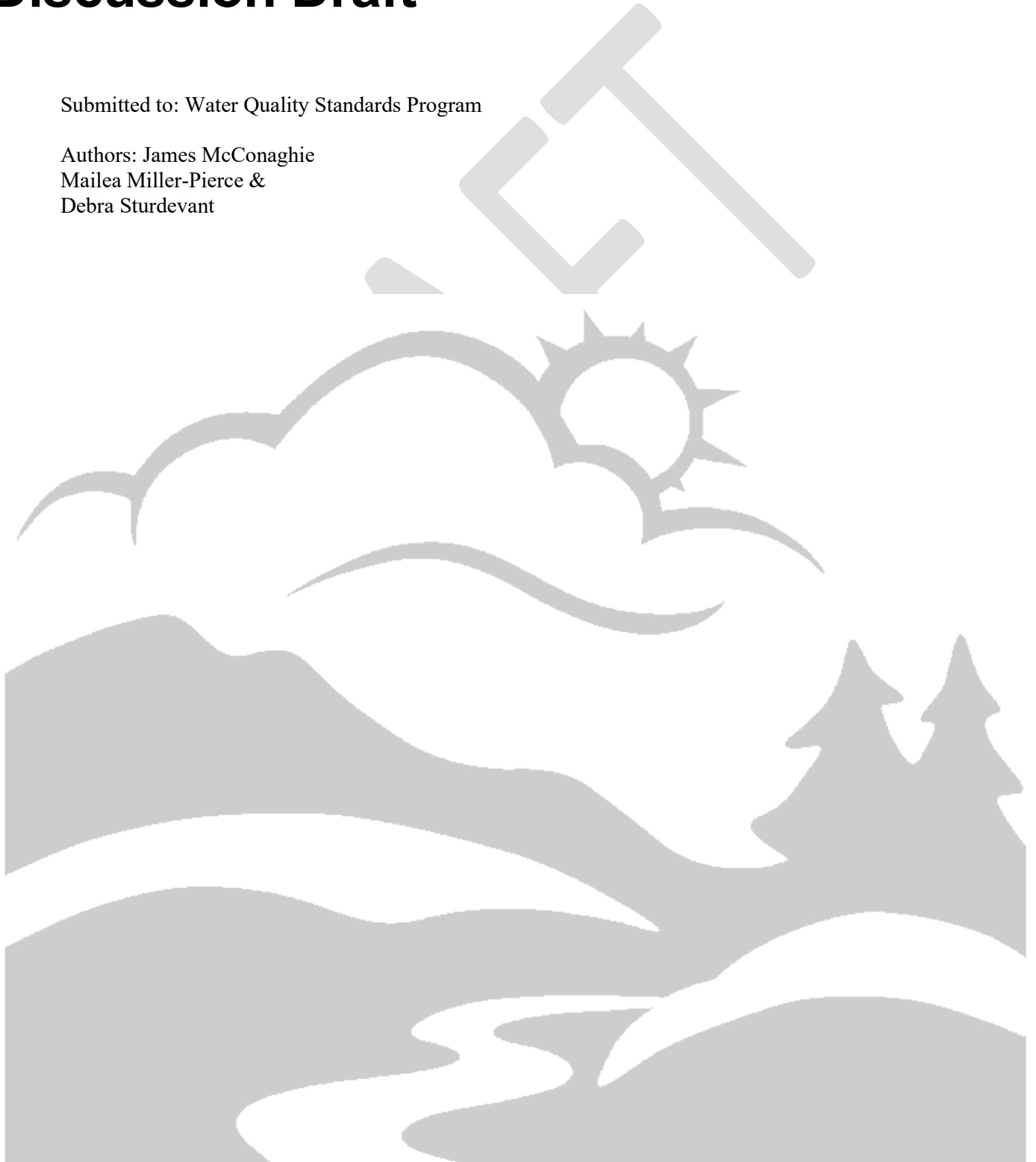


DISCUSSION DRAFT FOR REVIEW ONLY August 2022

Water Quality Standards Revisions: Aquatic Life Use Updates Technical Support Document Discussion Draft

Submitted to: Water Quality Standards Program

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Executive Summary (still TBD)

Objective of the Aquatic Life Use Updates

The objective of this project is to update the aquatic life use designations associated with Oregon's temperature and dissolved oxygen standards based on the most current data available, and to ensure that DEQ applies the correct water quality criteria to protect aquatic life in Oregon waters.

Through this rulemaking, DEQ is correcting and updating the state's use designations, meaning which use subcategories are assigned to each waterbody across the state. The rulemaking will also adjust or identify the timeframe to which the seasonal spawning criteria apply. DEQ is not changing the criteria values, we are only updating the designations to determine where and when certain water quality criteria apply.

Under the Clean Water Act, states are required to establish water quality standards that provide for the protection and propagation of fish, shellfish and wildlife. However, protection of fish and shellfish, what we call "Fish and aquatic life," is a very broad use, and different species, life stages or communities have different water quality requirements. Therefore, states may specify **Subcategories** of use within a broader use.

Water Quality standards are comprised of beneficial uses, sometimes also referred to as designated uses, water quality criteria established to protect the use, and an antidegradation provision designed to prevent degradation of that use (40 CFR 131.12). The beneficial use designations for fish and aquatic life set the protection goals for a waterbody, and in the case of Oregon's temperature and dissolved oxygen standards, determine where and when each criteria applies.

The accuracy of DEQ's beneficial use designations is important for applying appropriate criteria to the development of wastewater discharge permit limits, assessing Oregon waters and identifying impaired waters, establishing load and waste load allocations through total maximum daily load calculations (TMDLs), and for certification of federal permits and licenses for hydroelectric and fill and removal projects meet water quality standards.

The scope of this project is divided into three main components:

1. General update to the existing use subcategory designations associated with the temperature standard. This includes the 'year-round fish use' categories and the seasonal 'spawning use' category already included in the water quality standards rules under OAR-340-04141.
2. Formal designation of where and when the use subcategories in the dissolved oxygen standard apply. DEQ will adopt the procedures documented and used to implement the dissolved oxygen standard since 1998 as the basis for designation in the administrative rules for the first time.
3. Additional minor miscellaneous rule amendments to definitions in OAR-340-041-0002 and the pH criteria assigned to the Crooked River and Trout Creek sub-basins of the Deschutes River in OAR-340-041-0130.

Oregon has established the fish and aquatic life use subcategories for its temperature and dissolved oxygen standards. Each use subcategory has different criteria to protect that species or community.

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Because the temperature uses are based on sensitive species and life stages, the criteria will also protect other organisms with less sensitive life stages that co-occur. The dissolved oxygen standard use subcategories are based on the aquatic community, or a mix of species, rather than individual species. Therefore, the use subcategories for dissolved oxygen are similar, but not identical, to the use subcategories for temperature.

Through this rulemaking, DEQ is correcting and updating the state's use designations, meaning which use subcategories are assigned to each waterbody reach across the state. Where the spawning use has been designated, the rulemaking will also adjust or identify the timeframe to which the seasonal spawning criteria apply. DEQ is not proposing to change the criteria values, only updating where and when the different criteria apply.

The primary tasks of the revisions to update existing use subcategory designations associated with the temperature standard are first, to conduct a statewide evaluation and update of the existing designations. These are found on what are referred to as the 'fish use' and 'spawning use' maps and figures in our basin-specific rules. The main goal is to incorporate about 18 years of additional habitat distribution data collected and compiled by ODFW since 2003. Second, we are specifically reviewing the designations for bull trout spawning to make sure they conform with the final critical habitat rule adopted by USFWS in 2010. The USFWS Biological Opinion from 2015 also required DEQ to add some waters to this designation. Finally, DEQ is proposing to add more waters to the core cold water habitat based on additional temperature data. This data is used to identify streams that provide cold water all through the summer. This includes tributaries that provide cold water refuge for fish migrating in the Columbia River mainstem, which EPA identified a cold-water refuge plan for the Columbia River.

The primary tasks of the revisions to update existing use subcategory designations associated with the dissolved oxygen standard are first, to designate waterbodies for each category in the basin-specific rules. Second, there is a special focus on improving the way we identify resident trout spawning areas for designating the salmonid spawning use for the D.O. standard. This use category includes both the migratory salmon and steelhead spawning identified in the temperature rule with the addition of spawning habitat for resident trout and related cold-water fish. There is historically a lack of specific information on the location of resident trout spawning areas in Oregon and there are still significant data gaps. However, spawning likely occurs in a large proportion of the range.

DEQ also proposes to include two additional minor corrections to the basin specific rules in this rulemaking: clarification or removal of conflicting definitions for Cold-, Cool- and Warm-water aquatic life used in OAR-340-041-0002, and revision of the pH criteria designated for the Crooked River and Trout Creek Subbasins of the Deschutes River basin.

Purpose of this document

This Technical Support Document contains information about the data sources, methods, and supporting analyses for identifying the appropriate aquatic life use subcategory for waterbodies based on the most up to date data and information. DEQ is not required to provide additional justification for the existing designation of waterbodies, or when assigning a designation associated with a more stringent criterion. A separate Use Attainability Analysis documents the rationale where the use subcategories identified through these methods would result in a less stringent criterion.

Organization of the Document:

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Chapter 1: This section provides background information about the goals for this rulemaking, the temperature and dissolved oxygen standards, and the technical review process followed by DEQ.

Chapter 2: This section identifies the decision rule methodology used to designate the aquatic life use subcategories for the temperature and dissolved oxygen standards. Sub-sections under each subcategory of the designations identifies where data sources and decision methods used to designate the aquatic life uses have changed from the last rulemaking in 2003 and indicates whether any additional methods or data sources were considered during DEQ's technical review.

Chapter 3: This section provides details of supporting analyses and literature reviews, GIS procedures, and discussion of alternatives considered but not adopted into the decision rule methodology.

Appendices: Appendix A provides a summary of the decision rules methods detailed in Chapter 2 for easy reference. Appendix B provides a detailed cross walk of data sources and variables used between the 2003 decision rule methodology and the proposed decision rule methodology. Appendix C provides a list of data sources used to designate use subcategories. All data used by DEQ is from publicly available sources.

Data and Information

DEQ primarily relied on the Oregon Department of Fish and Wildlife (ODFW) Fish Habitat Distribution (FHD) database¹ for information on fish distribution and Timing / In-water work area mapping² (aka Timing Tables) for life-stage activity and timing information.

DEQ also incorporated additional information from the U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Forest Service, the U.S. Environmental Protection Agency, Oregon DEQ's Water Quality Monitoring Program, and from third parties that submitted data to DEQ's statewide water quality assessment for the 2018 and 2022 integrated reports.

Key Terms

Anadromous Species	A term for the life history of fish born in freshwater who spend most of their lives in saltwater and return to freshwater to spawn, such as salmon and steelhead.
Salmonid	In this document, the term refers to native fishes classified in the family Salmonidae: salmon, trout, char, and whitefish.
Salmon and steelhead	In this document, the term refers to the native salmon and anadromous trout species of Oregon: Chum, Chinook, Coho, & Sockeye Salmon, and steelhead trout.

¹ <https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata>

² <https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=datasources>

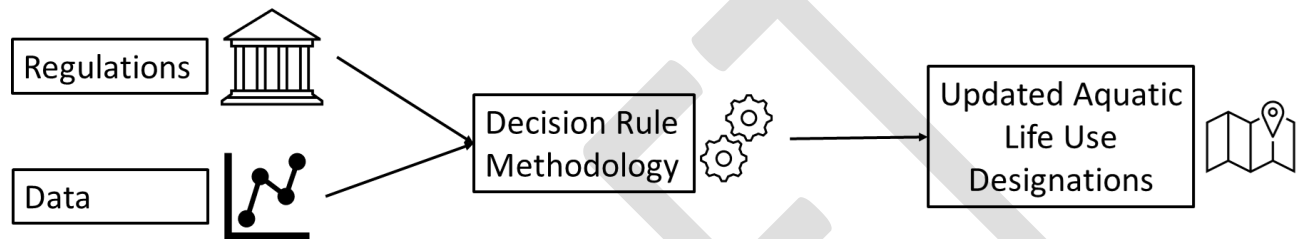
Resident Trout

In this document the term refers to the native resident trout and whitefish species of Oregon: Coastal, Lahontan, and Westslope Cutthroat, Rainbow, & Redband Trout, and Mountain Whitefish.

Methods

DEQ used a technical development process that combines the requirements of state and federal regulations with the data available to identify distribution and habitats of sensitive species of aquatic life.

Figure 1 Conceptual Model of DEQ's Technical Development Process



DEQ's aquatic life use designations are based on the **regulations** of Clean Water Act and water quality standards adopted into state administrative rules for the protection of aquatic life. The different subcategories of aquatic life use and the species or communities associated with them are defined in Oregon's water quality standards. Various publicly available **data** sources provide the means to identify the location of populations and habitats that fit each subcategory of the beneficial uses. DEQ was assisted in identifying and interpreting data sources by an interagency technical work group (see more information in Section 1.5).

The defined use subcategories are identified through application of the data using a **methodology** referred to as **decision rules**. The decision rules are a logical chain of operations for evaluating the data to identify the waterbodies where and when each specific use subcategory occurs. This is so DEQ can target them for protection that is consistent with our regulations. In 2003, DEQ published decision rules as part of the rulemaking record where the current use subcategories were designated (OR-DEQ 2003a). DEQ is retaining as many of the original methods used in 2003 as possible, with adjustments where necessary to account for new data sources and variables, or to fill any gaps identified in the original rules. As a result, most of the current designations are not likely to change. There will be differences where the amount or quality of the data has increased.

Finally, the end product of the technical development process are the proposed updates to the **aquatic life use designations**. These are depictions of the waterbodies assigned to each use subcategory in maps or tables that are adopted into Oregon's administrative Rules.

Proposed Use Changes

The fish and aquatic life use subcategory updates will be adopted as amended basin-specific rule maps or tables in Oregon's administrative rules OAR-340-041-0101 to OAR-340-041-0345. Because DEQ is using much of the pre-existing decision rule methods for assigning the use subcategories for temperature, and existing implementation procedures for dissolved oxygen, the majority of

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waterbodies will likely remain designated for the same uses, and therefore criteria, that are currently implemented in our programs.

DEQ expects that there will be changes to the use subcategory designation to uses with more stringent criteria in waters mainly where dam removal, restored passage, or reintroduction of populations have restored access to waters that were previously inaccessible. Or cases where increased availability of continuously monitored temperature indicates waters currently attain some of our more stringent criteria.

DEQ expects that there will be changes to the use subcategory designation to uses with less stringent criteria in waters mainly where the existing designations were based on incomplete or provisional data that has been replaced with more specific data. There are also hydrography and mapping errors that will be corrected- but the underlying habitat has not changed.

Preliminary maps of the proposed use changes resulting from applying the decision rule methodology in Chapter 2 are available to the public through the Oregon Geospatial Enterprise Office on ArcGIS Online. <https://arcg.is/vDS0D> These maps are not valid for Clean Water Act or other regulatory purposes and are provided for illustrative and informational purposes only.

1 Introduction

This document contains the proposed procedures, documentation, and analysis to support updates and new designation of aquatic life use subcategories related to Oregon's water quality standards for temperature and dissolved oxygen (D.O.). These designations are currently found in figures and tables in Oregon's Administrative Rules (OAR)'s under basin-specific rules at OAR-340-041-0101 to OAR-340-041-0345. The Oregon Department of Environmental Quality (DEQ) will use this document in agency and advisory committee discussions in preparation for rulemaking to revise the aquatic life use designations as appropriate. DEQ may update existing "fish use maps" or create new maps or other designation for adoption into state administrative rules as the official designation of these uses. DEQ plans to propose rule amendments for Environmental Quality Commission (EQC) adoption in early 2023.

Section 2 summarizes the methodology used to combine data and information to designate the aquatic life use subcategories consistent with the definitions and requirements of Oregon's temperature and D.O. standards in OAR-340-041-0002, OAR-340-041-0028, OAR 340-041-0016 and Table 21.

