
2009	WNF-099	SalmonCreek_Mouth_LTWT							23	31	30	13		
2009	WNF-100	SaltCreek_Mouth_LTWT							23	31	30			
2009	WNF-102	Separation_mouth_WT						15	31	31	29			
2009	WNF-104	SFMckenzie_below_RoaringR_WT						14	31	31	30	6		
2009	WNF-105	SFMcKenzie_Rd1927_WT						14	31	31	30	6		
2009	WNF-107	SFMcKenzie_Wilderness_WT						19	31	31	30	6		
2009	WNF-112	Smith_AbvSmithRes_WT						9	31	31	30	1		
2009	WNF-113	Smith_AbvTrailBridgeRes_WT						12	31	31	28			
2009	WNF-114	Smith_BlwSmithRes_WT						12	14					
2009	WNF-121	Tidbits_WT						9	31	31	30			
2009	WNF-122	TimberCreek_LTWT							25	31	30	3		
2009	WNF-127	Walker_WT						19	31	31	30	6		
2009	WNF-128	WinberryCreek_Mouth_LTWT							25	31	30			
2009	WNF-129	Wolf_WT						13	31	31	20			
2010	14144800	Middle Fork Willamette River Nr Oakridge, OR							9	31	30	31	30	31
2010	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR						14	31	31	30	31	30	31
2010	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR					5	30	31	31	30	31	30	31
2010	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2010	14150290	Fall Creek Above North Fork, Near Lowell, OR								6	30	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	SNF-040	2120						13	31	31	30	7		
2010	SNF-041	2121						27	31	31	30	7		
2010	SNF-042	2122						27	31	31	30	7		
2010	SNF-043	2123						27	31	31	30	10		
2010	SNF-044	2124						27	31	31	30	10		
2010	SNF-045	2125						27	31	31	30	7		
2010	SNF-046	2126						27	31	31	30	7		
2010	SNF-047	2127						27	31	31	30	7		
2010	SNF-049	2129						13	31	31	30	11		
2010	SNF-050	2130						13	31	31	30	19		
2010	SNF-051	2131						27	31	31	30	10		
2010	SNF-052	2132						27	31	31	30	7		
2010	SNF-053	2133							30	31	30	10		
2010	UmpNF-008	Brice Creek abv Champion Creek WT							23	31	14			
2010	UmpNF-009	Brice Creek abv Crawfish Creek WT							23	31	14			
2010	UmpNF-010	Brice Creek at the mouth WT						1	31	31	16			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	UmpNF-011	Brice Creek below Adams Creek_LTWT							23	31	12			
2010	UmpNF-020	China Creek blw Saddle Camp Creek WT							24	31	14			
2010	UmpNF-043	Grass Creek at the mouth WT							23	31	14			
2010	UmpNF-054	Layng Creek above Prather Creek_LTWT						2	31	31	16			
2010	UmpNF-056	Layng Creek abv Brice Creek WT						1	31	31	16			
2010	UmpNF-063	Martin Creek at the mouth WT							24	31	14			
2010	UmpNF-069	Row River above Sharps Creek LTWT							24	31	14			
2010	UmpNF-070	Sharps Creek above Staples Creek LTWT							24	31	14			
2010	UmpNF-071	Sharps Creek abv Martin Creek WT							24	31	13			
2010	UmpNF-072	Sharps Creek at the Mouth LTWT							24	31	14			
2010	UmpNF-073	Sharps Creek at the Quarry LTWT							24	31	14			
2010	WNF-004	AugustaAbv1927240_WT						14	31	31	16			
2010	WNF-005	AugustaMouth_WT						14	31	31	16			
2010	WNF-016	Castle_WT						7	31	31	21			
2010	WNF-017	ChristyCreekBelowLowell_LTWT							23	31	15			
2010	WNF-021	Cone_WT						8	31	31	21			
2010	WNF-022	Cook_WT						6	31	31	22			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	WNF-025	DeerNearMouth_LTWT						12	31	31	22			
2010	WNF-026	DeerPowerlines_LTWT						12	17					
2010	WNF-029	EastForkSouthForkSec17_WT						13	31	31	16			
2010	WNF-031	EighthCreek							23	31	15			
2010	WNF-032	EighthCreek_Mouth_LTWT							23	31	15			
2010	WNF-033	ElkNorth_WT						8	31	31	21			
2010	WNF-034	ElkSouthAbvMouth_WT						14	31	31	16			
2010	WNF-035	ElkSouthWilderness_WT						14	31	31	16			
2010	WNF-036	FallCreek _above Hehe_LTWT							24	31	20			
2010	WNF-037	FallCreek_1821_LTWT							24	31	20			
2010	WNF-039	FallCreek_AtPortlandCreek_LTWT							24	31	18			
2010	WNF-040	FallCreek_FSboundary_LTWT							24	31	20			
2010	WNF-042	Florence						8	31	31	21			
2010	WNF-043	FrenchPete_WT						14	31	31	16			
2010	WNF-044	Glen_WT						8	31	31	21			
2010	WNF-045	Grasshopper_WT						14	31	31	16			
2010	WNF-046	HardyRd204_WT						13	31	31	20			
2010	WNF-047	HardyRd225_WT						13	31	31	20			
2010	WNF-048	HeHe Creek_Mouth_LTWT							24	31	19			
2010	WNF-049	HillsCreek_USGS_LTWT							25	31	12			
2010	WNF-050	HorseAbvSeparation_WT						7	31	31	21			
2010	WNF-051	HorseBlwSeparation_WT						7	31	31	21			
2010	WNF-052	HorseBridge2638_LTWT						8	31	31	21			
2010	WNF-054	HuckleberryCreek_LTWT							23	31	15			
2010	WNF-057	King_WT						8	31	31	16			
2010	WNF-064	Mann_WT						6	31	31	22			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	WNF-066	McKenzieAbvTrailbridge_LTWT						12	31	31	23			
2010	WNF-067	McKenzieBlwTrailbridge_LTWT						12	31	31	23			
2010	WNF-068	McKenzieSpawning_WT						12	31	31	23			
2010	WNF-069	MFW_BelowStaley_LTWT							23	31	12			
2010	WNF-070	MFW_SandPrairie_LTWT							25	31	12			
2010	WNF-077	NF_1919_LTWT							23	31	12			
2010	WNF-078	NF_1925_LTWT							23	31	15			
2010	WNF-079	NF_Confl_LTWT							23	31	15			
2010	WNF-083	Ore_WT						6	31	31	22			
2010	WNF-086	Pasture_WT						7	31	31	21			
2010	WNF-088	Portland Creek_Mouth_LTWT							24	31	20			
2010	WNF-089	Pothole_WT						7	31	31	21			
2010	WNF-090	Powers_WT						8	31	31	21			
2010	WNF-095	Quentin_WT						6	31	31	22			
2010	WNF-096	Rebel_WT						14	31	31	16			
2010	WNF-097	Ridge_WT						14	31	31	16			
2010	WNF-098	Roaring_mouth_WT						14	31	31	16			
2010	WNF-099	SalmonCreek_Mouth_LTWT							23	31	12			
2010	WNF-100	SaltCreek_Mouth_LTWT							25	31	12			
2010	WNF-102	Separation_mouth_WT						7	31	31	21			
2010	WNF-104	SFMckenzie_below_RoaringR_WT						14	31	31	16			
2010	WNF-105	SFMcKenzie_Rd1927_WT						14	31	31	16			
2010	WNF-107	SFMcKenzie_Wilderness_WT						14	31	31	16			
2010	WNF-112	Smith_AbvSmithRes_WT						10	31	31	23			
2010	WNF-113	Smith_AbvTrailBridgeRes_WT						10	31	31	23			
2010	WNF-114	Smith_BlwSmithRes_WT						10	31	31	23			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	WNF-120	Starr_mouth_WT						14	31	31	20			
2010	WNF-121	Tidbits_WT						6	31	31	22			
2010	WNF-122	TimberCreek_LTWT							24	31	18			
2010	WNF-127	Walker_WT						13	31	31	16			
2010	WNF-128	WinberryCreek_Mouth_LTWT							24	31	19			
2010	WNF-129	Wolf_WT						6	31	31	9			
2011	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	28	31
2011	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2011	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	SNF-040	2120						23	31	31	30	20		
2011	SNF-041	2121						23	31	31	30	20		
2011	SNF-042	2122						23	31	31	30	20		
2011	SNF-043	2123						23	31	31	30	25		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	SNF-044	2124						23	31	31	30	25		
2011	SNF-045	2125						23	31	31	30	20		
2011	SNF-046	2126						23	31	31	30	20		
2011	SNF-047	2127						23	31	31	30	25		
2011	SNF-048	2128						23	31	31	30	20		
2011	SNF-049	2129						10	31	31	30	25		
2011	SNF-050	2130						23	31	31	30	20		
2011	SNF-051	2131						23	31	31	30	25		
2011	SNF-052	2132						23	31	31	30	25		
2011	SNF-053	2133						13	31	31	30	20		
2011	SNF-055	2136						23	31	31	30	20		
2011	UmpNF-008	Brice Creek abv Champion Creek WT						2	31	31	18			
2011	UmpNF-009	Brice Creek abv Crawfish Creek WT						2	31	31	18			
2011	UmpNF-010	Brice Creek at the mouth WT						2	31	31	16			
2011	UmpNF-011	Brice Creek below Adams Creek_LTWT							25	31	15			
2011	UmpNF-020	China Creek blw Saddle Camp Creek WT							26	31	18			
2011	UmpNF-043	Grass Creek at the mouth WT							24	31	18			
2011	UmpNF-054	Layng Creek above Prather Creek_LTWT						3	31	31	15			
2011	UmpNF-056	Layng Creek abv Brice Creek WT						1	31	31	15			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	UmpNF-069	Row River above Sharps Creek LTWT						1	31	31	18			
2011	UmpNF-070	Sharps Creek above Staples Creek LTWT							26	31	18			
2011	UmpNF-072	Sharps Creek at the Mouth LTWT						1	31	31	18			
2011	UmpNF-073	Sharps Creek at the Quarry LTWT							26	31	17			
2011	WNF-004	AugustaAbv1927240_WT						23	31	31	26			
2011	WNF-005	AugustaMouth_WT					7	30	31	31	27			
2011	WNF-017	ChristyCreekBelowLowell_LTWT							11	31	13			
2011	WNF-021	Cone_WT						27	31	31	22			
2011	WNF-022	Cook_WT						28	31	31	25			
2011	WNF-025	DeerNearMouth_LTWT						30	31	31	28			
2011	WNF-029	EastForkSouthForkSec17_WT					8	30	31	31	28			
2011	WNF-031	EighthCreek							11	31	13			
2011	WNF-032	EighthCreek_Mouth_LTWT							11	31	13			
2011	WNF-033	ElkNorth_WT						27	31	31	22			
2011	WNF-035	ElkSouthWilderness_WT					8	30	31	31	26			
2011	WNF-036	FallCreek _above Hehe_LTWT							10	31	11			
2011	WNF-037	FallCreek_1821_LTWT							10	31	11			
2011	WNF-038	FallCreek_1828_LTWT							10	31	11			
2011	WNF-039	FallCreek_AtPortlandCreek_LTWT							9	31	11			
2011	WNF-043	FrenchPete_WT					7	30	31	31	27			
2011	WNF-045	Grasshopper_WT						23	31	31	26			
2011	WNF-046	HardyRd204_WT					7	30	31	31	27			
2011	WNF-047	HardyRd225_WT					7	30	31	31	27			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	WNF-048	HeHe Creek_Mouth_LTWT							10	31	9			
2011	WNF-049	HillsCreek_USGS_LTWT							11	31	13			
2011	WNF-052	HorseBridge2638_LTWT						27	31	31	25			
2011	WNF-053	HorseWilderness_WT						27	31	31	22			
2011	WNF-054	HuckleberryCreek_LTWT							10	31	13			
2011	WNF-055	Ikenick_WT						29	31	31	20			
2011	WNF-064	Mann_WT						28	31	31	25			
2011	WNF-066	McKenzieAbvTrailbridge_LTWT						30	31	31	20			
2011	WNF-067	McKenzieBlwTrailbridge_LTWT						30	31	31	20			
2011	WNF-068	McKenzieSpawning_WT						30	31	31	20			
2011	WNF-069	MFW_BelowStaley_LTWT							11	31	12			
2011	WNF-070	MFW_SandPrairie_LTWT							11	31	12			
2011	WNF-073	Mona_WT						29	31	31	25			
2011	WNF-077	NF_1919_LTWT							11	31	12			
2011	WNF-078	NF_1925_LTWT							10	31	13			
2011	WNF-079	NF_Confl_LTWT							11	31	12			
2011	WNF-080	NFQuartz_WT						29	31	13				
2011	WNF-088	Portland Creek_Mouth_LTWT							10	31	11			
2011	WNF-092	Quartz_North_WT						29	31	31	25			
2011	WNF-095	Quentin_WT						28	31	31	25			
2011	WNF-096	Rebel_WT					7	30	31	31	27			
2011	WNF-097	Ridge_WT					7	30	31	13				
2011	WNF-098	Roaring_mouth_WT					8	30	31	31	26			
2011	WNF-099	SalmonCreek_Mouth_LTWT							10	31	12			
2011	WNF-102	Separation_mouth_WT						27	31	31	25			
2011	WNF-104	SFMckenzie_below_RoaringR_WT					6	30	31	31	27			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	WNF-105	SFMcKenzie_Rd1927_WT					6	30	31	31	27			
2011	WNF-106	SFMcKenzie_Rd1980_WT					7	30	31	31	27			
2011	WNF-107	SFMcKenzie_Wilderness_WT					8	30	31	31	26			
2011	WNF-109	Simmonds_WT						29	31	31	25			
2011	WNF-112	Smith_AbvSmithRes_WT						30	31	31	20			
2011	WNF-113	Smith_AbvTrailBridgeRes_WT						30	31	31	20			
2011	WNF-120	Starr_mouth_WT					7	30	31	31	27			
2011	WNF-121	Tidbits_WT						28	31	31	25			
2011	WNF-122	TimberCreek_LTWT							10	31	11			
2011	WNF-127	Walker_WT					2	30	31	2				
2011	WNF-128	WinberryCreek_Mouth_LTWT							10	31	11			
