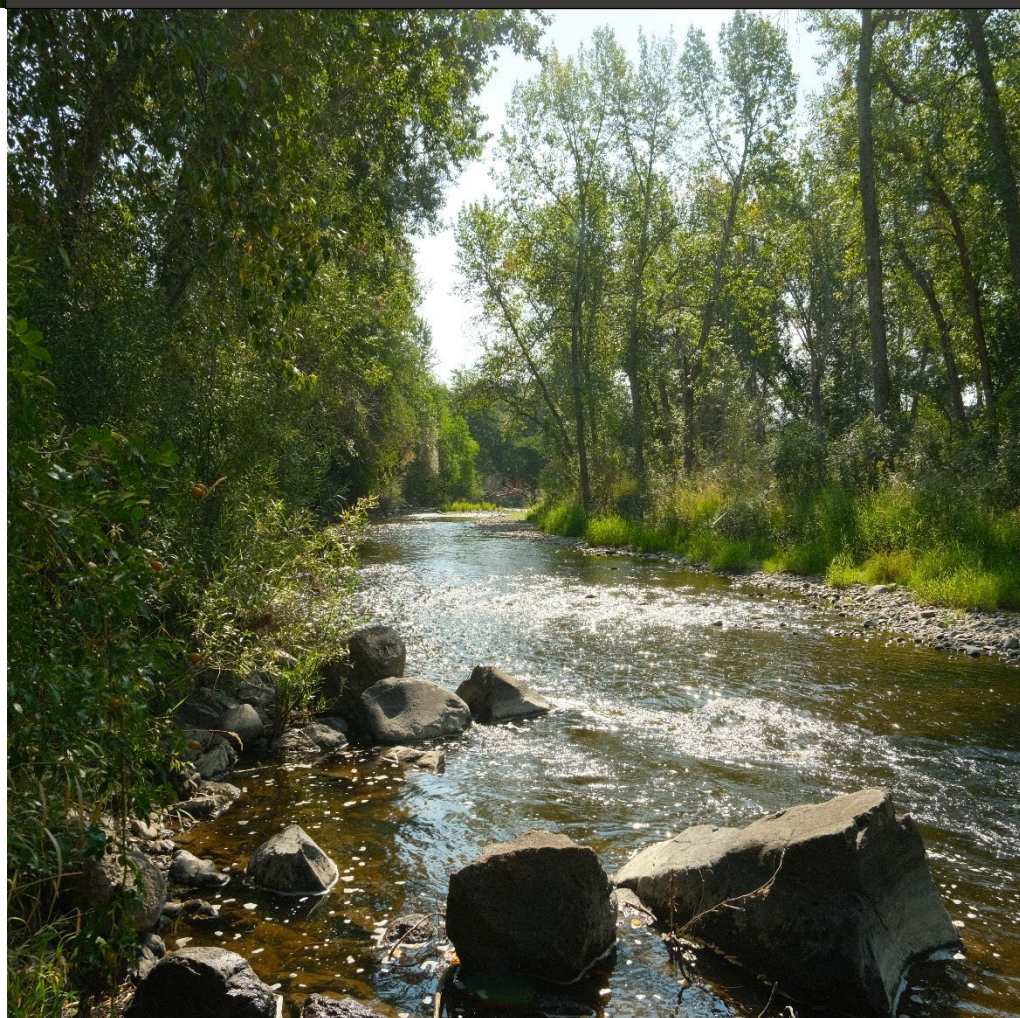
Draft Total Maximum Daily Loads for the John Day River Basin

Temperature

Date (EQC adoption meeting month and year)



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Acronyms

7DADM	7-Day Average Daily Maximum
7Q10	7-Day, 10-Year Low Flow
ADWDF	Average Dry Weather Design Flow
AU	Assessment Unit
CF	Coast Fork
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
DEQ	Oregon Department of Environmental Quality
DMA	Designated Management Agency
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
EQC	Oregon Environmental Quality Commission
EWEB	Eugene Water and Electric Board
GNIS	USGS Geographic Names Information System
HUA	Human Use Allowance
HUC	Hydrologic Unit Code
IMD	Internal Management Directive
LA	Load Allocation
LC	Loading Capacity
MF	Middle Fork
MGD	Millions of Gallons per Day
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
OAR	Oregon Administrative Rules
ODC	Oregon Department of Corrections
ODFW	Oregon Department of Fish & Wildlife
ORS	Oregon Revised Statutes
POMI	Point of Maximum Impact
SIC	Standard Industrial Classification
STP	Sewage Treatment Plant
TMDL	Total Maximum Daily Load
TSD	Technical Support Document
USGS	United States Geological Survey
WLA	Wasteload Allocation
WQMP	Water Quality Management Plan

WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1 Introduction

This Total Maximum Daily Load (TMDL) project includes the following John Day Subbasins: Lower John Day, North Fork John Day, Middle Fork John Day, and Upper John Day Subbasins. This TMDL was adopted by reference in Oregon Administrative Rules OAR 340-42-XXXX.

OAR 340-42-0040(3) requires the Oregon Department of Environmental Quality (DEQ) or the Oregon Environmental Quality Commission (EQC) to prioritize and schedule TMDLs for completion considering various factors outlined in the rule. Temperature TMDLs for the John Day River Basin were identified as a high priority on Oregon's TMDL priority ranking submitted with Oregon's 2022 Integrated Report and due to court order to Oregon and the Environmental Protection Agency (EPA) to establish TMDLs to replace the temperature TMDLs developed as part of the 2010 John Day Basin TMDL and WQMP (action ID 39753) (**Table 1-1**).

1.1 Previous TMDLs

In 2010 DEQ issued, and EPA approved, a TMDL action addressing temperature impairments (**Table 1-1**) within the project area for the John Day River Basin temperature TMDL and WQMP. Once approved by EPA, the John Day Basin TMDL for temperature will replace the temperature TMDL listed in **Table 1-1**. TMDLs for other water quality impaired parameters listed in **Table 1-1** are still effective.

Table 1-1: Summary of previous temperature TMDLs developed for the John Day River.

TMDL Action ID	TMDL Name	EPA Approval Date	Water Quality Impairments Addressed
39753	John Day Basin TMDL	12/17/2010	Ammonia, aquatic weeds or algae, E. coli, Fecal coliform, Nitrate, pH, Sedimentation, and Turbidity

2 TMDL name and location

Per OAR 340-042-0040(4)(a), this element describes the geographic area for which the TMDL was developed.

The John Day Basin comprises four 8-digit hydrologic unit code (HUC) subbasins, including the Upper John Day Subbasin (HUC 17070201), North Fork John Day Subbasin (HUC 17070202), Middle Fork John Day Subbasin (HUC 17070203), and Lower John Day Subbasin (HUC 17070204) (**Table 2-1**).

Temperature TMDLs for the John Day Subbasins address all Category 5 listed assessment units (AUs) impaired for temperature on Oregon's 2022 Section 303(d) list (**Table 2-2** through **Table 2-5**) and, as applicable, any AUs identified as temperature impaired in the future. In total, the TMDL applies to 476 unique AUs, of which 155 are impaired for temperature. Some of these assessment units have both year-round and spawning use designations impaired. If both use

designations are impaired, it is counted as two Category 5 303(d) listings. Therefore, the TMDL addresses a total of 187 Category 5 temperature listings identified on the 2022 Integrated Report.

The loading capacity, allocations, surrogate measures, and implementation framework apply to all waters in the John Day River Basin determined to be waters of the state as defined under Oregon Revised Statutes ORS 468B.005(10), including all perennial and intermittent streams that have surface flow or residual pools during the TMDL allocation period.

The TMDL implementation framework is presented in the John Day Basin TMDL WQMP and includes implementation activities and timeframes to improve water quality, as well as measures of success. These and other protection plan elements are further explained in Section 10.

The map in **Figure 2-1** provides an overview of where the temperature TMDLs are applicable. Appendix [TBD] of the John Day Basin TSD provides a list of all AUs addressed by the TMDL.

Table 2-1: HUC8 codes and names in the John Day Subbasins.

HUC8	Subbasin Name
17070201	Upper John Day
17070202	North Fork John Day
17070203	Middle Fork John Day
17070204	Lower John Day

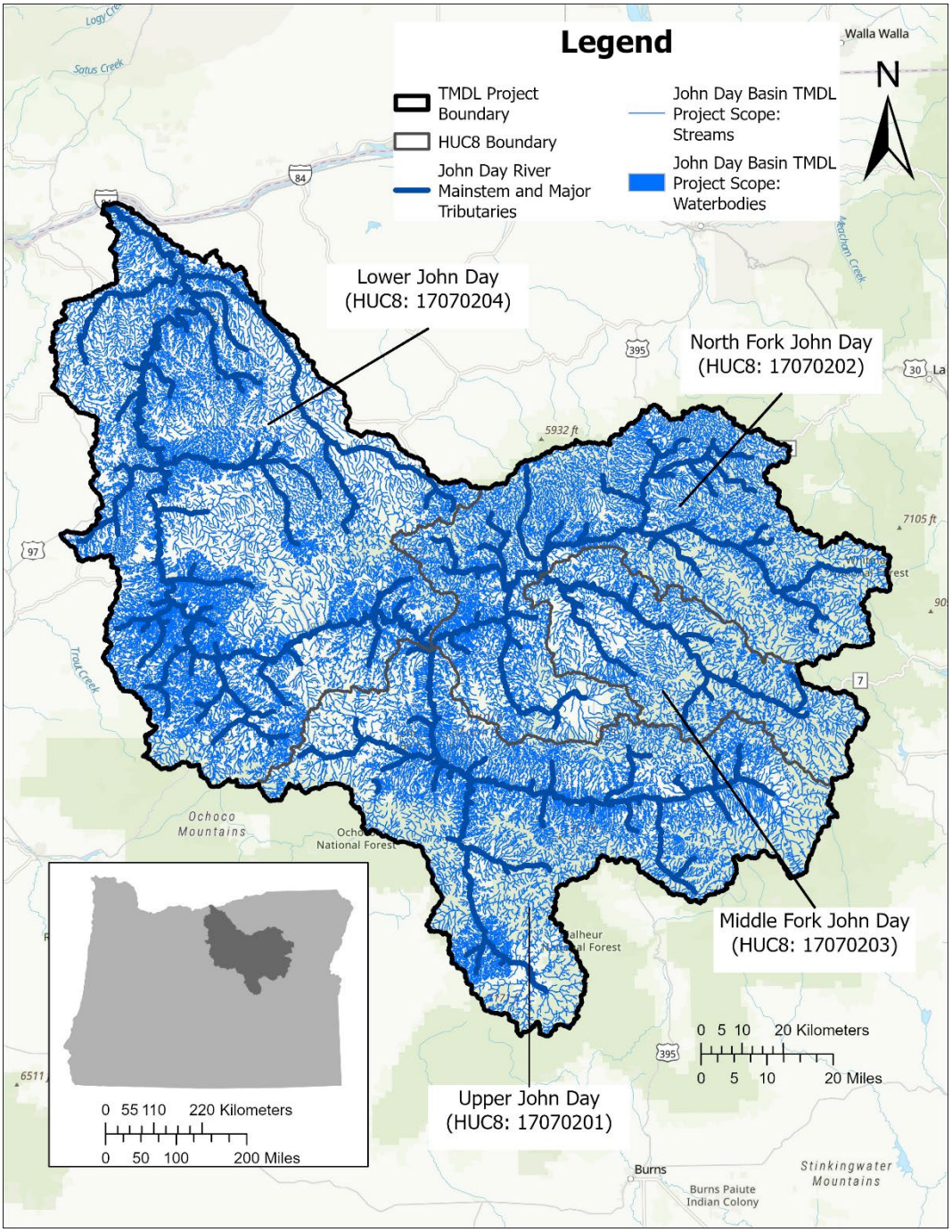

Figure 2-1: John Day Basin temperature TMDLs project area overview.

2.1 Impaired waters on 303(d) list

Table 2-2 through **Table 2-5** present stream AUs within the John Day Basin that were listed as impaired for temperature on DEQ's 2022 Clean Water Act Section 303(d) List (as part of Oregon's Integrated Report), which was approved by the EPA on September 1, 2022. Status category designations are prescribed by Sections 305(b) and 303(d) of the Clean Water Act.

AUs listed in Category 5 (i.e., designated use is not supported or a water quality standard is not attained) require development of a TMDL. Locations of these listed segments are depicted in **Figure** 2-2.

Table 2-2: Upper John Day Subbasin (17070201) Category 5 temperature impairments on the 2022 Integrated Report.

AU ID	AU Name	Use Period
OR_SR_1707020101_05_101516	South Fork John Day River	Year Round
OR_SR_1707020102_05_101519	South Fork John Day River	Year Round
OR_SR_1707020102_05_101521	Pine Creek	Year Round
OR_SR_1707020103_05_101525	Murderers Creek	Year Round
OR_SR_1707020103_05_101526	Murderers Creek	Year Round
OR_SR_1707020106_05_101531	Grub Creek	Year Round
OR_SR_1707020106_05_101532	Indian Creek	Year Round
OR_SR_1707020106_05_101534	Bear Creek	Year Round
OR_SR_1707020107_05_101537	Canyon Creek	Year Round
OR_SR_1707020107_05_101538	Canyon Creek	Year Round
OR_SR_1707020107_05_101539	East Fork Canyon Creek	Year Round
OR_SR_1707020108_05_101540	Beech Creek	Year Round
OR_SR_1707020110_05_101550	Fields Creek	Year Round
OR_SR_1707020111_05_101556	Battle Creek	Year Round
OR_SR_1707020111_05_101558	Cottonwood Creek	Year Round
OR_SR_1707020111_05_102568	John Day River	Year Round
OR_SR_1707020112_05_101560	Lower Mountain Creek	Year Round
OR_SR_1707020112_05_101561	Mountain Creek	Year Round
OR_SR_1707020113_05_101564	Rock Creek	Year Round
OR_SR_1707020114_05_102609	John Day River	Year Round
OR_LK_1707020107_05_100025	Canyon Meadows Lake	Year Round
OR_WS_170702010101_05_102015	HUC12 Name: Lonesome Creek	Year Round
OR_WS_170702010102_05_102016	HUC12 Name: Headwaters South Fork John Day River	Year Round
OR_WS_170702010104_05_102018	HUC12 Name: Utley Creek	Year Round
OR_WS_170702010204_05_102024	HUC12 Name: Sunflower Creek	Year Round
OR_WS_170702010205_05_102025	HUC12 Name: Upper Deer Creek	Year Round
OR_WS_170702010206_05_102026	HUC12 Name: Lower Deer Creek	Year Round
OR_WS_170702010301_05_102028	HUC12 Name: Headwaters Murderers Creek	Year Round
OR_WS_170702010501_05_102038	HUC12 Name: Headwaters John Day River	Year Round
OR_WS_170702010503_05_102040	HUC12 Name: Reynolds Creek	Year Round
OR_WS_170702010505_05_102042	HUC12 Name: Dads Creek-John Day River	Year Round
OR_WS_170702010601_05_102043	HUC12 Name: Strawberry Creek-John Day River	Year Round

AU ID	AU Name	Use Period
OR_WS_170702010606_05_102048	HUC12 Name: Castle Creek-John Day River	Year Round
OR_WS_170702010607_05_102049	HUC12 Name: Grub Creek	Year Round
OR_WS_170702010608_05_102050	HUC12 Name: Dog Creek-John Day River	Year Round
OR_WS_170702010701_05_102051	HUC12 Name: Upper Canyon Creek	Year Round
OR_WS_170702010801_05_102055	HUC12 Name: Upper Beech Creek	Year Round
OR_WS_170702010802_05_102056	HUC12 Name: East Fork Beech Creek	Year Round
OR_WS_170702011102_05_102072	HUC12 Name: Cottonwood Creek	Year Round
OR_WS_170702011201_05_102074	HUC12 Name: Upper Mountain Creek	Year Round

Table 2-3: North John Day Subbasin (17070202) Category 5 temperature impairments on the 2022 Integrated Report.

AU ID	AU Name	Use Period
OR_SR_1707020201_05_101569	North Fork John Day River	Year Round
OR_SR_1707020201_05_101569	North Fork John Day River	Spawning
OR_SR_1707020202_05_101570	Granite Creek	Year Round
OR_SR_1707020202_05_101571	Clear Creek	Year Round
OR_SR_1707020202_05_101572	Granite Creek	Year Round
OR_SR_1707020203_05_101573	Big Creek	Year Round
OR_SR_1707020203_05_101574	North Fork John Day River	Year Round
OR_SR_1707020203_05_101574	North Fork John Day River	Spawning
OR_SR_1707020203_05_101575	North Fork John Day River	Year Round
OR_SR_1707020203_05_101575	North Fork John Day River	Spawning
OR_SR_1707020203_05_101576	Texas Bar Creek	Year Round
OR_SR_1707020203_05_101577	Big Creek	Year Round
OR_SR_1707020203_05_101578	Meadow Creek	Year Round
OR_SR_1707020203_05_101578	Meadow Creek	Spawning
OR_SR_1707020204_05_101579	Desolation Creek	Year Round
OR_SR_1707020204_05_101579	Desolation Creek	Spawning
OR_SR_1707020205_05_101580	Lane Creek	Year Round
OR_SR_1707020205_05_101581	Camas Creek	Year Round
OR_SR_1707020205_05_101581	Camas Creek	Spawning
OR_SR_1707020205_05_101582	Cable Creek	Year Round
OR_SR_1707020205_05_101583	Hidaway Creek	Year Round
OR_SR_1707020205_05_101583	Hidaway Creek	Spawning
OR_SR_1707020205_05_101584	Camas Creek	Year Round
OR_SR_1707020205_05_101584	Camas Creek	Spawning
OR_SR_1707020206_05_101586	Owens Creek	Year Round
OR_SR_1707020206_05_101587	Camas Creek	Year Round
OR_SR_1707020206_05_101588	Camas Creek	Year Round

AU ID	AU Name	Use Period
OR_SR_1707020206_05_101590	Fivemile Creek	Year Round
OR_SR_1707020206_05_101591	Owens Creek	Year Round
OR_SR_1707020207_05_101592	Ditch Creek	Year Round
OR_SR_1707020207_05_101594	Mallory Creek	Year Round
OR_SR_1707020207_05_101595	North Fork John Day River	Year Round
OR_SR_1707020207_05_101596	North Fork John Day River	Year Round
OR_SR_1707020207_05_101596	North Fork John Day River	Spawning
OR_SR_1707020207_05_101599	West Fork Meadow Brook	Year Round
OR_SR_1707020207_05_101599	West Fork Meadow Brook	Spawning
OR_SR_1707020208_05_101600	Skookum Creek	Year Round
OR_SR_1707020208_05_101601	Wilson Creek	Year Round
OR_SR_1707020208_05_101601	Wilson Creek	Spawning
OR_SR_1707020208_05_101603	Little Wall Creek	Year Round
OR_SR_1707020208_05_101603	Little Wall Creek	Spawning
OR_SR_1707020208_05_101605	Big Wall Creek	Year Round
OR_SR_1707020208_05_101606	Wall Creek	Year Round
OR_SR_1707020208_05_101607	Indian Creek	Year Round
OR_SR_1707020208_05_101607	Indian Creek	Spawning
OR_SR_1707020208_05_101608	Swale Creek	Year Round
OR_SR_1707020208_05_101608	Swale Creek	Spawning
OR_SR_1707020208_05_102569	Skookum Creek	Year Round
OR_SR_1707020209_05_101609	East Fork Cottonwood Creek	Year Round
OR_SR_1707020210_05_101613	North Fork John Day River	Year Round
OR_SR_1707020210_05_101616	Rudio Creek	Year Round
OR_LK_1707020207_05_100032	Lake Penland	Year Round
OR_WS_170702020101_05_102087	HUC12 Name: Baldy Creek-North Fork John Day River	Year Round
OR_WS_170702020102_05_102088	HUC12 Name: Trail Creek	Year Round
OR_WS_170702020103_05_102089	HUC12 Name: Onion Creek-North Fork John Day River	Year Round
OR_WS_170702020105_05_102091	HUC12 Name: Crane Creek-North Fork John Day River	Year Round
OR_WS_170702020201_05_102092	HUC12 Name: Upper Granite Creek	Year Round
OR_WS_170702020202_05_102093	HUC12 Name: Bull Run Creek	Year Round
OR_WS_170702020203_05_102094	HUC12 Name: Beaver Creek	Year Round
OR_WS_170702020204_05_102095	HUC12 Name: Clear Creek	Year Round
OR_WS_170702020206_05_102096	HUC12 Name: Lower Granite Creek	Year Round
OR_WS_170702020303_05_102099	HUC12 Name: Big Creek	Year Round
OR_WS_170702020306_05_102102	HUC12 Name: Texas Bar Creek-North Fork John Day R*	Spawning

AU ID	AU Name	Use Period
OR_WS_170702020306_05_102102	HUC12 Name: Texas Bar Creek-North Fork John Day R*	Year Round
OR_WS_170702020401_05_102103	HUC12 Name: Headwaters Desolation Creek	Year Round
OR_WS_170702020402_05_102104	HUC12 Name: Upper Desolation Creek	Year Round
OR_WS_170702020403_05_102105	HUC12 Name: Middle Desolation Creek	Year Round
OR_WS_170702020501_05_102107	HUC12 Name: Dry Camas Creek-Camas Creek	Year Round
OR_WS_170702020502_05_102108	HUC12 Name: Bowman Creek-Camas Creek	Year Round
OR_WS_170702020504_05_102110	HUC12 Name: Cable Creek	Spawning
OR_WS_170702020504_05_102110	HUC12 Name: Cable Creek	Year Round
OR_WS_170702020505_05_102111	HUC12 Name: Lane Creek-Camas Creek	Year Round
OR_WS_170702020602_05_102113	HUC12 Name: Upper Owens Creek	Year Round
OR_WS_170702020604_05_102115	HUC12 Name: Upper Fivemile Creek	Year Round
OR_WS_170702020608_05_102119	HUC12 Name: Bridge Creek	Year Round
OR_WS_170702020706_05_102126	HUC12 Name: Ellis Creek-Potamus Creek	Spawning
OR_WS_170702020706_05_102126	HUC12 Name: Ellis Creek-Potamus Creek	Year Round
OR_WS_170702020708_05_102128	HUC12 Name: Mallory Creek	Year Round
OR_WS_170702020801_05_102132	HUC12 Name: Swale Creek	Year Round
OR_WS_170702020802_05_102133	HUC12 Name: Little Wall Creek	Spawning
OR_WS_170702020802_05_102133	HUC12 Name: Little Wall Creek	Year Round
OR_WS_170702020804_05_102135	HUC12 Name: Wilson Creek	Spawning
OR_WS_170702020804_05_102135	HUC12 Name: Wilson Creek	Year Round

Table 2-4: Middle John Day Subbasin (17070203) Category 5 temperature impairments on the 2022 Integrated Report.

AU ID	AU Name	Use Period
OR_SR_1707020301_05_101617	Middle Fork John Day River	Year Round
OR_SR_1707020302_05_101618	Camp Creek	Year Round
OR_SR_1707020302_05_101618	Camp Creek	Spawning
OR_SR_1707020302_05_101619	Middle Fork John Day River	Year Round
OR_SR_1707020302_05_101620	Vinegar Creek	Year Round
OR_SR_1707020302_05_101622	Lick Creek	Year Round
OR_SR_1707020302_05_101622	Lick Creek	Spawning
OR_SR_1707020302_05_101623	Camp Creek	Year Round
OR_SR_1707020302_05_101623	Camp Creek	Spawning
OR_SR_1707020302_05_102577	Middle Fork John Day River	Year Round
OR_SR_1707020302_05_102577	Middle Fork John Day River	Spawning
OR_SR_1707020303_05_101624	Middle Fork John Day River	Year Round
OR_SR_1707020303_05_101624	Middle Fork John Day River	Spawning
OR_SR_1707020303_05_101626	Big Creek	Year Round
OR_SR_1707020305_05_101597	Middle Fork John Day River	Year Round

AU ID	AU Name	Use Period
OR_WS_170702030101_05_102151	HUC12 Name: Squaw Creek	Year Round
OR_WS_170702030102_05_102152	HUC12 Name: Summit Creek	Year Round
OR_WS_170702030103_05_102153	HUC12 Name: Dry Fork Clear Creek	Year Round
OR_WS_170702030104_05_102154	HUC12 Name: Clear Creek	Year Round
OR_WS_170702030105_05_102155	HUC12 Name: Bridge Creek	Spawning
OR_WS_170702030105_05_102155	HUC12 Name: Bridge Creek	Year Round
OR_WS_170702030106_05_102156	HUC12 Name: Mill Creek-Middle Fork John Day River	Year Round
OR_WS_170702030201_05_102157	HUC12 Name: Vinegar Creek-Middle Fork John Day Ri*	Year Round
OR_WS_170702030202_05_102158	HUC12 Name: Little Boulder Creek-Middle Fork John*	Year Round
OR_WS_170702030203_05_102571	HUC12 Name: Granite Boulder Creek-Middle Fork Joh*	Year Round
OR_WS_170702030205_05_102160	HUC12 Name: Upper Camp Creek	Spawning
OR_WS_170702030205_05_102160	HUC12 Name: Upper Camp Creek	Year Round
OR_WS_170702030206_05_102161	HUC12 Name: Lick Creek	Year Round
OR_WS_170702030207_05_102162	HUC12 Name: Lower Camp Creek	Year Round
OR_WS_170702030208_05_102163	HUC12 Name: Balance Creek-Middle Fork John Day Ri*	Year Round
OR_WS_170702030301_05_102164	HUC12 Name: Bear Creek-Middle Fork John Day River	Spawning
OR_WS_170702030301_05_102164	HUC12 Name: Bear Creek-Middle Fork John Day River	Year Round
OR_WS_170702030302_05_102165	HUC12 Name: Big Creek	Year Round
OR_WS_170702030303_05_102166	HUC12 Name: Indian Creek-Middle Fork John Day Riv*	Spawning
OR_WS_170702030303_05_102166	HUC12 Name: Indian Creek-Middle Fork John Day Riv*	Year Round
OR_WS_170702030401_05_102169	HUC12 Name: Headwaters Long Creek	Year Round

Table 2-5: Lower John Day Subbasin (17070204) Category 5 temperature impairments on the 2022 Integrated Report.