Section 3 identifies where data sources and decision methods used to designate the aquatic life uses have changed from the last rulemaking in 2003, and additional methods or data sources that were considered during DEQ's technical review. Detailed inventory of data sources, including variables used, literature review, and other supporting analyses are documented in appendices.

Appendices are provided that detail the data sources and variables used in each designation, a shorthand of the decision rules, and flow charts.

1.1 Background

Water quality standards are comprised of a designated use that sets the goal for the waterbody and criteria for specific water quality parameters established to protect the uses from degradation and pollution. Fish and Aquatic Life Use is a designated use in virtually every waterbody in Oregon. The only exception being a constructed irrigation water conveyance canal screened off from aquatic organisms. Because Fish and Aquatic Life use is a broad category and many species, populations, or communities of organisms can have different biological tolerances and requirements to water quality parameters, the Clean Water Act allows states to establish use subcategories within their water quality standards to differentiate waterbodies where specific criteria may be applied for protection of the use. Several of Oregon's water quality standards contain multiple subcategories of the Fish and Aquatic Life use.

Oregon's temperature standard has criteria for subcategories of aquatic life use based on sensitive salmon, steelhead, resident trout and other native fish species and their life stages within flowing freshwaters (Table 1). These also include separate narrative criteria and use subcategories for cool water species, lakes, and oceans & bays.

Oregon's dissolved oxygen standard has criteria for subcategories of aquatic life based on community subcategories. The dissolved oxygen criteria were designed to protect community assemblages in estuarine, marine, and freshwater systems dominated by warm, cool, and cold-water species with similar dissolved oxygen requirements and are adapted to different habitats.

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Designated use subcategories for temperature and dissolved oxygen standards differ because of the way criteria were developed and because standards were adopted separately at different times. The temperature standard use subcategories rely on a species-based approach that focuses on the protection required for the most sensitive species present in a given waterbody, or stream reach. The Dissolved Oxygen standard use subcategories rely on a broader aquatic community-based approach that focuses on protection of an aquatic community, or grouping of species, with similar D.O. requirements.

In 2003, as part of the temperature standard rulemaking, DEQ mapped the waterbodies designated for each use subcategory associated with the different temperature criteria contained in its temperature standard rule (OR-DEQ 2003a). These 'fish use maps' were the product of a litigation settlement because the court found that it was not clear when and where Oregon's various temperature criteria applied. The 2003 mapping effort relied primarily on data for fish species and life stage distribution and timing information provided by the Oregon Department of Fish and Wildlife (ODFW). The 2003 ODFW database incorporated the best data available at the time, which was sometimes incomplete or provisional. In the absence of more comprehensive statewide availability of observations or survey data and to address data gaps, the professional opinion of biologists was used to determine fish uses and spawning dates. DEQ's 2003 use designations are contained in a variety of tables and maps in the water quality standards rules ([Oregon Administrative Rules 340, Chapter 41](#)). It was not a requirement to adopt explicit designation maps for the subcategories used in the dissolved oxygen standard when DEQ adopted the standard in 1996.

DEQ has not updated the fish use maps and tables since 2003, with a few exceptions. Since then, ODFW has continued to improve its information on fish habitat distribution. In addition, restoration projects and dam removals have opened certain previously impassable streams to fish passage. Since 2003, the United States Fish and Wildlife Service (USFWS) has also adopted a Critical Habitat rule for Bull Trout, making the state's existing designations inconsistent with the federal designation of critical habitat.

Finally, DEQ has recently adopted the NHD high-resolution (1:24,000) hydrography to align with statewide geospatial data standards. Prior to 1996 and following its original adoption of the aquatic life use in 1996, uses were designated at the scale of Oregon Water Resources Department administrative basins and visible for only major rivers and tributaries on the lower-resolution hydrographic maps of the time. DEQ did not intend these basin level designations to indicate that the use designations applied to every stream reach within a basin. The maps adopted in 2003 improved on the available information, using the StreamNET hydrography at a scale of 1:100,000.

DEQ determined there is a need to update Oregon's aquatic life use designations to:

1. incorporate new and improved data, especially the major improvements by ODFW to the base data used in 2003,
2. correct errors (e.g., inaccuracy resulting from different base hydrography), and
3. add habitat that is newly accessible since 2003.

These updates will ensure that the use designations in Oregon's water quality standards are accurate, up to date, and based on the best available scientific information.

Table 1 List of native salmonid species of Oregon referred to in this document.

Common Name	Genus	Species
Anadromous Species		
Chum Salmon	<i>Oncorhynchus</i>	<i>keta</i>
Spring Chinook Salmon	<i>Oncorhynchus</i>	<i>tshawytscha</i>
Fall Chinook Salmon	<i>Oncorhynchus</i>	<i>tshawytscha</i>
Coho Salmon	<i>Oncorhynchus</i>	<i>kisutch</i>
Sockeye Salmon	<i>Oncorhynchus</i>	<i>nerka</i>
Summer Steelhead Trout	<i>Oncorhynchus</i>	<i>mykiss</i>
Winter Steelhead Trout	<i>Oncorhynchus</i>	<i>mykiss</i>
Resident Species		
Bull Trout (char)	<i>Salvelinus</i>	<i>confluentus</i>
Coastal Cutthroat Trout	<i>Oncorhynchus</i>	<i>clarkii</i> spp. <i>clarkii</i>
Lahontan Cutthroat Trout	<i>Oncorhynchus</i>	<i>clarkii</i> spp. <i>henshawi</i>
Westslope Cutthroat Trout	<i>Oncorhynchus</i>	<i>clarkii</i> spp. <i>lewisii</i>
Rainbow Trout	<i>Oncorhynchus</i>	<i>mykiss</i>
Redband Trout	<i>Oncorhynchus</i>	<i>mykiss</i> spp. <i>gairdneri</i>
Mountain Whitefish	<i>Prosopium</i>	<i>williamsoni</i>

The seasonal runs of Spring and Fall Chinook and summer and winter steelhead are differentiated into populations, even though they are the same species, because of different life history strategies that they employ for migration and reproduction. Spring Chinook tend to enter freshwater in spring or summer, holding in freshwater and/or migrating long distances to spawning grounds, until they spawn in fall. Fall Chinook enter freshwater in the fall and migrate directly to spawn shortly thereafter. Summer steelhead tend to enter freshwater in the late summer, holding in freshwater and/or migrating long distance to spawning grounds, where they spawn later during the winter. Winter steelhead enter freshwater in the winter and migrate directly to spawn shortly thereafter. The summer steelhead tend to start spawning earlier in the winter season than winter steelhead.

For both salmon and steelhead, the spring to summer run timings tend to occur where migration distances to spawning areas are long or where there are partial barriers to access that favor summer migration periods. Usually these are waters where natural obstacles such as rapids or waterfalls are not conducive to passage during late fall and winter but are passable during spring or summer due to differences in seasonal flow conditions.

1.2 The Temperature Standards

Oregon's temperature standards are based on the available body of science describing the temperature requirements and preferences of the state's native aquatic life (McCullough et al. 2001). They are not intended to mimic what the "natural" stream temperatures of a waterbody are expected to be. The purpose of the temperature standards is to protect the beneficial uses.

In general, the temperature regime of streams and rivers in the Pacific Northwest follow a similar pattern. The annual maximum temperatures occur in the summer months (July and August), while temperatures are cooler in the spring and fall, and coldest during the winter months (December and January) (Figure 2). Water temperature is determined by the solar radiation and air temperature that deliver heat to the stream, the characteristics of the stream channel through which the water flows, and the physical characteristics of the flowing water itself (Poole et al. 2001).

Water quality criteria to protect beneficial uses apply at all times of the year (Table 2). Every water body in Oregon has a year-round aquatic life use designation. In many cases, habitat supports multiple species with a range of thermal tolerance. Waterbodies can also fit the requirements for multiple of the year-round aquatic life use designation subcategories. DEQ designates the aquatic life use based on the most sensitive use that occurs in the waterbody. DEQ has historically focused on salmonids as the most temperature sensitive species in cold or cool water aquatic communities. They are also usually the species for which the most data on thermal tolerance and distribution is available.

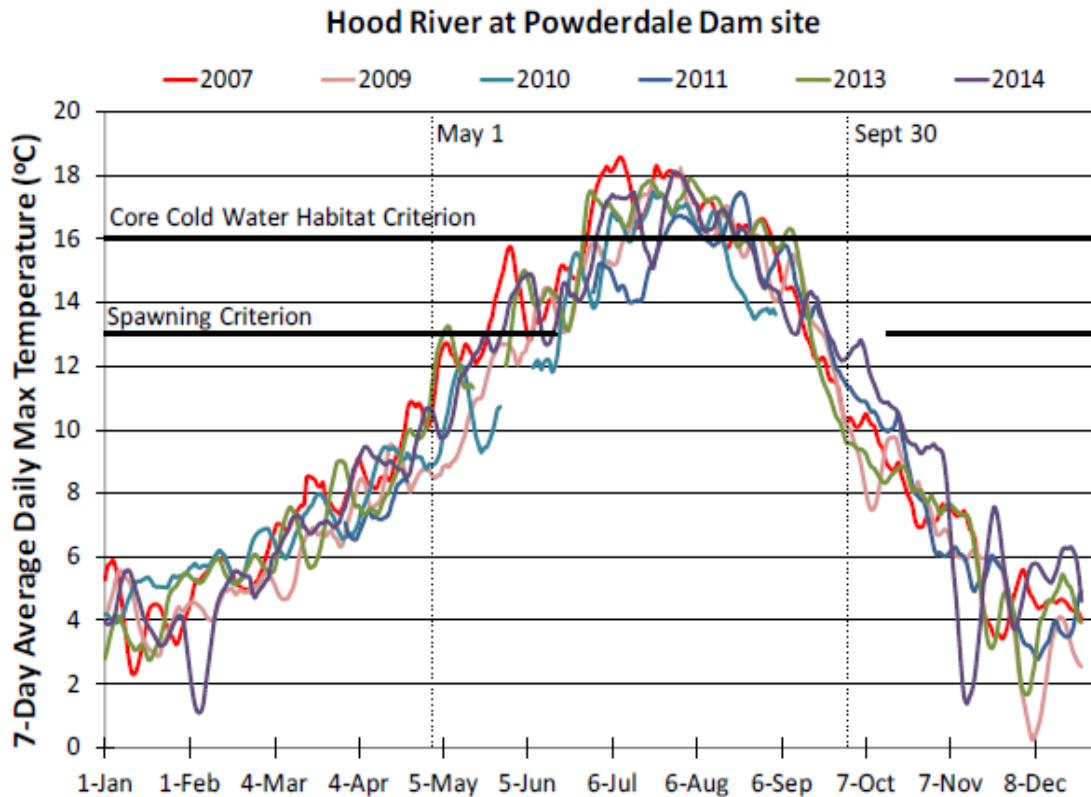
DEQ emphasizes attainment of the temperature criteria during the summer, because if they are attained during the hottest part of the year, there is assurance that stream temperatures will be cooler than the criteria for much of the rest of the year.

Table 2 Oregon's Use Subcategories and Criteria for Temperature. Ordered from most stringent to least stringent. Where a waterbody fits multiple use categories the most stringent category is designated.

Aquatic Use Subcategory	Criterion (7dADM ³)	When Applied
Year- Round Use Subcategories		
Bull Trout Spawning and Juvenile Rearing	12°C	Year-round
Core Cold Water Habitat	16°C	Year-round
Salmon and Trout Rearing and Migration	18°C	Year-round
Salmon and Steelhead Migration Corridors	20°C	Year-round
Redband or Lohantan Cutthroat Trout	20°C	Year-round
Cool Water Species	narrative	Year-round
Borax Lake Chub	narrative	Year-round
Seasonal Use Subcategories		
Salmon and Steelhead Spawning	13°C	During designated spawning time periods

³ Seven-day average daily maximum temperature (7dADM) means the average of the daily maximum temperatures from seven consecutive days made on a rolling basis. The daily maximum temperature experienced during the warmest consecutive 7-day period of the year must be no higher than the criterion for a waterbody to attain the corresponding criterion. Average daily water temperatures and maximum temperatures at most other times of year will be cooler than the temperature of the criterion.

Figure 2 Seasonal Variation in Stream Temperature and Critical Periods for Criteria. General example using data from the Hood River at Powderdale Dam. Horizontal lines show criteria thresholds and time periods and when year round and seasonal criteria are in effect. (DEQ 2018)



1.3 The Dissolved Oxygen Standards

The objective of the water quality standard for dissolved oxygen is to protect aquatic life from anthropogenic disruption of dissolved oxygen levels. There are various cold-water, cool-water and warm-water aquatic life communities in Oregon that each have different general dissolved oxygen requirements. Since fish and aquatic life is a beneficial use that is designated for essentially every waterbody in Oregon, each water body will be assigned one of these year-round aquatic life use subcategories for dissolved oxygen.

When DEQ adopted the existing dissolved oxygen standards in 1996, the use subcategories for dissolved oxygen were not designated in rule. However, Oregon has applied the standards consistently for many years as described in memos to EPA in 1998 and 2004. These memos identify where and when the various dissolved oxygen criteria are applied to protect aquatic life and have been DEQ's standard practice since 1998. DEQ is proposing to adopt use subcategory designations in rule consistent with these existing procedures where appropriate. The new use designations shall be amendments to the basin-specific beneficial use rules in OAR-340-041-101 to OAR-340-041-340.

Unlike the beneficial use subcategories and criteria for temperature, which are based on identifying the most sensitive individual species, the use subcategories and criteria for dissolved oxygen are

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based on protecting broader aquatic communities (Table 3). The dissolved oxygen criteria were developed to protect community assemblages in estuarine, marine, and freshwater systems dominated by warm, cool, and cold-water species with similar dissolved oxygen requirements. Therefore, use subcategories are not identical between the temperature and dissolved oxygen standards. Since salmonids are among the most sensitive species in terms of both dissolved oxygen requirements and temperature, the use subcategories for dissolved oxygen can overlap with some of the aquatic life use subcategories for temperature.

Because dissolved oxygen concentration varies through time in the natural environment, the water quality standard includes 7-day and 30-day mean criteria in addition to an instantaneous minimum of dissolved oxygen concentration. It also recognizes that dissolved oxygen concentration may not be optimal at all times or in all places for every individual organism. The water quality standards for dissolved oxygen were developed based on requirements of the most sensitive aquatic species in each community, but allow for an acceptable level of risk to occur for short periods of time to individual organisms as long as the community is protected (DEQ 1995a). Given these circumstances, the policy objective for the dissolved oxygen standard was to minimize risk to aquatic ecosystems from anthropogenic impacts.

The U.S. EPA approved Oregon's dissolved oxygen criteria in 1999 with the understanding that DEQ would identify where the application of the Cold Water Aquatic Life criterion for dissolved oxygen is necessary to fully protect threatened and endangered species. DEQ identifies where the application of the year round Cold Water Aquatic Life criterion is necessary by designating the Cold Water Aquatic Life use subcategory for dissolved oxygen to waters designated as Bull Trout Spawning and Rearing Habitat and Core Cold Water Habitat under the temperature standards. DEQ identifies where sensitive adult spawning and early life stages of egg incubation and larval development of threatened and endangered species are protected through application of the seasonal Salmonid Spawning criteria for dissolved oxygen, regardless of whether a cool-water aquatic life community is also present.

Oregon's cool-water aquatic life criteria for dissolved oxygen are protective of threatened and endangered salmonids for the portions of time they are expected to be present in waters designated for the Cool Water Aquatic Life use subcategory. DEQ's cool water aquatic life criteria for dissolved oxygen meets or exceeds the minimum protection of nationally recommended dissolved oxygen criteria for cold water species and salmonids (EPA 1986a), and is therefore protective of threatened or endangered salmonids in waters DEQ designates for Cool Water Aquatic Life. The nationally recommended criteria indicate a light production impairment at a constant exposure of 6.0mg/L and a moderate production impairment at a constant exposure of 5.0 mg/L for salmonids. DEQ's cool water aquatic life criterion allows 6.5 mg/L as an average and 5.0 mg/L as an absolute minimum. This results in slight risk to salmonid production for only the portion of the day when D.O. concentrations approach the minimums allowed by Oregon's criteria. The National Marine Fisheries Service (NMFS) did not expect significant increases in mortality to Threatened and Endangered populations of rearing juveniles or migrating adult salmonids by application of the cool water aquatic life criteria (NMFS 1999).