2011	WNF-129	Wolf_WT						28	31	31	25			
2012	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2012	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14150800	Winberry Creek Near Lowell,OR	31	29	31	14	16	30	31	31	30	31	30	31
2012	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	23		20	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	24	30	31	30	31
2012	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14161500	Lookout Creek Near Blue River, OR				26	31	30	31	31	30	31	30	31
2012	SNF-040	2120					1	30	31	31	30	31		
2012	SNF-041	2121					1	30	31	31	30	31		
2012	SNF-042	2122					1	30	31	31	30	31	1	
2012	SNF-043	2123					1	30	31	31	30	31	1	
2012	SNF-044	2124					1	30	31	31	30	31	1	
2012	SNF-045	2125					1	30	31	31	30	31	1	
2012	SNF-046	2126					1	30	31	31	30	31		
2012	SNF-047	2127						30	31	31	30	31		
2012	SNF-048	2128						30	31	31	30	31	1	
2012	SNF-049	2129						30	31	31	30	31	13	
2012	SNF-050	2130						30	31	31	30	31	6	
2012	SNF-054	2134					1	30	31	27				
2012	SNF-055	2136					1	30	31	31	30	31		
2012	SNF-063	2160						25	31	31	30	31		
2012	SNF-067	2164						25	31	31	30	31		
2012	SNF-068	2165						25	31	31	30	31		
2012	SNF-069	2166						30	31	31	30	31	1	
2012	SNF-070	2167						30	31	31	30	31	2	
2012	UmpNF-008	Brice Creek abv Champion Creek WT							28	31	17			
2012	UmpNF-009	Brice Creek abv Crawfish Creek WT							28	31	17			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	UmpNF-010	Brice Creek at the mouth WT						9	31	31	16			
2012	UmpNF-011	Brice Creek below Adams Creek_LTWT						10	31	31	17			
2012	UmpNF-020	China Creek blw Saddle Camp Creek WT						10	31	31	17			
2012	UmpNF-043	Grass Creek at the mouth WT						11	31	31	17			
2012	UmpNF-054	Layng Creek above Prather Creek_LTWT							29	31	16			
2012	UmpNF-056	Layng Creek abv Brice Creek WT						9	31	31	16			
2012	UmpNF-063	Martin Creek at the mouth WT						10	31	31	17			
2012	UmpNF-069	Row River above Sharps Creek LTWT						10	31	31	16			
2012	UmpNF-070	Sharps Creek above Staples Creek LTWT							29	31	17			
2012	UmpNF-071	Sharps Creek abv Martin Creek WT						10	31	31	17			
2012	UmpNF-072	Sharps Creek at the Mouth LTWT						10	31	31	17			
2012	UmpNF-073	Sharps Creek at the Quarry LTWT							29	31	17			
2012	WNF-001	Anderson_WT					15	30	31	31	24			
2012	WNF-017	ChristyCreekBelowLowell_LTWT							14	31	30			
2012	WNF-021	Cone_WT					14	30	31	31	20			
2012	WNF-025	DeerNearMouth_LTWT					14	30	31	31	25			
2012	WNF-032	EighthCreek_Mouth_LTWT							14	31	30			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	WNF-033	ElkNorth_WT					14	30	31	31	20			
2012	WNF-036	FallCreek _above Hehe_LTWT							15	31	24			
2012	WNF-037	FallCreek_1821_LTWT							15	31	25			
2012	WNF-038	FallCreek_1828_LTWT							15	31	24			
2012	WNF-039	FallCreek_AtPortlandCreek_LTWT							15	31	24			
2012	WNF-040	FallCreek_FSboundary_LTWT							15	31	24			
2012	WNF-048	HeHe Creek_Mouth_LTWT							15	31	24			
2012	WNF-049	HillsCreek_USGS_LTWT							14	31	23			
2012	WNF-054	HuckleberryCreek_LTWT							14	31	6			
2012	WNF-056	Indian_WT					19	30	31	31	18			
2012	WNF-062	Lytle_WT					19	30	31	31	19			
2012	WNF-070	MFW_SandPrairie_LTWT							14	31	23			
2012	WNF-077	NF_1919_LTWT							14	31	11			
2012	WNF-079	NF_Confl_LTWT							14	31	30			
2012	WNF-088	Portland Creek_Mouth_LTWT							15	31	24			
2012	WNF-093	QuartzSouth_WT						29	31	31	19			
2012	WNF-099	SalmonCreek_Mouth_LTWT							14	31	23			
2012	WNF-100	SaltCreek_Mouth_LTWT							14	31	10			
2012	WNF-101	Scott_WT					14	30	31	31	24			
2012	WNF-113	Smith_AbvTrailBridgeRes_WT					14	30	31	31	30	4		
2012	WNF-122	TimberCreek_LTWT							15	31	23			
2012	WNF-140	Kink_WT					15	30	31	31	30	3		
2012	WNF-152	Olallie_WT					15	30	31	31	30	4		
2013	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	28	31	29	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	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2013	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	30	30	31	30	19	15	21	31	30	31
2013	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	SNF-072	2170					11	30	31	31	30	20		
2013	UmpNF-008	Brice Creek abv Champion Creek WT							19	31	18			
2013	UmpNF-009	Brice Creek abv Crawfish Creek WT							19	31	18			
2013	UmpNF-010	Brice Creek at the mouth WT							20	31	30	24		
2013	UmpNF-011	Brice Creek below Adams Creek_LTWT						2	31	31	18			
2013	UmpNF-020	China Creek blw Saddle Camp Creek WT							20	31	22			
2013	UmpNF-043	Grass Creek at the mouth WT							19	31	18			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	UmpNF-054	Layng Creek above Prather Creek_LTWT							21	31	30	24		
2013	UmpNF-056	Layng Creek abv Brice Creek WT							20	31	30	24		
2013	UmpNF-063	Martin Creek at the mouth WT							20	31	18			
2013	UmpNF-069	Row River above Sharps Creek LTWT						2	31	31	18			
2013	UmpNF-070	Sharps Creek above Staples Creek LTWT							20	31	18			
2013	UmpNF-071	Sharps Creek abv Martin Creek WT							20	31	18			
2013	UmpNF-072	Sharps Creek at the Mouth LTWT						2	31	31	18			
2013	UmpNF-073	Sharps Creek at the Quarry LTWT						2	31	31	18			
2013	WNF-001	Anderson_WT					10	30	31	31	30	21		
2013	WNF-017	ChristyCreekBelowLowell_LTWT							16	31	15			
2013	WNF-021	Cone_WT					23	30	31	31	30	20		
2013	WNF-025	DeerNearMouth_LTWT					9	30	31	31	30	21		
2013	WNF-032	EighthCreek_Mouth_LTWT							16	31	15			
2013	WNF-036	FallCreek _above Hehe_LTWT							15	31	16			
2013	WNF-037	FallCreek_1821_LTWT							15	31	16			
2013	WNF-038	FallCreek_1828_LTWT							15	31	16			
2013	WNF-040	FallCreek_FSboundary_LTWT							15	31	16			
2013	WNF-049	HillsCreek_USGS_LTWT							16	31	15			
2013	WNF-054	HuckleberryCreek_LTWT							16	31	15			
2013	WNF-056	Indian_WT					8	30	31	31	30	23		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	WNF-062	Lytle_WT					8	30	31	31	30	22		
2013	WNF-068	McKenzieSpawning_WT					9	30	31	31	30	20		
2013	WNF-069	MFW_BelowStaley_LTWT							13	31	22			
2013	WNF-070	MFW_SandPrairie_LTWT							13	31	19			
2013	WNF-077	NF_1919_LTWT							16	31	15			
2013	WNF-078	NF_1925_LTWT							16	31	15			
2013	WNF-079	NF_Confl_LTWT							9	31	15			
2013	WNF-088	Portland Creek_Mouth_LTWT							15	31	16			
2013	WNF-099	SalmonCreek_Mouth_LTWT							16	31	15			
2013	WNF-100	SaltCreek_Mouth_LTWT							16	31	15			
2013	WNF-101	Scott_WT					10	30	31	31	30	19		
2013	WNF-112	Smith_AbvSmithRes_WT					7	30	27	31	30	23		
2013	WNF-113	Smith_AbvTrailBridgeRes_WT					9	30	31	31	30	27		
2013	WNF-114	Smith_BlwSmithRes_WT					9	30	31	31	30	25		
2013	WNF-122	TimberCreek_LTWT							15	31	16			
2013	WNF-128	WinberryCreek_Mouth_LTWT							15	31	16			
2013	WNF-152	Olallie_WT					10	30	31	31	30	22		
2014	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	29	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	29	2	21	31	30	31
2014	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14161500	Lookout Creek Near Blue River, OR	30	28	31	30	31	30	31	31	30	31	30	31
2014	UmpNF-008	Brice Creek abv Champion Creek WT						16	31	31	21			
2014	UmpNF-009	Brice Creek abv Crawfish Creek WT						16	31	31	21			
2014	UmpNF-010	Brice Creek at the mouth WT						16	31	31	21			
2014	UmpNF-011	Brice Creek below Adams Creek_LTWT						17	31	31	21			
2014	UmpNF-020	China Creek blw Saddle Camp Creek WT						17	31	31	21			
2014	UmpNF-043	Grass Creek at the mouth WT						16	31	31	21			
2014	UmpNF-054	Layng Creek above Prather Creek_LTWT						17	31	31	21			
2014	UmpNF-056	Layng Creek abv Brice Creek WT						16	31	31	21			
2014	UmpNF-063	Martin Creek at the mouth WT						17	31	31	21			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	UmpNF-069	Row River above Sharps Creek LTWT						17	31	31	21			
2014	UmpNF-070	Sharps Creek above Staples Creek LTWT						17	31	31	21			
2014	UmpNF-071	Sharps Creek abv Martin Creek WT						17	31	31	21			
2014	UmpNF-072	Sharps Creek at the Mouth LTWT						17	31	31	21			
2014	UmpNF-073	Sharps Creek at the Quarry LTWT						17	31	31	21			
2014	WNF-009	Boulder_WT					28	30	31	31	27			
2014	WNF-021	Cone_WT					28	30	31	31	25			
2014	WNF-023	Cougar_WT							13	31	21			
2014	WNF-026	DeerPowerlines_LTWT					28	30	31	31	26			
2014	WNF-033	ElkNorth_WT					28	30	31	31	25			
2014	WNF-036	FallCreek _above Hehe_LTWT							29	31	30	10		
2014	WNF-037	FallCreek_1821_LTWT							22	31	30			
2014	WNF-040	FallCreek_FSboundary_LTWT							29	31	30	10		
2014	WNF-048	HeHe Creek_Mouth_LTWT							29	31	30	25		
2014	WNF-056	Indian_WT					24	30	31	31	25			
2014	WNF-062	Lytle_WT					24	30	31	31	26			
2014	WNF-068	McKenzieSpawning_WT					28	30	31	31	26			
2014	WNF-087	PineCreek_LTWT							9	31	30	2		
2014	WNF-099	SalmonCreek_Mouth_LTWT						5	31	31	30	6		
2014	WNF-112	Smith_AbvSmithRes_WT					29	30	31	31	28			
2014	WNF-113	Smith_AbvTrailBridgeRes_WT					29	30	31	31	24			
2014	WNF-114	Smith_BlwSmithRes_WT					29	30	31	31	24			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	WNF-122	TimberCreek_LTWT							22	31	30	27		
2014	WNF-128	WinberryCreek_Mouth_LTWT							29	31	30	27		
2014	WNF-130	YoungsCreek_LTWT							9	31	30	2		
2014	WNF-137	CoalCreekAtMouth_LTWT							9	31	30	2		
2014	WNF-140	Kink_WT					28	30	31	31	27			
2015	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	18	
2015	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2015	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	24	4	9	24	31	30	31
2015	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	UmpNF-008	Brice Creek abv Champion Creek WT						14	31	31	21			
2015	UmpNF-009	Brice Creek abv Crawfish Creek WT						14	31	31	21			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	UmpNF-010	Brice Creek at the mouth WT						14	31	31	20			
2015	UmpNF-011	Brice Creek below Adams Creek_LTWT						15	31	31	21			
2015	UmpNF-020	China Creek blw Saddle Camp Creek WT						19	31	31	21			
2015	UmpNF-043	Grass Creek at the mouth WT						14	31	31	21			
2015	UmpNF-054	Layng Creek above Prather Creek_LTWT						15	31	31	20			
2015	UmpNF-056	Layng Creek abv Brice Creek WT						14	31	31	20			
2015	UmpNF-063	Martin Creek at the mouth WT						19	31	31	21			
2015	UmpNF-069	Row River above Sharps Creek LTWT						19	31	31	21			
2015	UmpNF-070	Sharps Creek above Staples Creek LTWT						19	31	31	21			
2015	UmpNF-071	Sharps Creek abv Martin Creek WT						19	31	31	21			
2015	UmpNF-072	Sharps Creek at the Mouth LTWT							17	31	21			
2015	UmpNF-073	Sharps Creek at the Quarry LTWT						19	31	31	21			
2015	WNF-012	Budworm_WT						7	31	31	30	14		
2015	WNF-024	DeerAbvBudworm_WT						7	31	31	30	16		
2015	WNF-025	DeerNearMouth_LTWT						5	31	31	30	17		
2015	WNF-037	FallCreek_1821_LTWT							16	30				
2015	WNF-038	FallCreek_1828_LTWT							3	31				