AU ID	AU Name	Use Period
OR_SR_1707020403_05_101647	Bridge Creek	Year Round
OR_SR_1707020403_05_101647	Bridge Creek	Spawning
OR_SR_1707020403_05_101648	Bear Creek	Year Round
OR_SR_1707020403_05_101650	Bridge Creek	Year Round
OR_SR_1707020403_05_101651	Bridge Creek	Year Round
OR_SR_1707020404_05_101662	Pine Creek	Year Round
OR_SR_1707020404_05_101662	Pine Creek	Spawning
OR_SR_1707020404_05_101664	Pine Creek	Year Round
OR_SR_1707020407_05_101677	Sorefoot Creek	Year Round
OR_SR_1707020408_05_101680	Dry Fork Thirtymile Creek	Year Round
OR_SR_1707020408_05_101684	Thirtymile Creek	Year Round

AU ID	AU Name	Use Period
OR_SR_1707020408_05_101685	Thirtymile Creek	Year Round
OR_SR_1707020410_05_101697	Hay Creek	Year Round
OR_SR_1707020411_05_101705	Rock Creek	Year Round
OR_SR_1707020412_05_101701	Rock Creek	Year Round
OR_SR_1707020413_05_101708	Grass Valley Canyon	Year Round
OR_SR_1707020413_05_101708	Grass Valley Canyon	Spawning
OR_SR_1707020413_05_101709	Rosebush Creek	Year Round
OR_WS_170702040103_05_102182	HUC12 Name: Upper Kahler Creek	Year Round
OR_WS_170702040108_05_102187	HUC12 Name: Alder Creek	Spawning
OR_WS_170702040108_05_102187	HUC12 Name: Alder Creek	Year Round
OR_WS_170702040201_05_102189	HUC12 Name: Service Creek-John Day River	Year Round
OR_WS_170702040303_05_102198	HUC12 Name: Upper Bridge Creek	Year Round
OR_WS_170702040501_05_102213	HUC12 Name: Cottonwood Creek-Butte Creek	Year Round
OR_WS_170702040701_05_102222	HUC12 Name: Sorefoot Creek-John Day River	Year Round
OR_WS_170702041105_05_102249	HUC12 Name: Buckhorn Creek	Year Round
OR_WS_170702041106_05_102250	HUC12 Name: Brown Creek	Year Round
OR_WS_170702041304_05_102261	HUC12 Name: Upper Grass Valley Canyon	Year Round

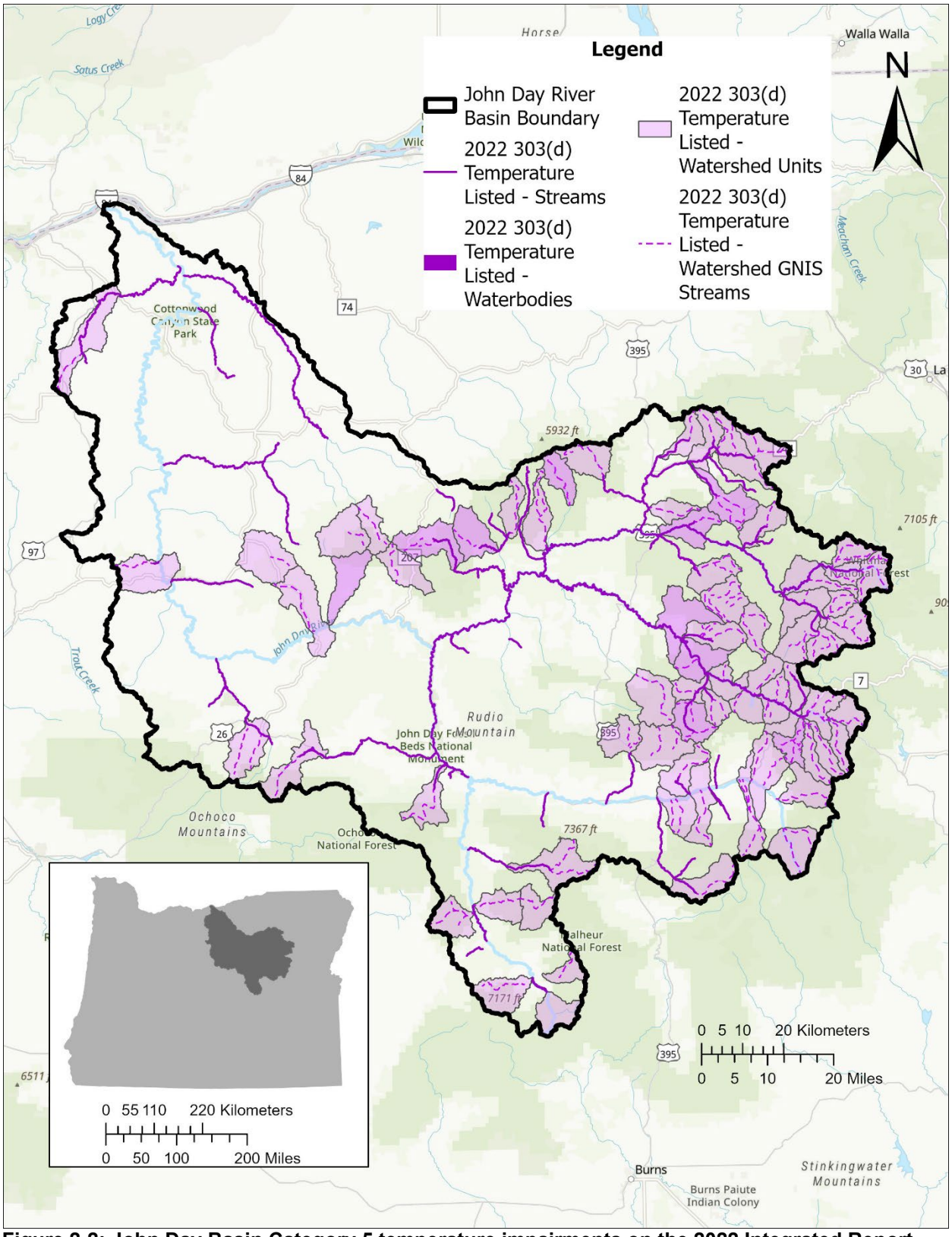

Figure 2-2: John Day Basin Category 5 temperature impairments on the 2022 Integrated Report.

2.2 Impaired waters not on 303(d) list

[Add section with table of any AUs that have data showing temperature exceedances but have not been listed on 303d of IR. Show reference to data and analysis that supports this conclusion.]

3 Pollutant identification

As stated in OAR 340-042-0040(4)(b), this element identifies the pollutants causing impairment of water quality that are addressed by these TMDLs. The associated water quality standards and beneficial uses are identified in Section 4.

Temperature is the water quality parameter of concern, but heat or thermal loading is the pollutant of concern causing impairment. Heat caused by human activities are of particular concern. Water temperature change (ΔT_w) 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 also result in water temperature change for a defined amount of heat exchange.

$$\Delta T_w = \frac{\Delta Heat}{Density \times Specific\ Heat \times \Delta Volume}$$

EPA regulations (40 CFR 130.2(i)) and OAR 340-042-0040(O)(5)(b) allow for TMDLs to utilize other appropriate measures (or surrogate measures). Surrogate measures are defined in OAR 340-042-0030(14) as “substitute methods or parameters used in a TMDL to represent pollutants.” In accordance with OAR 340-042-0040(5)(b), DEQ used effective shade as a surrogate measure for thermal loading caused by excessive solar radiation. Effective shade is the percent of the daily solar radiation flux blocked by vegetation and topography. Implementation of the surrogate measures ensures achievement of necessary pollutant reductions and the nonpoint load allocations for this temperature TMDL.

4 Temperature water quality standards and beneficial uses

As stated in OAR 340-042-0040(4)(c), this element identifies the beneficial uses in the basin, specifying the most sensitive beneficial use, and the relevant water quality standards established in OAR 340-041-0170 through 340-041-0175.

Water quality criteria have been set at a level to protect the most sensitive beneficial uses. These TMDLs are designed such that meeting water quality standards for the most sensitive beneficial uses will be protective of all other uses for that parameter. Fish and aquatic life use is the most sensitive beneficial use for temperature. Oregon’s water temperature criteria use salmonids’ life cycles as indicators. If temperatures are protective of these indicator species, other species will share in this protection. The locations and periods of criteria applicability are

determined from designated fish use maps in rule at OAR 340-041-0170 Figure 170A and Figure 170B. The maps from the rule have been reproduced and shown in **Figure 4-1** and **Figure 4-2**. **Figure 4-1** shows various designated fish uses and applicable criteria, while **Figure 4-2** shows salmon and steelhead spawning use designation, based on the NHD.
The temperature water quality standards for the John Day Basin are based on the rolling seven-day average daily maximum (7DADM)[1] and include the following numeric criteria:

The temperature water quality standards for the John Day Basin are based on the rolling seven-day average daily maximum (7DADM)[2] and include the following numeric criteria:

- Salmon and steelhead spawning: 13.0°C (55.4°F) (OAR 340-041-0028(4)(a))
- Core cold water habitat: 16.0°C (60.8°F) (OAR 340-041-0028(4)(b))
- Salmon and trout rearing and migration: 18.0°C (64.4°F) (OAR 340-041-0028(4)(c))
- Salmon and steelhead migration corridors: 20.0°C (68.0°F) (OAR 340-041-0028(4)(d))
- Bull trout spawning and juvenile rearing: 12°C (53.6°F) (OAR 340-041-0028(4)(f))

The following narrative temperature water quality standards and other rule provisions also apply in the John Day Basin Subbasins:

- Human use allowance (OAR 340-041-0028(12)(b))
- Minimum duties (OAR 340-041-0028(12)(a))
- Natural Lakes (OAR 340-041-0028(6))
- Protecting cold water (OAR 340-041-0028(11))
- Antidegradation (OAR 340-041-0004)

Table 4-1: Designated beneficial uses in the John Day Basin as identified in OAR 340-041-0170 Table 170A.

Beneficial Uses	All waterbodies
Public Domestic Water Supply[1]	X
Private Domestic Water Supply[1]	X
Industrial Water Supply	X
Irrigation	X
Livestock Watering	X
Fish and Aquatic Life[2]	X
Wildlife and Hunting	X
Fishing	X
Boating	X
Water Contact Recreation	X
Aesthetic Quality	X
Hydro Power	
Commercial Navigation & Transportation	

[1] Referred to as the "Seven-Day Average Maximum Temperature" in OAR 340-041 and defined as the average of the daily maximum temperatures from seven consecutive days made on a rolling basis.
[2] Referred to as the "Seven-Day Average Maximum Temperature" in OAR 340-041 and defined as the average of the daily maximum temperatures from seven consecutive days made on a rolling basis.

Table 4-2: Applicable water quality standards and most sensitive beneficial uses.

Rule Citation	Summary of applicable standards	Waters where standards are applicable
Statewide Narrative Criteria OAR 340-041-0007(1)	The highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor and other deleterious factors at the lowest possible levels.	All waters of the state
Biologically Based Numeric Criteria OAR 340-041-0028(4) OAR 340-041-0170 Figures 170A and 170B	(a) The 7-day average maximum temperature of a stream identified as having salmon and steelhead spawning use may not exceed 13.0˚C (55˚F) at the times indicated on maps and tables; (b) The 7-day average maximum temperature of a stream identified as having core cold water habitat use may not exceed 16.0˚C (60.8˚F); (c) The 7-day average maximum temperature of a stream identified as having salmon and trout rearing and migration use may not exceed 18.0˚C (64.4˚F); (d) The 7-day average maximum temperature of a stream identified as having a migration corridor use may not exceed 20.0˚C (68.0˚F). In addition, these water bodies must have cold water refugia that are sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body; (f) The 7-day average maximum temperature of a stream identified as having bull trout spawning and juvenile rearing use may not exceed 12.0˚C (53.6 ˚F).	See OAR Figures 170A and 170B (**Figure 4-1** and **Figure 4-2** in this document)
Natural Lakes OAR 340-041-0028(6)	Natural lakes may not be warmed by more than 0.3°C (0.5°F) above the natural condition unless a greater increase would not reasonably be expected to adversely affect fish or other aquatic life.	Natural Lakes or natural lakes that have been modified
Protecting Cold Water OAR 340-041-0028(11)	(a) Except as described in subsection (c) of this rule, waters of the State that have summer seven-day-average maximum ambient temperatures that are colder than the biologically based criteria in section (4) of this rule, may not be warmed by more than 0.3˚C (0.5˚F) above the colder water ambient temperature, by all sources taken together at the point of maximum impact.	Cold water
OAR 340-041-0028(12)	(a) Minimum Duties. There is no duty for anthropogenic sources to reduce heating of the waters of the State below their natural condition. Similarly, each anthropogenic point and nonpoint source is responsible only for controlling the thermal effects of its own discharge or activity in accordance with its overall heat contribution. In no case may a source cause more warming than that allowed by the human use allowance.	All waters of the state

Rule Citation	Summary of applicable standards	Waters where standards are applicable
	(b) Human Use Allowance. Insignificant additions of heat are authorized in waters that exceed the applicable temperature criteria. (B) Human Use Allowance. Following a temperature TMDL or other cumulative effects analysis, wasteload and load allocations will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3˚C (0.5˚F) above the applicable criteria after complete mixing in the waterbody, and at the point of maximum impact.	
Antidegradation OAR 340-041-0004 and 40 CFR 131.12(a)(2)	(3)(c) Insignificant temperature increases authorized under OAR 340-041-0028(11) and (12) are not considered a reduction in water quality. (5)(a) Riparian Restoration Activities Exemption: When DEQ determines that activities to restore geomorphology or riparian vegetation have a net ecological benefit, antidegradation review is not needed.	All waters of the state

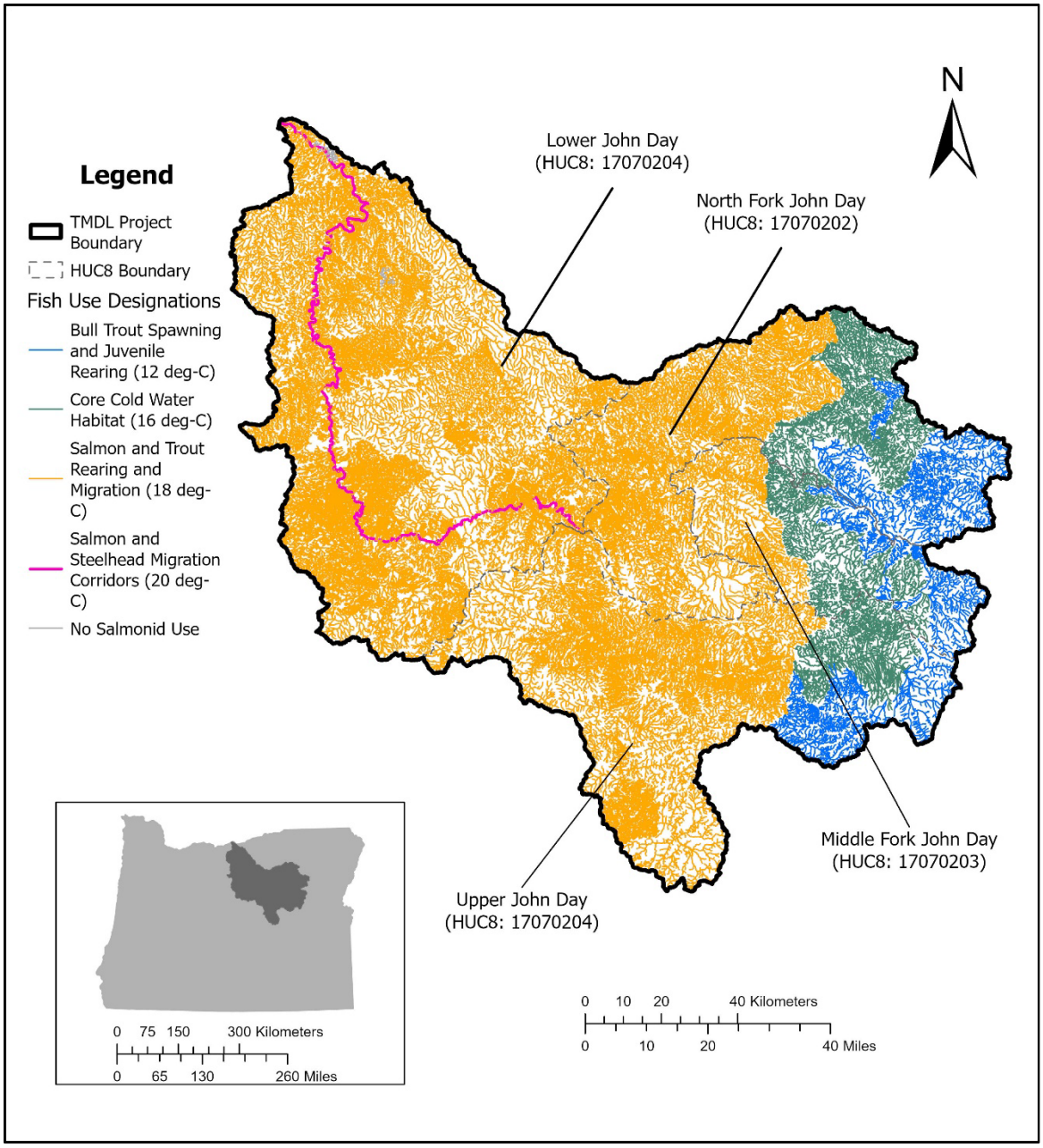

Figure 4-1: Fish use designations in the John Day River Basin TMDL project area.

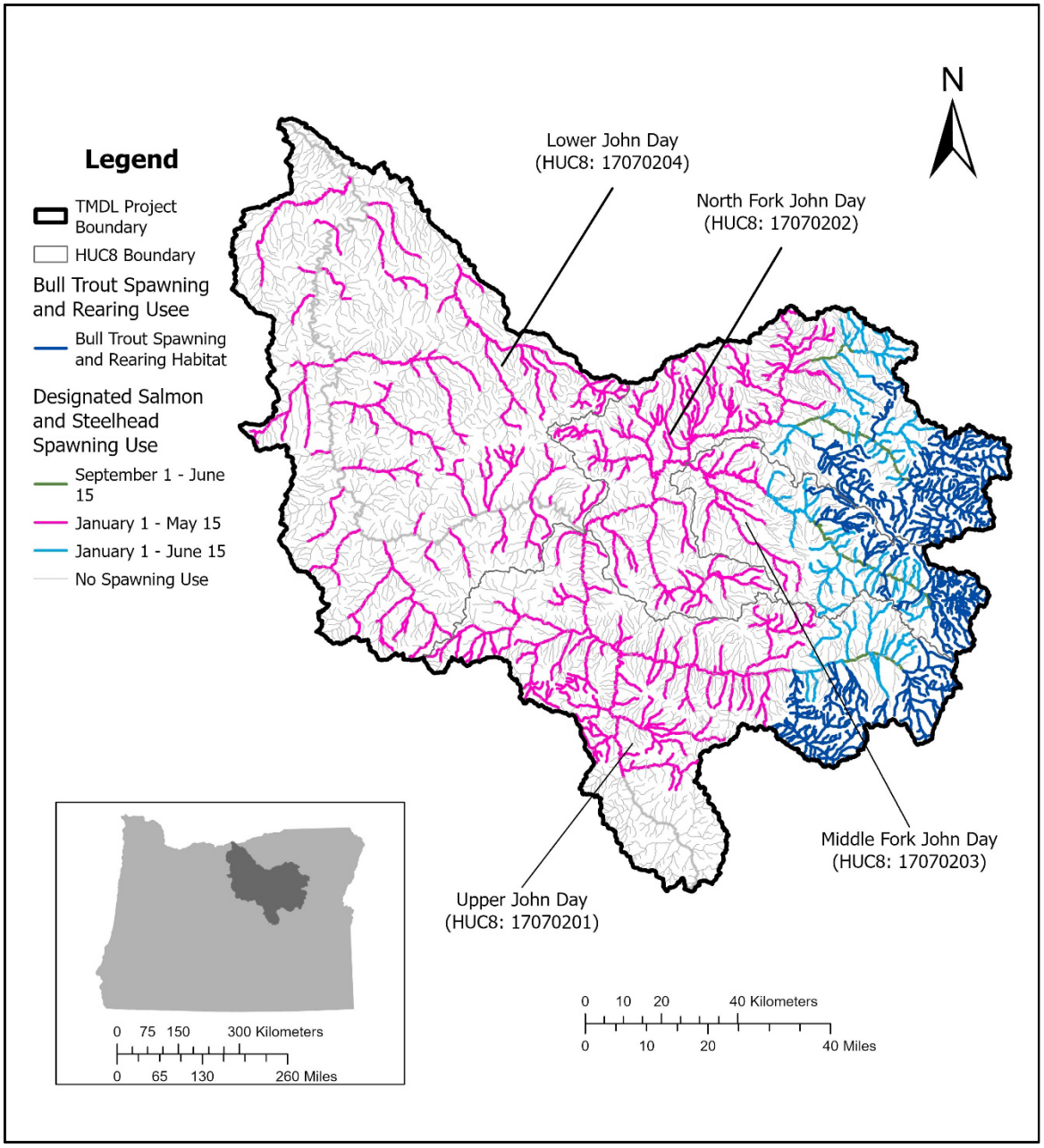

Figure 4-2: Salmon and steelhead spawning use designations in the John Day River Basin TMDL project area.

4.1 Salmon and steelhead spawning use

OAR 340-041-0028(4)(a) specifies that waters designated as having salmon and steelhead spawning use are identified in rule at OAR 340-041-0170 Figure 170B and shown in **Figure 4-2**. During the spawning period, these waters may not exceed 13.0°C (55.4°F) expressed as a 7DADM.

4.2 Core cold water habitat use

OAR 340-041-0028(4)(b) specifies that waters designated as having core cold water habitat use are identified in OAR 340-041-0170 Figure 170A and shown in **Figure 4-1**. These waters may not exceed 16.0°C (60.8°F) expressed as a 7DADM.

4.3 Salmon and trout rearing and migration

OAR 340-041-0028(4)(c) specifies that waters designated as having salmon and trout rearing and migration use are identified in OAR 340-041-0170 Figure 170A and shown in **Figure 4-1**. These waters may not exceed 18.0°C (64.4°F) expressed as a 7DADM.

4.4 Salmon and steelhead migration corridor use and cool water refugia

OAR 340-041-0028(4)(d) specifies that waters designated as having a migration corridor use are identified in OAR 340-041-0170 Figure 170A and shown in **Figure 4-1**. These waters may not exceed 20.0°C (68.0°F) expressed as a 7DADM. In addition, these waters must have cold water refugia that are sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body. Cold water refugia is defined in OAR 340-041-0002(10) to mean those portions of a water body where or times during the diel temperature cycle when the water temperature is at least 2°C colder than the daily maximum temperature of the adjacent well-mixed flow of the water body.

The John Day River from the mouth at the confluence with the Columbia River to the confluence of the John Day River and the North Fork John Day River is the only waterbody in the John Day Basin designated for salmon and steelhead migration corridor use.

4.5 Bull trout spawning and juvenile rearing

OAR 340-041-0028(4)(f) specifies that waters designated as having salmon and trout rearing and migration use are identified in OAR 340-041-0170 Figure 170A and shown in **Figure 4-1**. These waters may not exceed 12.0°C (53.6°F) expressed as a 7DADM.

4.6 Human use allowance

Oregon water quality standards have provisions for human use (OAR 340-041-0028(12)(b)). The human use allowance (HUA) is an insignificant addition of heat (0.3°C) authorized in waters that exceed the applicable temperature criteria. Following a temperature TMDL, or other cumulative effects analysis, wasteload and load allocations will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3°C (0.5°F) above the applicable biological criterion after complete mixing in the waterbody, and at the point of maximum impact (POMI). The rationale behind selection of 0.3°C for the HUA and how DEQ implements this portion of the standard can be found in DEQ (2003) and the Temperature IMD (DEQ, 2008a).

4.7 Antidegradation

[Discuss 40 CFR 131.12(a)(2)]

Oregon has antidegradation policy to guide decisions that affect water quality to prevent unnecessary further degradation from new or increased point and nonpoint sources of pollution, and to protect, maintain, and enhance existing surface water quality to ensure the full protection of all existing beneficial uses.

OAR 340-041-0004 (3)(c) specifies that insignificant temperature increases are authorized under OAR 340-041-0028(11) and (12) are not considered a reduction in water quality. Furthermore, OAR 340-041-0004 (5)(a) also specifies that DEQ determined activities to restore geomorphology or riparian vegetation that have a net ecological benefit, do not need antidegradation review, which is known as the Riparian Restoration Activities Exemption.

4.8 Protecting cold water

The “protecting cold water” criterion in OAR 340-041-0028(11) applies to waters of the state that have summer ambient 7DADM temperatures that are colder than the biologically based criteria. With some exceptions (summarized in **Figure 4-15**), these waters may not be warmed cumulatively by anthropogenic point and nonpoint sources by more than 0.3°C (0.5°F) above the colder water ambient temperature. This applies to all anthropogenic sources taken together at the POMI where salmon, steelhead or bull trout are present. A summary of how DEQ implements this portion of the standard can be found in the PCW IMD (DEQ, 2011) and the Temperature IMD (DEQ, 2008a).

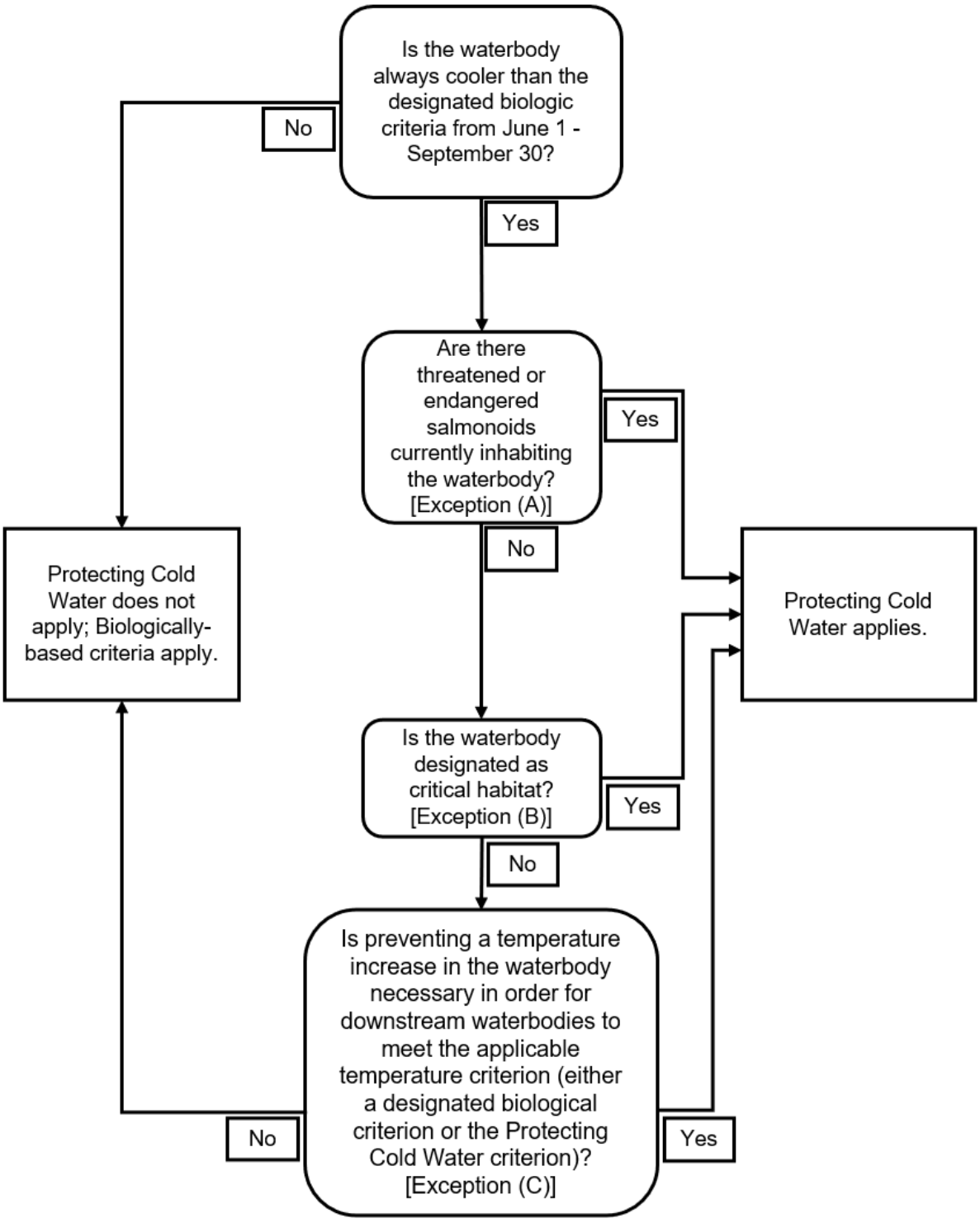

Figure 4-3: Flowchart to determine applicability of the PCW criterion. Adapted from DEQ, 2011.