Table 3 Dissolved oxygen use categories and criteria metrics. Multiple metrics apply, including a 30-day mean of daily mean concentration (30-D) a 7-day mean of daily mean (7-D), a 7-day mean of the daily minimum (7-Mi) concentration, and absolute minimum (Min) metrics. The 7-day and 30-day metrics are calculated from continuously monitored data sets. Concentrations shown in grey shaded boxes are used as a minimum allowed concentration when evaluating grab or instantaneous samples. All criteria apply to the water column except for the inter-gravel dissolved oxygen limit (IGDO) for salmonid spawning.

Use Subcategory	Metrics and Concentration (mg/L)			
	30-D	7- D	7- Mi	Min
Salmonid Spawning		11.0 ^{1,2}		9.0
				-OR-
				8.0 (IGDO)
Cold Water Aquatic Life	8.0 ³		6.5	6.0
Cool Water Aquatic Life	6.5		5.0	4.0
Warm Water Aquatic Life	5.5			4.0
Estuarine Waters				6.5
Marine	Narrative - No change from background			
1. When IGDO levels are 8.0 mg/L or greater, D.O. levels may be as low as 9.0 mg/L, without triggering a violation. 2. If conditions of barometric pressure, altitude and temperature preclude achievement of 11 mg/L, then a 90 percent saturation limit applies. 3. If conditions of barometric pressure, altitude, and temperature preclude achievement of 8.0 mg/L, then a 90 percent saturation limit applies.				

1.4 Scope of the Aquatic Life Use Updates

The scope of the project addresses amendments to the 'basin specific rules' section of Oregon's Administrative Rule OAR-340-041-0101 to OAR-340-041-0345 and definitions OAR-340-041-0002. The amendments address three main categories:

- 1) updates to the designation of waterbodies for aquatic life use subcategories associated with Oregon's temperature standards in the 'basin specific rules'.

- 2) new designation of waterbodies for aquatic life use subcategories associated with Oregon's dissolved oxygen standards in the 'basin specific rules'.
- 3) miscellaneous updates and corrections in the 'basin specific rules' and definitions.

1.4.1 Temperature Use Subcategory Updates

1.4.1.1 Statewide update of aquatic life fish use subcategory designations (maps and tables) for temperature standards based on updated data from ODFW

A primary objective of this project is to update and correct Oregon's fish use designations -in maps and tables- statewide based primarily on ODFW's most recent information regarding fish habitat distribution and use throughout the state. These uses are currently designated in the 'fish use maps' in OAR 340-041-0101 to 340-041-0340: Figures 130A, 151A, 160A, 170A, 180A, 201A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A and 'spawning use maps' in OAR 340-041-0101 to 340-041-0340: Tables 101B, 121B, and 190B, and Figures 130B, 151B, 160B, 170B, 180A, 201A, 220B, 230B, 260A, 271B, 286B, 300B, 310B, 320B, and 340B.

This update incorporates new information about habitat distribution and life stage use of salmon, trout and related species including anadromous and resident species, as well as the distribution of cool water species to the extent information is available.

The Oregon Department of Fish and Wildlife has recently completed a significant update to the statewide fish habitat distribution database. The database now includes more numerous and better data identifying fish presence, life stage use, and habitat than it did when DEQ mapped the current aquatic life use designations for temperature in 2003. DEQ's current fish use designations may no longer be accurate based on the new and improved data.

1.4.1.2 Review Bull Trout use designations and conform to the final federal critical habitat rule adopted in 2010.

The 2003 "Bull Trout spawning and juvenile rearing" use subcategory designations were based on provisional data in the draft Bull Trout critical habitat reaches published for public comment by the U.S. Fish and Wildlife Service in 2002. At the time, DEQ and USFWS agreed that DEQ would need to update its Bull Trout designations after final adoption of the federal habitat rule. The final critical habitat rule was adopted in 2010.

In a 2015 Biological Opinion, the USFWS also included a reasonable and prudent measure (RPM) requesting that DEQ designate an additional 33.5 miles of critical habitat for Bull Trout that were not included in the 2003 use designations. This review of Bull Trout uses will correct current designations to be consistent with this more recent information from USFWS. DEQ will also consider any updated data from ODFW before removing Bull Trout use from any reach.

DEQ shall add the stream reaches specifically identified in the USFWS's 2015 Biological Opinion as well as any other reaches identified in the published final federal critical habitat rule for Bull Trout spawning and rearing to the 'Bull Trout Spawning & Juvenile Rearing' aquatic life use subcategory as part of the statewide temperature use subcategory update.

1.4.1.3 Designate select Columbia River tributaries identified in EPA's Columbia River Cold Water Refuges Plan for the 'Core-cold Water Habitat' use subcategory.

The U.S. EPA identified existing cold-water refuge for Columbia River populations of threatened and endangered salmon and steelhead on the Oregon side of the Columbia River at Bridal Veil Creek, Wahkeena Creek, Oneonta Creek, Tanner Creek, Eagle Creek, and Herman Creek. The EPA Columbia cold-water refuge project team recommended that DEQ provide additional protection for certain cold-water refuge tributaries along the Columbia River based on water temperatures attaining the core cold-water numeric criterion (16°C) throughout the summer months and the importance of these habitats as thermal refuge for migrating populations of threatened and endangered salmon and steelhead in the Columbia River.

DEQ shall designate these tributaries and their upstream contributing waters not already designated as 'Core Cold Water Habitat.' This action will address Reasonable and Prudent Alternatives from the 2015 National Marine Fisheries Service Biological Opinion on EPA approval of certain temperature standards for Oregon.

1.4.2 New dissolved oxygen use subcategory designations

1.4.2.1 Designate “Cold”/ “Cool”/ “Warm” water aquatic life use subcategories for the dissolved oxygen standard into OAR-340-041-0101 to OAR-340-041-0345, consistent with DEQ’s current implementation procedures.

The means to identify waterbodies where “cool water” or “cold water” dominant aquatic communities are located was not identified in Oregon’s D.O. standard when adopted in 1996. Clarifications and procedures to apply the cold, cool, and warm water criteria for D.O. were subsequently developed and recorded in memoranda from DEQ to EPA, and other DEQ documents, but do not provide the desired regulatory certainty for either DEQ or stakeholders.

In 1998 and 2010, DEQ authored memoranda clarifying where the D.O. criteria apply based on ecoregion maps and previous use designations. However, this information was not adopted into the water quality standards rules. The use subcategories used in the D.O. standard were not assigned to specific waterbodies. This rulemaking will specify where the aquatic life community use designations associated with the D.O. standard are located. The methods rely on the various clarifications, policies and standard practice for implementing the D.O. criteria that DEQ has developed and used since the adoption of the current D.O. standards in 1996, and any additional relevant available information, including updates to the temperature use subcategories.

This update will provide clarity and certainty to other DEQ programs and the public regarding where and when the various D.O. criteria apply. In addition, EPA has requested that DEQ adopt this information into our administrative rules.

1.4.2.2 Identify Resident Trout Spawning Areas

Identify where resident trout spawning use occurs to designate salmonid spawning more completely as an aquatic life use subcategory associated with the dissolved oxygen standards. This will provide clarity and consistency regarding where and when the D.O. spawning criteria apply. Oregon’s administrative rules do not identify where and when resident trout spawning occurs.

When salmon and steelhead spawning areas were designated as use subcategories associated with the temperature standard, ODFW and DEQ lacked similar information about the distribution of resident trout spawning habitat. As an interim assumption, DEQ broadly applied salmonid spawning criteria for dissolved oxygen in nearly all waterbodies to protect resident trout where trout are resident unless the Department had documentation that a stream reach was not trout spawning habitat. This default

application of the spawning criterion is overly broad and applied the more stringent criterion in many locations where trout spawning is not an existing use, and sometimes where it is not attainable.

This may require the development of a procedure for incorporating new information as it becomes available, rather than mapping, because the data are not currently available in a statewide database. Trout spawning use designations will need to be based on the best available information, including the professional judgement of district biologists. However, the procedure should include an efficient method to update information based on older data or professional judgement when new, improved data become available.

Additionally, various stakeholders have requested during the Triennial Review process that DEQ identify and adopt some form of designation of where resident trout spawning areas are located into administrative rules so that it is clear where and when the spawning D.O. criterion applies.

A framework for managing and communicating information for identifying resident trout spawning areas is discussed in Section 3.3.

1.4.3 Miscellaneous rule amendments

1.4.3.1 Revise auxiliary definitions for “Cold/Cool/Warm-water aquatic life”:

The definitions for the terms “Warm-Water Aquatic Life” OAR-340-041-0002 (68), “Cool Water Aquatic Life” OAR-340-041-0002 (12) and “Cold-Water Aquatic Life” OAR-340-041-0002 (9), which simply identify species classified as cold, cool or warm, but are not consistent with the way these terms as used in the D.O. standard OAR-340-041-0016. “Cool” “Cold” and “Warm” aquatic life in 340-041-0002 identify species that are classified as such rather than communities and were adopted when DEQ revised the temperature standard. The definitions in 340-041-0002 are inconsistent with the definitions in Table 21 of the D.O. rule. This creates confusion because the aquatic life use subcategories in the temperature standard are based on species, and do not use the term “aquatic life.” The D.O. standard does use these terms, but defines them differently, as aquatic life communities dominated by cold or cool species, but not necessarily exclusive of any individuals from a different class. The current definitions provide examples of specific species classified as cold, cool or warm for general information, but the terms as defined are not used in any water quality standards.

DEQ shall revise or remove the general “cold-“, “cool-“and “warm-water aquatic life” definitions used in OAR 340-041-0002, so they do not conflict with the specific use of these terms to define aquatic life subcategories in the dissolved oxygen standard in OAR-340-041-0016.

1.4.3.2 Revisions to pH Criteria for Crooked River and Trout Creek

Amendments to OAR 340-041-0135, Basin Specific Criteria (Deschutes): Water Quality Standards for this Basin, to correct the pH standard as it applies to criteria for the Crooked River and Trout Creek sub-basins and to make them consistent with other eastern Oregon basins.

The current criteria for these subbasins are the same as the pH criteria for waters in western Oregon and the Cascade Mountains. However, these two basins are more characteristic of the dryer climate and geology found in eastern Oregon. As a result, the natural pH ranges are higher than those found in western Oregon.

DEQ proposes to amend the criteria so that the acceptable maximum pH is extended from 8.5 to 9.0. An action level may be included. Please the justification supporting the pH criteria change in the

Crooked River and Trout Creek subbasins, please see the issue paper associated with this rulemaking⁴.

1.5 Interagency Coordination

DEQ drew upon existing data sources, information and expertise to complete all aspects of the aquatic life use updates. DEQ relies primarily on ODFW’s Fish Habitat Distribution (FHD) database, with some supplemental data collected by other state and federal agencies, tribal organizations, academic researchers, and other organizations to address this project’s objectives. DEQ formed a technical workgroup comprised of experts from state, federal, and tribal scientific agencies and organizations.

1.5.1.1 Technical workgroup input and review

The interagency technical workgroup assisted DEQ in identifying, analyzing, and interpreting fish habitat distribution data to correct and clarify the designated aquatic life use subcategories in Oregon’s water quality standards. In most cases these organizations are the primary data providers and create or maintain the databases of fish habitat and timing used by DEQ for this rulemaking. DEQ staff coordinated the technical workgroup, which provided expertise not available within the department. Workgroup members served as peer-review experts and sometimes provided supplemental data sources to update the use designations with the latest and best available information. Members also referred DEQ to other experts on specific topics to help answer questions.

This technical workgroup reviewed DEQ’s data sources, methodology and analysis, and provided guidance, additional information, and expert professional judgement on the quality, uncertainty, and action-ability of this report’s conclusions. DEQ consulted with the technical workgroup through a series of virtual meetings between fall 2020 and spring 2022. DEQ also communicated individually with workgroup members as needed on questions related to their specific research or expertise. In addition, the workgroup reviewed documents, decision rules, and this technical support document. After their review, DEQ responded to the panel’s comments and incorporated their input into this document.

Table 4 Technical Workgroup Membership

Member	Affiliation	Title
Jon Bowers	ODFW	ODFW GIS Coordinator; Fish Habitat Distribution Data Steward
Anne Hayden-Lesmeister	ODFW	Instream Flow Specialist
Brian Bangs	U.S. FWS	Biologist, Oregon Fish and Wildlife Office

⁴ DEQ 2022, Proposed pH Criteria Revisions for the Crooked River and Trout Creek Subbasins, Deschutes Basin, Oregon.

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Member	Affiliation	Title
Barbara Adams	U.S. Forest Service	Threatened & Endangered Species Aquatic Biologist
Tom Skiles	CRITFC	Fisheries Biologist
Craig Contor	Confederated Tribes of the Umatilla Indian Reservation	Fisheries Habitat Project Leader
Joe Ebersole	U.S. EPA, Pacific Ecological Systems Division	Research Fisheries Biologist
Rochelle Labiosa	U.S. EPA, Region 10	Physical Scientist
John Palmer	U.S. EPA, Region 10	Senior Policy Advisor

2 Methodology for designating aquatic life use subcategories

2.1 Section Introduction

This section outlines each proposed decision rule method for designating the fish and aquatic life use subcategories for Oregon's temperature and dissolved oxygen standards. Each subsection identifies where data sources and decision methods used to designate the aquatic life uses have changed from the last rulemaking in 2003, and additional methods or data sources considered during DEQ's technical review. A more detailed inventory of data sources, including variables used, literature review, and other supporting analyses are documented in Chapter 3 and Appendix A and O. A reference sheet that shows only the proposed decision rule methods is in appendix C.

2.2 Data and Information Sources

DEQ primarily relies on the Oregon Department of Fish and Wildlife (ODFW) Fish Habitat Distribution (FHD) database⁵ for information on fish distribution and Timing / In-water work area mapping⁶ (aka Timing Tables) for life-stage activity and timing information. The FHD incorporates data from multiple sources including state and federal fisheries agencies, federal land management agencies, tribal entities, watershed councils and other interested public or private organizations. Fish habitat is identified within reaches where habitat for a specific population and life-stage or activity occurs. The timing tables identify when specific life-cycle activities occur throughout the year. The two data sources are complimentary and frequently used together.

DEQ also relies upon the following sources of additional information to identify the proposed designated uses:

1. U.S. Fish and Wildlife Service Final Bull Trout Critical Habitat Designation (September 30, 2010)⁷,
2. U.S. Geological Survey Data Release: Occurrence locations and trait data for freshwater fishes, amphibians, and reptile's native to the state of Oregon (2018)⁸,
3. U.S. Forest Service NorWeST Stream Temperature Regional Database (Isaak et al. 2019),
4. Oregon statewide assessment temperature database (ODEQ-AWQMS database, 2021)⁹.
5. U.S. Environmental Protection Agency, Region 10 Columbia River Cold Water Refuges Plan

⁵ <https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata>

⁶ <https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=datasources>

⁷ <https://www.fws.gov/pacific/bulltrout/FinalCH2010.html>

⁸ Mims, M., & Hockman-Wert, D. P. (2018). *Occurrence locations and trait data for freshwater fishes, amphibians, and reptiles native to the state of Oregon* [Data set]. U.S. Geological Survey. <https://doi.org/10.5066/P9F7FYYZ>

⁹ <https://orwater.deq.state.or.us/DataAnalysisIndex.aspx>

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(EPA-910-R-21-001, January 2021¹⁰)

A full crosswalk of the data sources and variables used in the methodology is available in 0.