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	WNF-040	FallCreek_FSboundary_LTWT							17	31	2			
2015	WNF-070	MFW_SandPrairie_LTWT							4	31	8			
2015	WNF-087	PineCreek_LTWT							11	31	15			
2015	WNF-113	Smith_AbvTrailBridgeRes_WT						4	31	31	30	19		
2015	WNF-114	Smith_BlwSmithRes_WT						3	31	31	30	16		
2015	WNF-122	TimberCreek_LTWT							17	31	2			
2015	WNF-128	WinberryCreek_Mouth_LTWT							14	31	7			
2015	WNF-130	YoungsCreek_LTWT							11	31	14			
2015	WNF-137	CoalCreekAtMouth_LTWT							31	31	15			
2016	14144800	Middle Fork Willamette River Nr Oakridge, OR			3	30	31	30	31	31	30	18	15	15
2016	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	26
2016	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2016	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14150800	Winberry Creek Near Lowell,OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	19	21	30	31	30	31
2016	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR									29	31	30	31
2016	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow 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
2016	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14161500	Lookout Creek Near Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	UmpNF-008	Brice Creek abv Champion Creek WT						15	31	31	14			
2016	UmpNF-009	Brice Creek abv Crawfish Creek WT						14	31	31	18			
2016	UmpNF-010	Brice Creek at the mouth WT						14	31	31	14			
2016	UmpNF-011	Brice Creek below Adams Creek_LTWT						14	31	31	14			
2016	UmpNF-020	China Creek blw Saddle Camp Creek WT						16	31	31	30	3		
2016	UmpNF-043	Grass Creek at the mouth WT						14	31	31	14			
2016	UmpNF-054	Layng Creek above Prather Creek_LTWT						14	31	31	14			
2016	UmpNF-055	Layng Creek above Silverstairs Creek WT						16	31	31	18			
2016	UmpNF-056	Layng Creek abv Brice Creek WT						14	31	31	14			
2016	UmpNF-057	Layng Creek abv Dinner Creek WT						16	31	31	14			
2016	UmpNF-058	Layng Creek abv Harvey Creek WT						16	31	31	14			
2016	UmpNF-059	Layng Creek abv Herman Creek WT						16	31	31	14			
2016	UmpNF-063	Martin Creek at the mouth WT						16	31	31	30	3		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	UmpNF-069	Row River above Sharps Creek LTWT						16	31	31	30	3		
2016	UmpNF-071	Sharps Creek abv Martin Creek WT						16	31	31	30	3		
2016	UmpNF-072	Sharps Creek at the Mouth LTWT						16	31	31	30	3		
2016	UmpNF-073	Sharps Creek at the Quarry LTWT						16	31	31	30	3		
2016	WNF-001	Anderson_WT						24	31	31	30	3		
2016	WNF-002	AndyCreekAtMouth_Temp						11	31	31	20			
2016	WNF-009	Boulder_WT						24	31	31	6			
2016	WNF-012	Budworm_WT						24	31	31	30	3		
2016	WNF-018	ClarkCreek_LTWT						29	31	31	18			
2016	WNF-021	Cone_WT						27	31	31	6			
2016	WNF-024	DeerAbvBudworm_WT						24	31	31	30	3		
2016	WNF-033	ElkNorth_WT						27	31	31	6			
2016	WNF-035	ElkSouthWilderness_WT						26	31	31	5			
2016	WNF-036	FallCreek _above Hehe_LTWT						19	31	31	20			
2016	WNF-038	FallCreek_1828_LTWT						20	31	31	20			
2016	WNF-039	FallCreek_AtPortlandCreek_LTWT						15	31	31	20			
2016	WNF-040	FallCreek_FSboundary_LTWT						8	31	31	20			
2016	WNF-041	FallCreekTrib_1816-178_LTWT						8	31	31	20			
2016	WNF-043	FrenchPete_WT						26	31	30	5			
2016	WNF-048	HeHe Creek_Mouth_LTWT						8	31	31	20			
2016	WNF-053	HorseWilderness_WT						27	31	31	30	4		
2016	WNF-056	Indian_WT						23	31	31	27			
2016	WNF-058	KinkCreekHeadwaters_WT						29	31	31	30	3		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	WNF-062	Lytle_WT						23	31	31	27			
2016	WNF-066	McKenzieAbvTrailbridge_LTWT						29	31	31	30	3		
2016	WNF-067	McKenzieBlwTrailbridge_LTWT						24	31	31	30	3		
2016	WNF-070	MFW_SandPrairie_LTWT						8	31	31	19			
2016	WNF-087	PineCreek_LTWT						8	31	31	19			
2016	WNF-093	QuartzSouth_WT						23	31	31	27			
2016	WNF-096	Rebel_WT						26	31	31	5			
2016	WNF-098	Roaring_mouth_WT						26	31	31	5			
2016	WNF-099	SalmonCreek_Mouth_LTWT						20	31	31	27			
2016	WNF-101	Scott_WT						24	31	31	6			
2016	WNF-102	Separation_mouth_WT						27	31	31	30	4		
2016	WNF-107	SFMcKenzie_Wilderness_WT						26	31	31	5			
2016	WNF-113	Smith_AbvTrailBridgeRes_WT						29	31	31	30	3		
2016	WNF-114	Smith_BlwSmithRes_WT						29	31	31	30	3		
2016	WNF-122	TimberCreek_LTWT						16	31	31	17			
2016	WNF-127	Walker_WT						26	31	31	5			
2016	WNF-128	WinberryCreek_Mouth_LTWT						8	31	31	30	19		
2016	WNF-137	CoalCreekAtMouth_LTWT						8	31	31	26			
2017	11118-ORDEQ	Teal Creek at Gardner Road (Falls City)						27	31	31	27			
2017	14144800	Middle Fork Willamette River Nr Oakridge, OR			31	30	31	30	31	15		27	29	31
2017	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	27	27	30	30	31	30	31	31	30	31	30	31
2017	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	19	24	31	30	31