4.9 Minimum duties

The minimum duties provision at OAR 340-041-0028(12)(a) states there is no duty for anthropogenic sources to reduce heating of the waters of the State below their natural condition.

Similarly, each anthropogenic point and nonpoint source is responsible only for controlling the thermal effects of their own discharge or activity in accordance with its overall heat contribution. In no case may a source cause more warming than that allowed by the human use allowance.

For point sources, DEQ is implementing the minimum duties provision if a facility operation meets acceptable operation and design requirements. The facility must be operated as a “flow through” facility where intake water moves through the facility and is not processed as part of an industrial or wastewater treatment operation. If a facility mixes the intake water with other wastewater or as a method to cool equipment, DEQ considers the thermal effects of this operation to be part of the facility’s own activity, and the minimum duties provision is not applicable. The intake water must also be returned to the same stream where the intake is located. If the water is not returned to the same stream the thermal effects are not from the receiving stream and therefore attributed to the facility’s own discharge.

For facilities that operate as a flow through facility, the minimum duties provision applies when the intake temperatures are warmer than the maximum effluent discharge temperatures allowed by the assigned wasteload allocation. On days when this occurs, the facility cannot add any additional thermal loading above what is contributed by the intake temperatures (i.e. no increase in temperature, HUA = 0.0^{o}C above the intake temperature) The purpose is to ensure the facility controls for thermal effects resulting from passing the water through and not from upstream sources. DEQ found this provision does not apply to any of the NPDES permitted facilities discharging to the John Day or other surface waters in the John Day River Basin.

The minimum duties provision is also applicable to dam and reservoir operations. On days when incoming temperatures upstream of the reservoir cause exceedances to applicable criteria plus assigned human use allowance in the reservoirs or downstream, the dam and reservoir operations must not contribute any additional heat to the waterbody above those incoming temperatures. This ensures dam operators are only responsible for temperature increases caused by the dam and reservoir operations. DEQ developed a surrogate measure temperature target for dam and reservoir operations to be consistent with the minimum duties provision (Section 9.4.1).

4.10 Statewide narrative criteria

Statewide narrative criteria at OAR 340-041-0007(1) apply to all waters of the state. The highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor and other deleterious factors at the lowest possible levels.

4.11 Natural lakes narrative

The narrative natural lakes criterion at OAR 340-041-0028(6) states that natural lakes may not be warmed by more than 0.3°C (0.5°F) above the natural condition unless a greater increase would not reasonably be expected to adversely affect fish or other aquatic life. Absent a discharge or human modification that would reasonably be expected to increase temperature, DEQ will presume that the ambient temperature of a natural lake is the same as its natural thermal condition.

The HUA assigned to anthropogenic sources in this TMDL do not exceed 0.3°C. Therefore, any increase above the natural condition temperatures shall be implemented so the target temperature plus 0.3°C HUA is protective of fish or other aquatic life.

For the purpose of applying the natural lakes criterion, ambient temperatures have the same meaning as defined in OAR 340-041-0002(2) where ambient means the temperature measured at a specific time and place. The selected location for measuring ambient temperature must be representative of the lake in the vicinity of the point being measured. The sampling approach and number of monitoring locations may vary depending on the lake size, temperature variability, and stratification regime. Monitoring and interpretation approaches are further discussed in TSD Section 4.7. Consistent with other temperature criteria, the 7DADM temperatures will be used for characterizing ambient or natural condition temperatures.

4.12 Numeric water quality targets

TMDLs must contain numeric water quality targets. The targets represent the instream endpoint that ensures all applicable temperature water quality standards are attained and beneficial uses are protected. Temperature targets summarized in **Table 4-3** are similar to the water quality standards summarized in **Table 4-2** but include application of water quality standard implementation provisions, relevant narrative provisions, and the antidegradation policy.

Table 4-3: Summary of applicable numeric temperature targets in the John Day River Basin.

Applicable Criteria	Fish and Aquatic Life Use Protected	7DADM Temperature Target (°C)	Notes
Biologically based numeric criteria apply OAR 340-041-0028(4) or Protecting cold water criterion OAR 340-041-0028(11)	**Waters that exceed the biologically based numeric criteria**		
	Salmon and steelhead spawning	13.0 + 0.3 HUA	Seasonally applies
	Bull trout spawning and juvenile rearing	12.0 + 0.3 HUA	
	Core cold water habitat	16.0 + 0.3 HUA	
	Salmon and trout rearing and migration	18.0 + 0.3 HUA	
	Salmon and steelhead migration corridor	20.0 + 0.3 HUA	
	Waters that are always colder than the applicable biologically based numeric criteria and the protecting colder water criterion does not apply		
	Salmon and steelhead spawning	13.0	Seasonally applies
	Core cold water habitat	16.0	
	Salmon and trout rearing and migration	18.0	
	Salmon and steelhead migration corridor	20.0	
	Waters that are always colder than the applicable biologically based numeric criteria and the protecting colder water criterion applies		
	Fish and aquatic life	Ambient temperature + 0.3 HUA	

Applicable Criteria	Fish and Aquatic Life Use Protected	7DADM Temperature Target (°C)	Notes
Coldwater refugia narrative OAR 340-041-0028(4)(d)	Salmon and steelhead migration corridor cold water refuges	2 degrees Celsius colder than the daily maximum temperature of the adjacent well-mixed water body	Cold water refugia must be sufficiently distributed.
Natural lakes narrative OAR 340-041-0028(6)	Fish and aquatic life Natural Lakes	Natural thermal condition + 0.3 HUA as a 7DADM	Absent a discharge or human modification that would reasonably be expected to increase temperature, DEQ will presume that the ambient temperature of a natural lake is the same as its natural thermal condition

5 Seasonal variation and critical period for temperature

Per OAR 340-042-0040(4)(j) and 40 Code of Federal Regulation 130.7(c)(1), TMDLs must also identify any seasonal variation and the critical condition or period of each pollutant, if applicable.

Maximum 7DADM stream temperatures typically occur in July or August. July and August are months when stream flows typically are low, solar radiation fluxes are high, and ambient air temperature conditions are warmest.

The critical period is based on the frequency and period when 7DADM stream temperatures exceed the applicable temperature criteria. DEQ uses the critical period to determine when allocations apply. In setting this period, DEQ relied upon monitoring sites with the longest period of exceedance and frequency of exceedance. When downstream monitoring sites have longer exceedance periods relative to upstream waters, the longer period is used as the critical period for upstream waterbodies when the downstream waterbodies were not modeled; or if the model shows thermal loads to upstream waterbodies contribute to temperature criteria exceedances in downstream waterbodies. [Add example of how critical period was determined].

The critical periods for waterbodies in the John Day River Basin are presented in **Table 5-1** to **Table 5-4**. Allocations presented in the TMDL apply during these periods. Section 5 of the TSD summarizes the critical period approach and presents plots of 7DADM temperature data used to determine seasonal variation and the critical periods.

Table 5-1: Designated critical periods for waters in the Upper John Day Subbasin (17070201).

Subbasin	Watershed or Waterbody Name	Critical Period
Upper John Day Subbasin 17070201	All waters	May 1 – October 31

Table 5-2: Designated critical periods for waters in the North Fork John Day Subbasin (17070202).

Subbasin	Watershed or Waterbody Name	Critical Period
North Fork John Day Subbasin	All waters, except those noted	May 1 – October 31
North Fork John Day Subbasin	Wall Creek Watershed (1707020208)	April 15 - October 31

Table 5-3: Designated critical periods for waters in the Middle Fork John Day Subbasin (17070203).

Subbasin	Watershed or Waterbody Name	Critical Period
Middle Fork John Day Subbasin	All waters, except those noted	July 1 - October 31
Middle Fork John Day Subbasin	Camp Creek-Middle Fork John Day River Watershed (1707020302) Bridge Creek-Middle Fork John Day River watershed (1707020301)	March 1 - October 31

Table 5-4: Designated critical periods for waters in the Lower John Day Subbasin (17070204).

Subbasin	Watershed or Waterbody Name	Critical Period
Lower John Day Subbasin	All waters, except those noted	March 15 – October 15
Lower John Day Subbasin	Lower Pine Creek Subwatersheds (170702040408) Upper Pine Creek Subwatersheds (170702040407)	February 1 - October 31

6 Temperature water quality data evaluation overview

A critical TMDL element is water quality data evaluation and analysis to the extent that existing data allow. To understand the water quality impairment, quantify the loading capacity, identify pollutant sources, and assess various management scenarios that achieve the TMDL and applicable water quality standards, the analysis requires a predictive component. Certain models provide a means to evaluate potential stream warming sources and, to the extent existing data allow, their current and potential pollutant loads. Heat Source temperature models were used in this effort and are described in the TSD model appendices.

Figure 6-1 provides an overview of the analyses completed for this TMDL.

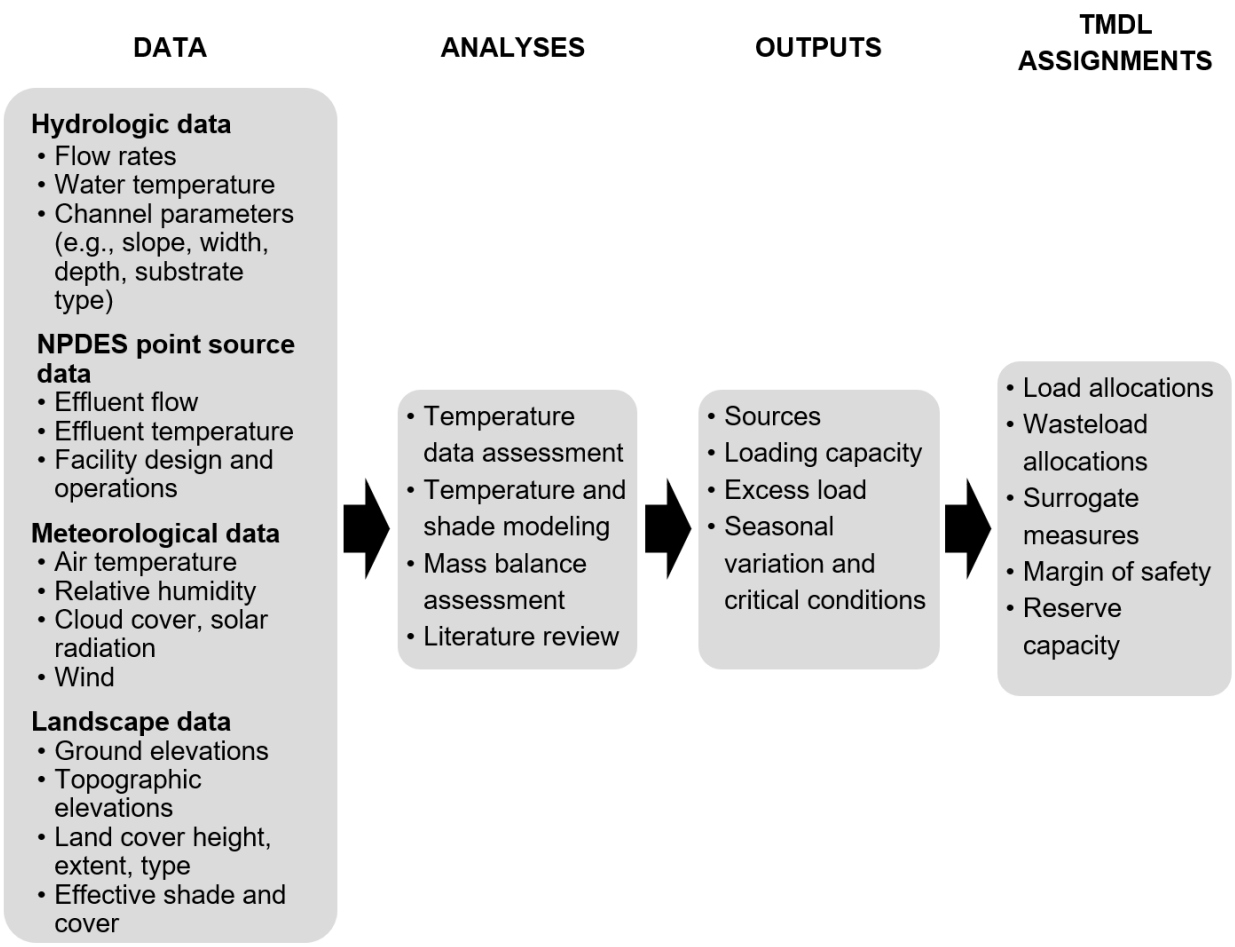

Figure 6-1: John Day River Basin temperature analysis overview.

6.1 Model overview

As described in the TSD model report appendices ([List appendices]), DEQ set up and calibrated temperature and shade models for streams in the John Day Basin (**Figure 6-2** and **Figure 6-3**). Temperature models were developed for:

- John Day River (Upper John Day and Lower John Day Subbasins)
- Middle Fork John Day River (Middle Fork John Day Subbasin)
- North Fork John Day River (North Fork John Day Subbasin)

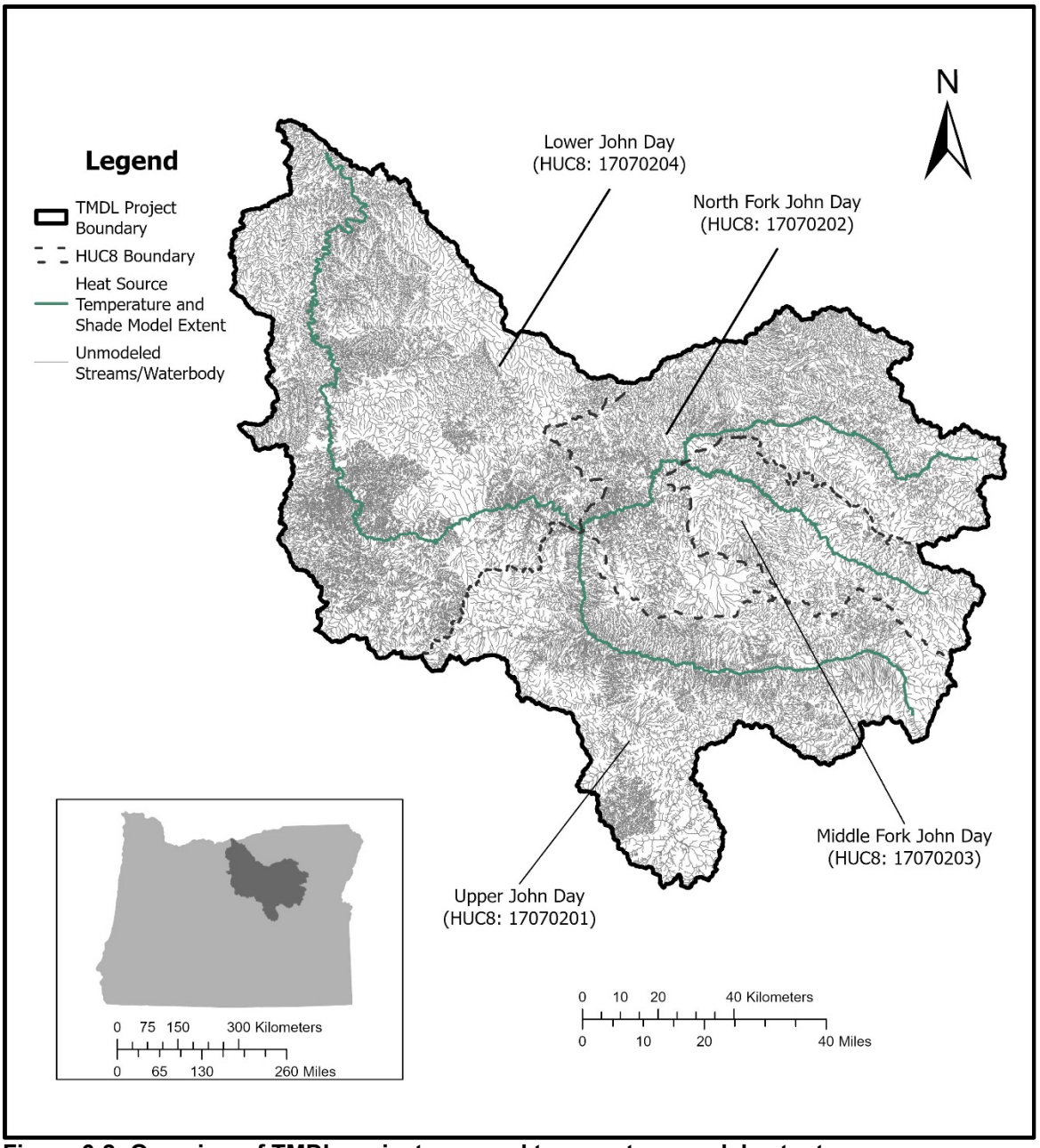

Figure 6-2: Overview of TMDL project area and temperature model extents.

[Brief description of the set up and calibration approach used in John Day Basin TMDL and WQMP (DEQ, 2010).] During development, the models were adjusted iteratively until acceptable goodness-of-fit was achieved relative to the observed current conditions. DEQ did not make adjustments to the original calibrated temperature models.

Adjustments were made to the various model scenarios developed for the 2010 TMDL with some new scenarios developed. The adjustments were principally focused on updating the version of Heat Source used (Heat Source 8.0.8) and assessment of various management scenarios such as changes in riparian conditions and water withdrawal rates.

The results of these models were used in tandem with applicable temperature criteria to complete source assessment and cumulative effects analyses, determine TMDL allocations and surrogate measures that attain the applicable temperature criteria, and develop information that will support TMDL implementation and development of the TMDL WQMP. Due to time and resource limitations, it was not possible to model all waters with a temperature listing, so the determination of sources and source categories is principally based on the findings from the streams that were modelled or were assessed using available data. Results from the modeled reaches and reaches with available data are relevant in the larger watershed context.
A summary of the source assessment findings is provided in Section 7. Detailed model calibration and scenario results are provided in the TSD model report appendices ([List Appendices]).

7 Sources or source categories

As noted in OAR 340-042-0040(4)(f) and OAR 340-042-0030(12), a source is any process, practice, activity or resulting condition that causes or may cause pollution or the introduction of pollutants to a waterbody. This section identifies the various pollutant sources and estimates, to the extent existing data allow, the significance of pollutant loading from existing sources.

Both point and nonpoint sources are sources of thermal pollution to surface waters in the John Day Basin. Within the nonpoint source category, both background and anthropogenic nonpoint sources contribute thermal pollution. Each source's thermal loading varies in frequency and magnitude based on the flow rate and temperature of discharge, prevalence of the activities, size of the land area on which the activities occur, locations of activities in relation to surface water, and transport mechanisms.

7.1 Thermal point sources

OAR 340-045-0010(17) defines a point source as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged."

Individual NPDES permittees were identified as sources of thermal loading to waters in the John Day Basin and assigned thermal waste load allocations. While individual NPDES permittees identified in this TMDL discharge or have potential to discharge thermal loads that increase stream temperature, the loading from the individual facilities evaluated do not result in temperature increases that exceed the 0.30°C human use allowance.

7.1.1 Individual NPDES permitted point sources

There are three domestic facilities with an individual NPDES permit within the John Day Basin. There is also one domestic WPCF permit within the John Day Basin. All four of the facilities were identified as potential sources of thermal load.

7.1.2 General NPDES permitted point sources

There is one category of general NPDES permit types with registrants in the John Day River Basin, a 400-J Industrial Wastewater: NPDES log ponds permit (GEN04).

There is one registrant of the 400-J permit. This registrant of general permits will not contribute to exceedances of applicable temperature criteria and impact beneficial uses based on the permit requirements, available dilution, or frequency and magnitude of discharge (see TSD Section 7.X). Therefore, no additional TMDL requirements are needed to control temperature, other than those included in the current NPDES permits. More specific wasteload allocations can be considered if subsequent data and evaluation demonstrates a need and if reserve capacity is available.

7.2 Thermal nonpoint sources

OAR 340-041-0002(42) defines nonpoint sources as “diffuse or unconfined sources of pollution where wastes can either enter, or be conveyed by the movement of water, into waters of the state.” Nonpoint sources of heat in the John Day Basin streams include activities associated with agriculture, forestry, and development.

Nonpoint sources or activities that contribute thermal load and may increase stream temperature include:

- Human caused increases in solar radiation loading to the stream network from the disturbance or removal of near-stream vegetation;
- Channel modification and widening;
- Dam and reservoir operation;
- Activities that modify flow rate or volume; and
- Background sources, including natural sources and anthropogenic sources of warming through climate change and other factors.

Anthropogenically influenced thermal loads are targeted for reduction to attain the temperature water quality criteria. The following actions are needed to attain the TMDL allocations:

- Restoration of streamside vegetation to reduce thermal loading from exposure to solar radiation;
- Restoration of complex channel morphology and hyporheic or groundwater connection;
- Management and operation of dams and reservoirs to minimize temperature warming; and
- Maintenance of minimum instream flows.

In many of the modeled streams, thermal loading from nonpoint sources contributed to exceedances of the applicable temperature criteria and therefore were identified as significant sources of thermal loading. The maximum daily maximum or 7DADM water temperature increase from nonpoint sources ranged from X°C in the [stream/river name] to X°C in the [stream/river name]. See the TSD for details. Reductions from nonpoint sources will be required to attain the applicable temperature criteria.

7.3 Thermal background sources

By definition (OAR 340-042-0030(1)), 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

the authority to regulate, such as pollutants emanating from another state, tribal lands, or sources otherwise beyond the jurisdiction of the state.

The amount of background thermal loading a stream receives is influenced by a number of landscape and meteorological characteristics, such as substrate and channel morphology conditions; streambank and channel elevations; near-stream vegetation; groundwater; hyporheic flow; tributary inflows; precipitation; cloudiness; air temperature; relative humidity; and others. Many of these factors, however, are influenced by anthropogenic impacts related to the surrogate measures. As such, it was not possible to develop a model in which all human influences were controlled or accounted for. As a best estimate, background thermal sources were quantified for the modeled rivers with delineable anthropogenic influences (i.e., dams and reservoirs, vegetation alterations, point source discharges, channel modification) accounted for, thus isolating the remaining background sources.

In many of the modeled streams, thermal loading from background sources contributed to exceedances of the applicable temperature criteria and therefore were identified as significant source of thermal loading. [Description of when and where applicable temperature criteria were exceeded]. See the TSD for detailed descriptions of analysis and results. Reductions from background sources will be required to attain the applicable temperature criteria.

8 Loading capacity and excess loads

Summarizing OAR 340-042-0040(4)(d) and 40 CFR 130.2(f), loading capacity is the amount of a pollutant or pollutants that a waterbody can receive and still meet water quality standards.

For temperature, thermal loading capacity is calculated on AUs using **Equation 8-1**.

$$LC = (T_C + \mathrm{HUA}) \cdot Q_R \cdot C_F$$ **Equation 8-1**

where,

$LC =$ Loading Capacity (kilocalories/day).

$T_C =$ The applicable river temperature criterion (ºC).

$\mathrm{HUA} =$ The 0.3°C human use allowance allocated to point sources, nonpoint sources, margin of safety, or reserve capacity.

$Q_R =$ The daily mean river flow rate in cubic feet per second (cfs). For a lake, a dilution factor of 1 may be used for Q_R unless determined using another method.

$C_F =$ Conversion factor using flow in cfs: 2,446,665

$$\left(\frac{1\ \mathrm{m}}{3.2808\ \mathrm{ft}}\right)^3 \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{86400\ sec}{1\ day} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 2{,}446{,}665$$

Equation 8-1 shall be used to calculate the thermal loading capacity for any surface water location in the John Day Basin. **Table 8-1** through **Table 8-4** presents the loading capacity for select temperature impaired Category 5 AUs modeled for the TMDL analysis at the critical 7Q10 low flow. **Equation 8-1** may be used to calculate the loading capacity when river flows are greater than 7Q10. **Equation 8-1** may also be used to calculate the loading capacity if in the future the applicable temperature criteria are updated and approved by EPA.

Table 8-1: Thermal loading capacity (LC) for select AUs by applicable fish use period at 7Q10 flow in the Upper John Day Subbasin (17070201).