The ODFW Fish Habitat Distribution (FHD) database is the product of a multi-year effort by ODFW to develop consistent and comprehensive fish distribution data for native salmonid species. This database was recently updated and includes all basins or sub-basins in Oregon that have anadromous fish, and the distribution of many resident species.

ODFW periodically compiles fish distribution information from a variety of sources including state and federal fishery agencies, federal land management agencies, tribal entities, watershed councils and other interested public or private groups. The ODFW fish distribution data reflect fish use based on the past five life cycles for species, which ranges from the last 15 to 35 years. If no use of habitat has occurred for five generations of the species, ODFW reclassifies the habitat as historical. In addition to spatial fish distribution data that describe where a life stage use is known or likely to occur, the ODFW Timing / In Water work database also includes timing information and mapping indicating when each life stage use is known or likely to occur within specific areas of the habitat distribution.

The habitat distribution data represent the presence of habitat for known fish life stages based on a combination of documented observations of organisms, habitat surveys, and the best professional judgment of local field biologists. This judgement concerns local knowledge of where use is likely to occur based on availability of suitable habitat. For example, waters near areas of documented life stage presence on the same or proximate water bodies that have similar habitat features, such as flow volume, gradient, gravel size, and pool frequency, and no known obstructions or other reasons why the use would not also be present in these waters, are included in the habitat distribution.

The methodology ODFW uses to develop and update its database is scientifically sound and is authoritative for salmonid use designations. DEQ supplemented the ODFW distribution and timing databases with data from other sources for some use subcategories. Where DEQ used additional sources of data, they are discussed in the description of the method for each use subcategory below. The ODFW database, together with the additional sources identified below, are the best information readily available upon which to base the fish use designations. The use of both data and professional judgment is appropriate because of the practical limitations of monitoring every stream reach, and because fish distributions may vary year to year for some waterbodies. Use designations are based on information about habitat availability and suitability collected over multiple years.

Published surveys and studies providing direct observation of fish distribution and habitat in the current FHD range from data collected between 1967-2021 with the greatest number of studies published since 2003. Professional judgement of habitat distribution in the FHD integrates knowledge about fish habitat distribution and historic fish habitat distribution for time periods beyond the range of published studies.

A detailed inventory of the data sources and variables used to designate each aquatic life use subcategory, and comparison to the data sources and variables used in the original 2003 aquatic life

¹⁰ <https://www.epa.gov/columbiariver/columbia-river-cold-water-refuges-plan>

fish use designations, is available in Appendix B: Inventory and crosswalk of data sources and attributes applied to decision rules 2003-2022.

2.3 Beneficial Use Designations for Temperature – Year-Round Uses

Most of Oregon’s basins have two maps, one representing year-round uses and the other seasonal spawning use, to represent different fish use subcategories from the temperature standard. This “Fish Use Designation” map identifies species and life stage activity uses of the habitat that occur throughout the year. The uses are based on the criteria necessary to protect the most sensitive species or life stage that uses the habitat during the warmest consecutive seven-day period occurring during the year (Table 2). Due to the natural variability in stream temperature throughout the year, daily temperatures are expected to be much cooler than these criteria outside the warmest weeks of the year (McCullough et al. 2001) (Figure 2).

To protect downstream uses, the criteria that apply to the nearest downstream water are applied to unmapped waters that do not appear on these maps of use designations per Oregon’s Unidentified Tributaries provision in OAR 340-041-0028(5).

2.3.1 Salmon and Trout Rearing and Migration

DEQ designates “Salmon and Trout Rearing and Migration” use for waters where any of the following conditions are met:

1. Salmon or steelhead rearing, migration, or presence occurs in July or August.
2. Rainbow Trout, Coastal Cutthroat Trout, Westslope Cutthroat Trout, or Mountain Whitefish rearing, or presence occurs in July or August.
3. Waters upstream of the waters identified above, except those designated for the Bull Trout Spawning & Juvenile Rearing or Core Cold-Water use subcategories.

This use designation identifies waters that provide suitable rearing habitat for salmon, steelhead, rainbow trout, and cutthroat trout, and upstream adult pre-spawn migration for salmon and steelhead. This use subcategory is designated where more stringent uses for Core Cold Water Habitat and Bull Trout Spawning & Juvenile Rearing are not applicable. This use designation also protects other cold-water biota that co-occur with salmonid fishes.

2.3.1.1 Updates to Data Sources

DEQ is updating habitat distribution data based on the most recent data in ODFW’s FHD for Coho, Chum, Sockeye, spring and fall Chinook salmon; summer and winter steelhead; Rainbow, Redband, and Coastal Cutthroat Trout rearing. DEQ included ‘primarily rearing’ and ‘resident’ uses for these species in the 2022 ODFW-FHD. DEQ is also updating life stage activity timing information for ‘juvenile rearing’ for these species from ODFW’s 2003 life stage activity timing tables to the recently updated 2022 version.

2.3.1.2 Revisions to Decision Rules

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DEQ will expand the species used to designate Salmon and Trout Rearing and Migration to include distribution of Westslope Cutthroat Trout and Mountain Whitefish 'primarily rearing' and 'resident' uses from the 2022 ODFW-FHD.

2.3.1.3 Other Factors considered

On recommendation of the technical workgroup, DEQ reviewed pacific lamprey as a potential indicator species for designating the Salmon and Trout Rearing and Migration aquatic life use subcategories. DEQ did not find that pacific lamprey is a suitable indicator species for designating Salmon and Trout Rearing and Migration. Please see our detailed analysis in Chapter 3.

2.3.2 Core Cold-water habitat

DEQ designates Core Cold-Water Habitat for waters where any of the following conditions are met:

1. Waters where Spring Chinook salmon spawning occurs early; **begins on or before** September 15.
2. Waters where winter or summer steelhead spawning occurs late; **ends on or after** June 1.
3. Waters having sub-adult and adult Bull Trout presence during July or August but are not also Bull Trout spawning and rearing streams.
4. Waters upstream of the areas identified in 1-3 above that also support salmon & steelhead rearing or provide cold water to these areas, unless those can be designated for the Bull Trout Spawning & Juvenile Rearing use subcategory.
5. Waters where water temperature data meeting DEQ's data quality requirements indicate that the warmest 7-day average maximum stream temperature is at or below 16.0°C.

This use designation identifies and ensures the protection of colder water habitats to provide thermal habitat diversity and refugia for salmon and steelhead juvenile rearing, adult salmon and steelhead pre-spawn holding, Bull Trout sub-adult and adult foraging, and to protect species that thrive in especially cold water, including certain amphibians and other cold-water biota.

Late steelhead spawning is a new indicator not used in 2003. In addition, DEQ has more continuously monitored temperature data for identifying streams where temperatures stay below 16°C all summer. DEQ used temperature collected by other entities to identify cold streams, but it must meet DEQ quality assurance requirements. DEQ uses temperature data only where multiple years of data were available to account for interannual variability and ensure waterbodies can reliably meet the 16°C 7-day average of daily maximum threshold all year. Temperature data is only used to identify additional waters for designation as Core Cold Water Habitat. It is not used as a basis to re-designate waters currently classified as Core Cold Water Habitat.

The designation of Core Cold Water Habitat using the indicators above will provide beyond optimal protection for salmonid rearing and other cold-water species habitat that is known or likely to occur at this time.

2.3.2.1 Updates to Data Sources

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DEQ is updating habitat distribution data for salmon, steelhead, and Bull Trout with data from the 2022 ODFW-FHD. Additional Bull Trout habitat distribution from the USFWS for adult 'foraging, migration, and overwintering' (FMO) from the draft Bull Trout Critical Habitat Rule (67 FR 71236, November 29, 2002) is being replaced with the 'foraging, migration, and overwintering' (FMO) habitat from the Final Bull Trout Critical Habitat Rule (75 FR 63898, October 18, 2010). DEQ is also replacing life stage activity timing information provided by ODFW in 2003 with that from the updated ODFW 2022 life stage activity timing tables.

DEQ's water quality database (AWQMS) provides temperature data collected by DEQ and 3rd party data submitted for the Integrated Report from other federal and state agencies, tribes, academic institutions, or other stakeholders. DEQ will use temperature data evaluated for the 2020 and 2022 Integrated Reports, which includes data from 2008-2020. Additional temperature observations were acquired from the USFS-NorWeST stream temperature weekly summaries database for the western U.S. collected from 1993-2014.

2.3.2.2 Revisions to Decision Rules

Late Steelhead Spawning

DEQ is proposing to add late steelhead spawning as an additional biological indicator for identifying Core Cold Water Habitat. The new indicator functions like the indicator for early Spring Chinook spawning in that it is likely to identify waters that remain cold throughout the summer. Late onset of steelhead spawning indicates waters that are especially cold and do not warm sufficiently to initiate spawning by steelhead populations until later in the season. Late steelhead spawning would be considered waters where ODFW's timing for peak periods of adult spawning use occurs later than June 1.

EcoTrust Anchor Habitat

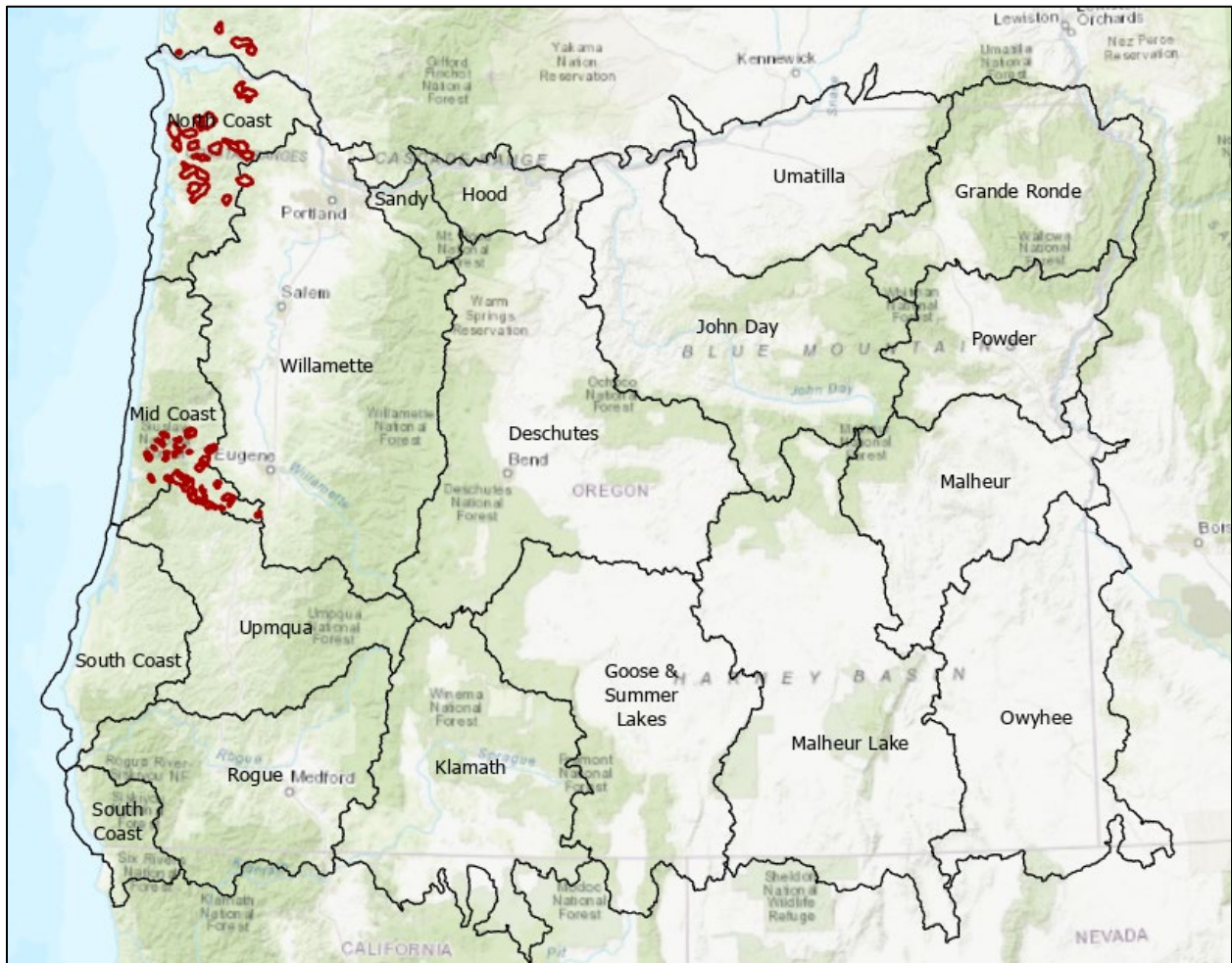
DEQ also re-evaluated the use of EcoTrust "anchor habitat" to designate the Core Cold Water Habitat use subcategory. In 2003, DEQ used habitat identified by EcoTrust and the Wild Salmon Center: "A salmon conservation strategy for the Tillamook and Clatsop State Forest"(Ecotrust 2000), referred to as the "Anchor Habitat Study", to assign the Core Cold Water Habitat use subcategory to waters in the North Coast and Mid Coast Basins. During the initial designation of aquatic life use subcategories in 2003, there was little data available on salmonid uses in these basins. As a result, DEQ classified the 32 catchments identified as anchor habitat by the study on state forest land in these basins (Figure 3).

The Anchor Habitat Study identified waters as core juvenile rearing habitat for Coho Salmon, Steelhead and Chinook Salmon with a focus on the Tillamook and Clatsop State Forests. EcoTrust also provided DEQ with a dataset of similar habitat in the Siuslaw State Forest. The purpose of the EcoTrust study was to identify critical areas for production of salmon in the State Forests. The habitat identified in the EcoTrust study is based on high productivity that support salmonid rearing. These characteristics are not consistent with DEQ's decision rules for core cold water use that use early Spring Chinook spawning or summertime Bull Trout habitat use as biological indicators of especially cold habitats. Neither thermal condition nor thermal potential of these waters was part of EcoTrust's habitat evaluation. Therefore, DEQ no longer considers these anchor habitats to be consistent with identification of Core Cold Water Habitat.

Since 2003, ODFW has collected more information about salmonid life stages in the North Coast and Siuslaw River basin, and DEQ has acquired temperature monitoring data for many streams in the

region. Therefore, DEQ proposed to evaluate whether these watersheds based on the core cold water designation methodology, and not use the Anchor habitat study for this purpose. In waters classified based on the EcoTrust anchor habitat study, but where neither ODFW's database demonstrates that early Chinook or late steelhead spawning occurs, or the 16°C criterion is attainable, DEQ is proposing to revise the designation for Core Cold Water use to Salmon and Steelhead Rearing and Migration use.

Figure 3 Location of EcoTrust salmon "anchor habitat" (Ecotrust 2000).



2.3.2.3 Other Factors Considered

In response to concerns that DEQ's aquatic life use designations are too narrowly focused on salmonids, DEQ reviewed information about indicator species that could serve as additional indicators of cold-water habitats, because the thermal requirements of the species are consistent with the core-cold water designation (maximum temperatures of 16°C or less). Based on these concerns and the advice of the technical workgroup, DEQ considered several native amphibians, pacific lamprey, and native freshwater mussels, to see if they would serve as indicator species for the 'core cold-water habitat' use designation.

Upon review, DEQ did not identify any candidates among these species as suitable indicators for designating the cold-water aquatic life use subcategory, either because their thermal needs do not require temperatures below 16°, because they are not stream-obligate, or because they tend to occupy colder microhabitats and are not a good indicator of the thermal conditions of the whole stream. Please see Appendix A for references and detailed analysis of these indicator species.

2.3.3 Bull Trout Spawning and Juvenile Rearing

DEQ designates Bull Trout rearing and spawning use for waters where any of the following conditions are met:

1. Waters where ODFW indicates Bull Trout primarily spawning and early life stage rearing habitat occurs.
2. Waters identified as potential Bull Trout spawning and juvenile rearing habitat that is necessary for long-term health and viability of Bull Trout populations consistent with recovery plans and restoration goals.
3. Waters identified by the USFWS 2010 final critical habitat rule¹¹ as Bull Trout spawning and rearing habitat, including 33 miles of habitat USFWS asked DEQ to add in their 2015 Biological Opinion on Oregon's temperature standards¹²; and
4. Waters upstream of the reaches identified above, which support Bull Trout by providing cold water to the habitats where Bull Trout Spawning & Juvenile Rearing use occurs.