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2017	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	28	31	30	24	30	31	31	30	31	30	31
2017	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14154500	Row River Above Pitcher Creek, Near Dorena, OR	30	28	31	30	31	30	31	31	30	31	30	31
2017	14158500	Mckenzie River At Outlet Of Clear Lake, OR							13	31	30	31	30	31
2017	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR							18	31	30	31	30	31
2017	14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs								22	30	31	30	31
2017	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR							19	31	30	31	30	31
2017	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	26
2017	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	28	28
2017	14164550	Camp Crk At Camp Crk Rd Bridge, Nr Springfield, OR							20	31	30	31	30	31
2017	14164700	Cedar Creek At Springfield, OR							21	31	30	31	30	31
2017	25459-ORDEQ	Brush Creek at Courtney Creek Road							6	31	30	16		
2017	25481-ORDEQ	Pedee Creek at Kings Highway						24	31	31	30	8		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	25482-ORDEQ	Ritner Creek at Ritner Wayside						28	31	31	30			
2017	25484-ORDEQ	Maxfield Creek at Hwy 223						30	31	31	30			
2017	25485-ORDEQ	Price Creek at Hwy 223						26	31	31	30	8		
2017	32653-ORDEQ	Turnbow Creek at High Pass Road, RM 0.88 (Owens Creek, Bear Creek, Long Tom R., Upper Willamette)					16	30	24	31	30	26		
2017	33915-ORDEQ	Maxfield Creek at River Mile 2.6 at Maxfield Creek Road (Luckiamute, Willamette)						30	31	31	30	10		
2017	37300-ORDEQ	Gettings Cr at Sears Rd								23	30	31	30	17
2017	39446-ORDEQ	Flat Cr US Junction City outfall (RM 9.5)					9					1	13	
2017	39447-ORDEQ	Flat Cr at Ferguson Rd (RM 6.7)					9					1	13	
2017	39448-ORDEQ	Flat Cr at 99W (RM 5.2)					9					1	13	
2017	39449-ORDEQ	Flat Cr at Old River Rd (RM 2.5)					9					1	13	
2017	39450-ORDEQ	Flat Cr at Cox Butte Rd (RM 8.0)										1	13	
2017	40071-ORDEQ	Brush Creek at Brush Creek Rd bridge							6	31	30	16		
2017	40072-ORDEQ	Brush Creek 0.75 MI ABV Brush Creek Rd bridge							6	24				
2017	40073-ORDEQ	Ferguson Creek 0.1 miles upstream of Eber Creek confluence					16	30	22	31	30	23		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	40087-ORDEQ	Ferguson Creek SFK at RM 0.48					16	30	22	31	30	23		
2017	40088-ORDEQ	Ferguson Ck 270 Meters DS SFK Mouth					16	30	22	31	30	23		
2017	40089-ORDEQ	Ferguson CK 0.1 Miles DS of Territorial RD					16	30	22	31	30	23		
2017	40090-ORDEQ	Turnbow Creek 0.6 miles US of Owens Creek confluence					16	30	24	31	30	26		
2017	40091-ORDEQ	Owen’s CK 0.3 miles US of Turnbow CK confluence					16	30	24	31	30	26		
2017	40092-ORDEQ	Owens Ck US of Bear CK confluence					16	30	24	1	14	26		
2017	40094-ORDEQ	Gettings CK 60 yds DS of crossing								23	30	31	30	17
2017	40371-ORDEQ	Gettings Creek North Fork DS of Witcher Gateway Rd								23	30	31	7	
2017	40513-ORDEQ	Plunkett Creek just upstream of Highway 223						26	31	31	27			
2017	40514-ORDEQ	Maxfield Creek about 1000 ft upstream of Highway 223						30	31	31	30	10		
2017	40515-ORDEQ	Maxfield Creek near Pit Rd.						30	31	31	30	8		
2017	40517-ORDEQ	South Fork Pedee Creek about 900 ft upstream of Pedee Creek Road						27	31	31	27			
2017	40522-ORDEQ	Woods Creek just upstream of Price Creek Road						3	31	31	30	8		
2017	40523-ORDEQ	North Fork Pedee Creek just upstream of Pedee Creek Road						27	31	31	27			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	40524-ORDEQ	Grant Creek at Frost Road culvert						27	31	31	27			
2017	40525-ORDEQ	Price Creek just downstream of 90-degree bend in Pit Road						26	31	31	30	8		
2017	40526-ORDEQ	Teal Creek at Frost Road bridge						27	31	31	27			
2017	40527-ORDEQ	Ritner Creek about 1000 ft upstream of Highway 223						28	31	31	30			
2017	40528-ORDEQ	Ritner Creek at upstream end of county park						28	31	31	30			
2017	40529-ORDEQ	Ritner Creek at Gage Road culvert						28	31	29	30			
2017	40530-ORDEQ	Maxfield Creek at most downstream bridge on Maxfield Creek Rd.						28	31	31	30	10		
2017	40531-ORDEQ	Maxfield Creek just upstream of Luckiamute R						30	31	31	30	10		
2017	UmpNF-008	Brice Creek abv Champion Creek WT						24	31	31	25			
2017	UmpNF-009	Brice Creek abv Crawfish Creek WT						24	31	31	25			
2017	UmpNF-010	Brice Creek at the mouth WT						23	31	31	25			
2017	UmpNF-011	Brice Creek below Adams Creek_LTWT						23	31	31	25			
2017	UmpNF-020	China Creek blw Saddle Camp Creek WT						24	31	31	26			
2017	UmpNF-043	Grass Creek at the mouth WT						24	31	31	25			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	UmpNF-054	Layng Creek above Prather Creek_LTWT						23	31	31	20			
2017	UmpNF-055	Layng Creek above Silverstairs Creek WT						23	31	26				
2017	UmpNF-056	Layng Creek abv Brice Creek WT						23	31	31	25			
2017	UmpNF-057	Layng Creek abv Dinner Creek WT						23	31	31	25			
2017	UmpNF-058	Layng Creek abv Harvey Creek WT						23	31	31	20			
2017	UmpNF-059	Layng Creek abv Herman Creek WT						23	31	31	20			
2017	UmpNF-063	Martin Creek at the mouth WT						24	31	31	26			
2017	UmpNF-069	Row River above Sharps Creek LTWT						24	31	31	26			
2017	UmpNF-070	Sharps Creek above Staples Creek LTWT						24	31	31	26			
2017	UmpNF-071	Sharps Creek abv Martin Creek WT						24	31	31	26			
2017	UmpNF-072	Sharps Creek at the Mouth LTWT						24	31	31	26			
2017	UmpNF-073	Sharps Creek at the Quarry LTWT						23	31	31	26			
2017	WNF-002	AndyCreekAtMouth_Temp						15	31	31	30	15		
2017	WNF-009	Boulder_WT						23	31	31	27			
2017	WNF-012	Budworm_WT						15	31	31	30	25		
2017	WNF-017	ChristyCreekBelowLowell_LTWT						15	31	31	30	3		
2017	WNF-018	ClarkCreek_LTWT						15	31	31	30	16		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	WNF-019	CoalCreekAtMFTrailBridge_LTWT							20	31	30	16		
2017	WNF-020	CoalCreekBelow200Bridge_LTWT						15	31	31	30	9		
2017	WNF-021	Cone_WT						10	31	31	30	2		
2017	WNF-024	DeerAbvBudworm_WT						15	31	31	30	3		
2017	WNF-025	DeerNearMouth_LTWT						15	31	31	30	31		
2017	WNF-026	DeerPowerlines_LTWT						15	31	31	30	31		
2017	WNF-030	EchoCreek_LTWT							20	31	30	9		
2017	WNF-032	EighthCreek_Mouth_LTWT						15	31	31	30	3		
2017	WNF-033	ElkNorth_WT						10	31	31	30	2		
2017	WNF-036	FallCreek _above Hehe_LTWT						15	31	31	30	15		
2017	WNF-037	FallCreek_1821_LTWT						15	31	31	30	17		
2017	WNF-038	FallCreek_1828_LTWT						15	31	31	30	15		
2017	WNF-039	FallCreek_AtPortlandCreek_LTWT						15	31	31	30	15		
2017	WNF-040	FallCreek_FSboundary_LTWT						10	31	31	30	12		
2017	WNF-041	FallCreekTrib_1816-178_LTWT						15	31	31	30	17		
2017	WNF-048	HeHe Creek_Mouth_LTWT						15	31	31	30	15		
2017	WNF-049	HillsCreek_USGS_LTWT							20	31	30	3		
2017	WNF-054	HuckleberryCreek_LTWT						15	31	31	30	3		
2017	WNF-056	Indian_WT						10	31	31	30	4		
2017	WNF-060	LittleFallCreekDownstream_LTWT						10	31	31	30	12		
2017	WNF-061	LittleFallCreekUpstream_LTWT						9	31	31	30	12		
2017	WNF-062	Lytle_WT						10	31	31	30	3		
2017	WNF-063	MacCreek_LTWT						15	31	31	30	4		
2017	WNF-065	MapleCreek_LTWT						15	31	31	30	9		
2017	WNF-066	McKenzieAbvTrailbridge_LTWT						23	31	31	27			
2017	WNF-067	McKenzieBlwTrailbridge_LTWT						23	31	31	27			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	WNF-069	MFW_BelowStaley_LTWT							24	31	30	12		
2017	WNF-070	MFW_SandPrairie_LTWT							20	31	30	3		
2017	WNF-072	MiddleForkAtPaddysValley_LTWT						9	31	31	30	4		
2017	WNF-078	NF_1925_LTWT						9	31	31	30	3		
2017	WNF-087	PineCreek_LTWT						15	31	31	30	4		
2017	WNF-088	Portland Creek_Mouth_LTWT						15	31	31	30	15		
2017	WNF-093	QuartzSouth_WT						10	31	31	30	4		
2017	WNF-099	SalmonCreek_Mouth_LTWT							20	31	30	3		
2017	WNF-100	SaltCreek_Mouth_LTWT							20	31	30	3		
2017	WNF-101	Scott_WT						23	31	31	27			
2017	WNF-110	SimpsonCreek_LTWT						15	31	31	30	4		
2017	WNF-113	Smith_AbvTrailBridgeRes_WT						23	31	31	30	25		
2017	WNF-114	Smith_BlwSmithRes_WT						21	31	31	30	24		
2017	WNF-118	StaleyCreekDownstream_LTWT							24	31	30	12		
2017	WNF-119	StaleyCreekUpstream_LTWT							24	31	30	9		
2017	WNF-122	TimberCreek_LTWT						15	31	31	30	16		
2017	WNF-124	TumblebugCreek_LTWT						9	31	31	30	4		
2017	WNF-128	WinberryCreek_Mouth_LTWT						10	31	31	30	17		
2017	WNF-130	YoungsCreek_LTWT						15	31	31	30	4		
2017	WNF-140	Kink_WT						23	31	31	30	31		
2017	WNF-152	Olallie_WT						23	31	31	30	31		
2017	WNF-160	Sweetwater_WT						23	31	31	30	24		
2018	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, 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	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	23	30	31
2018	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	28	31
2018	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	28
2018	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	26	30	31	30	31	31	30	31	30	31
2018	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	26	28	31	30	31	30	31	31	30	31	30	31
2018	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	27	31	30	31
2018	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14164550	Camp Crk At Camp Crk Rd Bridge, Nr Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14164700	Cedar Creek At Springfield, 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	25459-ORDEQ	Brush Creek at Courtney Creek Road					9	30	31	31	30	29		
2018	32653-ORDEQ	Turnbow Creek at High Pass Road, RM 0.88 (Owens Creek, Bear Creek, Long Tom R., Upper Willamette)				15	31	30	31	31	30	9		
2018	40071-ORDEQ	Brush Creek at Brush Creek Rd bridge						22	31	15	30	29		
2018	40072-ORDEQ	Brush Creek 0.75 MI ABV Brush Creek Rd bridge					9	30	30	31	30	30		
2018	40073-ORDEQ	Ferguson Creek 0.1 miles upstream of Eber Creek confluence				15	31	30	31	31	30	25		
2018	40087-ORDEQ	Ferguson Creek SFK at RM 0.48				15	31	30	31	31	30	25		
2018	40088-ORDEQ	Ferguson Ck 270 Meters DS SFK Mouth				15	31	30	31	31	30	25		
2018	40089-ORDEQ	Ferguson CK 0.1 Miles DS of Territorial RD				15	31	30	31	31	30	25		
2018	40090-ORDEQ	Turnbow Creek 0.6 miles US of Owens Creek confluence				15	31	30	31	31	30	9		
2018	40091-ORDEQ	Owen’s CK 0.3 miles US of Turnbow CK confluence				15	31	30	31	31	30	9		
2018	40092-ORDEQ	Owens Ck US of Bear CK confluence				15	31	30	31	31	30	9		