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
Battle Creek	OR_SR_1707020111_05_101556	0	18.3	NA	0.00E+00	NA
Bear Creek	OR_SR_1707020106_05_101534	0.595	16.3	NA	2.37E+07	NA
HUC12 Name: Upper Beech Creek	OR_WS_170702010801_05_102055	0	18.3	NA	0.00E+00	NA
HUC12 Name: Upper Beech Creek	OR_WS_170702010801_05_102055	0	18.3	NA	0.00E+00	NA
Beech Creek	OR_SR_1707020108_05_101540	1.31	18.3	NA	5.87E+07	NA
HUC12 Name: Upper Canyon Creek	OR_WS_170702010701_05_102051	1.14	12.3	NA	3.43E+07	NA
Canyon Meadows Lake	OR_LK_1707020107_05_100025	0.677	12.3	13.3	2.04E+07	2.20E+07
East Fork Canyon Creek	OR_SR_1707020107_05_101539	2.06	12.3	NA	6.20E+07	NA
Canyon Creek	OR_SR_1707020107_05_101538	3.03	12.3	13.3	9.12E+07	9.86E+07
Canyon Creek	OR_SR_1707020107_05_101537	5.87	12.3	NA	1.77E+08	NA
HUC12 Name: Cottonwood Creek	OR_WS_170702011102_05_102072	0.886	18.3	NA	3.97E+07	NA
Cottonwood Creek	OR_SR_1707020111_05_101558	0.313	18.3	NA	1.40E+07	NA
HUC12 Name: Dads Creek-John Day River	OR_WS_170702010505_05_102042	0	16.3	NA	0.00E+00	NA
HUC12 Name: Dads Creek-John Day River	OR_WS_170702010505_05_102042	0	16.3	NA	0.00E+00	NA
HUC12 Name: Upper Deer Creek	OR_WS_170702010205_05_102025	0.869	18.3	NA	3.89E+07	NA
HUC12 Name: Upper Deer Creek	OR_WS_170702010205_05_102025	0	18.3	NA	0.00E+00	NA
HUC12 Name: Lower Deer Creek	OR_WS_170702010206_05_102026	3.37	18.3	NA	1.51E+08	NA
HUC12 Name: Dog Creek-John Day River	OR_WS_170702010608_05_102050	0	16.3	NA	0.00E+00	NA
HUC12 Name: East Fork Beech Creek	OR_WS_170702010802_05_102056	0	18.3	NA	0.00E+00	NA
HUC12 Name: East Fork Beech Creek	OR_WS_170702010802_05_102056	0	18.3	NA	0.00E+00	NA
Fields Creek	OR_SR_1707020110_05_101550	1.15	18.3	NA	5.15E+07	NA
HUC12 Name: Utley Creek	OR_WS_170702010104_05_102018	0	18.3	NA	0.00E+00	NA
HUC12 Name: Lonesome Creek	OR_WS_170702010101_05_102015	0	18.3	NA	0.00E+00	NA
HUC12 Name: Grub Creek	OR_WS_170702010607_05_102049	0	16.3	NA	0.00E+00	NA
Grub Creek	OR_SR_1707020106_05_101531	0	16.3	NA	0.00E+00	NA
Indian Creek	OR_SR_1707020106_05_101532	1.94	16.3	13.3	7.74E+07	6.31E+07
HUC12 Name: Headwaters John Day River	OR_WS_170702010501_05_102038	16.82	12.3	NA	5.06E+08	NA

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
HUC12 Name: Headwaters John Day River	OR_WS_170702010501_05_102038	6.18	12.3	NA	1.86E+08	NA
John Day River	OR_SR_1707020111_05_102568	25.9	18.3	NA	1.16E+09	NA
John Day River	OR_SR_1707020114_05_102609	23.4	18.3	NA	1.05E+09	NA
HUC12 Name: Dog Creek-John Day River	OR_WS_170702010608_05_102050	0	16.3	NA	0.00E+00	NA
HUC12 Name: Headwaters Murderers Creek	OR_WS_170702010301_05_102028	0.575	18.3	13.3	2.57E+07	1.87E+07
HUC12 Name: Headwaters Murderers Creek	OR_WS_170702010301_05_102028	1.53	18.3	13.3	6.85E+07	4.98E+07
Murderers Creek	OR_SR_1707020103_05_101525	4.06	18.3	13.3	1.82E+08	1.32E+08
Murderers Creek	OR_SR_1707020103_05_101526	3.2	18.3	NA	1.43E+08	NA
Pine Creek	OR_SR_1707020102_05_101521	0	18.3	NA	0.00E+00	NA
HUC12 Name: Castle Creek-John Day River	OR_WS_170702010606_05_102048	0.823	16.3	NA	3.28E+07	NA
HUC12 Name: Reynolds Creek	OR_WS_170702010503_05_102040	4.71	12.3	13.3	1.42E+08	1.53E+08
Rock Creek	OR_SR_1707020113_05_101564	1.67	18.3	NA	7.48E+07	NA
Lower Mountain Creek	OR_SR_1707020112_05_101560	0.526	18.3	NA	2.36E+07	NA
Mountain Creek	OR_SR_1707020112_05_101561	0.03	18.3	NA	1.34E+06	NA
HUC12 Name: Upper Mountain Creek	OR_WS_170702011201_05_102074	0.0117	18.3	NA	5.24E+05	NA
HUC12 Name: Headwaters South Fork John Day River	OR_WS_170702010102_05_102016	0	18.3	NA	0.00E+00	NA
South Fork John Day River	OR_SR_1707020101_05_101516	2	18.3	NA	8.95E+07	NA
South Fork John Day River	OR_SR_1707020102_05_101519	5.59	18.3	NA	2.50E+08	NA
HUC12 Name: Strawberry Creek-John Day River	OR_WS_170702010601_05_102043	1.2	16.3	NA	4.79E+07	NA
HUC12 Name: Strawberry Creek-John Day River	OR_WS_170702010601_05_102043	0	16.3	NA	0.00E+00	NA
HUC12 Name: Sunflower Creek	OR_WS_170702010204_05_102024	0.758	18.3	NA	3.39E+07	NA
HUC12 Name: Sunflower Creek	OR_WS_170702010204_05_102024	0	18.3	NA	0.00E+00	NA
HUC12 Name: Sunflower Creek	OR_WS_170702010204_05_102024	0	18.3	NA	0.00E+00	NA
HUC12 Name: Strawberry Creek-John Day River	OR_WS_170702010601_05_102043	1.16	16.3	NA	4.63E+07	NA

Table 8-2: Thermal loading capacity (LC) for select AUs by applicable fish use period at 7Q10 flow in the North Fork John Day Subbasin (17070202).

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
HUC12 Name: Beaver Creek	OR_WS_170702020203_05_102094	3.03	12.3	NA	9.12E+07	NA
HUC12 Name: Beaver Creek	OR_WS_170702020203_05_102094	0.22	12.3	NA	6.62E+06	NA
HUC12 Name: Beaver Creek	OR_WS_170702020203_05_102094	1.69	12.3	NA	5.09E+07	NA
HUC12 Name: Big Creek	OR_WS_170702020303_05_102099	0.652	12.3	NA	1.96E+07	NA
Big Creek	OR_SR_1707020203_05_101577	3.1	16.3	NA	1.24E+08	NA
Meadow Creek	OR_SR_1707020203_05_101578	5.77	16.3	NA	2.30E+08	NA
Big Creek	OR_SR_1707020203_05_101573	10.2	16.3	NA	4.07E+08	NA
HUC12 Name: Bull Run Creek	OR_WS_170702020202_05_102093	2.57	12.3	NA	7.73E+07	NA
HUC12 Name: Bull Run Creek	OR_WS_170702020202_05_102093	0	12.3	NA	0.00E+00	NA
HUC12 Name: Bull Run Creek	OR_WS_170702020202_05_102093	0.372	12.3	NA	1.12E+07	NA
HUC12 Name: Dry Camas Creek-Camas Creek	OR_WS_170702020501_05_102107	0	16.3	NA	0.00E+00	NA
HUC12 Name: Dry Camas Creek-Camas Creek	OR_WS_170702020501_05_102107	0	16.3	NA	0.00E+00	NA
Camas Creek	OR_SR_1707020205_05_101584	1.73	16.3	NA	6.90E+07	NA
HUC12 Name: Bowman Creek-Camas Creek	OR_WS_170702020502_05_102108	0.0705	16.3	NA	2.81E+06	NA
HUC12 Name: Bowman Creek-Camas Creek	OR_WS_170702020502_05_102108	0	16.3	NA	0.00E+00	NA
HUC12 Name: Bowman Creek-Camas Creek	OR_WS_170702020502_05_102108	0	16.3	NA	0.00E+00	NA
Camas Creek	OR_SR_1707020205_05_101581	1.5	16.3	NA	5.98E+07	NA
HUC12 Name: Cable Creek	OR_WS_170702020504_05_102110	1.46	16.3	NA	5.82E+07	NA
HUC12 Name: Cable Creek	OR_WS_170702020504_05_102110	0.993	16.3	NA	3.96E+07	NA
Cable Creek	OR_SR_1707020205_05_101582	1.86	16.3	NA	7.42E+07	NA
Hidaway Creek	OR_SR_1707020205_05_101583	1.62	16.3	NA	6.46E+07	NA
HUC12 Name: Lane Creek-Camas Creek	OR_WS_170702020505_05_102111	0	16.3	NA	0.00E+00	NA
Lane Creek	OR_SR_1707020205_05_101580	0.282	16.3	13.3	1.12E+07	9.18E+06
Camas Creek	OR_SR_1707020206_05_101587	4.24	16.3	NA	1.69E+08	NA
HUC12 Name: Upper Owens Creek	OR_WS_170702020602_05_102113	0	18.3	NA	0.00E+00	NA

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
Owens Creek	OR_SR_1707020206_05_101591	0	18.3	NA	0.00E+00	NA
Owens Creek	OR_SR_1707020206_05_101586	0.166	18.3	NA	7.43E+06	NA
Camas Creek	OR_SR_1707020206_05_101588	7.25	18.3	NA	3.25E+08	NA
HUC12 Name: Bridge Creek	OR_WS_170702020608_05_102119	0	18.3	NA	0.00E+00	NA
HUC12 Name: Upper Fivemile Creek	OR_WS_170702020604_05_102115	0	18.3	NA	0.00E+00	NA
Fivemile Creek	OR_SR_1707020206_05_101590	2.94	18.3	NA	1.32E+08	NA
HUC12 Name: Clear Creek	OR_WS_170702020204_05_102095	6.5	12.3	NA	1.96E+08	NA
HUC12 Name: Clear Creek	OR_WS_170702020204_05_102095	0.841	12.3	NA	2.53E+07	NA
HUC12 Name: Clear Creek	OR_WS_170702020204_05_102095	0.265	12.3	NA	7.97E+06	NA
Clear Creek	OR_SR_1707020202_05_101571	11.2	12.3	NA	3.37E+08	NA
HUC12 Name: Crane Creek-North Fork John Day River	OR_WS_170702020105_05_102091	1.12	12.3	NA	3.37E+07	NA
HUC12 Name: Headwaters Desolation Creek	OR_WS_170702020401_05_102103	1.84	12.3	NA	5.54E+07	NA
HUC12 Name: Headwaters Desolation Creek	OR_WS_170702020401_05_102103	2.18	12.3	NA	6.56E+07	NA
HUC12 Name: Upper Desolation Creek	OR_WS_170702020402_05_102104	0	12.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Upper Desolation Creek	OR_WS_170702020402_05_102104	0	12.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Upper Desolation Creek	OR_WS_170702020402_05_102104	0	12.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Upper Desolation Creek	OR_WS_170702020402_05_102104	0	12.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Upper Desolation Creek	OR_WS_170702020402_05_102104	0	12.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Middle Desolation Creek	OR_WS_170702020403_05_102105	0.719	16.3	NA	2.87E+07	NA
HUC12 Name: Middle Desolation Creek	OR_WS_170702020403_05_102105	0	16.3	NA	0.00E+00	NA
Desolation Creek	OR_SR_1707020204_05_101579	8.09	16.3	NA	3.23E+08	NA
Ditch Creek	OR_SR_1707020207_05_101592	0.704	18.3	NA	3.15E+07	NA
East Fork Cottonwood Creek	OR_SR_1707020209_05_101609	0	18.3	NA	0.00E+00	NA
HUC12 Name: Upper Granite Creek	OR_WS_170702020201_05_102092	0.957	12.3	NA	2.88E+07	NA
HUC12 Name: Upper Granite Creek	OR_WS_170702020201_05_102092	0	12.3	NA	0.00E+00	NA
Granite Creek	OR_SR_1707020202_05_101572	3.58	12.3	13.3	1.08E+08	1.16E+08
Granite Creek	OR_SR_1707020202_05_101570	18.3	12.3	NA	5.51E+08	NA
HUC12 Name: Lower Granite Creek	OR_WS_170702020206_05_102096	0	12.3	13.3	0.00E+00	0.00E+00

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
Lake Penland	OR_LK_1707020207_05_100032	0	18.3	NA	0.00E+00	NA
HUC12 Name: Mallory Creek	OR_WS_170702020708_05_102128	1.01	18.3	NA	4.52E+07	NA
HUC12 Name: Mallory Creek	OR_WS_170702020708_05_102128	0	18.3	NA	0.00E+00	NA
Mallory Creek	OR_SR_1707020207_05_101594	0.592	18.3	13.3	2.65E+07	1.93E+07
North Fork John Day River	OR_SR_1707020201_05_101569	11.5	12.3	NA	3.46E+08	NA
HUC12 Name: Baldy Creek-North Fork John Day River	OR_WS_170702020101_05_102087	1.46	12.3	13.3	4.39E+07	4.75E+07
HUC12 Name: Baldy Creek-North Fork John Day River	OR_WS_170702020101_05_102087	0.491	12.3	13.3	1.48E+07	1.60E+07
HUC12 Name: Baldy Creek-North Fork John Day River	OR_WS_170702020101_05_102087	0	12.3	13.3	0.00E+00	0.00E+00
North Fork John Day River	OR_SR_1707020203_05_101575	28.1	16.3	NA	1.12E+09	NA
North Fork John Day River	OR_SR_1707020203_05_101574	33.9	16.3	NA	1.35E+09	NA
North Fork John Day River	OR_SR_1707020207_05_101596	37.6	16.3	NA	1.50E+09	NA
North Fork John Day River	OR_SR_1707020207_05_101595	36.6	18.3	NA	1.64E+09	NA
North Fork John Day River	OR_SR_1707020210_05_101613	44.33807638	18.3	NA	1.99E+09	NA
HUC12 Name: Onion Creek-North Fork John Day River	OR_WS_170702020103_05_102089	0	12.3	NA	0.00E+00	NA
HUC12 Name: Ellis Creek-Potamus Creek	OR_WS_170702020706_05_102126	1.69	18.3	NA	7.57E+07	NA
Rudio Creek	OR_SR_1707020210_05_101616	0.335	18.3	NA	1.50E+07	NA
HUC12 Name: Texas Bar Creek-North Fork John Day River	OR_WS_170702020306_05_102102	0	16.3	NA	0.00E+00	NA
Texas Bar Creek	OR_SR_1707020203_05_101576	0.498	16.3	NA	1.99E+07	NA
HUC12 Name: Trail Creek	OR_WS_170702020102_05_102088	1.63	12.3	NA	4.91E+07	NA
HUC12 Name: Trail Creek	OR_WS_170702020102_05_102088	0.699	12.3	NA	2.10E+07	NA
HUC12 Name: Trail Creek	OR_WS_170702020102_05_102088	0.203	12.3	NA	6.11E+06	NA
Wall Creek	OR_SR_1707020208_05_101606	3.68	18.3	NA	1.65E+08	NA
Big Wall Creek	OR_SR_1707020208_05_101605	1.98	18.3	NA	8.87E+07	NA
Indian Creek	OR_SR_1707020208_05_101607	0	18.3	NA	0.00E+00	NA
Wilson Creek	OR_SR_1707020208_05_101601	0.67	18.3	NA	3.00E+07	NA
HUC12 Name: Little Wall Creek	OR_WS_170702020802_05_102133	0	18.3	NA	0.00E+00	NA

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
Little Wall Creek	OR_SR_1707020208_05_101603	0.0394	18.3	NA	1.76E+06	NA
Skookum Creek	OR_SR_1707020208_05_101600	0.834	18.3	NA	3.73E+07	NA
Skookum Creek	OR_SR_1707020208_05_102569	1.46	18.3	NA	6.54E+07	NA
HUC12 Name: Swale Creek	OR_WS_170702020801_05_102132	0	18.3	NA	0.00E+00	NA
Swale Creek	OR_SR_1707020208_05_101608	0.113	18.3	NA	5.06E+06	NA
West Fork Meadow Brook	OR_SR_1707020207_05_101599	1.04	16.3	NA	4.15E+07	NA
HUC12 Name: Wilson Creek	OR_WS_170702020804_05_102135	0	18.3	NA	0.00E+00	NA
HUC12 Name: Wilson Creek	OR_WS_170702020804_05_102135	0	18.3	NA	0.00E+00	NA

Table 8-3: Thermal loading capacity (LC) for select AUs by applicable fish use period at 7Q10 flow in the Middle Fork John Day Subbasin (17070203).

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
HUC12 Name: Bear Creek-Middle Fork John Day River	OR_WS_170702030301_05_102164	0	16.3	NA	0.00E+00	NA
HUC12 Name: Big Creek	OR_WS_170702030302_05_102165	0.966	12.3	NA	2.91E+07	NA
HUC12 Name: Big Creek	OR_WS_170702030302_05_102165	0	12.3	NA	0.00E+00	NA
HUC12 Name: Big Creek	OR_WS_170702030302_05_102165	0	12.3	NA	0.00E+00	NA
HUC12 Name: Big Creek	OR_WS_170702030302_05_102165	0	12.3	NA	0.00E+00	NA
Big Creek	OR_SR_1707020303_05_101626	1.43	12.3	NA	4.30E+07	NA
HUC12 Name: Bridge Creek	OR_WS_170702030105_05_102155	1.75	16.3	NA	6.98E+07	NA
HUC12 Name: Bridge Creek	OR_WS_170702030105_05_102155	0.86	16.3	NA	3.43E+07	NA
HUC12 Name: Bridge Creek	OR_WS_170702030105_05_102155	0	16.3	NA	0.00E+00	NA
HUC12 Name: Upper Camp Creek	OR_WS_170702030205_05_102160	0.121	16.3	NA	4.83E+06	NA
HUC12 Name: Upper Camp Creek	OR_WS_170702030205_05_102160	0	16.3	NA	0.00E+00	NA
HUC12 Name: Upper Camp Creek	OR_WS_170702030205_05_102160	0	16.3	NA	0.00E+00	NA
HUC12 Name: Upper Camp Creek	OR_WS_170702030205_05_102160	0	16.3	NA	0.00E+00	NA
Camp Creek	OR_SR_1707020302_05_101618	3.29	16.3	NA	1.31E+08	NA
HUC12 Name: Lower Camp Creek	OR_WS_170702030207_05_102162	0	16.3	NA	0.00E+00	NA

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
Camp Creek	OR_SR_1707020302_05_101623	5.37	16.3	13.3	2.14E+08	1.75E+08
HUC12 Name: Clear Creek	OR_WS_170702030104_05_102154	5.2	12.3	NA	1.56E+08	NA
HUC12 Name: Dry Fork Clear Creek	OR_WS_170702030103_05_102153	1.07	12.3	NA	3.22E+07	NA
HUC12 Name: Balance Creek-Middle Fork John Day River	OR_WS_170702030208_05_102163	0	16.3	NA	0.00E+00	NA
HUC12 Name: Indian Creek-Middle Fork John Day River	OR_WS_170702030303_05_102166	0.13	16.3	NA	5.18E+06	NA
HUC12 Name: Lick Creek	OR_WS_170702030206_05_102161	1.01	16.3	NA	4.03E+07	NA
HUC12 Name: Lick Creek	OR_WS_170702030206_05_102161	0.817	16.3	NA	3.26E+07	NA
Lick Creek	OR_SR_1707020302_05_101622	2.17	16.3	NA	8.65E+07	NA
HUC12 Name: Headwaters Long Creek	OR_WS_170702030401_05_102169	1.33	18.3	NA	5.95E+07	NA
HUC12 Name: Mill Creek-Middle Fork John Day River	OR_WS_170702030106_05_102156	2.24	12.3	13.3	6.74E+07	7.29E+07
HUC12 Name: Mill Creek-Middle Fork John Day River	OR_WS_170702030106_05_102156	0	12.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Mill Creek-Middle Fork John Day River	OR_WS_170702030106_05_102156	0	12.3	13.3	0.00E+00	0.00E+00
Middle Fork John Day River	OR_SR_1707020301_05_101617	7.22	12.3	13.3	2.17E+08	2.35E+08
HUC12 Name: Little Boulder Creek-Middle Fork John Day River	OR_WS_170702030202_05_102158	0	16.3	NA	0.00E+00	NA
HUC12 Name: Little Boulder Creek-Middle Fork John Day River	OR_WS_170702030202_05_102158	0	16.3	NA	0.00E+00	NA
HUC12 Name: Little Boulder Creek-Middle Fork John Day River	OR_WS_170702030202_05_102158	0	16.3	NA	0.00E+00	NA
HUC12 Name: Little Boulder Creek-Middle Fork John Day River	OR_WS_170702030202_05_102158	0	16.3	NA	0.00E+00	NA
Middle Fork John Day River	OR_SR_1707020302_05_101619	7.43	16.3	13.3	2.96E+08	2.42E+08
Middle Fork John Day River	OR_SR_1707020302_05_102577	7.4	16.3	NA	2.95E+08	NA
HUC12 Name: Granite Boulder Creek-Middle Fork John Day River	OR_WS_170702030203_05_102571	0.577	16.3	NA	2.30E+07	NA
HUC12 Name: Granite Boulder Creek-Middle Fork John Day River	OR_WS_170702030203_05_102571	0.051	16.3	NA	2.03E+06	NA
Middle Fork John Day River	OR_SR_1707020303_05_101624	14.8	16.3	NA	5.90E+08	NA
Middle Fork John Day River	OR_SR_1707020305_05_101597	15	18.3	NA	6.72E+08	NA
HUC12 Name: Summit Creek	OR_WS_170702030102_05_102152	0.462	12.3	13.3	1.39E+07	1.50E+07

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
HUC12 Name: Vinegar Creek-Middle Fork John Day River	OR_WS_170702030201_05_102157	0	16.3	NA	0.00E+00	NA
Vinegar Creek	OR_SR_1707020302_05_101620	0.156	12.3	NA	4.69E+06	NA
HUC12 Name: Squaw Creek	OR_WS_170702030101_05_102151	0.655	12.3	13.3	1.97E+07	2.13E+07

Table 8-4: Thermal loading capacity (LC) for select AUs by applicable fish use period at 7Q10 flow in the Lower John Day Subbasin (17070204).

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
HUC12 Name: Alder Creek	OR_WS_170702040108_05_102187	0.21	18.3	NA	9.40E+06	NA
Bear Creek	OR_SR_1707020403_05_101648	0	18.3	NA	0.00E+00	NA
Bridge Creek	OR_SR_1707020403_05_101651	0	18.3	NA	0.00E+00	NA
Bridge Creek	OR_SR_1707020403_05_101650	0	18.3	NA	0.00E+00	NA
HUC12 Name: Upper Bridge Creek	OR_WS_170702040303_05_102198	0	18.3	NA	0.00E+00	NA
HUC12 Name: Upper Bridge Creek	OR_WS_170702040303_05_102198	0	18.3	NA	0.00E+00	NA
Bridge Creek	OR_SR_1707020403_05_101647	0.5	18.3	NA	2.24E+07	NA
HUC12 Name: Brown Creek	OR_WS_170702041106_05_102250	0	18.3	NA	0.00E+00	NA
Rosebush Creek	OR_SR_1707020413_05_101709	0	18.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Upper Grass Valley Canyon	OR_WS_170702041304_05_102261	0	18.3	13.3	0.00E+00	0.00E+00
Grass Valley Canyon	OR_SR_1707020413_05_101708	0	18.3	NA	0.00E+00	NA
Hay Creek	OR_SR_1707020410_05_101697	0	18.3	NA	0.00E+00	NA
HUC12 Name: Upper Kahler Creek	OR_WS_170702040103_05_102182	0	18.3	NA	0.00E+00	NA
Pine Creek	OR_SR_1707020404_05_101664	0	18.3	NA	0.00E+00	NA
Pine Creek	OR_SR_1707020404_05_101662	0.1	18.3	NA	4.48E+06	NA
Rock Creek	OR_SR_1707020411_05_101705	0.18	18.3	NA	8.06E+06	NA
Rock Creek	OR_SR_1707020412_05_101701	1.09	18.3	NA	4.88E+07	NA
HUC12 Name: Service Creek-John Day River	OR_WS_170702040201_05_102189	0.372	18.3	NA	1.67E+07	NA
HUC12 Name: Sorefoot Creek-John Day River	OR_WS_170702040701_05_102222	0	18.3	NA	0.00E+00	NA

AU Name	AU ID	Annual 7Q10 (cfs)	Year-Round Criterion + HUA (°C)	Spawning Criterion + HUA (°C)	7Q10 LC Year-Round (kcal/day)	7Q10 LC Spawning (kcal/day)
Sorefoot Creek	OR_SR_1707020407_05_101677	0	18.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Cottonwood Creek-Butte Creek	OR_WS_170702040501_05_102213	0	18.3	NA	0.00E+00	NA
Thirtymile Creek	OR_SR_1707020408_05_101684	0	18.3	NA	0.00E+00	NA
Thirtymile Creek	OR_SR_1707020408_05_101685	0	18.3	NA	0.00E+00	NA
Dry Fork Thirtymile Creek	OR_SR_1707020408_05_101680	0	18.3	13.3	0.00E+00	0.00E+00
HUC12 Name: Buckhorn Creek	OR_WS_170702041105_05_102249	0	18.3	NA	0.00E+00	NA

In accordance with OAR 340-042-0040(4)(e), the excess load calculation evaluates, to the extent existing data allow, the difference between the actual pollutant load in a waterbody and the loading capacity of that waterbody.

Because flow monitoring data were not available at most temperature monitoring locations, it was not possible to calculate the excess load. Instead, the excess temperatures and percent load reduction were calculated for each AU where temperature data were available (**Table 8-5** to **Table 8-8**). The extensive monitoring across the John Day Basin represents a wide range of waterbodies; however not all streams in the John Day Basin have monitoring data. **Equation 8-2** from the TSD can be used to determine excess temperature and percent reduction for additional streams if data becomes available in the future.

$$\mathrm{PR} = \frac{(T_R - T_C - \mathrm{HUA})}{T_R} \cdot 100$$ **Equation 8-2**

where,

$\mathrm{PR} =$ Percent load reduction (%). If PR < 0, PR = 0

$T_R =$ The maximum 7DADM ambient river temperature (°C).

$T_C =$ The applicable river temperature criterion (°C).

$\mathrm{HUA} =$ The 0.3°C human use allowance assigned to point sources, nonpoint sources, margin of safety, or reserve capacity.

The excess temperatures are the maximum difference between the monitored 7DADM river temperatures and applicable numeric criteria plus the HUA. The percent load reduction represents the portion of the actual thermal loading that must be reduced to attain the TMDL loading capacity. The percent load reduction can be calculated from the excess temperature.

Table 8-5: Excess temperature and percent load reduction for AUs with available temperature data in the Lower John Day Subbasin (17070204).