In 2003, Bull Trout juvenile rearing and spawning use was designated based on DEQ's Bull Trout Habitat Designation Report: Technical Work Group Recommendations (2003) and USFWS' proposed critical habitat for Bull Trout juvenile rearing and spawning. DEQ included areas identified as existing and as potential Bull Trout rearing and spawning habitat (identified in the above reports) because Bull Trout habitat in the State has been greatly reduced and fragmented, and because Bull Trout are listed under the federal Endangered Species Act. To protect Bull Trout populations in Oregon and allow for their recovery, additional habitat must be protected beyond that currently occupied.

The purpose of identifying potential habitat in the 2003 report was to protect additional habitat to allow local populations to grow to the point that they (1) are reconnected with other local populations and with foraging habitats, (2) are large enough to withstand losses due to natural stresses and events (e.g., drought); and (3) have the genetic diversity to support healthy reproduction.

DEQ proposes to align the Bull Trout designations with the most recent critical habitat designations and fish distribution datasets from USFWS and ODFW, which were updated since 2003. The potential habitat necessary for long-term health and viability of Bull Trout populations identified in 2003 will be retained unless ODFW and Bull Trout experts provide updated information and revise the potential habitat needed to be consistent with current recovery plans and restoration goals.

¹¹. <https://www.fws.gov/pacific/bulltrout/crithab/FinalCH2010.html>

¹². USFWS 2015m USFWS Biological Opinion, Concurrence and Conference Concurrence on USEPA Approval of 11 Oregon Water Quality Standards for Temperature and Intergravel Dissolved Oxygen. 01EOW00-2014-F-0087.

2.3.3.1 Updates to Data Sources

The current designation is the spawning and sub-adult rearing distributions for Bull Trout from the *Bull Trout Habitat Designation Report: Technical Work Group Recommendations (2002)*. DEQ is using updated habitat distribution data from the ODFW FHD (2022) for Bull Trout identifying ‘primarily spawning with some rearing’ Bull Trout habitat distribution.

In addition, to review the “potential Bull Trout spawning and juvenile rearing habitat that is necessary for long-term health and viability of Bull Trout populations consistent with recovery plans and restoration goals,” DEQ is consulting with ODFW and the USFWS, which coordinate a statewide working group for experts in Bull Trout conservation. Pending the input of this group, the potential habitat reaches from the DEQ 2002 (BTHD3) Technical Work Group Recommendations continue to be included. This potential habitat coincides with some Bull Trout ‘Historical’ and ‘Resident’ Bull Trout habitats from the ODFW-FHD (2022). DEQ may propose adjustments if recommended by the statewide working group.

DEQ is also replacing the distribution of ‘Spawning and rearing’ (SR) habitat from the USFWS draft Bull Trout Critical Habitat Rule (67 FR 71236, November 29, 2002) with the ‘Spawning and rearing’ (SR) habitat from the USFWS Final Bull Trout Critical Habitat Designation (75 FR 63898, October 18, 2010). DEQ is also including some specific additions of waterbodies or portions of waterbodies specified by the USFWS Biological Opinion on Oregon's Temperature and Dissolved Oxygen Standards (USFWS 2015) for designation in the Bull Trout Spawning and Juvenile Rearing subcategory.

2.3.3.2 Revisions to Decision Rules

DEQ is adding 33 stream miles of Bull Trout spawning and rearing habitat specifically identified as a reasonable and prudent alternative (RPA) by the USFWS in their 2015 Biological Opinion/Letter of Concurrence/Conference Proposed Approval of Revised Oregon Water Quality Standards for Temperature and Intergravel Dissolved Oxygen.

2.3.3.3 Other Factors Considered

No additional factors were considered.

2.3.4 Redband and Lahontan Cutthroat Trout

DEQ designates Redband and Lahontan Cutthroat Trout use in waters:

1. for Redband trout (*Oncorhynchus mykiss gairdneri*) where:
 - a. resident *O. mykiss* occur within part, or all the following basins and steelhead are not present due to a natural or permanent passage barrier.
 - Goose and Summer Lakes Basin
 - Malheur Lake Basin
 - Powder Basin
 - Burnt Basin
 - Malheur River Basin

- Owyhee Basin
- Klamath Basin
- Umatilla Basin
- Walla Walla Basin

2. for Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*) where:

a. Lahontan Cutthroat Trout habitat occurs.

Redband Trout are a resident sub-species of Rainbow Trout found in arid and semi-arid interior portions of Oregon east of the Cascade Mountains. They have sufficient physiological differences from Coastal Rainbow Trout that they are a distinct subspecies of *Oncorhynchus mykiss*. Lahontan Cutthroat Trout are resident trout located in isolated reaches in the interior Great Basin area of southeastern Oregon. Only a small portion of their range is within Oregon.

Redband and Lahontan Cutthroat Trout are the most sensitive use in basins and sub-basins where anadromous steelhead, which have lower thermal tolerance, are absent. Due to uncertainty about admixture between populations of coastal and interior subspecies of *O. mykiss*, Redband Trout use is designated only for portions of interior basins that do not contain steelhead populations.

2.3.4.1 Updates to Data Sources

DEQ is updating habitat distribution data based on the most recent data in ODFW's FHD, which includes updated Lahontan cutthroat distribution data provided by the USFWS to ODFW. DEQ included Redband trout, or Lahontan Cutthroat Trout for 'Resident- Multiple Uses', 'Foraging', 'Migration and Overwintering', 'Primarily Rearing with some Migration', and 'Primarily Spawning with some rearing' life-stage activities from the ODFW fish habitat database compiled in 2003 to the 2022 ODFW-FHD.

2.3.4.2 Revisions to Decision Rules

No revisions to the decision rules are being considered at this time.

2.3.4.3 Other Factors considered

As an additional source of data, DEQ reviewed a large USGS database of occurrence locations for native freshwater fishes, amphibians, and reptiles (Mims and Hockman-Wert 2018). While the USGS database contains records for Coastal Cutthroat Trout (*Oncorhynchus clarkii*), mainly in the coast range and Columbia basin, it contains no data specific to Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*).

2.3.5 Salmon and steelhead Migration Corridors

DEQ designates the 'Salmon and Steelhead Migration Corridor' use to waters with multiple lines of evidence approach that includes consideration of the following characteristics:

1. Migration corridor reaches previously approved in 2003.
2. Where ODFW's FHD indicates a reach is "Primarily migration" for an anadromous salmon or steelhead species.
3. Where ODFW's life-stage activity timing tables indicate no peak salmonid rearing, adult

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migration, spawning, holding, or egg incubation & emergence use in July-August, inclusive of resident trout species.

4. There is evidence indicating that the reach naturally exceeds 18°C 7-dADM.

The “migration corridor” use is applied to waters that might be seasonally cold but not optimal salmonid rearing or holding habitat during the warm summer months. Anadromous or adfluvial species migrate through or use some of these reaches, primarily during other times of the year. There may be some cold-water fish use during the summer, such as juvenile rearing or out migration, but these are not typically natal streams and do not provide optimal juvenile rearing conditions during the summer. The presence of native cool water species also supports a migration corridor designation. It is important to protect existing habitat heterogeneity and cold-water refuges in these reaches.

In this review, DEQ evaluated methods to consider whether additional reaches might qualify for the migration corridor criterion designation, using the decision rules above. A full evaluation of the multiple lines of evidence including specific data and information considered for designating this use for additional waterbodies is detailed below in Section 3.1.6. DEQ considers the migration corridor use to represent the highest attainable use for reaches approved as Salmon and Steelhead Migration Corridors during the 2003 rulemaking process.

2.3.5.1 Updates to Data Sources

DEQ is updating habitat distribution data based on the most recent data in ODFW’s FHD showing where ‘Primarily migration’ habitat for Coho, Spring / Fall Chinook, Chum, and Sockeye Salmon and Summer / Winter steelhead; or ‘primarily rearing’ habitat for Rainbow Trout, Redband Trout, Coastal Cutthroat, West Slope Cutthroat, and Lahontan Cutthroat Trout, Bull Trout, and Mountain Whitefish occurs.

DEQ is also clarifying the application of multiple lines of evidence to indicate reaches for the Migration Corridor designation. Candidates must naturally exceed 18°C as a 7dAM in the summer and therefore are not optimal juvenile rearing or adult holding habitat in July or August. Additional lines of evidence considered shall specifically include HEATSOURCE model results from OR-DEQ TMDLs, temperature models published by Federal agencies, and other published studies that estimate natural thermal potential or fully restored thermal conditions.

2.3.5.2 Revisions to Decision Rules

DEQ is introducing data on fish habitat identified as “Primarily migration” in the ODFW-FHD (2022) for Coho, spring and fall Chinook, Chum, Sockeye salmon, and summer and winter Steelhead to refine identification of potential migration corridors.

DEQ is also using the timing and location of ‘peak juvenile rearing’ and ‘egg development through fry emergence for Coho Salmon, Spring and Fall Chinook, Chum, Sockeye Salmon, and Summer and Winter Steelhead; Rainbow Trout, Redband Trout, Coastal Cutthroat, West Slope Cutthroat, and Lahontan Cutthroat Trout, Bull Trout, and Mountain Whitefish, from the 2022 ODFW life stage activity timing tables to identify where reaches are not optimal juvenile rearing or adult holding habitat in July or August.

2.3.5.3 Other Factors considered

No additional factors were considered at this time.

2.3.6 Cool Water Species

DEQ designates the cool water species use for waters:

1. not identified as primary migration or rearing habitat for any resident or anadromous salmonid fish in July or August.

UNLESS

2. ODFW identifies a reach as having salmon or steelhead “primary migration” use. Then the waterbody is designated as Salmon and Steelhead Migration Corridors.

The Cool Water Species use subcategory, as used in the temperature standard, includes aquatic organisms that either have a wider temperature tolerance range than cold-water organisms or are physiologically restricted to cool waters, including but not limited to, native sturgeon, Pacific lamprey, suckers, chub, sculpins and certain other species of cyprinids (minnows). DEQ uses the absence of cold water species, such as salmonids, during July or August to indicate cool waters reaches. In addition, DEQ may also use the presence of other cool water dependent fish, amphibians, or invertebrate species to support the designation for cool water species use.

2.3.6.1 Updates to Data Sources

DEQ is updating habitat distribution data based on the most recent data in ODFW’s FHD showing sub-basins where no life-stage habitat use is indicated for salmonids, including steelhead, trout, and char, in the 2022 ODFW-FHD.

DEQ is also replacing information for reaches where no salmonid life stage activities, including salmon, steelhead, char, or resident trout, occur in July or August from ODFW’s 2003 life stage activity timing tables to ODFW’s updated 2022 timing information.

2.3.6.2 Revisions to Decision Rules

No changes to the decision rules at this time.

2.3.6.3 Other Factors considered

DEQ evaluated the suitability of using Foothills Yellow-Legged Frog (YLF) as an additional biological indicator supporting designation of the cool water species or salmon and steelhead migration corridor use rather than Salmon and Trout Rearing & Migration use. YLF require a warmer thermal range for reproduction than salmonids. Therefore, they are not expected to be the most sensitive use where they co-occur with salmonids. However, DEQ may point to YLF occurrence data to further support designations of the migration corridor or cool water uses based on salmonid absence in the summer.

2.3.7 Borax Lake Chub

DEQ designates the Borax Lake Chub use subcategory for:

1. State waters in Borax Lake, in the Alvord Lake sub-basin of the Malheur Lake Basin supporting the Borax Lake chub.

The Borax Lake Chub use subcategory, as used in the temperature standard, protects the only native warm-water species of Oregon from excessively low water temperatures that are detrimental to this species.

No changes to the current data or decision rules for this aquatic life use subcategory are proposed at this time.

2.4 Beneficial Use Designations for Temperature – Seasonal Use

2.4.1 Salmon & steelhead Spawning

DEQ designates seasonal use for **Salmon and Steelhead Spawning** for the following locations and dates:

1. In reaches identified by ODFW as “Primarily Spawning” habitat for populations of Coho, Spring Chinook, Fall Chinook, Chum, and Sockeye salmon, and summer or winter Steelhead trout.
2. Spawning through emergence use shall be applied **starting** on the following dates:
 - a. in reaches with fall spawning populations (Chinook, Coho, sockeye, or chum salmon), on the date specified by ODFW if it begins with a period of peak use, and 2 weeks after the date specified by ODFW if it begins with a period of lesser use. On no occasion shall spawning through emergence use for salmon be applied starting later than November 1.
 - b. in reaches with spring spawning populations (summer or winter steelhead), on January 1st if fall spawning populations are not also present.
 - c. in reaches designated as ‘Salmon & Steelhead Migration Corridor’ use, for the date of the Upstream Adult Migration life stage habitat use specified in ODFW’s timing tables.
3. Spawning through emergence use shall be applied **ending** on the following dates:
 - a. in reaches where spring spawning populations (summer/ winter steelhead) occur on May 15.
 - b. in reaches designated as “Core Cold-water habitat” use where spring spawning populations (summer or winter steelhead) occur, on June 15.
 - c. in reaches designated as ‘Salmon & Trout Migration Corridor’ use, on the date specified by ODFW’s timing tables.

The ODFW life-stage activity-timing database shows salmon or steelhead spawning through emergence for each species and each timing unit, sometimes resulting in more than 30 different spawning date ranges for one administrative basin. Because this approach seemed overly complicated to designate and implement, DEQ continues to apply a simplification procedure developed by the Interagency Team in 2003 to designate spawning use for a more generalized time-period than the

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specific dates used in ODFW's life stage activity timing tables that still protect this use (DEQ 2003, Attachment H).

2.4.1.1 Updates to Data Sources

DEQ is updating habitat distribution for 'primarily spawning' habitat indicated for Coho, spring and fall Chinook, Chum, Sockeye salmon, and summer or winter steelhead trout from the ODFW fish habitat database compiled in 2003 to the 2022 ODFW-FHD.

DEQ is also updating life stage activity timing information for reaches where "adult spawning" and "egg development through fry emergence" life-stage activities from ODFW's life stage activity timing tables originally compiled in 2003 to the recently updated 2022 version.

2.4.1.2 Revisions to Decision Rules

Revised spawning start date cutoff

In 2003, DEQ determined spawning period start dates should start no later than October 15. The October 15 date was based on information about Fall Chinook spawning available at the time. In the absence of specific data about timing for other salmon species, this date was assumed to be broadly applicable to spawn timing for other salmon populations statewide. It was assumed that most salmon populations would begin spawning before this date. There was also an assumption, absent wide availability of temperature data for waterbodies across the state, that most waterbodies in Oregon could attain the spawning criterion by this date (OR-DEQ 2003b).

To leverage increased availability of information on the actual start of spawn timing for salmon populations since 2003, DEQ is proposing to start spawning in reaches where salmon spawning occurs on the actual start or peak spawning use or two weeks after the start of lesser use, whichever is earlier according to ODFW's updated timing table information, but no later than Nov. 1.

Spawning end date cutoff for fall spawning populations

DEQ specified the end of periods when salmon & steelhead spawning criteria would apply to reaches where spring spawning populations (winter /summer steelhead) occurred until May 15, and until June 15 if the reaches were also designated for the Core Cold-Water use subcategory. However, using ODFW's improved habitat distribution data and life-stage timing information, DEQ has identified multiple reaches where spring spawning populations do not co-occur with fall spawning populations. Therefore, the spawning criteria dates extend several months beyond the end of emergence for fall-spawning salmon in those waterbodies.