2018	40109-ORDEQ	Unnamed stream at RM 0.41					10	30	31	31	30	29		
2018	40371-ORDEQ	Gettings Creek North Fork DS of Witcher Gateway Rd					10	30	31	31	30	29		
2018	UmpNF-008	Brice Creek abv Champion Creek WT						28	31	31	24			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	UmpNF-009	Brice Creek abv Crawfish Creek WT						28	31	31	24			
2018	UmpNF-010	Brice Creek at the mouth WT						28	31	31	24			
2018	UmpNF-011	Brice Creek below Adams Creek_LTWT						28	31	31	24			
2018	UmpNF-020	China Creek blw Saddle Camp Creek WT						15	31	31	24			
2018	UmpNF-043	Grass Creek at the mouth WT						28	31	31	24			
2018	UmpNF-054	Layng Creek above Prather Creek_LTWT						17	31	31	30	1		
2018	UmpNF-055	Layng Creek above Silverstairs Creek WT						10	31	31	30	2		
2018	UmpNF-058	Layng Creek abv Harvey Creek WT						17	31	31	30	1		
2018	UmpNF-059	Layng Creek abv Herman Creek WT						17	31	31	30	1		
2018	UmpNF-063	Martin Creek at the mouth WT						15	31	31	24			
2018	UmpNF-069	Row River above Sharps Creek LTWT						15	31	31	24			
2018	UmpNF-070	Sharps Creek above Staples Creek LTWT						15	31	31	24			
2018	UmpNF-071	Sharps Creek abv Martin Creek WT						15	31	31	24			
2018	UmpNF-072	Sharps Creek at the Mouth LTWT						15	31	31	24			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	UmpNF-086	Alex Creek at Road 1790 WT						17	31	31	30	1		
2018	UmpNF-089	Junetta Creek WT						17	31	31	30	2		
2018	UmpNF-091	Patterson Creek at mouth WT						17	31	31	30	1		
2018	WNF-001	Anderson_WT					9	30	31	31	30	24		
2018	WNF-002	AndyCreekAtMouth_Temp						15	31	31	12			
2018	WNF-009	Boulder_WT					9	30	31	31	30	24		
2018	WNF-012	Budworm_WT					6	30	31	31	30	24		
2018	WNF-018	ClarkCreek_LTWT						15	31	31	13			
2018	WNF-020	CoalCreekBelow200Bridge_LTWT						15	31	31	26			
2018	WNF-021	Cone_WT					7	30	31	31	30	22		
2018	WNF-024	DeerAbvBudworm_WT					6	30	31	31	30	24		
2018	WNF-026	DeerPowerlines_LTWT					6	30	31	31	30	7		
2018	WNF-033	ElkNorth_WT					7	30	31	31	30	22		
2018	WNF-036	FallCreek _above Hehe_LTWT						15	31	31	11			
2018	WNF-037	FallCreek_1821_LTWT						15	31	31	13			
2018	WNF-038	FallCreek_1828_LTWT						15	31	31	11			
2018	WNF-039	FallCreek_AtPortlandCreek_LTWT						15	31	31	11			
2018	WNF-040	FallCreek_FSboundary_LTWT						15	31	31	19			
2018	WNF-041	FallCreekTrib_1816-178_LTWT						15	31	31	13			
2018	WNF-048	HeHe Creek_Mouth_LTWT						15	31	31	10			
2018	WNF-056	Indian_WT					7	30	31	31	30	6		
2018	WNF-062	Lytle_WT					7	30	31	31	30	7		
2018	WNF-066	McKenzieAbvTrailbridge_LTWT					9	30	31	31	30	7		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	WNF-067	McKenzieBlwTrailbridge_LTWT					9	29	31	31	30	20		
2018	WNF-087	PineCreek_LTWT						15	31	31	30			
2018	WNF-088	Portland Creek_Mouth_LTWT						15	31	31	11			
2018	WNF-093	QuartzSouth_WT					7	30	31	31	30	8		
2018	WNF-099	SalmonCreek_Mouth_LTWT						15	31	31	24			
2018	WNF-101	Scott_WT					9	30	31	31	30	24		
2018	WNF-113	Smith_AbvTrailBridgeRes_WT					5	30	31	31	30	23		
2018	WNF-122	TimberCreek_LTWT						15	31	31	13			
2018	WNF-128	WinberryCreek_Mouth_LTWT						15	31	31	19			
2018	WNF-133	BuckCreek_LTWT							28	31	25			
2018	WNF-135	Calapooia River							25	31	20			
2018	WNF-160	Sweetwater_WT					8	30	31	31	30	22		
2019	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	29	31	30	31	31	30	31	30	31
2019	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	29	12	31	30	31
2019	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	27	31	19	31	30	31	31	30	31	29	31
2019	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	28	31	29	30	30	31	31	30	31	30	31
2019	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14152500	Coast Fork Willamette At London, OR									26	31	30	31
2019	14154500	Row River Above Pitcher Creek, Near Dorena, 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
2019	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	30	30	31
2019	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	29	28	28	30	31	30	31	31	30	31	27	31
2019	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14164550	Camp Crk At Camp Crk Rd Bridge, Nr Springfield, OR	31	28	31	30	31	30	31	31	30	27	30	31
2019	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	25459-ORDEQ	Brush Creek at Courtney Creek Road					1	30	31	31	30	8		
2019	32653-ORDEQ	Turnbow Creek at High Pass Road, RM 0.88 (Owens Creek, Bear Creek, Long Tom R., Upper Willamette)					15	30	31	27	30	30		
2019	37300-ORDEQ	Gettings Cr at Sears Rd					1	30	6	1	30	31	21	
2019	40071-ORDEQ	Brush Creek at Brush Creek Rd bridge					1	30	31	31	30	8		
2019	40072-ORDEQ	Brush Creek 0.75 MI ABV Brush Creek Rd bridge						30	31	31	30	8		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	40073-ORDEQ	Ferguson Creek 0.1 miles upstream of Eber Creek confluence					15	30	31	31	30	30		
2019	40087-ORDEQ	Ferguson Creek SFK at RM 0.48					15	30	31	31	30	30		
2019	40088-ORDEQ	Ferguson Ck 270 Meters DS SFK Mouth					15	30	31	31	30	30		
2019	40089-ORDEQ	Ferguson CK 0.1 Miles DS of Territorial RD					15	30	31	31	30	30		
2019	40090-ORDEQ	Turnbow Creek 0.6 miles US of Owens Creek confluence					15	30	31	31	30	30		
2019	40091-ORDEQ	Owen’s CK 0.3 miles US of Turnbow CK confluence					15	30	31	31	30	30		
2019	40092-ORDEQ	Owens Ck US of Bear CK confluence					15	30	31	31	30	30		
2019	40094-ORDEQ	Gettings CK 60 yds DS of crossing					1	9			3	31	14	
2019	40109-ORDEQ	Unnamed stream at RM 0.41					1	30	31	31	30	31	21	
2019	40371-ORDEQ	Gettings Creek North Fork DS of Witcher Gateway Rd								1	30	31	21	
2019	UmpNF-008	Brice Creek abv Champion Creek WT						30	31	31	25			
2019	UmpNF-009	Brice Creek abv Crawfish Creek WT						30	31	31	25			
2019	UmpNF-010	Brice Creek at the mouth WT						30	31	31	25			
2019	UmpNF-011	Brice Creek below Adams Creek_LTWT						30	31	31	25			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	UmpNF-020	China Creek blw Saddle Camp Creek WT					6	30	31	31	23			
2019	UmpNF-043	Grass Creek at the mouth WT						30	31	31	25			
2019	UmpNF-054	Layng Creek above Prather Creek_LTWT						30	31	31	25			
2019	UmpNF-055	Layng Creek above Silverstairs Creek WT					1	30	31	31	24			
2019	UmpNF-056	Layng Creek abv Brice Creek WT						30	31	31	25			
2019	UmpNF-058	Layng Creek abv Harvey Creek WT					1	30	31	31	24			
2019	UmpNF-059	Layng Creek abv Herman Creek WT					1	30	31	31	24			
2019	UmpNF-063	Martin Creek at the mouth WT					6	30	31	31	23			
2019	UmpNF-069	Row River above Sharps Creek LTWT					6	30	31	31	23			
2019	UmpNF-070	Sharps Creek above Staples Creek LTWT					6	30	31	31	23			
2019	UmpNF-071	Sharps Creek abv Martin Creek WT					6	30	31	31	23			
2019	UmpNF-072	Sharps Creek at the Mouth LTWT					6	30	31	31	23			
2019	UmpNF-086	Alex Creek at Road 1790 WT					1	30	31	31	24			
2019	UmpNF-088	Herman Creek at mouth WT					1	30	31	31	24			
2019	WNF-001	Anderson_WT					10	30	31	31	30	14		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	WNF-002	AndyCreekAtMouth_Temp							28	31	30	6		
2019	WNF-009	Boulder_WT					10	30	31	31	30	14		
2019	WNF-012	Budworm_WT							20	31	30	25		
2019	WNF-018	ClarkCreek_LTWT							29	31	30	6		
2019	WNF-020	CoalCreekBelow200Bridge_LTWT							23	31	30	8		
2019	WNF-021	Cone_WT							31	31	30	2		
2019	WNF-024	DeerAbvBudworm_WT							20	31	30	26		
2019	WNF-025	DeerNearMouth_LTWT							20	31	30	1		
2019	WNF-026	DeerPowerlines_LTWT							20	31	30	28		
2019	WNF-039	FallCreek_AtPortlandCreek_LTWT							28	31	30	7		
2019	WNF-040	FallCreek_FSboundary_LTWT							29	31	30	6		
2019	WNF-041	FallCreekTrib_1816-178_LTWT							29	31	30	6		
2019	WNF-048	HeHe Creek_Mouth_LTWT							28	31	30	7		
2019	WNF-056	Indian_WT						4	31	31	30	2		
2019	WNF-062	Lytle_WT						3	31	31	30	2		
2019	WNF-066	McKenzieAbvTrailbridge_LTWT						1	31	31	30			
2019	WNF-067	McKenzieBlwTrailbridge_LTWT						1	31	31	30			
2019	WNF-070	MFW_SandPrairie_LTWT						17	31	31	30	8		
2019	WNF-087	PineCreek_LTWT							23	31	30	7		
2019	WNF-088	Portland Creek_Mouth_LTWT							28	31	30	7		
2019	WNF-093	QuartzSouth_WT						3	31	31	30	9		
2019	WNF-099	SalmonCreek_Mouth_LTWT						12	31	31	30	8		
2019	WNF-101	Scott_WT					10	30	31	31	30	14		
2019	WNF-113	Smith_AbvTrailBridgeRes_WT							25	31	17			
2019	WNF-114	Smith_BlwSmithRes_WT							27	31	30			
2019	WNF-122	TimberCreek_LTWT							29	31	30	7		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	WNF-128	WinberryCreek_Mouth_LTWT							23	31	30	15		
2019	WNF-130	YoungsCreek_LTWT							23	31	30	8		
2019	WNF-133	BuckCreek_LTWT							23	31	30	8		
2019	WNF-137	CoalCreekAtMouth_LTWT							22	31	30	7		
2019	WNF-140	Kink_WT						1	31	31	30	7		
2019	WNF-152	Olallie_WT						4	31	31	30	7		
2019	WNF-158	SalmonBelowBlack_LTWT							21	31	30	9		
2019	WNF-160	Sweetwater_WT						4	31	31	30	7		
2020	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	29	31	27		28	31	31	30	31	30	31
2020	14144900	Hills Cr Ab Hills Cr Res, Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2020	14150290	Fall Creek Above North Fork, Near Lowell, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14150800	Winberry Creek Near Lowell,OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14152500	Coast Fork Willamette At London, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, 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
2020	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	29	31	30	29	29	31	31	30	19	30	31
2020	14161500	Lookout Creek Near Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14164550	Camp Crk At Camp Crk Rd Bridge, Nr Springfield, OR	31	29	31	30	31	30	31	31	15	8	28	31
2020	14164700	Cedar Creek At Springfield, OR	31	29	31	30	31	30	27	30	30	31	30	31
2020	25459-ORDEQ	Brush Creek at Courtney Creek Road						15	31	31	30	31	2	
2020	32653-ORDEQ	Turnbow Creek at High Pass Road, RM 0.88 (Owens Creek, Bear Creek, Long Tom R., Upper Willamette)					2	30	31	31	30	28		
2020	40071-ORDEQ	Brush Creek at Brush Creek Rd bridge						15	31	31	30	31	2	
2020	40072-ORDEQ	Brush Creek 0.75 MI ABV Brush Creek Rd bridge						15	31	31	30	31	2	
2020	40073-ORDEQ	Ferguson Creek 0.1 miles upstream of Eber Creek confluence					2	30	31	31	30	28		
2020	40087-ORDEQ	Ferguson Creek SFK at RM 0.48					2	30	31	31	30	28		
2020	40088-ORDEQ	Ferguson Ck 270 Meters DS SFK Mouth					2	30	31	31	30	28		