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
Parrish Creek	OR_SR_1707020401_05_101633	29.51	18.3	11.21	37.99
Kahler Creek	OR_SR_1707020401_05_101636	9.59	13.3	0	0
Kahler Creek	OR_SR_1707020401_05_101636	16.60	18.3	0	0
John Day River	OR_SR_1707020401_05_101639	27.20	20.3	6.90	25.37
John Day River	OR_SR_1707020402_05_101644	43.48	20.3	23.18	53.31
Bridge Creek	OR_SR_1707020403_05_101647	22.00	13.3	8.70	39.55
Bridge Creek	OR_SR_1707020403_05_101647	33.00	18.3	14.70	44.55
Bridge Creek	OR_SR_1707020403_05_101650	18.59	13.3	5.29	28.46
Bridge Creek	OR_SR_1707020403_05_101650	28.03	18.3	9.73	34.71
Pine Creek	OR_SR_1707020404_05_101662	18.60	13.3	5.30	28.49
Pine Creek	OR_SR_1707020404_05_101662	23.66	18.3	5.36	22.65
Pine Creek	OR_SR_1707020404_05_101664	22.90	18.3	4.60	20.09
Butte Creek	OR_SR_1707020405_05_101671	16.83	13.3	3.53	20.97
Butte Creek	OR_SR_1707020405_05_101671	30.45	18.3	12.15	39.90
Pine Hollow	OR_SR_1707020406_05_101673	16.42	18.3	0	0
John Day River	OR_SR_1707020407_05_101678	27.94	20.3	7.64	27.34
Dry Fork Thirtymile Creek	OR_SR_1707020408_05_101680	19.04	18.3	0.74	3.89
Condon Creek	OR_SR_1707020408_05_101682	13.50	18.3	0	0
Thirtymile Creek	OR_SR_1707020408_05_101684	16.49	13.3	3.19	19.35
Thirtymile Creek	OR_SR_1707020408_05_101684	37.74	18.3	19.44	51.51
Thirtymile Creek	OR_SR_1707020408_05_101685	26.63	18.3	8.33	31.28
Shiption Canyon	OR_SR_1707020408_05_101686	16.67	18.3	0	0
Hay Creek	OR_SR_1707020410_05_101697	23.89	18.3	5.59	23.40
John Day River	OR_SR_1707020410_05_101700	27.79	20.3	7.49	26.95
Grass Valley Canyon	OR_SR_1707020413_05_101708	19.40	13.3	6.10	31.44
Grass Valley Canyon	OR_SR_1707020413_05_101708	26.49	18.3	8.19	30.92
John Day River	OR_SR_1707020414_05_101712	28.14	20.3	7.84	27.86

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
John Day River	OR_SR_1707020414_05_101712	29.06	20.3	8.76	30.14
HUC12 Name: Bologna Canyon	OR_WS_170702040101_05_102180	9.48	13.3	0	0
HUC12 Name: Bologna Canyon	OR_WS_170702040101_05_102180	16.22	18.3	0	0
HUC12 Name: Upper Kahler Creek	OR_WS_170702040103_05_102182	14.74	13.3	1.44	9.77
HUC12 Name: Upper Kahler Creek	OR_WS_170702040103_05_102182	22.86	18.3	4.56	19.95
HUC12 Name: Horseshoe Creek	OR_WS_170702040106_05_102185	20.70	18.3	2.40	11.59
HUC12 Name: Lake Creek	OR_WS_170702040107_05_102186	26.46	18.3	8.16	30.84
HUC12 Name: Alder Creek	OR_WS_170702040108_05_102187	16.81	13.3	3.51	20.88
HUC12 Name: Alder Creek	OR_WS_170702040108_05_102187	25.67	18.3	7.37	28.71
HUC12 Name: Service Creek-John Day River	OR_WS_170702040201_05_102189	17.03	18.3	0	0
HUC12 Name: Headwaters Bridge Creek	OR_WS_170702040301_05_102196	14.44	18.3	0	0
HUC12 Name: West Branch Bridge Creek	OR_WS_170702040302_05_102197	16.83	18.3	0	0
HUC12 Name: Upper Bear Creek	OR_WS_170702040304_05_102199	21.81	18.3	3.51	16.09
HUC12 Name: Middle Bear Creek	OR_WS_170702040305_05_102200	10.90	13.3	0	0
HUC12 Name: Middle Bear Creek	OR_WS_170702040305_05_102200	17.29	18.3	0	0
HUC12 Name: Cottonwood Creek-Butte Creek	OR_WS_170702040501_05_102213	15.31	18.3	0	0
HUC12 Name: Deep Creek-Butte Creek	OR_WS_170702040505_05_102217	17.11	13.3	3.81	22.27
HUC12 Name: Deep Creek-Butte Creek	OR_WS_170702040505_05_102217	23.29	18.3	4.99	21.43
HUC12 Name: Lost Valley Creek-East Fork Thirtymil*	OR_WS_170702040802_05_102226	16.76	18.3	0	0
HUC12 Name: Buckhorn Creek	OR_WS_170702041105_05_102249	10.04	13.3	0	0
HUC12 Name: Buckhorn Creek	OR_WS_170702041105_05_102249	17.30	18.3	0	0

Table 8-6: Excess temperature and percent load reduction for AUs with available temperature data in the North Fork John Day Subbasin (17070202).

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
North Fork John Day River	OR_SR_1707020201_05_101569	24.23	12.3	11.93	49.24
Granite Creek	OR_SR_1707020202_05_101570	25.34	12.3	13.04	51.46

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
Clear Creek	OR_SR_1707020202_05_101571	24.01	12.3	11.71	48.77
Granite Creek	OR_SR_1707020202_05_101572	24.09	12.3	11.79	48.94
Big Creek	OR_SR_1707020203_05_101573	25.12	12.3	12.82	51.04
North Fork John Day River	OR_SR_1707020203_05_101574	24.77	13.3	11.47	46.31
North Fork John Day River	OR_SR_1707020203_05_101574	27.15	16.3	10.85	39.96
North Fork John Day River	OR_SR_1707020203_05_101575	20.62	13.3	7.32	35.50
North Fork John Day River	OR_SR_1707020203_05_101575	26.62	16.3	10.32	38.77
Texas Bar Creek	OR_SR_1707020203_05_101576	16.05	13.3	2.75	17.13
Texas Bar Creek	OR_SR_1707020203_05_101576	21.28	16.3	4.98	23.40
Big Creek	OR_SR_1707020203_05_101577	12.87	13.3	0	0
Big Creek	OR_SR_1707020203_05_101577	21.17	16.3	4.87	23.00
Meadow Creek	OR_SR_1707020203_05_101578	19.1	13.3	5.8	30.37
Meadow Creek	OR_SR_1707020203_05_101578	24.9	16.3	8.6	34.54
Desolation Creek	OR_SR_1707020204_05_101579	25.06	12.3	12.76	50.92
Desolation Creek	OR_SR_1707020204_05_101579	19.37	13.3	6.07	31.34
Desolation Creek	OR_SR_1707020204_05_101579	22.64	16.3	6.34	28.00
Lane Creek	OR_SR_1707020205_05_101580	16.32	13.3	3.02	18.50
Lane Creek	OR_SR_1707020205_05_101580	21.82	16.3	5.52	25.30
Cable Creek	OR_SR_1707020205_05_101582	15.94	13.3	2.64	16.56
Cable Creek	OR_SR_1707020205_05_101582	26.9	16.3	10.6	39.41
Hidaway Creek	OR_SR_1707020205_05_101583	23.51	12.3	11.21	47.68
Hidaway Creek	OR_SR_1707020205_05_101583	19.26	13.3	5.96	30.94
Hidaway Creek	OR_SR_1707020205_05_101583	24.07	16.3	7.77	32.28
Camas Creek	OR_SR_1707020205_05_101584	19.7	13.3	6.4	32.49
Camas Creek	OR_SR_1707020205_05_101584	26.85	16.3	10.55	39.29
Owens Creek	OR_SR_1707020206_05_101586	16.13	13.3	2.83	17.54
Owens Creek	OR_SR_1707020206_05_101586	27.36	18.3	9.06	33.11
Camas Creek	OR_SR_1707020206_05_101588	27.18	18.3	8.88	32.67
Fivemile Creek	OR_SR_1707020206_05_101590	21.22	18.3	2.92	13.76

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
Ditch Creek	OR_SR_1707020207_05_101592	26.51	18.3	8.21	30.97
North Fork John Day River	OR_SR_1707020207_05_101595	33.79	18.3	15.49	45.84
North Fork John Day River	OR_SR_1707020207_05_101596	25.79	16.3	9.49	36.80
Potamus Creek	OR_SR_1707020207_05_101598	30.25	18.3	11.95	39.50
West Fork Meadow Brook	OR_SR_1707020207_05_101599	21.61	13.3	8.31	38.45
West Fork Meadow Brook	OR_SR_1707020207_05_101599	24.46	16.3	8.16	33.36
Wilson Creek	OR_SR_1707020208_05_101601	18.88	13.3	5.58	29.56
Wilson Creek	OR_SR_1707020208_05_101601	28.59	18.3	10.29	35.99
Little Wall Creek	OR_SR_1707020208_05_101603	19.64	13.3	6.34	32.28
Little Wall Creek	OR_SR_1707020208_05_101603	25.67	18.3	7.37	28.71
Big Wall Creek	OR_SR_1707020208_05_101604	10.6	13.3	0	0
Big Wall Creek	OR_SR_1707020208_05_101604	19.59	18.3	1.29	6.58
Big Wall Creek	OR_SR_1707020208_05_101605	14.08	13.3	0.78	5.54
Big Wall Creek	OR_SR_1707020208_05_101605	25.9	18.3	7.6	29.34
Wall Creek	OR_SR_1707020208_05_101606	31.57	18.3	13.27	42.03
Indian Creek	OR_SR_1707020208_05_101607	14.31	13.3	1.01	7.06
Indian Creek	OR_SR_1707020208_05_101607	22.2	18.3	3.9	17.57
Swale Creek	OR_SR_1707020208_05_101608	13.97	13.3	0.67	4.80
Swale Creek	OR_SR_1707020208_05_101608	22.2	18.3	3.9	17.57
Skookum Creek	OR_SR_1707020208_05_102569	30.13	18.3	11.83	39.26
Cottonwood Creek	OR_SR_1707020209_05_101612	23.33	18.3	5.03	21.56
North Fork John Day River	OR_SR_1707020210_05_101613	29.51	18.3	11.21	37.99
HUC12 Name: Baldy Creek-North Fork John Day River	OR_WS_170702020101_05_102087	16.6	12.3	4.3	25.90
HUC12 Name: Trail Creek	OR_WS_170702020102_05_102088	24.94	12.3	12.64	50.68
HUC12 Name: Onion Creek-North Fork John Day River	OR_WS_170702020103_05_102089	15.72	12.3	3.42	21.76
HUC12 Name: Crane Creek-North Fork John Day River	OR_WS_170702020105_05_102091	12.88	12.3	0.58	4.50
HUC12 Name: Upper Granite Creek	OR_WS_170702020201_05_102092	21	12.3	8.7	41.43
HUC12 Name: Bull Run Creek	OR_WS_170702020202_05_102093	22.81	12.3	10.51	46.08

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
HUC12 Name: Beaver Creek	OR_WS_170702020203_05_102094	26.29	12.3	13.99	53.21
HUC12 Name: Clear Creek	OR_WS_170702020204_05_102095	20.46	12.3	8.16	39.88
HUC12 Name: Lake Creek	OR_WS_170702020205_05_102603	20.79	12.3	8.49	40.84
HUC12 Name: Lower Granite Creek	OR_WS_170702020206_05_102096	21.82	12.3	9.52	43.63
HUC12 Name: Glade Creek-North Fork John Day River	OR_WS_170702020301_05_102097	16	16.3	0	0
HUC12 Name: Meadow Creek	OR_WS_170702020302_05_102098	24.07	16.3	7.77	32.28
HUC12 Name: Big Creek	OR_WS_170702020303_05_102099	20.73	12.3	8.43	40.67
HUC12 Name: Oriental Creek-North Fork John Day Ri*	OR_WS_170702020305_05_102101	27.16	16.3	10.86	39.99
HUC12 Name: Texas Bar Creek-North Fork John Day R*	OR_WS_170702020306_05_102102	18.88	13.3	5.58	29.56
HUC12 Name: Texas Bar Creek-North Fork John Day R*	OR_WS_170702020306_05_102102	24.4	16.3	8.1	33.20
HUC12 Name: Headwaters Desolation Creek	OR_WS_170702020401_05_102103	20.84	12.3	8.54	40.98
HUC12 Name: Upper Desolation Creek	OR_WS_170702020402_05_102104	22.87	12.3	10.57	46.22
HUC12 Name: Middle Desolation Creek	OR_WS_170702020403_05_102105	21.11	12.3	8.81	41.73
HUC12 Name: Dry Camas Creek-Camas Creek	OR_WS_170702020501_05_102107	13.36	13.3	0.06	0.45
HUC12 Name: Dry Camas Creek-Camas Creek	OR_WS_170702020501_05_102107	25.4	16.3	9.1	35.83
HUC12 Name: Bowman Creek-Camas Creek	OR_WS_170702020502_05_102108	19.36	13.3	6.06	31.30
HUC12 Name: Bowman Creek-Camas Creek	OR_WS_170702020502_05_102108	25.2	16.3	8.9	35.32
HUC12 Name: Hidaway Creek	OR_WS_170702020503_05_102109	18.12	12.3	5.82	32.12
HUC12 Name: Cable Creek	OR_WS_170702020504_05_102110	18.5	13.3	5.2	28.11
HUC12 Name: Cable Creek	OR_WS_170702020504_05_102110	23.9	16.3	7.6	31.80
HUC12 Name: Upper Owens Creek	OR_WS_170702020602_05_102113	22.42	18.3	4.12	18.38
HUC12 Name: Bridge Creek	OR_WS_170702020608_05_102119	10.73	13.3	0	0
HUC12 Name: Bridge Creek	OR_WS_170702020608_05_102119	22.19	18.3	3.89	17.53
HUC12 Name: East Fork Meadow Brook	OR_WS_170702020701_05_102121	16.13	13.3	2.83	17.54
HUC12 Name: East Fork Meadow Brook	OR_WS_170702020701_05_102121	22.91	16.3	6.61	28.85
HUC12 Name: Jericho Creek-North Fork John Day Riv*	OR_WS_170702020704_05_102124	24.16	18.3	5.86	24.25
HUC12 Name: Matlock Creek-Stony Creek	OR_WS_170702020705_05_102125	19.71	18.3	1.41	7.15

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
HUC12 Name: Ellis Creek-Potamus Creek	OR_WS_170702020706_05_102126	13.58	13.3	0.28	2.06
HUC12 Name: Ellis Creek-Potamus Creek	OR_WS_170702020706_05_102126	25.01	18.3	6.71	26.83
HUC12 Name: Mallory Creek	OR_WS_170702020708_05_102128	17.76	13.3	4.46	25.11
HUC12 Name: Mallory Creek	OR_WS_170702020708_05_102128	24.79	18.3	6.49	26.18
HUC12 Name: Swale Creek	OR_WS_170702020801_05_102132	20.84	18.3	2.54	12.19
HUC12 Name: Little Wall Creek	OR_WS_170702020802_05_102133	16.38	13.3	3.08	18.80
HUC12 Name: Little Wall Creek	OR_WS_170702020802_05_102133	25.17	18.3	6.87	27.29
HUC12 Name: Skookum Creek-Little Wall Creek	OR_WS_170702020803_05_102134	10.47	13.3	0	0
HUC12 Name: Skookum Creek-Little Wall Creek	OR_WS_170702020803_05_102134	22.8	18.3	4.5	19.74
HUC12 Name: Wilson Creek	OR_WS_170702020804_05_102135	15.94	13.3	2.64	16.56
HUC12 Name: Wilson Creek	OR_WS_170702020804_05_102135	25.12	18.3	6.82	27.15

Table 8-7: Excess temperature and percent load reduction for AUs with available temperature data in the Middle Fork John Day Subbasin (17070203).

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
Camp Creek	OR_SR_1707020302_05_101618	16.51	13.3	3.21	19.44
Camp Creek	OR_SR_1707020302_05_101618	25.17	16.3	8.87	35.24
Vinegar Creek	OR_SR_1707020302_05_101620	24.33	12.3	12.03	49.45
Lick Creek	OR_SR_1707020302_05_101622	18.57	13.3	5.27	28.38
Lick Creek	OR_SR_1707020302_05_101622	22.16	16.3	5.86	26.44
Camp Creek	OR_SR_1707020302_05_101623	22.82	13.3	9.52	41.72
Camp Creek	OR_SR_1707020302_05_101623	29.71	16.3	13.41	45.14
Middle Fork John Day River	OR_SR_1707020302_05_102577	24.6	13.3	11.3	45.93
Middle Fork John Day River	OR_SR_1707020302_05_102577	27.4	16.3	11.1	40.51
Middle Fork John Day River	OR_SR_1707020303_05_101624	17.47	13.3	4.17	23.87
Middle Fork John Day River	OR_SR_1707020303_05_101624	26.54	16.3	10.24	38.58
Big Creek	OR_SR_1707020303_05_101626	19.83	12.3	7.53	37.97

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
Middle Fork John Day River	OR_SR_1707020305_05_101597	30.29	18.3	11.99	39.58
Middle Fork John Day River	OR_SR_1707020305_05_101597	28.64	18.3	10.34	36.10
HUC12 Name: Squaw Creek	OR_WS_170702030101_05_102151	25.41	12.3	13.11	51.59
HUC12 Name: Summit Creek	OR_WS_170702030102_05_102152	26.96	12.3	14.66	54.38
HUC12 Name: Dry Fork Clear Creek	OR_WS_170702030103_05_102153	25	12.3	12.7	50.80
HUC12 Name: Clear Creek	OR_WS_170702030104_05_102154	21.89	12.3	9.59	43.81
HUC12 Name: Bridge Creek	OR_WS_170702030105_05_102155	18.73	13.3	5.43	28.99
HUC12 Name: Bridge Creek	OR_WS_170702030105_05_102155	23.58	16.3	7.28	30.87
HUC12 Name: Mill Creek-Middle Fork John Day River	OR_WS_170702030106_05_102156	25.11	12.3	12.81	51.02
HUC12 Name: Vinegar Creek-Middle Fork John Day Ri*	OR_WS_170702030201_05_102157	12.77	13.3	0	0
HUC12 Name: Vinegar Creek-Middle Fork John Day Ri*	OR_WS_170702030201_05_102157	15.91	16.3	0	0
HUC12 Name: Vinegar Creek-Middle Fork John Day Ri*	OR_WS_170702030201_05_102157	14.78	12.3	2.48	16.78
HUC12 Name: Granite Boulder Creek-Middle Fork Joh*	OR_WS_170702030203_05_102571	20.01	12.3	7.71	38.53
HUC12 Name: Granite Boulder Creek-Middle Fork Joh*	OR_WS_170702030203_05_102571	18.85	16.3	2.55	13.53
HUC12 Name: Big Boulder Creek	OR_WS_170702030204_05_102159	23.57	12.3	11.27	47.82
HUC12 Name: Upper Camp Creek	OR_WS_170702030205_05_102160	14.94	13.3	1.64	10.98
HUC12 Name: Upper Camp Creek	OR_WS_170702030205_05_102160	20.79	16.3	4.49	21.60
HUC12 Name: Lick Creek	OR_WS_170702030206_05_102161	22.93	16.3	6.63	28.91
HUC12 Name: Lower Camp Creek	OR_WS_170702030207_05_102162	16.89	16.3	0.59	3.49
HUC12 Name: Balance Creek-Middle Fork John Day Ri*	OR_WS_170702030208_05_102163	12.81	13.3	0	0
HUC12 Name: Balance Creek-Middle Fork John Day Ri*	OR_WS_170702030208_05_102163	20.7	16.3	4.4	21.26
HUC12 Name: Bear Creek-Middle Fork John Day River	OR_WS_170702030301_05_102164	18.21	13.3	4.91	26.96
HUC12 Name: Bear Creek-Middle Fork John Day River	OR_WS_170702030301_05_102164	20.9	16.3	4.6	22.01
HUC12 Name: Big Creek	OR_WS_170702030302_05_102165	18.37	12.3	6.07	33.04

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
HUC12 Name: Indian Creek-Middle Fork John Day Riv*	OR_WS_170702030303_05_102166	22.37	12.3	10.07	45.02
HUC12 Name: Indian Creek-Middle Fork John Day Riv*	OR_WS_170702030303_05_102166	18.55	13.3	5.25	28.30
HUC12 Name: Indian Creek-Middle Fork John Day Riv*	OR_WS_170702030303_05_102166	21.82	16.3	5.52	25.30
HUC12 Name: Slide Creek	OR_WS_170702030304_05_102167	21.8	16.3	5.5	25.23
HUC12 Name: Headwaters Long Creek	OR_WS_170702030401_05_102169	19.64	18.3	1.34	6.82
HUC12 Name: Basin Creek	OR_WS_170702030404_05_102172	17.04	18.3	0	0

Table 8-8: Excess temperature and percent load reduction for AUs with available temperature data in the Upper John Day Subbasin (17070201).

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
South Fork John Day River	OR_SR_1707020101_05_101516	16.61	18.3	0	0
Pine Creek	OR_SR_1707020102_05_101521	23.83	18.3	5.53	23.21
Murderers Creek	OR_SR_1707020103_05_101525	21.05	18.3	2.75	13.06
South Fork John Day River	OR_SR_1707020104_05_101527	24.8	18.3	6.5	26.21
Canyon Creek	OR_SR_1707020107_05_101537	20.6	12.3	8.3	40.29
Canyon Creek	OR_SR_1707020107_05_101538	24.16	12.3	11.86	49.09
East Fork Canyon Creek	OR_SR_1707020107_05_101539	21.27	12.3	8.97	42.17
Beech Creek	OR_SR_1707020108_05_101540	22.9	18.3	4.6	20.09
East Fork Beech Creek	OR_SR_1707020108_05_101541	24.14	18.3	5.84	24.19
John Day River	OR_SR_1707020109_05_101547	24.57	18.3	6.27	25.52
Fields Creek	OR_SR_1707020110_05_101550	18.93	18.3	0.63	3.33
John Day River	OR_SR_1707020110_05_101552	28.24	18.3	9.94	35.20
John Day River	OR_SR_1707020111_05_102568	27.76	18.3	9.46	34.08
Rock Creek	OR_SR_1707020113_05_101564	25.5	18.3	7.2	28.24
Goose Creek	OR_SR_1707020114_05_101568	21.57	18.3	3.27	15.16
John Day River	OR_SR_1707020114_05_102609	28.2	18.3	9.9	35.11

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
HUC12 Name: Lonesome Creek	OR_WS_170702010101_05_102015	21.94	18.3	3.64	16.59
HUC12 Name: Headwaters South Fork John Day River	OR_WS_170702010102_05_102016	20.42	18.3	2.12	10.38
HUC12 Name: Venator Creek-South Fork John Day Riv*	OR_WS_170702010106_05_102020	25.36	18.3	7.06	27.84
HUC12 Name: Sunflower Creek	OR_WS_170702010204_05_102024	23.16	18.3	4.86	20.98
HUC12 Name: Sunflower Creek	OR_WS_170702010204_05_102024	19.76	18.3	1.46	7.39
HUC12 Name: Upper Deer Creek	OR_WS_170702010205_05_102025	22.43	18.3	4.13	18.41
HUC12 Name: Lower Deer Creek	OR_WS_170702010206_05_102026	25.78	18.3	7.48	29.01
HUC12 Name: Headwaters Murderers Creek	OR_WS_170702010301_05_102028	23.11	18.3	4.81	20.81
HUC12 Name: South Fork Murderers Creek	OR_WS_170702010302_05_102029	20.13	18.3	1.83	9.09
HUC12 Name: Black Canyon Creek	OR_WS_170702010403_05_102035	11.57	13.3	0	0
HUC12 Name: Black Canyon Creek	OR_WS_170702010403_05_102035	17.28	18.3	0	0
HUC12 Name: Smoky Creek-South Fork John Day River	OR_WS_170702010405_05_102037	14.66	18.3	0	0
HUC12 Name: Headwaters John Day River	OR_WS_170702010501_05_102038	14.7	12.3	2.4	16.33
HUC12 Name: Deardorff Creek	OR_WS_170702010502_05_102039	16.54	12.3	4.24	25.63
HUC12 Name: Reynolds Creek	OR_WS_170702010503_05_102040	17.02	12.3	4.72	27.73
HUC12 Name: Strawberry Creek-John Day River	OR_WS_170702010601_05_102043	15.52	12.3	3.22	20.75
HUC12 Name: Strawberry Creek-John Day River	OR_WS_170702010601_05_102043	10.41	16.3	0	0
HUC12 Name: Grub Creek	OR_WS_170702010607_05_102049	25.44	16.3	9.14	35.93
HUC12 Name: Upper Canyon Creek	OR_WS_170702010701_05_102051	18.95	12.3	6.65	35.09
HUC12 Name: Upper Beech Creek	OR_WS_170702010801_05_102055	31.21	18.3	12.91	41.36
HUC12 Name: East Fork Beech Creek	OR_WS_170702010802_05_102056	26.16	18.3	7.86	30.05
HUC12 Name: Laycock Creek	OR_WS_170702010901_05_102058	13.16	18.3	0	0
HUC12 Name: Riley Creek	OR_WS_170702010903_05_102060	15.39	18.3	0	0
HUC12 Name: Cottonwood Creek	OR_WS_170702011102_05_102072	20.05	18.3	1.75	8.73
HUC12 Name: Upper Mountain Creek	OR_WS_170702011201_05_102074	24.62	18.3	6.32	25.67
HUC12 Name: Middle Mountain Creek	OR_WS_170702011202_05_102075	19.67	18.3	1.37	6.96

AU Name	AU ID	Maximum 7DADM River Temperature (°C)	Applicable Criterion + HUA (°C)	Excess Temperature (°C)	Percent Load Reduction
HUC12 Name: Big Creek	OR_WS_170702030302_05_102165	17.91	12.3	5.61	31.32

9 Allocations, reserve capacity, and margin of safety

OAR 340-042-0040(4)(g),(h),(i) and (k) [and 40 CFR 130.2(h) and (g) and 130.7(c)(2)] respectively define the required TMDL elements of apportionment of the allowable pollutant load: point source wasteload allocations; nonpoint source load allocations (including background); margin of safety; and reserve capacity. Collectively, these elements add up to the maximum load of a pollutant that still allows a waterbody to meet water quality standards. OAR 304-042-0040(5) and (6) describe the potential factors of consideration for determining and distributing these allocations of the allowable pollutant loading capacities. Water quality data analysis must be conducted to determine allocations, potentially including statistical analysis and mathematical modeling. Factors to consider in allocation distribution may include: source contributions; costs of implementing management measures; ease of implementation; timelines for attaining water quality standards; environmental impacts of allocations; unintended consequences; reasonable assurance of implementation; and any other relevant factor.

9.1 Thermal allocations

9.1.1 Human use allowance assignments

The HUA at OAR 340-041-0028(12)(b)(B) identifies the allowed temperature increase reserved for human uses. The rule requires that wasteload and load allocations restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3°C (0.5°F) above the applicable criteria after complete mixing in the waterbody, and at the POMI.

Table 9-1 through **Table 9-4** present the portions of the HUA assigned to anthropogenic source categories across different AUs and stream extents in the John Day Basin. Temperature impacts associated with climate change sources are assigned a zero HUA. See TSD Section 9 for approach to HUA assignments.

The dam and reservoir operations source category accounts for nonpoint source temperature impacts associated with the dam impoundment and release of the impounded water back into the natural channel. Dam and reservoir discharges associated with an NPDES permit are included in the NPDES assigned HUA.

The water management activities and water withdrawals source category accounts for nonpoint source temperature impacts associated with the withdrawal of water that is intended for consumptive uses (such as irrigation) and the warming that might occur as that water moves through a canal or ditch before being returned to the natural river.

The assigned HUA for NPDES point sources is the maximum cumulative warming allowed anywhere in the AU from all NPDES individual permittees and registrants to general NPDES permits. The HUA assigned to any single NPDES point source is summarized in **Table 9-5**. Similarly, the assigned portion of the HUA for nonpoint sources represents the maximum cumulative warming allowed anywhere in the AU and stream extents at the POMI from all nonpoint source activities within each source category. Therefore, DEQ expects the amount of

warming for each unique point or nonpoint source activity to be less than the values shown in **Table 9-1** through **Table 9-4**. DEQ will implement the TMDL in a manner consistent with the HUA rule by requiring all nonpoint sources to implement management strategies and reduce their warming impact such that the assigned HUA is attained. Point sources will be required to implement their wasteload allocations through their NPDES permits such that the assigned HUA is attained.

The HUA assignments in **Table 9-1** through **Table 9-4** for nonpoint source categories are achieved through the implementation of the load allocations described in Section 9.1.4 and the surrogate measures described in Section 9.1.5. Designated Management Agencies (DMAs) are responsible for implementing management activities that achieve the surrogate measure targets appropriate to their source category and location. A DMA has achieved their load allocation when surrogate measure targets are met. When all DMAs within a nonpoint source category have met their surrogate measure targets and achieved their load allocations, the HUA assigned to that nonpoint source category is achieved.

[Description of how allocations associated with temperature Columbia River TMDLs will be met at the confluence of the John Day River and the Columbia River]

Table 9-1: HUA assignments for source or source categories on assessment units in the Upper John Day Subbasin (17070201).