DEQ is proposing to apply a spawning use end date of April 30 in these reaches to better match the emergence timing of fall spawning populations (salmon) when these are the only species that spawn in the reach. Analysis of statewide timing of egg incubation through fry emergence in ODFW's draft 2022 timing table database showed the majority emergence for fall-spawning salmon populations Chinook, Chum, Coho, and Sockeye Salmon, are concluded by April 30. As the spawning criteria are based on thermal requirements of the more sensitive spawning adults and egg incubation stages, assigning a default spawning end date of April 30 will be sufficient to protect egg incubation through emergence in these species, even if in some reaches a small number of maturing fry are present after that date.

2.4.1.3 Other Factors considered

Currently, salmon spawning use begins on the peak spawning use start date or two weeks after the start of lesser use, whichever is earlier according to ODFW's updated timing table information. To leverage increased availability of information on the actual start of spawn timing for salmon populations since 2003, however, DEQ's current proposal is to change the "no later than" spawning start date from October 15 to November 1.

An alternative proposal under consideration is to dispense with a start-date cutoff and rely on the exact timing from ODFW's timing tables for all populations. Unlike 2003, there is specific timing data for all anadromous salmonid populations in ODFW's timing tables. This alternative would be more accurate, and the assumption that all waters will meet 13°C by October 15 was ultimately incorrect. This method change would add nine spawning date ranges, with start dates of Nov. 15 – Dec. 15 combined with end dates of May 15 or June 15.

2.5 Beneficial Use Designations for Dissolved Oxygen– Year-Round Uses

This section identifies where data sources and decision methods used to designate the aquatic life uses are modified from the established interpretation methods that DEQ has used to implement the dissolved oxygen standard since 1998. The following decision rules are proposed to identify the aquatic life use subcategories for dissolved oxygen that occur year-round, including throughout the summer.

2.5.1 Cold Water Aquatic Life

The most sensitive fish and aquatic life use subcategory for dissolved oxygen is for protection of Oregon's native cold-water communities as described in **OAR-340-041-016 Table 21**. These communities are identified as waters dominated by populations of cold- water fish that may include native salmon, steelhead, mountain whitefish, char (Bull Trout), and native resident trout. The criteria for this use subcategory present no measurable risk to cold-water native fish and invertebrate species.

2.5.1.1 Decision Rules

DEQ designates the **Cold Water Aquatic Life** use for waters where any of the following are met:

1. Where the designated use subcategory for temperature is "Core Cold Water Habitat"
2. Where the designated use subcategory for temperature is "Bull Trout Spawning and Juvenile Rearing"
3. Where the designated use subcategory for temperature is:
 - a. Redband or Lahontan Cutthroat Trout; or
 - b. Salmon and Trout Rearing and Migration; and
 - c. a waterbody is not otherwise designated for Cool Water or Warm Water Aquatic Life based on site-specific information

DEQ designates waters within NHD-PLUS catchments that intersect the following EPA Level III and Level IV Ecoregions as "Cold water aquatic life":

Table 5 'Cold Water' Community Ecoregions of Oregon

EPA Level III Ecoregion:	EPA Level IV Ecoregions:
Coast Range	All
Cascades	All
Klamath Mountains	All
Willamette Valley	Willamette Valley Foothills
Eastern Cascades Slope and Foothills	Ponderosa Pine/Bitterbrush Woodland
	Pumice Plateau Basins
	Fremont Pine/Fir Forest
	Southern Cascade Slope
	Grand Fir Mixed Forest
	Pumice Plateau
Blue Mountains	John Day/Clarno Highlands
	Maritime-Influenced Zone
	Melange
	Wallowas/Seven Devil's Mountains
	Canyons and Dissected Highlands
	Continental Zone Highlands
	Mesic Forest Zone
	Subalpine-Alpine Zone
Cold Basins	

All streams designated for the 'Core Cold Water' and "Bull Trout Spawning & Juvenile Rearing" use subcategories for temperature will be designated for Cold Water Aquatic Life for dissolved oxygen, regardless of ecoregion. DEQ will use the updated use designations for these temperature subcategories as the basis for the cold water aquatic life designation for dissolved oxygen.

Since 1998, DEQ has differentiated waters in the cool- and cold-water aquatic life use subcategories for purposes of implementation using EPA Level III and Level IV Ecoregions. Ecoregions are delineated based on multiple factors related to geology, landforms, soils, vegetation, climate, land use, wildlife, and hydrology (Omernik 1987, EPA 2007). The ecoregion boundaries are not hydrologically based and do not generally align well with NHD watershed and catchment boundaries. Because the ecoregion boundaries are not hydrologically based, their geometry creates undesirable edge effects when these divide streams oriented longitudinally to the ecoregion boundaries. DEQ proposes to realign boundaries used to classify cold- and cool-water aquatic life with the boundaries of NHD-PLUS catchments that intersect these Ecoregions to addresses those edge effects.

The use of ecoregion boundaries to designate waterbodies as 'Cold' and 'Cool' is a backstop to be used when site-specific data about the community composition is not available. Within the 'Cold' ecoregions, there can be waterbodies that are characterized by cool water aquatic life communities that fit the designation for Cool Water Aquatic Life, For example, low elevation and gradient valley-bottom mainstems or tributaries. Within the 'Cool' ecoregions there can also be waterbodies that support cold water communities. For example, high elevation or colder mainstems that support cold

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water communities- namely those designated under the temperature standards for Core Cold Water Habitat or Bull Trout Spawning and Juvenile Rearing.

2.5.1.2 Updates to Data Sources

DEQ is updating habitat distribution data for the "Core Cold Water" and "Bull Trout Spawning & Juvenile Rearing" use subcategories for temperature based on the most recent data in ODFW's FHD for salmon, steelhead, and Bull Trout and additional Bull Trout habitat distribution from the USFWS Final Critical Habitat Rule (75 FR 63898, October 18, 2010) **in addition to** the most recent life stage activity timing information provided by ODFW.

In addition, DEQ is updating habitat distribution data for potential Bull Trout spawning and juvenile rearing habitat that is necessary for long-term health and viability of Bull Trout populations consistent with recovery plans and restoration goals for the "Bull Trout Spawning & Juvenile Rearing" use subcategory identified through consultation with ODFW and the USFWS.

2.5.1.3 Revisions to Implementation Methods

There are two relatively minor revisions to the methods for identifying waters as "Cold Water Aquatic Life." These are: 1) smoothing the ecoregion boundaries using NHD catchments, and 2) using FHD habitat distribution for cool water species to indicate where "Cool Water Aquatic Life" is the appropriate use within an ecoregion identified as cold water. Use of additional FHD distribution of non-salmonid cool water species to designate waters for the 'Cool Water Aquatic Life' use subcategory are detailed in Section 2.5.2.2, below.

2.5.1.4 Other Factors Considered

DEQ considered the possibility of delineating 'Cold' waterbodies versus "Cool" waterbodies based on distribution of cold-water aquatic invertebrate communities. DEQ has developed a large database of aquatic invertebrate taxa distribution and abundance to address assessment of waters for impairments of biocriteria. There is potential to refine the distribution of cold-water communities from this information by adopting methods similar to (Richards et al. 2018), (Huff et al. 2006), and (Hubler et al. 2016). However, at this time the methods for establishing thresholds for taxa type and abundance that would indicate a 'Cold' aquatic community are still in development and have not been peer reviewed. Therefore, development of a list of taxa and community composition for reliable identification of 'Cold' vs "Cool" aquatic invertebrate communities is not yet advisable but may be considered for future use updates.

2.5.2 Cool Water Aquatic Life

The cool water aquatic life use subcategory recognizes that there are waters in Oregon dominated by cool water communities in the summer months even though they are also used by some cold-water species at least part of the year as described in **OAR-340-041-016 Table 21**. The cool-water aquatic life community is identified as those waters supporting mixed populations of native cool-water species, such as sculpin, sucker, smelt, chub, and minnows (cyprinids). Salmon, trout, and other cold-water biota may be present during part or all the year but do not form a dominant component of the community structure. The criteria that protect this use present no risk to non-salmonid native fish or invertebrate species and slight production impairment to salmonid fish, if they are present (EPA 1986b, DEQ 1995a).

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Decision Rules

DEQ designates **Cool Water Aquatic Life Use** for waters where any of the following conditions are met:

1. the designated use subcategory for temperature is “Cool Water Species” and the waters are **NOT** specifically identified as "Warm Water Aquatic Life" (see Warm Water Aquatic Life below).
2. the designated use subcategory for temperature is “Salmon and Steelhead Migration Corridors”
3. Waterbodies that contain cool water species according to ODFW's fish habitat distribution database (FHD) (see **Table 8** in Appendix A, below).
4. In waters where the designated use subcategory for temperature is:
 - a. 'Redband or Lahontan Cutthroat Trout'; or
 - b. 'Salmon and Trout Rearing and Migration'; and
 - c. a waterbody is not otherwise designated for Cold Water or Warm Water Aquatic Life based on site-specific information.

DEQ designates waters within NHD-PLUS catchments that intersect the following EPA Level III and Level IV Ecoregions as “Cool water aquatic life”:

Table 6 Cool Water Community Ecoregions of Oregon

Level III Ecoregion:	Level IV Ecoregions:
Columbia Plateau	All
Snake River Plain	All
Northern Basin and Range	All
Willamette Valley	Willamette River and Tributaries Gallery Forest
	Prairie Terraces
	Portland/Vancouver Basin
Eastern Cascades Slope and Foothills	Oak/Conifer Foothills
	Klamath/Goose Lake Basins
	Klamath Juniper Woodland

Level III Ecoregion:	Level IV Ecoregions:
Blue Mountains	John Day/Clarno Uplands
	Canyons and Dissected Uplands
	Continental Zone Foothills
	Blue Mountain Basins
	Deschutes River Valley

2.5.2.1 Updates to Data Sources

DEQ is updating habitat distribution data from the ODFW fish habitat database compiled in 2003 to the 2022 ODFW-FHD to determine where the designated use subcategory for temperature is 'Cool Water Species'. The 2022 ODFW-FHD shows sub-basins where there is no salmonid habitat, including steelhead, resident trout, and char. And ODFW's 2022 timing information shows where no salmonid life stage activities occur in July or August. The FHD also includes data on known habitat for species of concern indicating cool water communities of aquatic life.

2.5.2.2 Revisions to Implementation Methods

Therefore, where site-specific information is available, DEQ shall delineate waterbodies for Cold Water Aquatic Life or Cool Water Aquatic Life, even when these waters occur within a contrasting ecoregion area. To differentiate waterbodies with a 'Cool' community that are within a 'Cold' Ecoregion, DEQ considers the distribution of habitat supporting cool-water species from the ODFW FHD. This requires development of a candidate list of cool water indicator species.

According to DEQ's 1996 dissolved oxygen rulemaking issue paper, species that could characterize a cool water community include:

"Waterbodies whose community structure is characterized by native cool-water species believed by the department to have dissolved oxygen requirements similar to the salmonids, including but not limited to cottidae [Sculpin], osmeridae [Smelt], clupeidae [Shad], acipenseridae [sturgeon], sensitive centarchids[bass/sunfish] such as small-mouth bass, and several invertebrates." (DEQ 1995a)

DEQ's 1995 temperature standards issue paper also identified various non-salmonid species in Oregon as members of Cool, Cold, or mixed Cool/Cold aquatic communities (**Table 7**) (DEQ 1995a).

Table 7 List of non-salmonid fish species and their thermal guild classification from the DEQ water quality standards review for temperature (DEQ 1995b).**Table 2-3: Non-Salmonid Fish Species Present in Oregon**

FAMILY, GENUS OR SPECIES	NATIVE OR INTRODUCED	TEMPERATURE CLASSIFICATION
Lamprey	Native	Cold
Sculpins (Cottids)	Native	Cool (2 species)
		Cold (8 species)
Squawfish	Native	Cool/Cold
Cyprinids (Minnows): Dace, Redshide Shiners	Native	Cool/Cold
Chub	Native	Cool
Suckers	Native	Cool
Sandroller	Native	Cool
Sturgeon	Native	Cool
Borax Chub (Near Hot Springs)	Native	Warm
Cyprinids: Goldfish, Carp, Fathead Minnows	Introduced	Warm
Centrarchids: Small-Mouth Bass	Introduced	Cool
Centrarchids: Bluefill, Crappie, Large-Mouth Bass	Introduced	Warm
Catfish	Introduced	Warm
Striped Bass	Introduced	Cool
Walleye	Introduced	Cool

The 2022 update of ODFW's FHD database contains habitat distribution data for many of the native species identified as characterizing waters with a 'Cool' community or mixed 'Cool/Cold' community structure (Table 8, below). DEQ proposes to use this list of species and their habitat distribution from the FHD to differentiate waters where the designated use subcategory for temperature is 'Redband or Lahontan Cutthroat Trout' or Salmon and Trout Rearing and Migration' between the subcategories of 'Cool Water Aquatic Life' and 'Cold Water Aquatic Life' for purposes of designating the dissolved oxygen use subcategories. If site-specific information is not available, the subcategory shall continue to be assigned based on the ecoregion.

Table 8 Species list of non-salmonid cool water community indicator species in the FHD.

Family	Common Name	Genus	Species
Acipenseridae	Green sturgeon	<i>Acipenser</i>	<i>medirostris</i>
Acipenseridae	White sturgeon	<i>Acipenser</i>	<i>transmontanus</i>
Centrarchidae	Smallmouth bass	<i>Micropterus</i>	<i>dolomieu</i>
Clupeidae	American shad	<i>Alosa</i>	<i>Sapidissima spp.</i> <i>Clupeidae</i>
Cottidae	Columbia mottled sculpin	<i>Cottus</i>	<i>hubbsi</i>
Cottidae	Klamath Lake sculpin	<i>Cottus</i>	<i>princeps</i>

Family	Common Name	Genus	Species
Cottidae	Klamath marbled sculpin	<i>Cottus</i>	<i>klamathensis</i>
Cottidae	Malheur mottled sculpin	<i>Cottus</i>	<i>bendirei</i>
Cottidae	Margined sculpin	<i>Cottus</i>	<i>marginatus</i>
Cottidae	Mottled sculpin	<i>Cottus</i>	<i>bairdii</i>
Cottidae	Paiute sculpin	<i>Cottus</i>	<i>beldingii</i>
Cottidae	Pit sculpin	<i>Cottus</i>	<i>pitensis</i>
Cottidae	Prickly sculpin	<i>Cottus</i>	<i>asper</i>
Cottidae	Reticulate sculpin	<i>Cottus</i>	<i>perplexus</i>
Cottidae	Slender sculpin	<i>Cottus</i>	<i>tenuis</i>
Cottidae	Torrent sculpin	<i>Cottus</i>	<i>rhotheus</i>
Cyprinidae	Tui chub	<i>Siphateles</i>	<i>bicolor</i>
Catostomidae	Goose Lake sucker	<i>Catostomus</i>	<i>Occidentalis spp. lacusanserinus</i>
Catostomidae	Klamath largescale sucker	<i>Catostomus</i>	<i>snyderi</i>
Catostomidae	Klamath smallscale sucker	<i>Catostomus</i>	<i>rimiculus</i>
Catostomidae	Largescale sucker	<i>Catostomus</i>	<i>macrocheilus</i>
Catostomidae	Lost River sucker	<i>Deltistes</i>	<i>luxatus</i>
Catostomidae	Modoc sucker	<i>Catostomus</i>	<i>microps</i>
Catostomidae	Mountain sucker	<i>Catostomus</i>	<i>platyrhynchus</i>
Catostomidae	Shortnose sucker	<i>Chasmistes</i>	<i>brevirostris</i>
Catostomidae	Tahoe sucker	<i>Catostomus</i>	<i>tahoensis</i>
Catostomidae	Warner sucker	<i>Catostomus</i>	<i>warnerensis</i>
Osmeridae	Eulachon	<i>Thaleichthys</i>	<i>pacificus</i>
Percopsidae	Sand roller	<i>Percopsis</i>	<i>transmontana</i>
Pogonichthyinae	Speckled Dace	<i>Rhinichthys</i>	<i>osculus</i>
Pogonichthyinae	Longnose Dace	<i>Rhinichthys</i>	<i>cataractae</i>
Pogonichthyinae	Leopard Dace	<i>Rhinichthys</i>	<i>falcatus</i>
Pogonichthyinae	Klamath Speckled Dace	<i>Rhinichthys</i>	<i>osculus spp. klamathensis</i>
Pogonichthyinae	Umpqua Dace	<i>Rhinichthys</i>	<i>evermanni</i>

2.5.2.3 Other Factors Considered

DEQ is proposing to refine the boundaries of the EPA Ecoregions using hydrological catchments from the NHD-PLUS dataset. Availability of the much finer-scaled NHD-PLUS catchment boundaries was a preferred alternative to align the 'Cool' and 'Cold' Ecoregion areas with

hydrologically relevant boundaries. Use of HUC-12 boundaries from the NHD-High Resolution dataset was considered, but these boundaries were too coarse.