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	40089-ORDEQ	Ferguson CK 0.1 Miles DS of Territorial RD					2	30	31	31	30	28		
2020	40090-ORDEQ	Turnbow Creek 0.6 miles US of Owens Creek confluence					2	30	20	18	19			
2020	40091-ORDEQ	Owen's CK 0.3 miles US of Turnbow CK confluence					2	18						
2020	40092-ORDEQ	Owens Ck US of Bear CK confluence						22	31	31	30	28		

* 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 43: Continuous flow measurements available from the USGS flow gaging stations in the Southern Willamette Subbasins.

Station ID	Station	Latitude/Longitude
14144800	Middle Fork Willamette River Nr Oakridge, OR	43.60179/-122.4575
14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	43.72096/-122.4378
14146500	Salmon Creek Near Oakridge,OR	43.76235/-122.3728
14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	43.75679/-122.5053
14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	43.80124/-122.5609
14150300	Fall Creek Near Lowell, OR	43.97068/-122.6387
14150800	Winberry Creek Near Lowell,OR	43.91429/-122.6887
14152500	Coast Fork Willamette At London, OR	43.64151/-123.0859
14154500	Row River Above Pitcher Creek, Near Dorena, OR	43.73596/-122.8734
14158500	Mckenzie River At Outlet Of Clear Lake, OR	44.36095/-121.9956
14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	44.28639/-122.0368
14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	44.33457/-122.047
14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs	44.28989/-122.0486
14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	44.2679/-122.0498
14159000	Mckenzie R At Mckenzie Bridge, OR	44.17901/-122.1303
14159110	Mckenzie River Above South Fork, Near Rainbow, OR	44.16638/-122.2565
14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	44.04707/-122.2178
14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	44.2179/-122.2651
14161500	Lookout Creek Near Blue River, OR	44.20957/-122.2567
14163000	Gate Creek At Vida, OR	44.14568/-122.572
14164550	Camp Crk At Camp Crk Rd Bridge, Nr Springfield, OR	44.07067/-122.8847
14164700	Cedar Creek At Springfield, OR	44.05935/-122.9197
14165000	Mohawk River Near Springfield, OR	44.0929/-122.9573
14166500	Long Tom River Near Noti, OR	44.04984/-123.4262
14171000	Marys River Near Philomath, OR	44.525/-123.334
14172000	Calapooia R At Holley OReg	44.35124/-122.7873
14190500	Luckiamute River Near Suver, OR	44.78318/-123.2345
441344122095400	Lookout Creek Above Mack Creek, Nr Blue River, OR	44.22883/-122.1651
441400122123000	Mcrae Creek Near Blue River, OR	44.23336/-122.2083
441504122105500	Unnamed Trib To Mcrae Creek Near Blue River, OR	44.25122/-122.1818