AU Name	AU ID	NPDES point sources (°C)	Dam and reservoir operations (°C)	Anthropogenic warming from tributaries (°C)	Solar loading from existing transportation corridors, existing utility infrastructure (°C)	Consumptive use water management and water withdrawals (°C)	Solar loading from nonpoint sectors (°C)	Reserve capacity (°C)	Total HUA (°C)
John Day River	OR_SR_1707020110_05_101552 OR_SR_1707020109_05_101547 OR_SR_1707020106_05_101533	0.10	0.00	0.05	0.025	0.10	0.00	0.025	0.30
All other AUs	Applicable AUs are listed in TSD Appendix [TBD]	0.00	0.00	0.05	0.050	0.15	0.00	0.050	0.30

Table 9-2: HUA assignments for source or source categories on assessment units in the North Fork Subbasin (17070202).

AU Name	AU ID	NPDES point sources (°C)	Dam and reservoir operations (°C)	Anthropogenic warming from tributaries (°C)	Solar loading from existing transportation corridors, existing utility infrastructure (°C)	Consumptive use water management and water withdrawals (°C)	Solar loading from nonpoint sectors (°C)	Reserve capacity (°C)	Total HUA (°C)
All other AUs	Applicable AUs are listed in TSD Appendix [TBD]	0.00	0.00	0.05	0.10	0.10	0.00	0.05	0.30

Table 9-3: HUA assignments for source or source categories on assessment units in the Middle Fork John Day Subbasin (17070203).

AU Name	AU ID	NPDES point sources (°C)	Dam and reservoir operations (°C)	Anthropogenic warming from tributaries (°C)	Solar loading from existing transportation corridors, existing utility infrastructure (°C)	Consumptive use water management and water withdrawals (°C)	Solar loading from nonpoint sectors (°C)	Reserve capacity (°C)	Total HUA (°C)
Long Creek	OR_SR_1707020304_05_101629	0.10	0.00	0.05	0.05	0.05	0.00	0.05	0.30
All other AUs	Applicable AUs are listed in TSD Appendix [TBD]	0.00	0.00	0.05	0.10	0.10	0.00	0.05	0.30

Table 9-4: HUA assignments for source or source categories on assessment units in the Lower John Day Subbasin (17070204).

AU Name	AU ID	NPDES point sources (°C)	Dam and reservoir operations (°C)	Anthropogenic warming from tributaries (°C)	Solar loading from existing transportation corridors, existing utility infrastructure (°C)	Consumptive use water management and water withdrawals (°C)	Solar loading from nonpoint sectors (°C)	Reserve capacity (°C)	Total HUA (°C)
All other AUs	Applicable AUs are listed in TSD Appendix [TBD]	0.00	0.00	0.05	0.10	0.10	0.00	0.05	0.30

9.1.2 Wasteload allocations for point sources

Wasteload allocations are assigned to NPDES permitted point sources listed in **Table 9-5**. The wasteload allocation for general permit registrants not identified in **Table 9-5** is equal to any existing thermal load authorized under the current permit. More precise wasteload allocations may be considered if subsequent data analysis indicates a need and loading capacity is available.

Wasteload allocations were calculated using **Equation 9-1**.

$$WLA = \Delta T \cdot (Q_E + Q_R) \cdot C_F \qquad \textbf{Equation 9-1a}$$

$$WLA = \Delta T \cdot Q_E \cdot D_F \cdot C_F \qquad \textbf{Equation 9-1b}$$

where,

$WLA =$ Wasteload allocation (kilocalories/day), expressed as a rolling seven-day average.

$\Delta T =$ The assigned portion of the HUA from **Table 9-5**. It is the maximum temperature increase (°C) above the applicable river temperature criterion using 100% of river flow not to be exceeded by each individual source from all outfalls combined.

$Q_E =$ The daily mean effluent flow (cfs).

When effluent flow is in million gallons per day (MGD) convert to cfs:

$$\frac{1{,}000{,}000\ gallons}{1\ day} \cdot \frac{0.13368 ft^3}{1\ \text{gallon}} \cdot \frac{1\ day}{86{,}400\ sec} = 1.5472\ ft^3/sec$$

$Q_R =$ The daily mean river flow rate, upstream (cfs).
When river flow is <= 7Q10, Q_R = 7Q10. When river flow > 7Q10, Q_R is equal to the daily mean river flow, upstream.

$D_F =$ Dilution factor. $(Q_E + Q_R)/Q_E$ For lakes, the dilution factor is 1 unless determined using another method.

$C_F =$ Conversion factor using flow in cfs: 2,446,665

$$\left(\frac{1\ \text{m}}{3.2808\ \text{ft}}\right)^3 \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{86400\ sec}{1\ day} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 2{,}446{,}665$$

The effluent discharge used to calculate the wasteload allocations presented in **Table 9-5** are based on the average dry weather facility design, a maximum discharge authorized by an NPDES permit, or an effluent discharge characterized from discharge data. More information on the specific source of the effluent discharge flow and the rationale behind the assigned HUA is described in the TSD Section 9.X.

Wasteload allocations may be implemented in NPDES permits in any of the following ways:

(1) Incorporate the 7Q10 wasteload allocation in **Table 9-5** as a static numeric limit. Permit writers may recalculate the static limit using different values for 7Q10 (Q_R) and effluent discharge (Q_E) using seasonal values or annual values, as appropriate, if more recent data or better estimates are available.
(2) Incorporate **Equation 9-1** directly into the permit with effluent flow (Q_E), river flow (Q_R), and the wasteload allocation (WLA) being dynamic and calculated on a daily basis. The assigned portion of the HUA (ΔT) is static and based on the value in **Table 9-5**. Permit

writers may recalculate the 7Q10 using seasonal or annual values, as appropriate, if more recent data or better estimates are available.

The wasteload allocation period for each facility is consistent with the critical period of the receiving waterbody, which is presented in Section 5: Seasonal variation and critical period for temperature.

Table 9-5: Thermal wasteload allocations (WLA) for point sources. Listed WLAs were calculated based on the 7Q10 flow. Listed 7Q10s calculated based on a seasonal period corresponding to WLA period.

NPDES Permittee WQ File Number: EPA Number	Assigned HUA ΔT (°C)	WLA period start	WLA period end	7Q10 River flow (cfs)	Effluent discharge (cfs)	7Q10 WLA (kilocalories/ day)
City Of Dayville 23560 : OR0041505	0.1	1-May	31-Oct	4.2	0.074	1.05E+06
John Day WWTP 43569 : OR0027227	0.1	1-May	31-Oct	12.0	0.928	3.16E+06
Long Creek STP 51180 : OR0034070	0.1	1-May	31-Oct	0.9	0.155	2.58E+05
Mt Vernon STP 59065 : OR0030694	0.1	1-May	31-Oct	12.0	0.155	2.97E+06

9.1.3 Load allocations for nonpoint sources

Load allocations are assigned to background sources and anthropogenic nonpoint sources on all waters, as defined in Section 2, in the John Day Basin.

The allocation period is consistent with the critical period of each waterbody, which is presented in Section 5: Seasonal variation and critical period for temperature.

Load allocations for background sources are calculated using **Equation 9-2**.

$$LA_{BG} = (T_C) \cdot (Q_R) \cdot C_F$$ **Equation 9-2**

where,

$LA_{BG} =$ Load allocation to background sources (kilocalories/day), expressed as a rolling seven-day average.

$T_C =$ The applicable temperature criteria, not including the HUA. When there are two year-round applicable temperature criteria that apply to the same AU, the more stringent criteria shall be used.

$Q_R =$ The daily average river flow rate (cfs). For a lake, a dilution factor of 1 may be used for Q_R unless determined using another method.

$C_F =$ Conversion factor using flow in cfs: 2,446,665

$$\left(\frac{1\text{ m}}{3.2808\text{ ft}}\right)^3 \cdot \frac{1\ m^3}{35.31\ ft^3} \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{86400\ sec}{1\ day} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 2{,}446{,}665$$

Table 9-6 through **Table 9-9** presents the load allocations assigned to background sources on temperature impaired Category 5 AUs. The load allocations are based on the 7Q10 low river flows and the minimum applicable criterion in the respective AUs. **Equation 9-2** shall be used to calculate the load allocations assigned to background sources on all other AUs or stream location in the John Day Basin not identified in **Table 9-6** through **Table 9-9**; or for any AUs identified in **Table 9-6** through **Table 9-9** when river flows are greater than 7Q10.

If the applicable temperature criteria are updated and approved by EPA, the background load allocations assigned to any AU or stream location where the temperature criterion changed shall be recalculated using the updated criterion and **Equation 9-2**.

Table 9-6: Thermal load allocations (LA) for background sources in the Upper John Day Basin (17070201).

AU Name and AU ID	Annual 7Q10 (cfs)	Year-Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
Battle Creek OR_SR_1707020111_05_101556	0.00	18	NA	0	NA
Bear Creek OR_SR_1707020106_05_101534	0.60	16	NA	2.33E+07	NA
HUC12 Name: Upper Beech Creek OR_WS_170702010801_05_102055	0.00	18	NA	0	NA
HUC12 Name: Upper Beech Creek OR_WS_170702010801_05_102055	0.00	18	NA	0	NA
Beech Creek OR_SR_1707020108_05_101540	1.31	18	NA	5.77E+07	NA
HUC12 Name: Upper Canyon Creek OR_WS_170702010701_05_102051	1.14	12	NA	3.35E+07	NA
Canyon Meadows Lake OR_LK_1707020107_05_100025	0.68	12	12	1.99E+07	1.99E+07
East Fork Canyon Creek OR_SR_1707020107_05_101539	2.06	12	NA	6.05E+07	NA
Canyon Creek OR_SR_1707020107_05_101538	3.03	12	12	8.90E+07	8.90E+07
Canyon Creek OR_SR_1707020107_05_101537	5.87	12	NA	1.72E+08	NA
HUC12 Name: Cottonwood Creek OR_WS_170702011102_05_102072	0.89	18	NA	3.90E+07	NA
Cottonwood Creek OR_SR_1707020111_05_101558	0.31	18	NA	1.38E+07	NA
HUC12 Name: Dads Creek-John Day River OR_WS_170702010505_05_102042	0.00	16	NA	0	NA
HUC12 Name: Dads Creek-John Day River OR_WS_170702010505_05_102042	0.00	16	NA	0	NA
HUC12 Name: Upper Deer Creek OR_WS_170702010205_05_102025	0.87	18	NA	3.83E+07	NA
HUC12 Name: Upper Deer Creek OR_WS_170702010205_05_102025	0.00	18	NA	0	NA
HUC12 Name: Lower Deer Creek OR_WS_170702010206_05_102026	3.37	18	NA	1.48E+08	NA
HUC12 Name: Dog Creek-John Day River OR_WS_170702010608_05_102050	0.00	16	NA	0	NA
HUC12 Name: East Fork Beech Creek OR_WS_170702010802_05_102056	0.00	18	NA	0	NA
HUC12 Name: East Fork Beech Creek OR_WS_170702010802_05_102056	0.00	18	NA	0	NA
Fields Creek OR_SR_1707020110_05_101550	1.15	18	NA	5.06E+07	NA
HUC12 Name: Utley Creek OR_WS_170702010104_05_102018	0.00	18	NA	0	NA
HUC12 Name: Lonesome Creek OR_WS_170702010101_05_102015	0.00	18	NA	0	NA
HUC12 Name: Grub Creek OR_WS_170702010607_05_102049	0.00	16	NA	0	NA
Grub Creek OR_SR_1707020106_05_101531	0.00	16	NA	0	NA
Indian Creek OR_SR_1707020106_05_101532	1.94	16	13	7.59E+07	6.17E+07

AU Name and AU ID	Annual 7Q10 (cfs)	Year-Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
HUC12 Name: Headwaters John Day River OR_WS_170702010501_05_102038	16.82	12	NA	4.94E+08	NA
HUC12 Name: Headwaters John Day River OR_WS_170702010501_05_102038	6.18	12	NA	1.81E+08	NA
John Day River OR_SR_1707020111_05_102568	25.90	18	NA	1.14E+09	NA
John Day River OR_SR_1707020114_05_102609	23.40	18	NA	1.03E+09	NA
HUC12 Name: Dog Creek-John Day River OR_WS_170702010608_05_102050	0.00	16	NA	0	NA
HUC12 Name: Headwaters Murderers Creek OR_WS_170702010301_05_102028	0.58	18	13	2.53E+07	1.83E+07
HUC12 Name: Headwaters Murderers Creek OR_WS_170702010301_05_102028	1.53	18	13	6.74E+07	4.87E+07
Murderers Creek OR_SR_1707020103_05_101525	4.06	18	13	1.79E+08	1.29E+08
Murderers Creek OR_SR_1707020103_05_101526	3.20	18	NA	1.41E+08	NA
Pine Creek OR_SR_1707020102_05_101521	0.00	18	NA	0	NA
HUC12 Name: Castle Creek-John Day River OR_WS_170702010606_05_102048	0.82	16	NA	3.22E+07	NA
HUC12 Name: Reynolds Creek OR_WS_170702010503_05_102040	4.71	12	12	1.38E+08	1.38E+08
Rock Creek OR_SR_1707020113_05_101564	1.67	18	NA	7.35E+07	NA
Lower Mountain Creek OR_SR_1707020112_05_101560	0.53	18	NA	2.32E+07	NA
Mountain Creek OR_SR_1707020112_05_101561	0.03	18	NA	1.32E+06	NA
HUC12 Name: Upper Mountain Creek OR_WS_170702011201_05_102074	0.01	18	NA	5.15E+05	NA
HUC12 Name: Headwaters South Fork John Day River OR_WS_170702010102_05_102016	0.00	18	NA	0	NA
South Fork John Day River OR_SR_1707020101_05_101516	2.00	18	NA	8.81E+07	NA
South Fork John Day River OR_SR_1707020102_05_101519	5.59	18	NA	2.46E+08	NA
HUC12 Name: Strawberry Creek-John Day River OR_WS_170702010601_05_102043	1.20	16	NA	4.70E+07	NA
HUC12 Name: Strawberry Creek-John Day River OR_WS_170702010601_05_102043	0.00	16	NA	0	NA
HUC12 Name: Sunflower Creek OR_WS_170702010204_05_102024	0.76	18	NA	3.34E+07	NA
HUC12 Name: Sunflower Creek OR_WS_170702010204_05_102024	0.00	18	NA	0	NA
HUC12 Name: Sunflower Creek OR_WS_170702010204_05_102024	0.00	18	NA	0	NA
HUC12 Name: Strawberry Creek-John Day River OR_WS_170702010601_05_102043	1.16	16	NA	4.54E+07	NA

Table 9-7: Thermal load allocations (LA) for background sources in the North Fork John Day Basin (17070202).

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
HUC12 Name: Beaver Creek OR_WS_170702020203_05_102094	3.03	12	NA	8.90E+07	NA
HUC12 Name: Beaver Creek OR_WS_170702020203_05_102094	0.22	12	NA	6.46E+06	NA
HUC12 Name: Beaver Creek OR_WS_170702020203_05_102094	1.69	12	NA	4.96E+07	NA
HUC12 Name: Big Creek OR_WS_170702020303_05_102099	0.65	12	NA	1.91E+07	NA
Big Creek OR_SR_1707020203_05_101577	3.10	16	NA	1.21E+08	NA
Meadow Creek OR_SR_1707020203_05_101578	5.77	16	NA	2.26E+08	NA
Big Creek OR_SR_1707020203_05_101573	10.20	16	NA	3.99E+08	NA
HUC12 Name: Bull Run Creek OR_WS_170702020202_05_102093	2.57	12	NA	7.55E+07	NA
HUC12 Name: Bull Run Creek OR_WS_170702020202_05_102093	0.00	12	NA	0	NA
HUC12 Name: Bull Run Creek OR_WS_170702020202_05_102093	0.37	12	NA	1.09E+07	NA
HUC12 Name: Dry Camas Creek-Camas Creek OR_WS_170702020501_05_102107	0.00	16	NA	0	NA
HUC12 Name: Dry Camas Creek-Camas Creek OR_WS_170702020501_05_102107	0.00	16	NA	0	NA
Camas Creek OR_SR_1707020205_05_101584	1.73	16	NA	6.77E+07	NA
HUC12 Name: Bowman Creek-Camas Creek OR_WS_170702020502_05_102108	0.07	16	NA	2.76E+06	NA
HUC12 Name: Bowman Creek-Camas Creek OR_WS_170702020502_05_102108	0.00	16	NA	0	NA
HUC12 Name: Bowman Creek-Camas Creek OR_WS_170702020502_05_102108	0.00	16	NA	0	NA
Camas Creek OR_SR_1707020205_05_101581	1.50	16	NA	5.87E+07	NA
HUC12 Name: Cable Creek OR_WS_170702020504_05_102110	1.46	16	NA	5.72E+07	NA
HUC12 Name: Cable Creek OR_WS_170702020504_05_102110	0.99	16	NA	3.89E+07	NA
Cable Creek OR_SR_1707020205_05_101582	1.86	16	NA	7.28E+07	NA
Hidaway Creek OR_SR_1707020205_05_101583	1.62	16	NA	6.34E+07	NA
HUC12 Name: Lane Creek-Camas Creek OR_WS_170702020505_05_102111	0.00	16	NA	0	NA
Lane Creek OR_SR_1707020205_05_101580	0.28	16	13	1.10E+07	8.97E+06
Camas Creek OR_SR_1707020206_05_101587	4.24	16	NA	1.66E+08	NA
HUC12 Name: Upper Owens Creek OR_WS_170702020602_05_102113	0.00	18	NA	0	NA
Owens Creek OR_SR_1707020206_05_101591	0.00	18	NA	0	NA
Owens Creek OR_SR_1707020206_05_101586	0.17	18	NA	7.31E+06	NA

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
Camas Creek OR_SR_1707020206_05_101588	7.25	18	NA	3.19E+08	NA
HUC12 Name: Bridge Creek OR_WS_170702020608_05_102119	0.00	18	NA	0	NA
HUC12 Name: Upper Fivemile Creek OR_WS_170702020604_05_102115	0.00	18	NA	0	NA
Fivemile Creek OR_SR_1707020206_05_101590	2.94	18	NA	1.29E+08	NA
HUC12 Name: Clear Creek OR_WS_170702020204_05_102095	6.50	12	NA	1.91E+08	NA
HUC12 Name: Clear Creek OR_WS_170702020204_05_102095	0.84	12	NA	2.47E+07	NA
HUC12 Name: Clear Creek OR_WS_170702020204_05_102095	0.27	12	NA	7.78E+06	NA
Clear Creek OR_SR_1707020202_05_101571	11.20	12	NA	3.29E+08	NA
HUC12 Name: Crane Creek-North Fork John Day River OR_WS_170702020105_05_102091	1.12	12	NA	3.29E+07	NA
HUC12 Name: Headwaters Desolation Creek OR_WS_170702020401_05_102103	1.84	12	NA	5.40E+07	NA
HUC12 Name: Headwaters Desolation Creek OR_WS_170702020401_05_102103	2.18	12	NA	6.40E+07	NA
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	12	12	0	0
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	12	12	0	0
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	12	12	0	0
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	12	12	0	0
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	12	12	0	0
HUC12 Name: Middle Desolation Creek OR_WS_170702020403_05_102105	0.72	16	NA	2.81E+07	NA
HUC12 Name: Middle Desolation Creek OR_WS_170702020403_05_102105	0.00	16	NA	0	NA
Desolation Creek OR_SR_1707020204_05_101579	8.09	16	NA	3.17E+08	NA
Ditch Creek OR_SR_1707020207_05_101592	0.70	18	NA	3.10E+07	NA
East Fork Cottonwood Creek OR_SR_1707020209_05_101609	0.00	18	NA	0	NA
HUC12 Name: Upper Granite Creek OR_WS_170702020201_05_102092	0.96	12	NA	2.81E+07	NA
HUC12 Name: Upper Granite Creek OR_WS_170702020201_05_102092	0.00	12	NA	0	NA
Granite Creek OR_SR_1707020202_05_101572	3.58	12	12	1.05E+08	1.05E+08
Granite Creek OR_SR_1707020202_05_101570	18.30	12	NA	5.37E+08	NA
HUC12 Name: Lower Granite Creek OR_WS_170702020206_05_102096	0.00	12	12	0	0

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
Lake Penland OR_LK_1707020207_05_100032	0.00	18	NA	0	NA
HUC12 Name: Mallory Creek OR_WS_170702020708_05_102128	1.01	18	NA	4.45E+07	NA
HUC12 Name: Mallory Creek OR_WS_170702020708_05_102128	0.00	18	NA	0	NA
Mallory Creek OR_SR_1707020207_05_101594	0.59	18	13	2.61E+07	1.88E+07
North Fork John Day River OR_SR_1707020201_05_101569	11.50	12	NA	3.38E+08	NA
HUC12 Name: Baldy Creek-North Fork John Day River OR_WS_170702020101_05_102087	1.46	12	12	4.29E+07	4.29E+07
HUC12 Name: Baldy Creek-North Fork John Day River OR_WS_170702020101_05_102087	0.49	12	12	1.44E+07	1.44E+07
HUC12 Name: Baldy Creek-North Fork John Day River OR_WS_170702020101_05_102087	0.00	12	12	0	0
North Fork John Day River OR_SR_1707020203_05_101575	28.10	16	NA	1.10E+09	NA
North Fork John Day River OR_SR_1707020203_05_101574	33.90	16	NA	1.33E+09	NA
North Fork John Day River OR_SR_1707020207_05_101596	37.60	16	NA	1.47E+09	NA
North Fork John Day River OR_SR_1707020207_05_101595	36.60	18	NA	1.61E+09	NA
North Fork John Day River OR_SR_1707020210_05_101613	44.34	18	NA	1.95E+09	NA
HUC12 Name: Onion Creek-North Fork John Day River OR_WS_170702020103_05_102089	0.00	12	NA	0	NA
HUC12 Name: Ellis Creek-Potamus Creek OR_WS_170702020706_05_102126	1.69	18	NA	7.44E+07	NA
Rudio Creek OR_SR_1707020210_05_101616	0.34	18	NA	1.48E+07	NA
HUC12 Name: Texas Bar Creek-North Fork John Day River OR_WS_170702020306_05_102102	0.00	16	NA	0	NA
Texas Bar Creek OR_SR_1707020203_05_101576	0.50	16	NA	1.95E+07	NA
HUC12 Name: Trail Creek OR_WS_170702020102_05_102088	1.63	12	NA	4.79E+07	NA
HUC12 Name: Trail Creek OR_WS_170702020102_05_102088	0.70	12	NA	2.05E+07	NA
HUC12 Name: Trail Creek OR_WS_170702020102_05_102088	0.20	12	NA	5.96E+06	NA
Wall Creek OR_SR_1707020208_05_101606	3.68	18	NA	1.62E+08	NA
Big Wall Creek OR_SR_1707020208_05_101605	1.98	18	NA	8.72E+07	NA
Indian Creek OR_SR_1707020208_05_101607	0.00	18	NA	0	NA

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
Wilson Creek OR_SR_1707020208_05_101601	0.67	18	NA	2.95E+07	NA
HUC12 Name: Little Wall Creek OR_WS_170702020802_05_102133	0.00	18	NA	0	NA
Little Wall Creek OR_SR_1707020208_05_101603	0.04	18	NA	1.74E+06	NA
Skookum Creek OR_SR_1707020208_05_101600	0.83	18	NA	3.67E+07	NA
Skookum Creek OR_SR_1707020208_05_102569	1.46	18	NA	6.43E+07	NA
HUC12 Name: Swale Creek OR_WS_170702020801_05_102132	0.00	18	NA	0	NA
Swale Creek OR_SR_1707020208_05_101608	0.11	18	NA	4.98E+06	NA
West Fork Meadow Brook OR_SR_1707020207_05_101599	1.04	16	NA	4.07E+07	NA
HUC12 Name: Wilson Creek OR_WS_170702020804_05_102135	0.00	18	NA	0	NA
HUC12 Name: Wilson Creek OR_WS_170702020804_05_102135	0.00	18	NA	0	NA

Table 9-8: Thermal load allocations (LA) for background sources in the Middle Fork John Day Basin (17070203).

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
HUC12 Name: Bear Creek-Middle Fork John Day River OR_WS_170702030301_05_102164	0.00	16	NA	0	NA
HUC12 Name: Big Creek OR_WS_170702030302_05_102165	0.97	12	NA	2.84E+07	NA
HUC12 Name: Big Creek OR_WS_170702030302_05_102165	0.00	12	NA	0	NA
HUC12 Name: Big Creek OR_WS_170702030302_05_102165	0.00	12	NA	0	NA
HUC12 Name: Big Creek OR_WS_170702030302_05_102165	0.00	12	NA	0	NA
Big Creek OR_SR_1707020303_05_101626	1.43	12	NA	4.20E+07	NA
HUC12 Name: Bridge Creek OR_WS_170702030105_05_102155	1.75	16	NA	6.85E+07	NA
HUC12 Name: Bridge Creek OR_WS_170702030105_05_102155	0.86	16	NA	3.37E+07	NA
HUC12 Name: Bridge Creek OR_WS_170702030105_05_102155	0.00	16	NA	0	NA
HUC12 Name: Upper Camp Creek OR_WS_170702030205_05_102160	0.12	16	NA	4.74E+06	NA
HUC12 Name: Upper Camp Creek OR_WS_170702030205_05_102160	0.00	16	NA	0	NA
HUC12 Name: Upper Camp Creek OR_WS_170702030205_05_102160	0.00	16	NA	0	NA
HUC12 Name: Upper Camp Creek OR_WS_170702030205_05_102160	0.00	16	NA	0	NA

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
Camp Creek OR_SR_1707020302_05_101618	3.29	16	NA	1.29E+08	NA
HUC12 Name: Lower Camp Creek OR_WS_170702030207_05_102162	0.00	16	NA	0	NA
Camp Creek OR_SR_1707020302_05_101623	5.37	16	13	2.10E+08	1.71E+08
HUC12 Name: Clear Creek OR_WS_170702030104_05_102154	5.20	12	NA	1.53E+08	NA
HUC12 Name: Dry Fork Clear Creek OR_WS_170702030103_05_102153	1.07	12	NA	3.14E+07	NA
HUC12 Name: Balance Creek-Middle Fork John Day River OR_WS_170702030208_05_102163	0.00	16	NA	0	NA
HUC12 Name: Indian Creek-Middle Fork John Day River OR_WS_170702030303_05_102166	0.13	16	NA	5.09E+06	NA
HUC12 Name: Lick Creek OR_WS_170702030206_05_102161	1.01	16	NA	3.95E+07	NA
HUC12 Name: Lick Creek OR_WS_170702030206_05_102161	0.82	16	NA	3.20E+07	NA
Lick Creek OR_SR_1707020302_05_101622	2.17	16	NA	8.49E+07	NA
HUC12 Name: Headwaters Long Creek OR_WS_170702030401_05_102169	1.33	18	NA	5.86E+07	NA
HUC12 Name: Mill Creek-Middle Fork John Day River OR_WS_170702030106_05_102156	2.24	12	12	6.58E+07	6.58E+07
HUC12 Name: Mill Creek-Middle Fork John Day River OR_WS_170702030106_05_102156	0.00	12	12	0	0
HUC12 Name: Mill Creek-Middle Fork John Day River OR_WS_170702030106_05_102156	0.00	12	12	0	0
Middle Fork John Day River OR_SR_1707020301_05_101617	7.22	12	12	2.12E+08	2.12E+08
HUC12 Name: Little Boulder Creek-Middle Fork John Day River OR_WS_170702030202_05_102158	0.00	16	NA	0	NA
HUC12 Name: Little Boulder Creek-Middle Fork John Day River OR_WS_170702030202_05_102158	0.00	16	NA	0	NA
HUC12 Name: Little Boulder Creek-Middle Fork John Day River OR_WS_170702030202_05_102158	0.00	16	NA	0	NA
HUC12 Name: Little Boulder Creek-Middle Fork John Day River OR_WS_170702030202_05_102158	0.00	16	NA	0	NA
Middle Fork John Day River OR_SR_1707020302_05_101619	7.43	16	13	2.91E+08	2.36E+08
Middle Fork John Day River OR_SR_1707020302_05_102577	7.40	16	NA	2.90E+08	NA
HUC12 Name: Granite Boulder Creek-Middle Fork John Day River OR_WS_170702030203_05_102571	0.58	16	NA	2.26E+07	NA

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
HUC12 Name: Granite Boulder Creek-Middle Fork John Day River OR_WS_170702030203_05_102571	0.05	16	NA	2.00E+06	NA
Middle Fork John Day River OR_SR_1707020303_05_101624	14.80	16	NA	5.79E+08	NA
Middle Fork John Day River OR_SR_1707020305_05_101597	15.00	18	NA	6.61E+08	NA
HUC12 Name: Summit Creek OR_WS_170702030102_05_102152	0.46	12	12	1.36E+07	1.36E+07
HUC12 Name: Vinegar Creek-Middle Fork John Day River OR_WS_170702030201_05_102157	0.00	16	NA	0	NA
Vinegar Creek OR_SR_1707020302_05_101620	0.16	12	NA	4.58E+06	NA
HUC12 Name: Squaw Creek OR_WS_170702030101_05_102151	0.66	12	12	1.92E+07	1.92E+07

Table 9-9: Thermal load allocations (LA) for background sources in the Lower John Day Subbasin (17070204).