2.5.3 Warm Water Aquatic Life

The "Warm-Water Aquatic Life" use subcategory applies to aquatic communities that are adapted to warm-water conditions and do not contain cold-water species as described in OAR-340-041-016 Table 21. The warm water community is characterized by native or introduced warm-water species (see examples in **Table 7**, above). The criteria that protect this use are based on a level that presents no measurable risk, (i.e., production impairment) to warm-water native fish and invertebrate species. These communities occur in waterbodies that would not naturally support cold water species and where salmonids are absent.

DEQ designates the **warm water aquatic life** use subcategory for waters:

1. With a designated use subcategory for temperature of "Borax Lake Chub"
2. The following waters:
 - a. Malheur River – Namorf Creek to Mouth
 - b. Willow Creek – Brogan Creek to Mouth
 - c. Bully Creek - Reservoir to Mouth
 - d. Owyhee River - River Mile 0 to 18
 - e. Malheur Lake Basin - Natural lakes; water associated with Borax Lake and Lower Borax Lake
 - f. Goose and Summer Lakes Basin - Highly alkaline and saline lakes

No revisions to the current implementation procedures for identifying this use subcategory are being considered at this time.

2.5.3.1 Updates to Data Sources

DEQ did not have a standard waterbody polygon layer for lakes and reservoirs in the 2003 rulemaking. A more accurate and complete waterbody polygon layer delineating lakes, reservoirs, and other impoundments is available from the NHD- High Resolution waterbody dataset. This dataset can more accurately identify natural lakes in the Malheur Lake Basin and highly alkaline and saline lakes in the Goose and Summer Lakes Basin for designation of waters for "Warm Water Aquatic Life". Natural lakes will be identified as the NHD waterbodies coded with the feature type (FType) for lake/pond (390). Highly alkaline and saline lakes will be identified as the NHD waterbodies coded with the FType for lakes/ponds and identified by the Oregon Lakes Atlas¹³ as saline or highly alkaline or identified as NHD waterbodies coded with the FType for playa (361).

2.5.3.2 Revisions to Decision Rules

¹³ <https://oregonlakesatlas.org/>

No revisions to the established implementation procedures currently used for identifying this subcategory of dissolved oxygen are being considered at this time.

2.5.3.3 Other Factors considered

No additional factors were considered at this time.

2.5.4 Estuarine Waters

Estuarine waters have a numeric dissolved oxygen criterion, as stated in **OAR-340-041-0016 (5)**. Estuarine waters are defined in **OAR-340-041-0002 (22)** as mixed fresh and oceanic waters in estuaries or bays from the point of oceanic water intrusion inland to a line connecting the outermost points of the headlands or protective jetties.

DEQ uses the estuary classification used by the Oregon Department of Land Conservation and Development (DLCD) Oregon Coastal Management Program¹⁴ to delineate estuarine waters¹⁵. **Estuarine waters** include waters within the Estuarine Coastal, Estuarine Open Water, and Estuarine Open Water Subtidal classes of the Oregon Department of Land Conservation and Development's Oregon Estuary and Shorelands Habitat Atlas.¹⁶ The estuary delineation from the DLCD classification for the purposes of applying Oregon's water quality standards is available in a web-based GIS tool¹⁷.

No revisions to the established implementation procedures currently used for dissolved oxygen are being considered at this time. Use of the CMECS boundaries to identify estuarine waters has been used in implementation of the dissolved oxygen standard since 2017.

2.5.4.1 Updates to Data Sources

No data sources updated at this time. Use of the CMECS boundaries to identify estuarine waters has been used in implementation of the dissolved oxygen standard since 2017.

2.5.4.2 Revisions to Decision Rules

No revisions to the established implementation procedures currently used for dissolved oxygen are being considered at this time.

2.5.4.3 Other Factors considered

No additional factors were considered at this time.

2.5.5 Ocean Waters

"Ocean Waters" or marine waters are defined in **OAR-340-041-002 (34)** as all oceanic, offshore waters outside of estuaries or bays and within the territorial limits (3 nautical miles) of the State of

¹⁴ Oregon Coastal Management Program <https://www.oregon.gov/LCD/OCMP/pages/index.aspx>

¹⁵ DEQ 2017, Water Quality Program Memorandum: Methods for Delineating Estuarine Water Type for Mapping Beneficial Uses and Applying Criteria

¹⁶ <https://www.coastalatlantlas.net/estuarymaps/>

¹⁷ <https://hdcgex2.deq.state.or.us/HVR291/?viewer=wqsa>

Oregon. Ocean waters are determined to begin immediately offshore of designated estuarine waters and open coastline.

Aquatic life is a designated use for ocean waters, and there is a specific narrative criterion for ocean/marine waters in the DO standard.

No revisions to the established water body or aquatic life use definitions or implementation procedures are being proposed.

2.5.5.1 Updates to Data Sources

No data sources updated at this time.

2.5.5.2 Revisions to Decision Rules

No revisions to the established implementation procedures currently used for identifying this subcategory dissolved oxygen are being considered at this time.

2.5.5.3 Other Factors considered

No additional factors were considered at this time.

2.6 Beneficial Use Designations for Dissolved Oxygen–Seasonal Uses

2.6.1 Salmonid Spawning locations

"Salmonid Spawning" is a seasonal use that applies to active spawning habitat of native salmon, steelhead, resident trout and char. The spawning criteria are applicable during the part of the year when spawning and incubation of embryos occurs. The criteria established to protect this use provide a level of low to no risk of impairment to spawning, egg development and incubation for sensitive native fish species, other native fish, and for invertebrates. ODFW identifies 'primarily spawning' habitat on the fish habitat distribution database through a combination of direct observation of spawning behavior and suitable habitat characteristics (substrate, flow, gradient, accessibility). This is the best available data for identifying active spawning habitat and DEQ uses that data to designate waters where it applies the salmonid spawning criteria. However, under OAR-340-041-0016 (1) DEQ spawning criteria apply to waters with active spawning use by salmonid species. This does not include unoccupied historic habitat.

DEQ identifies salmonid spawning by anadromous salmon and steelhead populations and native char in waters where:

1. Salmon & Steelhead Spawning is designated following the procedures for designating use subcategories for temperature. These subcategories will be designated on the following sub-basin maps set out at OAR 340-041-0101 to 340-041-0340: Tables 101B, and 121B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B.

2. Where 'Bull Trout Spawning and Juvenile Rearing' is designated following the procedures for designating use subcategories for temperature.

2.6.1.1 Updates to Data Sources

DEQ is updating habitat distribution for salmonid spawning habitat from the 2003 ODFW-FHD to the 2022 ODFW-FHD. The 2022 FHD includes expanded information about the distribution of 'primarily spawning' habitat for native salmonids, including steelhead, trout, and char. The 2022 FHD also has expanded information about the distribution of habitat where native trout are resident, where multiple life stage uses occur that may include spawning.

The distribution of data on resident trout habitat in ODFW's FHD is much more comprehensive than was available previously. ODFW estimates it has identified as much as 95% of the distribution of resident trout species within Oregon in the current database. In some areas ODFW has also specifically identified where 'Primarily Spawning' habitat occurs. However, most of the habitat is identified for "Resident- Multiple Uses" where multiple life stage activities occur. In most streams, ODFW has not yet specified where resident trout spawning habitat is located.

DEQ is also updating life stage activity timing information for reaches where "adult spawning" and "egg development through fry emergence" life-stage activities from ODFW's life stage activity timing tables from 2003 to the recently updated 2022 version. The latest version now includes specific timing information for each resident trout population in Oregon.

2.6.1.2 Revisions to Implementation Methods

The data on distribution of resident trout habitat in ODFW's 2022 FHD is much more comprehensive than was available previously. ODFW estimates it has identified as much as 95% of the distribution of resident trout species for Oregon waters in the current database. In some areas ODFW has also specifically identified where 'Primarily Spawning' habitat for resident trout occurs. However, most of the habitat is identified as "Resident- Multiple Uses" where multiple life stage activities, such as spawning, rearing, and foraging, could occur. However, ODFW has not determined which specific uses occur at the reach level.

Without specific information about which habitat is suitable for resident trout spawning, DEQ shall presume spawning use in waters identified as 'Resident – Multiple Uses' unless there is additional information indicating that the specific habitat is not suitable for spawning.

DEQ will also work with ODFW to develop a policy where site-specific information can be used to refine whether a specific waterbody is or is not active spawning habitat for resident trout species. A framework for such a policy is outlined in Section 3.3.

2.6.1.3 Other Factors considered

No additional factors were considered at this time.

2.6.2 Salmon and steelhead start dates

Currently, salmon spawning use begins on the peak spawning use start date or two weeks after the start of lesser use, whichever is earlier according to ODFW's updated timing table information. However, DEQ used a "no later than" start date of October 15 to simplify the number of spawning

date ranges shown on the maps, assuming the temperature spawning criterion could be met by that date and therefore it didn't matter if it was not accurate. To leverage increased availability of information on the actual start of spawn timing for salmon populations since 2003, however, DEQ proposes to change the "no later than" spawning start date to November 1.

An alternative proposal under consideration is to dispense with a start-date cutoff and rely on the exact timing from ODFW's timing tables for all populations. Unlike 2003, there is specific timing data for all anadromous salmonid populations in ODFW's timing tables. This alternative would be more accurate, and the assumption that all waters will meet 13°C by October 15 anyway was incorrect. This method change would add nine spawning date ranges, with start dates of Nov. 15 – Dec. 15 combined with end dates of May 15 or June 15.

2.6.2.1 Other Factors considered

No additional factors were considered at this time.

2.6.3 Presumed Resident Trout Spawning Locations

The spawning criteria for dissolved oxygen also apply to "active spawning areas used by resident trout species." Therefore, resident trout spawning is a seasonal use in waterbodies or reaches that are either known or presumed to support resident trout spawning.

DEQ proposes to designate active spawning areas used by resident trout species for waters:

1. Where the ODFW FHD indicates "Primarily spawning" for a resident trout species.

In addition, DEQ proposed to apply spawning criteria for dissolved oxygen where there is not specific information about spawning use by resident trout species, but a conservative assumption is spawning use is presumed to occur. This includes waters:

1. Where the ODFW FHD indicates "Resident- multiple use" or "Unknown" habitat use with the following exceptions.
2. Resident trout spawning is NOT presumed to occur in the above waters where any of the following conditions are met:
 - a. Where 'Cool Water Species' is the designated use subcategory for temperature.
 - b. Within timing units where ODFW's timing tables specifically indicate spawning use by resident trout species does not occur.
 - c. Within estuarine waters (CMECS)
 - d. Within tidally influenced riverine waters (CMECS), and
 - e. Where a site-specific determination of habitat indicates habitat characteristics do not support resident trout spawning (i.e., substrate, velocity, depth, channel size).

Without specific information about which habitat is suitable for resident trout spawning, DEQ shall presume spawning use in waters where native trout species are resident unless there is additional site-specific information that the habitat uses or life history of resident trout species in a waterbody

excludes spawning for purposes of applying criteria under the dissolved oxygen standard. See Section 3.4 for further discussion about DEQ's framework for presumed resident trout spawning uses.

To date, DEQ has made site-specific determinations about the status of resident trout spawning in coordination with ODFW for the Tualatin River basin¹⁸, Fern Ridge Reservoir¹⁹, and the lower Coquille River²⁰.

2.6.4 Resident Trout Spawning Period Start Dates

The dates when "Salmon & Steelhead Spawning" are designated, or as revised in this rule, for the temperature use subcategory also apply for the dissolved oxygen spawning criteria to protect spawning and egg incubation for anadromous salmon and steelhead. Both the temperature and dissolved oxygen criteria for spawning are derived from studies of requirements for salmonid life stages of egg incubation from adult spawning to hatch.

DEQ proposes to use the following procedures to designate when the resident trout spawning use occurs. DEQ will use data from ODFW's life stage timing tables, which include more specific data on spawn timing for resident trout species than was previously available.

DEQ proposes to designate resident trout spawning use starting on the following dates:

1. On the initial data of peak use according to ODFW's timing tables, but no later than January 1.

2.6.4.1 Updates to Data Sources

DEQ is updating life stage activity timing information for reaches where "adult spawning" and "egg development through fry emergence" life-stage activities occur using the recently updated 2022 version of ODFW's life stage activity timing tables. The tables contain much expanded information about timing for resident trout species than was available in 2003.

2.6.4.2 Revisions to Implementation Methods

¹⁸ ODFW Letter to DEQ of April 10, 2006. <https://www.oregon.gov/deq/FilterDocs/ResidentTroutLetter.pdf>
ODFW Letter to DEQ of August 14, 2014, <https://www.oregon.gov/deq/FilterDocs/2014UrbanStreamTrout.pdf>

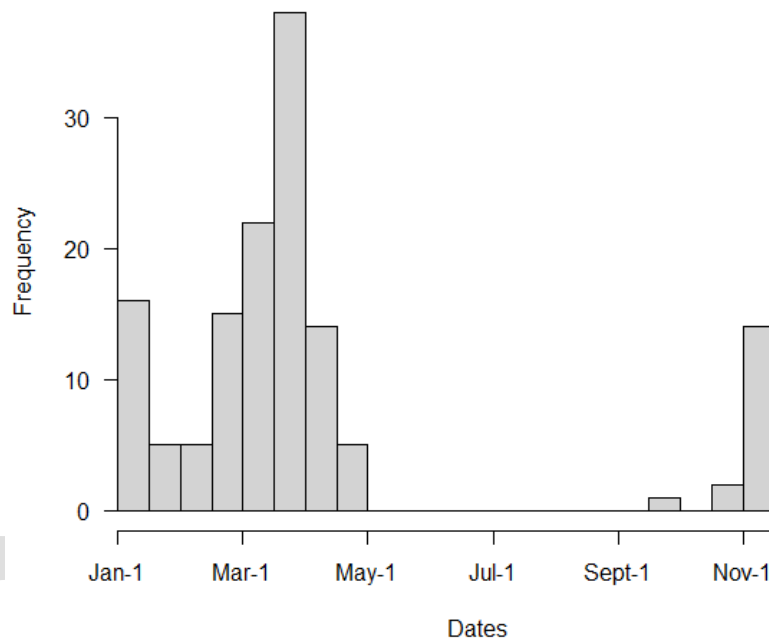
¹⁹ ODFW Letter to DEQ of July 2014. <https://www.oregon.gov/deq/FilterDocs/2014TroutSpawn.pdf>

²⁰ Clarification of Resident Rainbow Trout and Coastal Cutthroat Spawning Use in the Coquille, Nov. 13, 2020, <https://www.oregon.gov/deq/wq/Documents/ir1820coqTroutSpawnResub.pdf>

DEQ has used January 1 as the assumed start date for spawning of resident trout species, which are spring spawning species, since 2004²¹. This generalization assumed that most resident trout populations, which are spring spawning species, will initiate spawning on January 1 or later. It also assumed that waterbodies which support resident trout spawning would be able to attain the dissolved oxygen criterion by this date under natural conditions.

Analysis of ODFW's updated timing tables shows resident trout populations initiate spawning between Nov. 1 (Bi-Week 21) and April 1 (Bi-week 7), with January 1, February 1, and March 15 the most common start dates for resident trout populations across the state.