Table 44: Continuous flow measurements available from the OWRD flow gaging stations in the Southern Willamette Subbasins.

Station ID	Station	Latitude/Longitude
14153800	Layng Cr Ab Prather Cr Nr Disston, OR	43.7092/-122.728

Table 45: Instantaneous flow measurements available from DEQ in the Southern Willamette Subbasins.

Station ID	Station	Latitude/Longitude	Data Source
11114-ORDEQ	Little Luckiamute River at Elkins Rd. (Trib to Luckiamute RM 18.2)	44.7972/-123.292	DEQ
25481-ORDEQ	Pedee Creek at Kings Highway (Trib to Luckiamute RM 30.2)	44.7445/-123.439	DEQ
25482-ORDEQ	Ritner Creek at Ritner Wayside (Trib to Luckiamute RM 31.2)	44.7282/-123.442	DEQ
25484-ORDEQ	Maxfield Creek at HWY 223 (Trib to Luckiamute RM 34.0)	44.6948/-123.432	DEQ
25485-ORDEQ	Price Creek at HWY 223 (Trib to Luckiamute RM 35.2)	44.6858/-123.434	DEQ
25489-ORDEQ	Slick Creek at Mouth (Trib to Luckiamute RM 48.6)	44.7625/-123.567	DEQ
25491-ORDEQ	Rock Pit Creek at Mouth (trib to Luckiamute RM 49.8)	44.7727/-123.585	DEQ
25492-ORDEQ	Miller Creek at Mouth (Trib to Luckiamute RM 50.5)	44.7762/-123.597	DEQ

Table 46: Summary of existing flow data in the Southern Willamette Subbasins. 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	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14146500	Salmon Creek Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1990	14150300	Fall Creek Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14159000	Mckenzie R At Mckenzie Bridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14163000	Gate Creek At Vida, OR	31	28	31	30	31	30	31	31	30			