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
HUC12 Name: Alder Creek OR_WS_170702040108_05_102187	0.21	18	NA	9.25E+06	NA
Bear Creek OR_SR_1707020403_05_101648	0.00	18	NA	0	NA
Bridge Creek OR_SR_1707020403_05_101651	0.00	18	NA	0	NA
Bridge Creek OR_SR_1707020403_05_101650	0.00	18	NA	0	NA
HUC12 Name: Upper Bridge Creek OR_WS_170702040303_05_102198	0.00	18	NA	0	NA
HUC12 Name: Upper Bridge Creek OR_WS_170702040303_05_102198	0.00	18	NA	0	NA
Bridge Creek OR_SR_1707020403_05_101647	0.50	18	NA	2.20E+07	NA
HUC12 Name: Brown Creek OR_WS_170702041106_05_102250	0.00	18	NA	0	NA
Rosebush Creek OR_SR_1707020413_05_101709	0.00	18	13	0	0
HUC12 Name: Upper Grass Valley Canyon OR_WS_170702041304_05_102261	0.00	18	13	0	0
Grass Valley Canyon OR_SR_1707020413_05_101708	0.00	18	NA	0	NA
Hay Creek OR_SR_1707020410_05_101697	0.00	18	NA	0	NA
HUC12 Name: Upper Kahler Creek OR_WS_170702040103_05_102182	0.00	18	NA	0	NA
Pine Creek OR_SR_1707020404_05_101664	0.00	18	NA	0	NA
Pine Creek OR_SR_1707020404_05_101662	0.10	18	NA	4.40E+06	NA

AU Name and AU ID	Annual 7Q10 (cfs)	Year Round Criterion (°C)	Spawning Criterion (°C)	7Q10 LA Year-Round (kilocalories/ day)	7Q10 LA Spawning (kilocalories/ day)
Rock Creek OR_SR_1707020411_05_101705	0.18	18	NA	7.93E+06	NA
Rock Creek OR_SR_1707020412_05_101701	1.09	18	NA	4.80E+07	NA
HUC12 Name: Service Creek-John Day River OR_WS_170702040201_05_102189	0.37	18	NA	1.64E+07	NA
HUC12 Name: Sorefoot Creek-John Day River OR_WS_170702040701_05_102222	0.00	18	NA	0	NA
Sorefoot Creek OR_SR_1707020407_05_101677	0.00	18	13	0	0
HUC12 Name: Cottonwood Creek-Butte Creek OR_WS_170702040501_05_102213	0.00	18	NA	0	NA
Thirtymile Creek OR_SR_1707020408_05_101684	0.00	18	NA	0	NA
Thirtymile Creek OR_SR_1707020408_05_101685	0.00	18	NA	0	NA
Dry Fork Thirtymile Creek OR_SR_1707020408_05_101680	0.00	18	13	0	0
HUC12 Name: Buckhorn Creek OR_WS_170702041105_05_102249	0.00	18	NA	0	NA

Load allocations assigned to anthropogenic nonpoint sources on any AU or stream location in the John Day Basin are calculated using **Equation 9-3**. The portions of the HUA (ΔT) assigned to nonpoint sources or source categories are presented in Section 9.1.1. When all of the load allocations assigned to a nonpoint source or source category have been achieved, the HUA allocation to that nonpoint source or source category is achieved.

$$LA_{NPS} = (\Delta T) \cdot (Q_R) \cdot C_F \qquad \textbf{Equation 9-3}$$

where,

$LA_{NPS} =$ Load allocation to anthropogenic nonpoint sources (kilocalories/day), expressed as a rolling seven-day average.

$\Delta T =$ The portion of the HUA assigned to each nonpoint source category representing the maximum cumulative temperature increase (°C) from all source activity in the nonpoint source category.

$Q_R =$ The daily average river flow rate (cfs). For a lake, a dilution factor of 1 may be used for Q_R unless determined using another method.

$C_F =$ Conversion factor using flow in cfs: 2,446,665

$$\left(\frac{1\text{ m}}{3.2808\text{ ft}}\right)^3 \cdot \frac{1\ m^3}{35.31\ ft^3} \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{86400\ sec}{1\ day} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 2{,}446{,}665$$

Table 9-10 through **Table 9-13** presents the load allocations assigned to anthropogenic nonpoint sources on temperature impaired Category 5 AUs. The load allocations are based on the 7Q10 low river flows and the minimum applicable criterion in the respective AUs. **Equation 9-3** shall be used to calculate the load allocations assigned to anthropogenic sources on all other AUs or stream location in the John Day Basin not identified in **Table 9-10** through **Table 9-13**; or for any AUs identified in able when river flows are greater than 7Q10.

Table 9-10: Thermal load allocations (LA) in kilocalories per day assigned to anthropogenic nonpoint sources in the Lower John Day Subbasin (17070201).

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
Battle Creek OR_SR_1707020111_05_101556	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bear Creek OR_SR_1707020106_05_101534	0.60	1.46E+05	0.00E+00	7.28E+04	3.64E+04	1.46E+05	0.00E+00
HUC12 Name: Upper Beech Creek OR_WS_170702010801_05_102055	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Beech Creek OR_WS_170702010801_05_102055	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beech Creek OR_SR_1707020108_05_101540	1.31	3.21E+05	0.00E+00	1.60E+05	8.01E+04	3.21E+05	0.00E+00
HUC12 Name: Upper Canyon Creek OR_WS_170702010701_05_102051	1.14	2.79E+05	0.00E+00	1.39E+05	6.97E+04	2.79E+05	0.00E+00
Canyon Meadows Lake OR_LK_1707020107_05_100025	0.68	1.66E+05	0.00E+00	8.28E+04	4.14E+04	1.66E+05	0.00E+00
East Fork Canyon Creek OR_SR_1707020107_05_101539	2.06	5.04E+05	0.00E+00	2.52E+05	1.26E+05	5.04E+05	0.00E+00
Canyon Creek OR_SR_1707020107_05_101538	3.03	7.41E+05	0.00E+00	3.71E+05	1.85E+05	7.41E+05	0.00E+00
Canyon Creek OR_SR_1707020107_05_101537	5.87	1.44E+06	0.00E+00	7.18E+05	3.59E+05	1.44E+06	0.00E+00
HUC12 Name: Cottonwood Creek OR_WS_170702011102_05_102072	0.89	2.17E+05	0.00E+00	1.08E+05	5.42E+04	2.17E+05	0.00E+00
Cottonwood Creek OR_SR_1707020111_05_101558	0.31	7.66E+04	0.00E+00	3.83E+04	1.91E+04	7.66E+04	0.00E+00
HUC12 Name: Dads Creek-John Day River OR_WS_170702010505_05_102042	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Dads Creek-John Day River OR_WS_170702010505_05_102042	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Deer Creek OR_WS_170702010205_05_102025	0.87	2.13E+05	0.00E+00	1.06E+05	5.32E+04	2.13E+05	0.00E+00
HUC12 Name: Upper Deer Creek OR_WS_170702010205_05_102025	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Lower Deer Creek OR_WS_170702010206_05_102026	3.37	8.25E+05	0.00E+00	4.12E+05	2.06E+05	8.25E+05	0.00E+00
HUC12 Name: Dog Creek-John Day River OR_WS_170702010608_05_102050	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: East Fork Beech Creek OR_WS_170702010802_05_102056	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: East Fork Beech Creek OR_WS_170702010802_05_102056	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fields Creek OR_SR_1707020110_05_101550	1.15	2.81E+05	0.00E+00	1.41E+05	7.03E+04	2.81E+05	0.00E+00
HUC12 Name: Utley Creek OR_WS_170702010104_05_102018	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Lonesome Creek OR_WS_170702010101_05_102015	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Grub Creek OR_WS_170702010607_05_102049	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grub Creek OR_SR_1707020106_05_101531	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indian Creek OR_SR_1707020106_05_101532	1.94	4.75E+05	0.00E+00	2.37E+05	1.19E+05	4.75E+05	0.00E+00
HUC12 Name: Headwaters John Day River OR_WS_170702010501_05_102038	16.82	4.12E+06	0.00E+00	2.06E+06	1.03E+06	4.12E+06	0.00E+00
HUC12 Name: Headwaters John Day River OR_WS_170702010501_05_102038	6.18	1.51E+06	0.00E+00	7.56E+05	3.78E+05	1.51E+06	0.00E+00
John Day River OR_SR_1707020111_05_102568	25.90	6.34E+06	0.00E+00	3.17E+06	1.58E+06	6.34E+06	0.00E+00
John Day River OR_SR_1707020114_05_102609	23.40	5.73E+06	0.00E+00	2.86E+06	1.43E+06	5.73E+06	0.00E+00
HUC12 Name: Dog Creek-John Day River OR_WS_170702010608_05_102050	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Headwaters Murderers Creek OR_WS_170702010301_05_102028	0.58	1.41E+05	0.00E+00	7.03E+04	3.52E+04	1.41E+05	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Headwaters Murderers Creek OR_WS_170702010301_05_102028	1.53	3.74E+05	0.00E+00	1.87E+05	9.36E+04	3.74E+05	0.00E+00
Murderers Creek OR_SR_1707020103_05_101525	4.06	9.93E+05	0.00E+00	4.97E+05	2.48E+05	9.93E+05	0.00E+00
Murderers Creek OR_SR_1707020103_05_101526	3.20	7.83E+05	0.00E+00	3.91E+05	1.96E+05	7.83E+05	0.00E+00
Pine Creek OR_SR_1707020102_05_101521	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Castle Creek-John Day River OR_WS_170702010606_05_102048	0.82	2.01E+05	0.00E+00	1.01E+05	5.03E+04	2.01E+05	0.00E+00
HUC12 Name: Reynolds Creek OR_WS_170702010503_05_102040	4.71	1.15E+06	0.00E+00	5.76E+05	2.88E+05	1.15E+06	0.00E+00
Rock Creek OR_SR_1707020113_05_101564	1.67	4.09E+05	0.00E+00	2.04E+05	1.02E+05	4.09E+05	0.00E+00
Lower Mountain Creek OR_SR_1707020112_05_101560	0.53	1.29E+05	0.00E+00	6.43E+04	3.22E+04	1.29E+05	0.00E+00
Mountain Creek OR_SR_1707020112_05_101561	0.03	7.34E+03	0.00E+00	3.67E+03	1.83E+03	7.34E+03	0.00E+00
HUC12 Name: Upper Mountain Creek OR_WS_170702011201_05_102074	0.01	2.86E+03	0.00E+00	1.43E+03	7.16E+02	2.86E+03	0.00E+00
HUC12 Name: Headwaters South Fork John Day River OR_WS_170702010102_05_102016	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
South Fork John Day River OR_SR_1707020101_05_101516	2.00	4.89E+05	0.00E+00	2.45E+05	1.22E+05	4.89E+05	0.00E+00
South Fork John Day River OR_SR_1707020102_05_101519	5.59	1.37E+06	0.00E+00	6.84E+05	3.42E+05	1.37E+06	0.00E+00
HUC12 Name: Strawberry Creek-John Day River OR_WS_170702010601_05_102043	1.20	2.94E+05	0.00E+00	1.47E+05	7.34E+04	2.94E+05	0.00E+00
HUC12 Name: Strawberry Creek-John Day River OR_WS_170702010601_05_102043	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Sunflower Creek OR_WS_170702010204_05_102024	0.76	1.85E+05	0.00E+00	9.27E+04	4.64E+04	1.85E+05	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Sunflower Creek OR_WS_170702010204_05_102024	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Sunflower Creek OR_WS_170702010204_05_102024	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Strawberry Creek-John Day River OR_WS_170702010601_05_102043	1.16	2.84E+05	0.00E+00	1.42E+05	7.10E+04	2.84E+05	0.00E+00

Table 9-11: Thermal load allocations (LA) in kilocalories per day assigned to anthropogenic nonpoint sources in the North Fork John Day Subbasin (17070202).

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Beaver Creek OR_WS_170702020203_05_102094	3.03	0.00E+00	0.00E+00	3.71E+05	7.41E+05	7.41E+05	0.00E+00
HUC12 Name: Beaver Creek OR_WS_170702020203_05_102094	0.22	0.00E+00	0.00E+00	2.69E+04	5.38E+04	5.38E+04	0.00E+00
HUC12 Name: Beaver Creek OR_WS_170702020203_05_102094	1.69	0.00E+00	0.00E+00	2.07E+05	4.13E+05	4.13E+05	0.00E+00
HUC12 Name: Big Creek OR_WS_170702020303_05_102099	0.65	0.00E+00	0.00E+00	7.98E+04	1.60E+05	1.60E+05	0.00E+00
Big Creek OR_SR_1707020203_05_101577	3.10	0.00E+00	0.00E+00	3.79E+05	7.58E+05	7.58E+05	0.00E+00
Meadow Creek OR_SR_1707020203_05_101578	5.77	0.00E+00	0.00E+00	7.06E+05	1.41E+06	1.41E+06	0.00E+00
Big Creek OR_SR_1707020203_05_101573	10.20	0.00E+00	0.00E+00	1.25E+06	2.50E+06	2.50E+06	0.00E+00
HUC12 Name: Bull Run Creek OR_WS_170702020202_05_102093	2.57	0.00E+00	0.00E+00	3.14E+05	6.29E+05	6.29E+05	0.00E+00
HUC12 Name: Bull Run Creek OR_WS_170702020202_05_102093	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Bull Run Creek OR_WS_170702020202_05_102093	0.37	0.00E+00	0.00E+00	4.55E+04	9.10E+04	9.10E+04	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Dry Camas Creek-Camas Creek OR_WS_170702020501_05_102107	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Dry Camas Creek-Camas Creek OR_WS_170702020501_05_102107	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Camas Creek OR_SR_1707020205_05_101584	1.73	0.00E+00	0.00E+00	2.12E+05	4.23E+05	4.23E+05	0.00E+00
HUC12 Name: Bowman Creek-Camas Creek OR_WS_170702020502_05_102108	0.07	0.00E+00	0.00E+00	8.62E+03	1.72E+04	1.72E+04	0.00E+00
HUC12 Name: Bowman Creek-Camas Creek OR_WS_170702020502_05_102108	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Bowman Creek-Camas Creek OR_WS_170702020502_05_102108	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Camas Creek OR_SR_1707020205_05_101581	1.50	0.00E+00	0.00E+00	1.83E+05	3.67E+05	3.67E+05	0.00E+00
HUC12 Name: Cable Creek OR_WS_170702020504_05_102110	1.46	0.00E+00	0.00E+00	1.79E+05	3.57E+05	3.57E+05	0.00E+00
HUC12 Name: Cable Creek OR_WS_170702020504_05_102110	0.99	0.00E+00	0.00E+00	1.21E+05	2.43E+05	2.43E+05	0.00E+00
Cable Creek OR_SR_1707020205_05_101582	1.86	0.00E+00	0.00E+00	2.28E+05	4.55E+05	4.55E+05	0.00E+00
Hidaway Creek OR_SR_1707020205_05_101583	1.62	0.00E+00	0.00E+00	1.98E+05	3.96E+05	3.96E+05	0.00E+00
HUC12 Name: Lane Creek-Camas Creek OR_WS_170702020505_05_102111	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lane Creek OR_SR_1707020205_05_101580	0.28	0.00E+00	0.00E+00	3.45E+04	6.90E+04	6.90E+04	0.00E+00
Camas Creek OR_SR_1707020206_05_101587	4.24	0.00E+00	0.00E+00	5.19E+05	1.04E+06	1.04E+06	0.00E+00
HUC12 Name: Upper Owens Creek OR_WS_170702020602_05_102113	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Owens Creek OR_SR_1707020206_05_101591	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
Owens Creek OR_SR_1707020206_05_101586	0.17	0.00E+00	0.00E+00	2.03E+04	4.06E+04	4.06E+04	0.00E+00
Camas Creek OR_SR_1707020206_05_101588	7.25	0.00E+00	0.00E+00	8.87E+05	1.77E+06	1.77E+06	0.00E+00
HUC12 Name: Bridge Creek OR_WS_170702020608_05_102119	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Fivemile Creek OR_WS_170702020604_05_102115	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fivemile Creek OR_SR_1707020206_05_101590	2.94	0.00E+00	0.00E+00	3.60E+05	7.19E+05	7.19E+05	0.00E+00
HUC12 Name: Clear Creek OR_WS_170702020204_05_102095	6.50	0.00E+00	0.00E+00	7.95E+05	1.59E+06	1.59E+06	0.00E+00
HUC12 Name: Clear Creek OR_WS_170702020204_05_102095	0.84	0.00E+00	0.00E+00	1.03E+05	2.06E+05	2.06E+05	0.00E+00
HUC12 Name: Clear Creek OR_WS_170702020204_05_102095	0.27	0.00E+00	0.00E+00	3.24E+04	6.48E+04	6.48E+04	0.00E+00
Clear Creek OR_SR_1707020202_05_101571	11.20	0.00E+00	0.00E+00	1.37E+06	2.74E+06	2.74E+06	0.00E+00
HUC12 Name: Crane Creek-North Fork John Day River OR_WS_170702020105_05_102091	1.12	0.00E+00	0.00E+00	1.37E+05	2.74E+05	2.74E+05	0.00E+00
HUC12 Name: Headwaters Desolation Creek OR_WS_170702020401_05_102103	1.84	0.00E+00	0.00E+00	2.25E+05	4.50E+05	4.50E+05	0.00E+00
HUC12 Name: Headwaters Desolation Creek OR_WS_170702020401_05_102103	2.18	0.00E+00	0.00E+00	2.67E+05	5.33E+05	5.33E+05	0.00E+00
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Desolation Creek OR_WS_170702020402_05_102104	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Middle Desolation Creek OR_WS_170702020403_05_102105	0.72	0.00E+00	0.00E+00	8.80E+04	1.76E+05	1.76E+05	0.00E+00
HUC12 Name: Middle Desolation Creek OR_WS_170702020403_05_102105	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Desolation Creek OR_SR_1707020204_05_101579	8.09	0.00E+00	0.00E+00	9.90E+05	1.98E+06	1.98E+06	0.00E+00
Ditch Creek OR_SR_1707020207_05_101592	0.70	0.00E+00	0.00E+00	8.61E+04	1.72E+05	1.72E+05	0.00E+00
East Fork Cottonwood Creek OR_SR_1707020209_05_101609	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Granite Creek OR_WS_170702020201_05_102092	0.96	0.00E+00	0.00E+00	1.17E+05	2.34E+05	2.34E+05	0.00E+00
HUC12 Name: Upper Granite Creek OR_WS_170702020201_05_102092	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Granite Creek OR_SR_1707020202_05_101572	3.58	0.00E+00	0.00E+00	4.38E+05	8.76E+05	8.76E+05	0.00E+00
Granite Creek OR_SR_1707020202_05_101570	18.30	0.00E+00	0.00E+00	2.24E+06	4.48E+06	4.48E+06	0.00E+00
HUC12 Name: Lower Granite Creek OR_WS_170702020206_05_102096	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lake Penland OR_LK_1707020207_05_100032	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Mallory Creek OR_WS_170702020708_05_102128	1.01	0.00E+00	0.00E+00	1.24E+05	2.47E+05	2.47E+05	0.00E+00
HUC12 Name: Mallory Creek OR_WS_170702020708_05_102128	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mallory Creek OR_SR_1707020207_05_101594	0.59	0.00E+00	0.00E+00	7.24E+04	1.45E+05	1.45E+05	0.00E+00
North Fork John Day River OR_SR_1707020201_05_101569	11.50	0.00E+00	0.00E+00	1.41E+06	2.81E+06	2.81E+06	0.00E+00
HUC12 Name: Baldy Creek-North Fork John Day River OR_WS_170702020101_05_102087	1.46	0.00E+00	0.00E+00	1.79E+05	3.57E+05	3.57E+05	0.00E+00
HUC12 Name: Baldy Creek-North Fork John Day River OR_WS_170702020101_05_102087	0.49	0.00E+00	0.00E+00	6.01E+04	1.20E+05	1.20E+05	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Baldy Creek-North Fork John Day River OR_WS_170702020101_05_102087	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
North Fork John Day River OR_SR_1707020203_05_101575	28.10	0.00E+00	0.00E+00	3.44E+06	6.88E+06	6.88E+06	0.00E+00
North Fork John Day River OR_SR_1707020203_05_101574	33.90	0.00E+00	0.00E+00	4.15E+06	8.29E+06	8.29E+06	0.00E+00
North Fork John Day River OR_SR_1707020207_05_101596	37.60	0.00E+00	0.00E+00	4.60E+06	9.20E+06	9.20E+06	0.00E+00
North Fork John Day River OR_SR_1707020207_05_101595	36.60	0.00E+00	0.00E+00	4.48E+06	8.95E+06	8.95E+06	0.00E+00
North Fork John Day River OR_SR_1707020210_05_101613	44.34	0.00E+00	0.00E+00	5.42E+06	1.08E+07	1.08E+07	0.00E+00
HUC12 Name: Onion Creek-North Fork John Day River OR_WS_170702020103_05_102089	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Ellis Creek-Potamus Creek OR_WS_170702020706_05_102126	1.69	0.00E+00	0.00E+00	2.07E+05	4.13E+05	4.13E+05	0.00E+00
Rudio Creek OR_SR_1707020210_05_101616	0.34	0.00E+00	0.00E+00	4.10E+04	8.20E+04	8.20E+04	0.00E+00
HUC12 Name: Texas Bar Creek-North Fork John Day River OR_WS_170702020306_05_102102	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Texas Bar Creek OR_SR_1707020203_05_101576	0.50	0.00E+00	0.00E+00	6.09E+04	1.22E+05	1.22E+05	0.00E+00
HUC12 Name: Trail Creek OR_WS_170702020102_05_102088	1.63	0.00E+00	0.00E+00	1.99E+05	3.99E+05	3.99E+05	0.00E+00
HUC12 Name: Trail Creek OR_WS_170702020102_05_102088	0.70	0.00E+00	0.00E+00	8.55E+04	1.71E+05	1.71E+05	0.00E+00
HUC12 Name: Trail Creek OR_WS_170702020102_05_102088	0.20	0.00E+00	0.00E+00	2.48E+04	4.97E+04	4.97E+04	0.00E+00
Wall Creek OR_SR_1707020208_05_101606	3.68	0.00E+00	0.00E+00	4.50E+05	9.00E+05	9.00E+05	0.00E+00
Big Wall Creek OR_SR_1707020208_05_101605	1.98	0.00E+00	0.00E+00	2.42E+05	4.84E+05	4.84E+05	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
Indian Creek OR_SR_1707020208_05_101607	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Wilson Creek OR_SR_1707020208_05_101601	0.67	0.00E+00	0.00E+00	8.20E+04	1.64E+05	1.64E+05	0.00E+00
HUC12 Name: Little Wall Creek OR_WS_170702020802_05_102133	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Little Wall Creek OR_SR_1707020208_05_101603	0.04	0.00E+00	0.00E+00	4.82E+03	9.64E+03	9.64E+03	0.00E+00
Skookum Creek OR_SR_1707020208_05_101600	0.83	0.00E+00	0.00E+00	1.02E+05	2.04E+05	2.04E+05	0.00E+00
Skookum Creek OR_SR_1707020208_05_102569	1.46	0.00E+00	0.00E+00	1.79E+05	3.57E+05	3.57E+05	0.00E+00
HUC12 Name: Swale Creek OR_WS_170702020801_05_102132	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Swale Creek OR_SR_1707020208_05_101608	0.11	0.00E+00	0.00E+00	1.38E+04	2.76E+04	2.76E+04	0.00E+00
West Fork Meadow Brook OR_SR_1707020207_05_101599	1.04	0.00E+00	0.00E+00	1.27E+05	2.54E+05	2.54E+05	0.00E+00
HUC12 Name: Wilson Creek OR_WS_170702020804_05_102135	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Wilson Creek OR_WS_170702020804_05_102135	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 9-12: Thermal load allocations (LA) in kilocalories per day assigned to anthropogenic nonpoint sources in the Middle Fork John Day Subbasin (17070203).

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Bear Creek-Middle Fork John Day River OR_WS_170702030301_05_102164	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Big Creek OR_WS_170702030302_05_102165	0.97	0.00E+00	0.00E+00	1.18E+05	2.36E+05	2.36E+05	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Big Creek OR_WS_170702030302_05_102165	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Big Creek OR_WS_170702030302_05_102165	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Big Creek OR_WS_170702030302_05_102165	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Big Creek OR_SR_1707020303_05_101626	1.43	0.00E+00	0.00E+00	1.75E+05	3.50E+05	3.50E+05	0.00E+00
HUC12 Name: Bridge Creek OR_WS_170702030105_05_102155	1.75	0.00E+00	0.00E+00	2.14E+05	4.28E+05	4.28E+05	0.00E+00
HUC12 Name: Bridge Creek OR_WS_170702030105_05_102155	0.86	0.00E+00	0.00E+00	1.05E+05	2.10E+05	2.10E+05	0.00E+00
HUC12 Name: Bridge Creek OR_WS_170702030105_05_102155	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Camp Creek OR_WS_170702030205_05_102160	0.12	0.00E+00	0.00E+00	1.48E+04	2.96E+04	2.96E+04	0.00E+00
HUC12 Name: Upper Camp Creek OR_WS_170702030205_05_102160	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Camp Creek OR_WS_170702030205_05_102160	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Camp Creek OR_WS_170702030205_05_102160	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Camp Creek OR_SR_1707020302_05_101618	3.29	0.00E+00	0.00E+00	4.02E+05	8.05E+05	8.05E+05	0.00E+00
HUC12 Name: Lower Camp Creek OR_WS_170702030207_05_102162	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Camp Creek OR_SR_1707020302_05_101623	5.37	0.00E+00	0.00E+00	6.57E+05	1.31E+06	1.31E+06	0.00E+00
HUC12 Name: Clear Creek OR_WS_170702030104_05_102154	5.20	0.00E+00	0.00E+00	6.36E+05	1.27E+06	1.27E+06	0.00E+00
HUC12 Name: Dry Fork Clear Creek OR_WS_170702030103_05_102153	1.07	0.00E+00	0.00E+00	1.31E+05	2.62E+05	2.62E+05	0.00E+00
HUC12 Name: Balance Creek-Middle Fork John Day River OR_WS_170702030208_05_102163	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Indian Creek-Middle Fork John Day River OR_WS_170702030303_05_102166	0.13	0.00E+00	0.00E+00	1.59E+04	3.18E+04	3.18E+04	0.00E+00
HUC12 Name: Lick Creek OR_WS_170702030206_05_102161	1.01	0.00E+00	0.00E+00	1.24E+05	2.47E+05	2.47E+05	0.00E+00
HUC12 Name: Lick Creek OR_WS_170702030206_05_102161	0.82	0.00E+00	0.00E+00	9.99E+04	2.00E+05	2.00E+05	0.00E+00
Lick Creek OR_SR_1707020302_05_101622	2.17	0.00E+00	0.00E+00	2.65E+05	5.31E+05	5.31E+05	0.00E+00
HUC12 Name: Headwaters Long Creek OR_WS_170702030401_05_102169	1.33	0.00E+00	0.00E+00	1.63E+05	3.25E+05	3.25E+05	0.00E+00
HUC12 Name: Mill Creek-Middle Fork John Day River OR_WS_170702030106_05_102156	2.24	0.00E+00	0.00E+00	2.74E+05	5.48E+05	5.48E+05	0.00E+00
HUC12 Name: Mill Creek-Middle Fork John Day River OR_WS_170702030106_05_102156	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Mill Creek-Middle Fork John Day River OR_WS_170702030106_05_102156	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Middle Fork John Day River OR_SR_1707020301_05_101617	7.22	0.00E+00	0.00E+00	8.83E+05	1.77E+06	1.77E+06	0.00E+00
HUC12 Name: Little Boulder Creek-Middle Fork John Day River OR_WS_170702030202_05_102158	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Little Boulder Creek-Middle Fork John Day River OR_WS_170702030202_05_102158	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Little Boulder Creek-Middle Fork John Day River OR_WS_170702030202_05_102158	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Little Boulder Creek-Middle Fork John Day River OR_WS_170702030202_05_102158	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Middle Fork John Day River OR_SR_1707020302_05_101619	7.43	0.00E+00	0.00E+00	9.09E+05	1.82E+06	1.82E+06	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
Middle Fork John Day River OR_SR_1707020302_05_102577	7.40	0.00E+00	0.00E+00	9.05E+05	1.81E+06	1.81E+06	0.00E+00
HUC12 Name: Granite Boulder Creek-Middle Fork John Day River OR_WS_170702030203_05_102571	0.58	0.00E+00	0.00E+00	7.06E+04	1.41E+05	1.41E+05	0.00E+00
HUC12 Name: Granite Boulder Creek-Middle Fork John Day River OR_WS_170702030203_05_102571	0.05	0.00E+00	0.00E+00	6.24E+03	1.25E+04	1.25E+04	0.00E+00
Middle Fork John Day River OR_SR_1707020303_05_101624	14.80	0.00E+00	0.00E+00	1.81E+06	3.62E+06	3.62E+06	0.00E+00
Middle Fork John Day River OR_SR_1707020305_05_101597	15.00	0.00E+00	0.00E+00	1.83E+06	3.67E+06	3.67E+06	0.00E+00
HUC12 Name: Summit Creek OR_WS_170702030102_05_102152	0.46	0.00E+00	0.00E+00	5.65E+04	1.13E+05	1.13E+05	0.00E+00
HUC12 Name: Vinegar Creek-Middle Fork John Day River OR_WS_170702030201_05_102157	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinegar Creek OR_SR_1707020302_05_101620	0.16	0.00E+00	0.00E+00	1.91E+04	3.82E+04	3.82E+04	0.00E+00
HUC12 Name: Squaw Creek OR_WS_170702030101_05_102151	0.66	0.00E+00	0.00E+00	8.01E+04	1.60E+05	1.60E+05	0.00E+00

Table 9-13: Thermal load allocations (LA) in kilocalories per day assigned to anthropogenic nonpoint sources in the Lower John Day Subbasin (17070204).

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Alder Creek OR_WS_170702040108_05_102187	0.21	0.00E+00	0.00E+00	2.57E+04	5.14E+04	5.14E+04	0.00E+00
Bear Creek OR_SR_1707020403_05_101648	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bridge Creek OR_SR_1707020403_05_101651	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
Bridge Creek OR_SR_1707020403_05_101650	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Bridge Creek OR_WS_170702040303_05_102198	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Bridge Creek OR_WS_170702040303_05_102198	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bridge Creek OR_SR_1707020403_05_101647	0.50	0.00E+00	0.00E+00	6.12E+04	1.22E+05	1.22E+05	0.00E+00
HUC12 Name: Brown Creek OR_WS_170702041106_05_102250	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rosebush Creek OR_SR_1707020413_05_101709	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Grass Valley Canyon OR_WS_170702041304_05_102261	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grass Valley Canyon OR_SR_1707020413_05_101708	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hay Creek OR_SR_1707020410_05_101697	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Upper Kahler Creek OR_WS_170702040103_05_102182	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pine Creek OR_SR_1707020404_05_101664	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pine Creek OR_SR_1707020404_05_101662	0.10	0.00E+00	0.00E+00	1.22E+04	2.45E+04	2.45E+04	0.00E+00
Rock Creek OR_SR_1707020411_05_101705	0.18	0.00E+00	0.00E+00	2.20E+04	4.40E+04	4.40E+04	0.00E+00
Rock Creek OR_SR_1707020412_05_101701	1.09	0.00E+00	0.00E+00	1.33E+05	2.67E+05	2.67E+05	0.00E+00
HUC12 Name: Service Creek-John Day River OR_WS_170702040201_05_102189	0.37	0.00E+00	0.00E+00	4.55E+04	9.10E+04	9.10E+04	0.00E+00
HUC12 Name: Sorefoot Creek-John Day River OR_WS_170702040701_05_102222	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sorefoot Creek OR_SR_1707020407_05_101677	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

AU Name and ID	Annual 7Q10 (cfs)	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Solar loading from existing transportation corridors, existing utility infrastructure	Consumptive use water management and water withdrawals	Solar loading from nonpoint sectors
HUC12 Name: Cottonwood Creek-Butte Creek OR_WS_170702040501_05_102213	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Thirtymile Creek OR_SR_1707020408_05_101684	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Thirtymile Creek OR_SR_1707020408_05_101685	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dry Fork Thirtymile Creek OR_SR_1707020408_05_101680	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HUC12 Name: Buckhorn Creek OR_WS_170702041105_05_102249	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

9.1.4 Surrogate measures

EPA regulations (40 CFR 130.2(i)) and OAR 340-042-0040(O)(5)(b) allow for TMDLs to utilize other appropriate measures (or surrogate measures). This section presents surrogate measures that implement the load allocations.

[Description and/or subsections of additional surrogate measures, similar to those of the 2010 John Day Temperature TMDL]

9.1.4.1 Site specific effective shade surrogate measure

Effective shade surrogate measure targets shown in **Table 9-X** and **Table 9-X** represent a surrogate for the amount of solar loading that will attain the HUA and load allocations for nonpoint sources managing streamside vegetation. The surrogate measure is the arithmetic mean of the effective shade values at all model nodes assigned to each DMA (**Equation 9-4**). **Equation 9-4** may be used to recalculate the mean effective shade targets if DMA boundaries change or the DMA boundary needs to be corrected. **Equation 9-4** may also be used to recalculate the mean effective shade targets based on an updated shade gap assessment following the process and methods outlined in the WQMP.

Changes in the target effective shade from the values presented in **Table 9-X** and **Table 9-X** may result in redistribution of the sector or source responsible for excess load reduction. If the shade target increases, the equivalent portion of the excess load is reassigned from background sources to nonpoint sources. If the shade target decreases, the portion of the excess load is reassigned from nonpoint sources to background sources. The exact portion reassigned can only be determined in locations where temperature models have been developed. In locations without temperature models, the reassignment remains unquantified. Changes to the target effective shade do not impact the loading capacity, HUA, or the load allocations. They remain the same as presented in this TMDL.

$$\overline{ES} = \frac{\sum ES_{n_i}}{n_i}$$ **Equation 9-4**

Where,

$\overline{ES} =$ The mean effective shade for DMA *i.*

$\sum ES_{n_i} =$ The sum of effective shade from all model nodes or measurement points assigned to DMA *i.*

$n_i =$ Total number of model nodes or measurement points assigned to DMA *i.*

[Table of site specific effective shade surrogate measure targets to meet nonpoint source load allocations for specific model extents.]

[Insert tables of site specific effective shade surrogate measure targets to meet nonpoint source load allocations for DMAs.]

9.1.4.2 Effective shade curve surrogate measure

[Effective shade curve description and figures to be added]

9.1.5 Reserve capacity

DEQ set aside explicit portions of the HUA as reserve capacity that may be available to provide either point or nonpoint source allocation(s) to new or increased thermal loads, or to assign corrected allocations to any existing source(s) that were assigned an erroneous allocation or may not have been identified during the development of this TMDL. The portion of the HUA associated with the reserve capacity is described Section 9.1.1.

If DEQ determines the cumulative warming from all NPDES point sources is less than the assigned portion of the HUA, the remainder may be considered as reserve capacity for point sources.

Modeling analyses were performed to evaluate the impacts of wasteload and load allocations (WLAs and LAs) provided for the John Day River, Middle Fork John Day River, and North Fork John Day River in order to ensure that cumulative impacts of WLAs and LAs do not exceed the 0.3°C HUA and to determine maximum amounts of the HUA that can be assigned as reserve capacity (see TSD Section 10.X). [Description of analysis results and findings].

DEQ will consider requests for allocation of reserve capacity submitted in writing on a case-by-case basis. Except when DEQ is correcting an error or omission, DEQ may require requesters to demonstrate that there are no reasonable alternatives to an increased load and to prepare modeling or similar analysis to ensure that loading capacity is available at the discharge location(s) or in downstream waters. The HUA assigned to reserve capacity may not be available for allocation due to cumulative warming and points of maximum impact downstream. DEQ will use its discretion in making determinations on requests, based on the information available and priorities appropriate at the time of the request. DEQ will track allocation of reserve capacity over time and will not approve requests once reserve capacity is depleted. Allocations of reserve capacity must be approved by DEQ's Director or designee.

9.2 Margin of safety

CFR 130.7(c)(1) and OAR 340-042-0040(4)(i) require a TMDL to include a margin of safety. The margin of safety accounts for lack of knowledge or uncertainty. This may result from limited data; an incomplete understanding of the exact magnitude or quantity of thermal loading from various sources; or the actual effect controls will have on loading reductions and receiving water. The margin of safety is intended to account for such uncertainties in a manner that is conservative and will result in environmental protection. A margin of safety can be achieved through two approaches: (1) implicitly using conservative analytical assumptions to develop allocations, or (2) explicitly specifying a portion of the TMDL loading capacity as a margin of safety.

In the John Day Basin, an implicit margin of safety was used in derivation of the allocations. The primary conservative assumptions include:

- Setting effluent flow rates at average dry weather design flow (ADWDF) or a maximum flow obtained from discharge monitoring reports (DMRs) for the model scenario assessing the wasteload allocations and for assessments of current thermal loading. It is rare that actual discharges from point sources will reach design flows and sustain that discharge for long periods of time.

- The cumulative effects analysis applied the maximum assigned HUA to each source category to assess cumulative allocation attainment. [Description of the frequency in which the maximum allowed temperature increase occurs]
- Groundwater inflows were assumed to be zero in most models. Because groundwater directly cools stream temperatures via mixing, this means that actual instream temperatures would be lower than modeled temperatures anywhere that groundwater influences exist.
- On unmodeled streams, the sum of individual human use allocations (HUAs) was used to assess cumulative attainment across the entirety of a given AU. This method does not account for longitudinal instream heat dissipation downstream from each thermal source. Thus, the total thermal load and corresponding temperature increase is likely to result in a maximum temperature increase of less than 0.3°C.

9.3 Allocation summary

Table 9-14 through **Table 9-26** present examples of allocation calculations for sources or source categories on select temperature impaired AUs. The allocations to background sources were calculated using **Equation 9-2** and were based on the applicable year-round criterion and the spawning criterion in the respective AU. In cases when there was more than one year-round criterion applicable in the AU, the minimum criterion was used. The allocations to NPDES point sources were calculated using **Equation 9-1**. The allocations to nonpoint sources were calculated using **Equation 9-3**. All allocations presented in **Table 9-14** through **Table 9-26** were calculated using the annual 7Q10 river flow rate. As summarized in the TMDL, allocations may be dynamic and calculated using the relevant equations when river flow rates are greater than 7Q10.

The HUA assignments to anthropogenic sources or source categories are equal to 0.30°C. Wasteload allocations to point sources and load allocations to nonpoint sources are based on loads equivalent to the allowed 0.30°C increase. For some NPDES permitted point sources and nonpoint sources, the maximum cumulative impact at the POMI in an AU is less than the sum of the individual HUA assignments at their respective points of discharge or activity due to heat dissipation within the AU.

Table 9-14: Allocation summary for a portion of the John Day River (AU ID: OR_SR_1707020114_05_102609) based on an annual 7Q10 of 23.4 cfs and a year-round criterion of 18°C. The allocation period is May 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Background	0.00	1.03E+09
NPDES point sources	0.10	5.73E+06
Nonpoint source dam and reservoir operations	0.00	0.00E+00
Anthropogenic warming from tributaries	0.05	2.86E+06
Solar loading from nonpoint sectors	0.00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.025	1.43E+06
Consumptive use water management and water withdrawals	0.10	5.73E+06

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Reserve capacity	0.025	1.43E+06
-	Total Allocated Load:	1.05E+09
-	Loading Capacity:	1.05E+09

Table 9-15: Allocation summary for a portion of the John Day River between South Fork John Day River to Rock Creek (AU ID: OR_SR_1707020111_05_102568) based on an annual 7Q10 of 25.9 cfs and a year-round criterion of 18°C. The allocation period is May 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Background	0.00	1.14E+09
NPDES point sources	0.10	6.34E+06
Nonpoint source dam and reservoir operations	0.00	0.00E+00
Anthropogenic warming from tributaries	0.05	3.17E+06
Solar loading from nonpoint sectors	0.00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.025	1.58E+06
Consumptive use water management and water withdrawals	0.10	6.34E+06
Reserve capacity	0.025	1.58E+06
-	Total Allocated Load:	1.16E+09
-	Loading Capacity:	1.16E+09

Table 9-16: Allocation summary for a portion of the North Fork John Day River from Baldy Creek to Lake Creek (AU ID: OR_SR_1707020201_05_101569) based on an annual 7Q10 of 11.5 cfs and a year-round criterion of 12°C and a spawning criterion of 13°C. The allocation period is May 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)	7Q10 Allocation Spawning (kilocalories/day)
Background	0.00	3.38E+08	3.66E+08
NPDES point sources	0.00	0.00E+00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00	0.00E+00
Anthropogenic warming from tributaries	0.05	1.41E+06	1.41E+06
Solar loading from nonpoint sectors	0.00	0.00E+00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.100	2.81E+06	2.81E+06
Consumptive use water management and water withdrawals	0.10	2.81E+06	2.81E+06
Reserve capacity	0.05	1.41E+06	1.41E+06

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)	7Q10 Allocation Spawning (kilocalories/day)
-	Total Allocated Load:	3.46E+08	3.74E+08
-	Loading Capacity:	3.46E+08	3.74E+08

Table 9-17: Allocation summary for a portion of the North Fork John Day River from Granite Creek to Big Creek (AU ID: OR_SR_1707020203_05_101575) based on an annual 7Q10 of 28.1 cfs and a year-round criterion of 16°C and a spawning criterion of 13°C. The allocation period is May 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)	7Q10 Allocation Spawning (kilocalories/day)
Background	0.00	1.10E+09	8.94E+08
NPDES point sources	0.00	0.00E+00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00	0.00E+00
Anthropogenic warming from tributaries	0.05	3.44E+06	3.44E+06
Solar loading from nonpoint sectors	0.00	0.00E+00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.100	6.88E+06	6.88E+06
Consumptive use water management and water withdrawals	0.10	6.88E+06	6.88E+06
Reserve capacity	0.05	3.44E+06	3.44E+06
-	Total Allocated Load:	1.12E+09	9.14E+08
-	Loading Capacity:	1.12E+09	9.14E+08

Table 9-18: Allocation summary for a portion of the North Fork John Day River from Big Creek to Desolation Creek (AU ID: OR_SR_1707020203_05_101574) based on an annual 7Q10 of 33.9 cfs and a year-round criterion of 16°C and a spawning criterion of 13°C. The allocation period is May 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)	7Q10 Allocation Spawning (kilocalories/day)
Background	0.00	1.33E+09	1.08E+09
NPDES point sources	0.00	0.00E+00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00	0.00E+00
Anthropogenic warming from tributaries	0.05	4.15E+06	4.15E+06
Solar loading from nonpoint sectors	0.00	0.00E+00	0.00E+00

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)	7Q10 Allocation Spawning (kilocalories/day)
Solar loading from existing transportation corridors, existing utility infrastructure	0.100	8.29E+06	8.29E+06
Consumptive use water management and water withdrawals	0.10	8.29E+06	8.29E+06
Reserve capacity	0.05	4.15E+06	4.15E+06
-	Total Allocated Load:	1.35E+09	1.10E+09
-	Loading Capacity:	1.35E+09	1.10E+09

Table 9-19: Allocation summary for a portion of the North Fork John Day River from Desolation Creek to Camas Creek (AU ID: OR_SR_1707020207_05_101596) based on an annual 7Q10 of 37.6 cfs and a year-round criterion of 18°C. The allocation period is May 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)	7Q10 Allocation Spawning (kilocalories/day)
Background	0.00	1.47E+09	1.20E+09
NPDES point sources	0.00	0.00E+00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00	0.00E+00
Anthropogenic warming from tributaries	0.05	4.60E+06	4.60E+06
Solar loading from nonpoint sectors	0.00	0.00E+00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.100	9.20E+06	9.20E+06
Consumptive use water management and water withdrawals	0.10	9.20E+06	9.20E+06
Reserve capacity	0.05	4.60E+06	4.60E+06
-	Total Allocated Load:	1.50E+09	1.22E+09
-	Loading Capacity:	1.50E+09	1.22E+09

Table 9-20: Allocation summary for a portion of the North Fork John Day River from Camas Creek to Wall Creek (AU ID: OR_SR_1707020207_05_101595) based on an annual 7Q10 of 36.6 cfs and a year-round criterion of 18°C. The allocation period is May 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Background	0.00	1.61E+09
NPDES point sources	0.00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00
Anthropogenic warming from tributaries	0.05	4.48E+06

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Solar loading from nonpoint sectors	0.00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.100	8.95E+06
Consumptive use water management and water withdrawals	0.10	8.95E+06
Reserve capacity	0.05	4.48E+06
-	Total Allocated Load:	1.64E+09
-	Loading Capacity:	1.64E+09

Table 9-21: Allocation summary for a portion of the North Fork John Day River from Wall Creek to the confluence with the John Day River (AU ID: OR_SR_1707020210_05_101613) based on an annual 7Q10 of 44.34 cfs and a year-round criterion of 18°C. The allocation period is May 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Background	0.00	1.95E+09
NPDES point sources	0.00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00
Anthropogenic warming from tributaries	0.05	5.42E+06
Solar loading from nonpoint sectors	0.00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.100	1.08E+07
Consumptive use water management and water withdrawals	0.10	1.08E+07
Reserve capacity	0.05	5.42E+06
-	Total Allocated Load:	1.99E+09
-	Loading Capacity:	1.99E+09

Table 9-22: Allocation summary for a portion of the Middle Fork John Day River from Mill Creek to Bridge Creek (AU ID: OR_SR_1707020301_05_101617) based on an annual 7Q10 of 7.22 cfs and a year-round criterion of 12°C. The allocation period is March 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Background	0.00	2.12E+08
NPDES point sources	0.00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00
Anthropogenic warming from tributaries	0.05	8.83E+05
Solar loading from nonpoint sectors	0.00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.10	1.77E+06

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Consumptive use water management and water withdrawals	0.10	1.77E+06
Reserve capacity	0.05	8.83E+05
-	Total Allocated Load:	2.17E+08
-	Loading Capacity:	2.17E+08

Table 9-23: Allocation summary for a portion of the Middle Fork John Day River from Bridge Creek to Vinegar Creek (AU ID: OR_SR_1707020302_05_101619) based on an annual 7Q10 of 7.43 cfs and a year-round criterion of 16°C. The allocation period is March 1 through October 31

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Background	0.00	2.91E+08
NPDES point sources	0.00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00
Anthropogenic warming from tributaries	0.05	9.09E+05
Solar loading from nonpoint sectors	0.00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.10	1.82E+06
Consumptive use water management and water withdrawals	0.10	1.82E+06
Reserve capacity	0.05	9.09E+05
-	Total Allocated Load:	2.96E+08
-	Loading Capacity:	2.96E+08

Table 9-24: Allocation summary for a portion of the Middle Fork John Day River from Vinegar Creek to Camp Creek (AU ID: OR_SR_1707020302_05_102577) based on an annual 7Q10 of 7.4 cfs and a year-round criterion of 16°C. The allocation period is March 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Background	0.00	1.95E+09
NPDES point sources	0.00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00
Anthropogenic warming from tributaries	0.05	5.42E+06
Solar loading from nonpoint sectors	0.00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.10	1.08E+07
Consumptive use water management and water withdrawals	0.10	1.08E+07
Reserve capacity	0.05	5.42E+06
-	Total Allocated Load:	1.99E+09

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
-	Loading Capacity:	1.99E+09

Table 9-25: Allocation summary for a portion of the Middle Fork John Day River from Camp Creek to Granite Creek (AU ID: OR_SR_1707020303_05_101624) based on an annual 7Q10 of 14.8 cfs and a year-round criterion of 16°C, and a spawning criterion of 16°C. The allocation period is March 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)	7Q10 Allocation Spawning (kilocalories/day)
Background	0.00	5.79E+08	4.71E+08
NPDES point sources	0.00	0.00E+00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00	0.00E+00
Anthropogenic warming from tributaries	0.05	1.81E+06	1.81E+06
Solar loading from nonpoint sectors	0.00	0.00E+00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.10	3.62E+06	3.62E+06
Consumptive use water management and water withdrawals	0.10	3.62E+06	3.62E+06
Reserve capacity	0.05	1.81E+06	1.81E+06
-	Total Allocated Load:	5.90E+08	4.82E+08
-	Loading Capacity:	5.90E+08	4.82E+08

Table 9-26: Allocation summary for a portion of the Middle Fork John Day River from Granite Creek to the confluence with the North Fork John Day River (AU ID: OR_SR_1707020305_05_101597) based on an annual 7Q10 of 15 cfs and a year-round criterion of 18°C. The allocation period is July 1 through October 31.

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
Background	0.00	6.61E+08
NPDES point sources	0.00	0.00E+00
Nonpoint source dam and reservoir operations	0.00	0.00E+00
Anthropogenic warming from tributaries	0.05	1.83E+06
Solar loading from nonpoint sectors	0.00	0.00E+00
Solar loading from existing transportation corridors, existing utility infrastructure	0.10	3.67E+06
Consumptive use water management and water withdrawals	0.10	3.67E+06
Reserve capacity	0.05	1.83E+06
-	Total Allocated Load:	6.72E+08

Source or Source Category	Assigned HUA (°C)	7Q10 Allocation Year Round (kilocalories/day)
-	Loading Capacity:	6.72E+08

10 Water quality management plan

As described in OAR 340-042-0040(4)(I)(A)-(O), an associated WQMP is a required element of a TMDL and must include the following components: (A) Condition assessment and problem description; (B) Goals and objectives; (C) Proposed management strategies design to meet the TMDL allocations; (D) Timeline for implementing management strategies; (E) Explanation of how TMDL implementation will attain water quality standards; (F) Timeline for attaining water quality standards; (G) Identification of persons, including DMAs, responsible for TMDL implementation; (H) Identification of existing implementation plans; (I) Schedule for submittal of implementation plans and revision triggers; (J) Description of reasonable assurance of TMDL implementation; (K) Plan to monitor and evaluate progress toward achieving TMDL allocations and water quality standards; (L) Plan for public involvement in TMDL implementation; (M) Description of planned efforts to maintain management strategies over time; (N) General discussion of costs and funding for TMDL implementation; and (O) citation of legal authorities relating to TMDL implementation.

DEQ sought and considered input from various persons, including DMAs, responsible for TMDL implementation and other interested public and prepared the John Day Basin WQMP as a stand-alone document. DEQ intends to propose the WQMP as an element of the Temperature TMDL for the John Day Basin for adoption as rule by the Oregon Environmental Quality Commission.

11 Reasonable assurance

OAR 340-042-0030(9) defines Reasonable Assurance as “a demonstration that a TMDL will be implemented by federal, state or local governments or individuals through regulatory or voluntary actions including management strategies or other controls.” OAR 340-042-0040(6)(g) states that “to establish reasonable assurance that the TMDL’s load allocations will be achieved requires determination that practices capable of reducing the specified pollutant load: (1) exist; (2) are technically feasible at a level required to meet allocations; and (3) have a high likelihood of implementation.” Likewise federal regulations (40 CFR § 130.2(i)) and EPA’s TMDL guidance describes that when a TMDL is developed for waters impaired by both point and nonpoint sources and WLAs are based on an assumption that NPS load reductions will occur, the TMDL

must provide “reasonable assurances” that NPS control measures will achieve expected load reductions (EPA, 1991).

The John Day Basin TMDLs were developed to address both point and nonpoint sources with TMDL load reductions set at a level estimated to attain the applicable temperature criteria with consideration of opportunities for effective measures to reduce those contributions. Reasonable assurance that Oregon’s three-point test is met, needed load reductions will be achieved for nonpoint sources, and that antidegradation requirements and narrative water quality criteria will be attained is based primarily on an accountability framework incorporated into the WQMP. The accountability framework includes identification of pollutant reduction strategies by source and activity, identification of persons and agencies responsible to implement the strategies, timelines and measurable objectives, tracking implementation progress and water quality conditions, and DEQ action when responsible persons or agencies fail to implement. Section 7 of the WQMP (Reasonable Assurance of Implementation) discuss this framework directly.

The WQMP also includes a general discussion of implementation costs and available funding programs, identification of state legal authorities that aid in implementation of management strategies, and DEQ’s adaptive management approach DMA implementation if sufficient progress towards TMDL attainment is not being made. The entirety of the WQMP and its execution along with the implementation plans of persons and agencies responsible for TMDL implementation represents reasonable assurance that NPS load reductions will be achieved.