Year	Station ID	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1990	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
1990	14172000	Calapooia R At Holley OReg	31	28	31	30	31	30	31	31	30			
1990	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14146500	Salmon Creek Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1991	14150300	Fall Creek Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14159000	Mckenzie R At Mckenzie Bridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14161100	Blue River Below Tidbits Creek, Nr Blue River, 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
1991	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
1991	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
1992	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14146500	Salmon Creek Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
1992	14150300	Fall Creek Near Lowell, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14159000	Mckenzie R At Mckenzie Bridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14161100	Blue River Below Tidbits Creek, Nr Blue River, 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
1992	14161500	Lookout Creek Near Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14165000	Mohawk River Near Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14166500	Long Tom River Near Noti, OR	31	29	31	30	31	30	31	31	30	31	30	31
1992	14190500	Luckiamute River Near Suver, OR	31	29	31	30	31	30	31	31	30	31	30	31
1993	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14146500	Salmon Creek Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1993	14150300	Fall Creek Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14159000	Mckenzie R At Mckenzie Bridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14161100	Blue River Below Tidbits Creek, Nr Blue River, 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	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
1993	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14146500	Salmon Creek Near Oakridge,OR	31	28	31	30	31	13						
1994	14147500	N Fk Of M Fk Willamette R Nr Oakridge, OR	31	28	31	30	31	30	31	31	30			
1994	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1994	14150300	Fall Creek Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14159000	Mckenzie R At Mckenzie Bridge, OR	31	28	31	30	31	30	31	31	29			
1994	14161100	Blue River Below Tidbits Creek, Nr Blue River, 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
1994	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
1994	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1995	14150300	Fall Creek Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
1995	14166500	Long Tom River Near Noti, 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	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
1996	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
1996	14150300	Fall Creek Near Lowell, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14161500	Lookout Creek Near Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14165000	Mohawk River Near Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14166500	Long Tom River Near Noti, OR	31	29	31	30	31	30	31	31	30	31	30	31
1996	14190500	Luckiamute River Near Suver, OR	31	29	31	30	31	30	31	31	30	31	30	31
1997	14144800	Middle Fork Willamette River Nr Oakridge, OR	31	28	31	30	31	30	31	31	30			
1997	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,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
1997	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1997	14150300	Fall Creek Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	29			
1997	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
1997	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1998	14150300	Fall Creek Near Lowell, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14154500	Row River Above Pitcher Creek, Near Dorena, 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	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14165000	Mohawk River Near Springfield, OR										31	30	31
1998	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
1998	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
1999	14150300	Fall Creek Near Lowell, OR	31	28	31	30	31	30	31	31	30			
1999	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, 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
1999	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
1999	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2000	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2000	14150800	Winberry Creek Near Lowell,OR										31	30	31
2000	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR										31	30	31
2000	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14161500	Lookout Creek Near Blue River, 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	14165000	Mohawk River Near Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14166500	Long Tom River Near Noti, OR	31	29	31	30	31	30	31	31	30	31	30	31
2000	14171000	Marys River Near Philomath, OR										31	30	31
2000	14190500	Luckiamute River Near Suver, OR	31	29	31	30	31	30	31	31	30	31	30	31
2001	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2001	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14164700	Cedar Creek At Springfield, OR										31	30	31
2001	14165000	Mohawk River Near Springfield, 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
2001	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2001	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2002	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2002	14171000	Marys River Near Philomath, 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
2002	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2003	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14159110	Mckenzie River Above South Fork, Near Rainbow, OR	2	28	31	30	31	30	31	31	30	31	30	31
2003	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14161100	Blue River Below Tidbits Creek, Nr Blue River, OR	31	28	31	30	31	30	31	31	29			
2003	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2003	14171000	Marys River Near Philomath, 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	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2004	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2004	14150800	Winberry Creek Near Lowell,OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14159110	Mckenzie River Above South Fork, Near Rainbow, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14161500	Lookout Creek Near Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14164700	Cedar Creek At Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14165000	Mohawk River Near Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14166500	Long Tom River Near Noti, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14171000	Marys River Near Philomath, OR	31	29	31	30	31	30	31	31	30	31	30	31
2004	14190500	Luckiamute River Near Suver, 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
2005	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2005	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14159110	Mckenzie River Above South Fork, Near Rainbow, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2005	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,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
2006	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2006	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14159110	Mckenzie River Above South Fork, Near Rainbow, OR	31	28	31	30	31	30	31	31	30			
2006	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2006	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, 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	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2007	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2008	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2008	14150800	Winberry Creek Near Lowell,OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14153800	Layng Cr Ab Prather Cr Nr Disston, 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
2008	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14161500	Lookout Creek Near Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14164700	Cedar Creek At Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14165000	Mohawk River Near Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14166500	Long Tom River Near Noti, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14171000	Marys River Near Philomath, OR	31	29	31	30	31	30	31	31	30	31	30	31
2008	14190500	Luckiamute River Near Suver, OR	31	29	31	30	31	30	31	31	30	31	30	31
2009	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2009	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14158500	Mckenzie River At Outlet Of Clear Lake, 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	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2009	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2010	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, 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
2010	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2010	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2011	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14152500	Coast Fork Willamette At London, OR										31	30	31
2011	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	29
2011	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow 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	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2011	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2012	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2012	14150800	Winberry Creek Near Lowell,OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14152500	Coast Fork Willamette At London, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14161500	Lookout Creek Near Blue River, 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
2012	14164550	Camp Crk At Camp Crk Rd Bridge, Nr Springfield, OR										31	30	31
2012	14164700	Cedar Creek At Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14165000	Mohawk River Near Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14166500	Long Tom River Near Noti, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14171000	Marys River Near Philomath, OR	31	29	31	30	31	30	31	31	30	31	30	31
2012	14190500	Luckiamute River Near Suver, OR	31	29	31	30	31	30	31	31	30	31	30	31
2013	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2013	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14152500	Coast Fork Willamette At London, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14161500	Lookout Creek Near Blue River, 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	14164550	Camp Crk At Camp Crk Rd Bridge, Nr Springfield, OR	31	28	31	30	31	30	31	31	30	20		
2013	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2013	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2014	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14152500	Coast Fork Willamette At London, OR	31	28	31	30	31	30	31	31	30			
2014	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14161500	Lookout Creek Near Blue River, 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
2014	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2014	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2015	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	27	31	30	31	31	9	31	30	31
2015	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14166500	Long Tom River Near Noti, 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	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2015	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2016	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2016	14150800	Winberry Creek Near Lowell,OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR							11	31	30	31	30	31
2016	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14161500	Lookout Creek Near Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14164700	Cedar Creek At Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14165000	Mohawk River Near Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14166500	Long Tom River Near Noti, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14171000	Marys River Near Philomath, OR	31	29	31	30	31	30	31	31	30	31	30	31
2016	14190500	Luckiamute River Near Suver, 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
2017	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2017	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs								21	30	31	30	31
2017	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2017	14190500	Luckiamute River Near Suver, 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	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2018	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs	31	28	31	30	31	30	31	31	30	31	30	31
2018	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14164700	Cedar Creek At Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14165000	Mohawk River Near Springfield, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14171000	Marys River Near Philomath, OR	31	28	31	30	31	30	31	31	30	31	30	31
2018	14190500	Luckiamute River Near Suver, 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
2019	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	28	31	30	31	30	31	31	30	31	30	31
2019	14150800	Winberry Creek Near Lowell,OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14152500	Coast Fork Willamette At London, OR										31	30	31
2019	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs	31	28	31	30	31	30	31	31	30	31	30	31
2019	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14161500	Lookout Creek Near Blue River, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14164700	Cedar Creek At Springfield, OR	31	28	31	26	31	30	31	31	30	31	30	31
2019	14165000	Mohawk River Near Springfield, OR	31	26	31	30	31	30	31	31	30	31	30	31
2019	14166500	Long Tom River Near Noti, OR	31	28	31	30	31	30	31	31	30	31	30	31
2019	14171000	Marys River Near Philomath, 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
2019	14190500	Luckiamute River Near Suver, OR	31	28	31	30	31	30	31	31	30	31	30	31
2020	14145500	Mf Willamette River Abv Salt Crk, Near Oakridge,OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14148000	Mf Willamette River Blw N Fork, Nr Oakridge, OR.	31	29	31	30	31	30	31	31	30	31	30	31
2020	14150800	Winberry Creek Near Lowell,OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14152500	Coast Fork Willamette At London, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14153800	Layng Cr Ab Prather Cr Nr Disston, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14154500	Row River Above Pitcher Creek, Near Dorena, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158500	Mckenzie River At Outlet Of Clear Lake, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158740	Mckenzie River Bl Payne Cr, Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158790	Smith River Abv Smith R Resv,Nr Belknap Sprngs,OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158798	Smith River Abv Trail Brdg Resv Nr Belknap Springs	31	29	31	30	31	30	31	31	30	31	30	31
2020	14158850	Mckenzie R Blw Trail Br Dam Nr Belknap Springs, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14159200	So Fk Mckenzie River Abv Cougar Lake Nr Rainbow OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14161500	Lookout Creek Near Blue River, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14163000	Gate Creek At Vida, OR											5	31
2020	14164700	Cedar Creek At Springfield, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14165000	Mohawk River Near Springfield, 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
2020	14166500	Long Tom River Near Noti, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14171000	Marys River Near Philomath, OR	31	29	31	30	31	30	31	31	30	31	30	31
2020	14190500	Luckiamute River Near Suver, OR	31	29	31	30	31	30	31	31	30	31	30	28
2020	441344122095400	Lookout Creek Above Mack Creek, Nr Blue River, OR						19	31	31	30	31	30	2
2020	441400122123000	Mcrae Creek Near Blue River, OR						19	31	31	30	31	30	1
2020	441504122105500	Unnamed Trib To Mcrae Creek Near Blue River, OR						18	31	31	30	31	27	2

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. USGS hydro cache base map that represents hydrologic information of the National Hydrography Dataset (NHD).
3. 2017 and 2018 one foot Oregon Statewide Imagery Program (OSIP) aerial imagery.
4. TMDL project area boundary.
5. 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.
6. 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.
7. The location of meteorological monitoring locations and the source of the data.
8. The location of active individual NPDES permitted facilities, the permit type, and DEQ file number.
9. The locations of current registrants covered under the general NPDES GEN01, GEN03, GEN04, GEN05, GEN19, or GEN40 (MS4) permits.
10. The extent of existing calibrated models described in this QAPP.
11. The extent of newly proposed calibrated models described in this QAPP.
12. The location of temperature calibration sites.
13. The location of temperature monitoring used for model boundary conditions and tributary inputs.
14. The location of flow monitoring locations used for model boundary conditions and tributary inputs.
15. Eight-digit hydrologic unit boundaries (HUC8 Subbasins).
16. Ten-digit hydrologic unit boundaries (HUC10 Watersheds).
17. Twelve-digit hydrologic unit boundaries (HUC12 Subwatersheds).
18. 2018/2020 303(d) Integrated Report status that are classified as water quality limited Category 5 and/or Category 4A for temperature.
19. Fish use designations depicted in OAR 340-041-0340 Figure 340A.

20. Salmon and Steelhead spawning use extent and period depicted in OAR 340-041-0340 Figure 340B.

DEQ21-HQ-0052-QAPP

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