Figure 4 Temporal distribution of start dates for peak spawning of resident trout (not including Bull Trout).



However, only 22 populations (1.5%) out of a total of 1,433 resident trout populations, identified by species and timing unit statewide, start spawning prior to January 1. Therefore, DEQ proposes to start application of the spawning criteria by the start of peak spawning for these particularly early populations. DEQ will continue the current implementation procedure of applying spawning criteria on January 1 for all other populations. This differs slightly from the established implementation procedures currently used for identifying the start of the resident trout spawning for applying the dissolved oxygen criteria for salmonid spawning.

²¹ DEQ Letter to EPA Region 10 of February 4, 2004. <https://www.oregon.gov/deq/FilterDocs/standardsclar.pdf>

2.6.5 Resident Trout Spawning Period End Dates

No revisions to the established implementation procedures currently used for identifying spawning end dates for dissolved oxygen are being considered at this time. End dates for resident trout, other than Lahontan Cutthroat Trout, will follow those for steelhead of May 15, or June 15 if the temperature use subcategory is Core Cold-Water habitat.

DEQ proposes to apply spawning through emergence use ending on the following dates:

1. On May 15 in waters designated for resident trout spawning.
2. On June 15 in waters where the designated use subcategory for temperature is “Core Cold-water habitat”.

2.6.5.1 Spawning Date Range for “Bull Trout spawning and juvenile rearing” Use Designations

In waters where the designated use subcategory for temperature is 'Bull Trout Spawning & Juvenile Rearing' on the following specific dates in the administrative basins indicated below²²:

1. August 15 - May 15 - Deschutes, Hood, Powder
2. August 15 - May 30 - Klamath, Willamette, Malheur River
3. August 15 - March 31 - Grande Ronde- Wenaha sub-basin
4. August 15 - May 31 - Grande Ronde - Imnaha sub-basin
5. September 15 - April 30 - John Day, Umatilla, Walla Walla
6. September 15 - April 15 - Grande Ronde – Upper Grande Ronde sub-basin
7. September 15 - May 15 - Grande Ronde – Wallowa sub-basin

DEQ is also updating life stage activity timing information for reaches where “adult spawning” and “egg development through fry emergence” life-stage activities to the recently updated 2022 draft version of ODFW’s life stage activity timing tables. The tables contain much expanded information about timing for resident trout species than was available in 2003.

Since 2004, DEQ has used January 1 as the assumed start date for spawning of resident trout species. Like steelhead these are spring spawning species, it also assumed that waterbodies which support resident trout spawning would be able to attain the dissolved oxygen criterion by this date under natural conditions.

Analysis of new updated data for resident trout species in ODFW's timing tables shows resident trout populations initiate spawning between Nov. 1 and March 15. January 1 is the most common start date for resident trout spawning in populations across the state. Only 22 populations of resident trout identified by timing unit statewide (1.5%) start spawning before January 1. Therefore, DEQ proposed to start application of the spawning criteria by the start of peak spawning for these particularly early

²² DEQ Letter to EPA Region 10 of February 4, 2004. <https://www.oregon.gov/deq/FilterDocs/standardsclar.pdf>

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populations and continue to apply the current implementation procedure of January 1 for the rest. This is only slightly different from the current implementation procedures for applying dissolved oxygen spawning.

No revisions to the established implementation procedures currently used for identifying resident trout spawning end dates are being considered at this time. The method for applying spawning criteria is the same as for the 'Salmon & Steelhead Spawning' use subcategory for temperature. End dates for resident trout species are the same that apply to steelhead, which are also spring spawners and a subspecies of *Oncorhynchus mykiss* along with Rainbow and Redband trout.

DRAFT

3 Analyses and Information Supporting Decision Rules Revisions

This section provides additional background, analysis, and discussion of changes to methods proposed in Chapter 2, above. The first section includes detailed supporting analyses, literature review, and information on GIS procedures for the proposed decision rule methods. The second section details alternatives considered but not ultimately proposed as new methods for the decision rules.

3.1 Supporting Analyses for Proposed Decision Rules

3.1.1 Salmon and Trout Rearing and Migration

No additional analyses at this time.

3.1.2 Core Cold-Water Habitat

DEQ has received comments that the aquatic life use designations are too narrowly focused on salmonids. In response, DEQ reviewed information about the potential for additional cold-water indicator species in need of similar thermal protection consistent with the core-cold water designation and associated criteria. New indicator species would act as additional lines of evidence for identifying core cold-water habitats. Based on these comments and with input from members of the technical workgroup, DEQ considered and populations of late spawning steelhead, as additional indicator species for applying the 'core cold-water habitat' use designation. DEQ reviewed information about several native amphibians, pacific lamprey, native freshwater mussels, as potential indicators but did not ultimately include these in the methods. See Section 3.6.1 below.

DEQ also applied two updated temperature databases to identify cold water streams that can attain the core cold-water criterion of 16.0°C in the summer. See analysis and procedures for applying data from the NorWeST temperature observations data set and DEQ-AWQMS assessment database in sub-sections below.

3.1.2.1 Early Chinook/Late Steelhead spawning

In discussion with the Technical Workgroup, representatives of the U.S. EPA suggested that DEQ consider using late steelhead spawning as an additional indicator for Oregon's core cold-water habitat. Washington Department of Ecology uses this life stage activity as one of their indicators for designating their similar "Core Summer Salmonid Habitat" aquatic life use subcategory. In Washington, they refer specifically to early dates for the start of adult spawning activity and do not include egg incubation through fry emergence. The presence of late steelhead spawning indicates that a waterbody remains cold long enough to delay the start of spawning, relative to other steelhead populations, until water temperatures warm sufficiently in the spring.

DEQ's 'Core Cold-Water' use is currently identified partially by early spring Chinook spawning that occurs prior to September 15, as well as Bull Trout adult and sub-adult use in July – August as biological indicators. In addition to the biological indicators, DEQ uses current temperature records (10-20 years) that demonstrate waterbodies can maintain the 16°C 7-DADM criterion throughout the summer to designate the 'Core Cold Water' aquatic life use.

WA Ecology's "Core summer salmonid habitat" designation uses the same spring Chinook spawning date ranges as DEQ, but also considers late steelhead spawning as that ending after June 1 – (U.S.EPA 2007) as a biological indicator.

DEQ shall evaluate the effect of modifying the decision rules for designation of 'core cold-water habitat' with the inclusion of:

1. Waters where ODFW identifies Chinook spawning use starting **on or before** September 15.
2. Waters where ODFW identifies peak steelhead spawning use ending **after** June 1.

3.1.3 Application of temperature data to core cold-water designations

This section explains the data and analysis used to generate geographic points for sampling locations that indicate temperature monitoring stations where maximum summer temperatures reliably stay below 16.0°C as a 7-day average maximum temperature for purposes of designating rivers and tributaries to the Core Cold-Water aquatic life use designation for purposes of applying Oregon’s water temperature standards and criteria. Temperature data is only used in this context to identify additional waters for designation as Core Cold Water Habitat. It is not used as a basis to reclassify waters currently designated as Core Cold Water Habitat to a less stringent use.

3.1.3.1 NorWeST Temperature Observations Database

Data was retrieved from the USDA-Forest Service NorWeST database weekly summaries of temperature data for observation sites. These data span years 1993-2011 and include data from Federal and State Agencies, Oregon DEQ, tribes, and third parties.

<https://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST/StreamTemperatureDataSummaries.shtml>

The NorWeST weekly temperature data summaries provide weekly maximum temperatures (non-rolling 7 day maximums) see week assignments at:

http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST/downloads/ObservedStreamTemperatureMaps/NorWeST_ObservedStreamTemp_WeekAssignment.zip

The following data conditioning procedures were applied to identify sites within this database that reliably indicate rivers and tributaries water temperature conditions that are likely to attain and remain below 16.0°C throughout the summer. Because the NorWeST database is extensive, but many stations were only monitored for one year, stations with at least 3 years of data were included in the analysis to provide a means to account for inter-annual variability and the possible effect of a particularly cold summer on meeting the 16°C threshold. If the maximum weekly maximum temperature at a site was below 16°C with at least 3 years represented, we could be reasonably assured that sites could maintain 16°C regularly.

1. Select observations which were collected during the summer critical period (July 1 – September 30.) Monitoring data should be collected during the critical warm period (July 1 to September 30) to adequately capture peak temperatures, according to DEQ’s most current assessment methodology: <https://www.oregon.gov/deq/wq/Documents/ir2022AssessMethod2022DF.pdf>
2. Group observations by site with at least 10 weeks of observations. Nearly all stations had at least 10 weeks of observations in years sampled.
3. Filter for stations with a maximum weekly maximum temperature that did not exceed 16°C.
4. The resulting GIS Shapefile is used to indicate the downstream extent of waters that meet the temperature threshold for classification as Core Cold-Water Habitat. Where these stations are representative of upstream waters, all waters upstream are included in the designation, unless a more stringent use applies. Sites on mainstem rivers where the contributing area is exceedingly large and the observation point could not be reasonably considered representative of upstream waters are designated for the main channel only to the confluence of the next major tributary or waterbody, such as a lake or reservoir.

NorWeST weekly observation database	n=
Observations of weekly maximum temperature	659,601
Observations in critical period	428,225
NorWeST monitoring sites in Oregon	1,497
Sites with at least 10 observations	1,464
Sites achieving 16.0°C or less 1993-2011	643

3.1.3.2 DEQ-AWQMS Assessment Temperature database

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Data was retrieved from the DEQ 2018/2020 assessment database for the Integrated Report. This database is comprised of all continuous temperature data meeting quality assurance criteria stored in the DEQ AWQMS database, and provided by third parties, including state, federal, and tribal agencies for the 2018/2020 Integrated Report Call for Data covering years 2008-2020 (Figure 5). Temperature data is provided as the maximum 7-dADM temperature for a monitoring site.

The 7-dADM metrics are calculated from continuous data and must be collected to reliably capture the daily maximum temperature for at least seven consecutive days. At a minimum, monitoring data is collected during the critical warm period (July 1 to September 30) that adequately captures peak temperatures. The length of deployment varies by data provider and observation, and this metadata was not readily available.

The assessment database provides 7-dADM rolling averages of daily maximum temperatures directly comparable to Oregon's temperature criteria. The following data conditioning procedures were applied to identify stations within this database that reliably indicate rivers and tributaries water temperature conditions that are likely to attain and remain below 16.0C throughout the summer.

Extract 7-dADM metrics and monitoring location information from the assessment database and select observations which were collected during the summer critical period (July 1 – September 30). Monitoring data should be collected during the critical warm period (July 1 to September 30) to adequately capture peak temperatures, according to DEQ's most current assessment methodology <https://www.oregon.gov/deq/wq/Documents/ir2022AssessMethod2022DF.pdf>

Group observations by monitoring location with at least 10 observations of the rolling 7-day average. Nearly all stations in the critical period had at least 10 observations.

1. Identify the maximum 7-dADM metric for each monitoring location.
2. Filter for monitoring locations with a maximum 7-dADM temperature that did not exceed 16°C.

DEQ-AWQMS database	n=
Total 7-dADM obs.	952,952
Total obs. in critical period	474,630
Total number of stations in Oregon	1,767
Stations with at least 10 obs.	1,749
Stations with obs. in critical period	1,738
Stations reliably achieving 16.0°C or less 2008-2018	324

The resulting GIS Shapefile is used to indicate the downstream extent of waters that meet the temperature threshold for classification as Core Cold-Water Habitat (Figure 6). Waters upstream of these points are included in the designation, unless a more stringent use applies.

The intent of the core cold-water designation is to protect large areas of habitat used by cold water fish, and not manage individual patches of cold water that may occur throughout the state's waters. DEQ applied a minimum stream order for adding reaches to this designation based on temperature.

It was not the intent of the core cold-water use to be applied to identify individual or isolated reaches of cold water where the fish populations and life stage activity supported do not indicate core rearing habitat for native salmon and steelhead. It does intend to protect extensive areas of cold-water habitat that currently meet the temperature criterion and thus could support this aquatic life use. To ensure a significant drainage area served by perennial flowing streams are classified based on temperature, only temperature sites on reaches of Strahler 3rd order and above were included.

The 2003 Temperature Rule Technical Advisory Committee found that for downstream waters to achieve the 18°C "Salmon and Trout Rearing & Migration" criterion in the summer, colder water temperatures upstream would necessarily need to exist. They did not suggest, however, that these upstream waters also needed to be classified as core cold water to achieve the desired protection. The

protecting cold water narrative (OAR-340-041-0028(11)) also does not allow significant warming of these upstream waters if they are currently colder than the criterion (OR-DEQ 2003b).

Figure 5 Location of temperature monitoring sites evaluated for attainment of the core cold water habitat criteria.

	Originator	Data Set
	U.S. Forest Service	NorWeST Observed Temperature Regional Database
	Oregon DEQ	2020 & 2022 Integrated Report

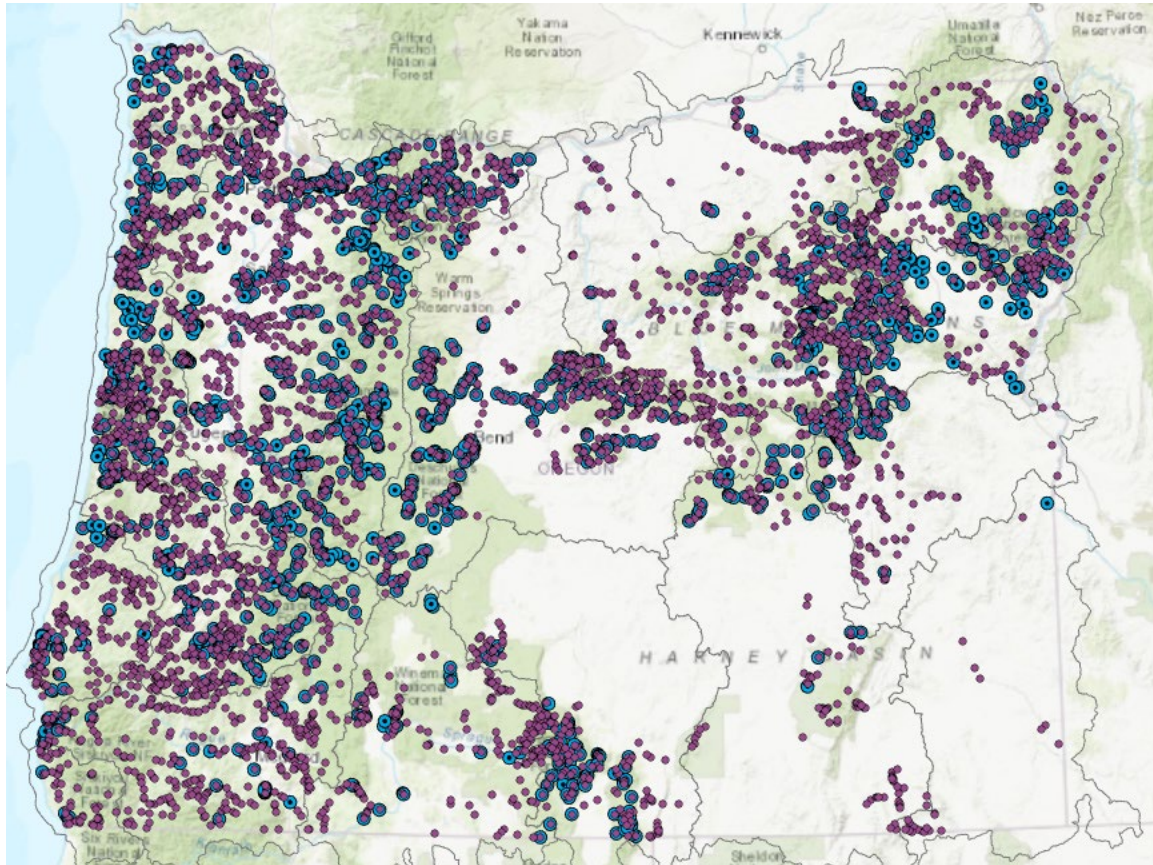


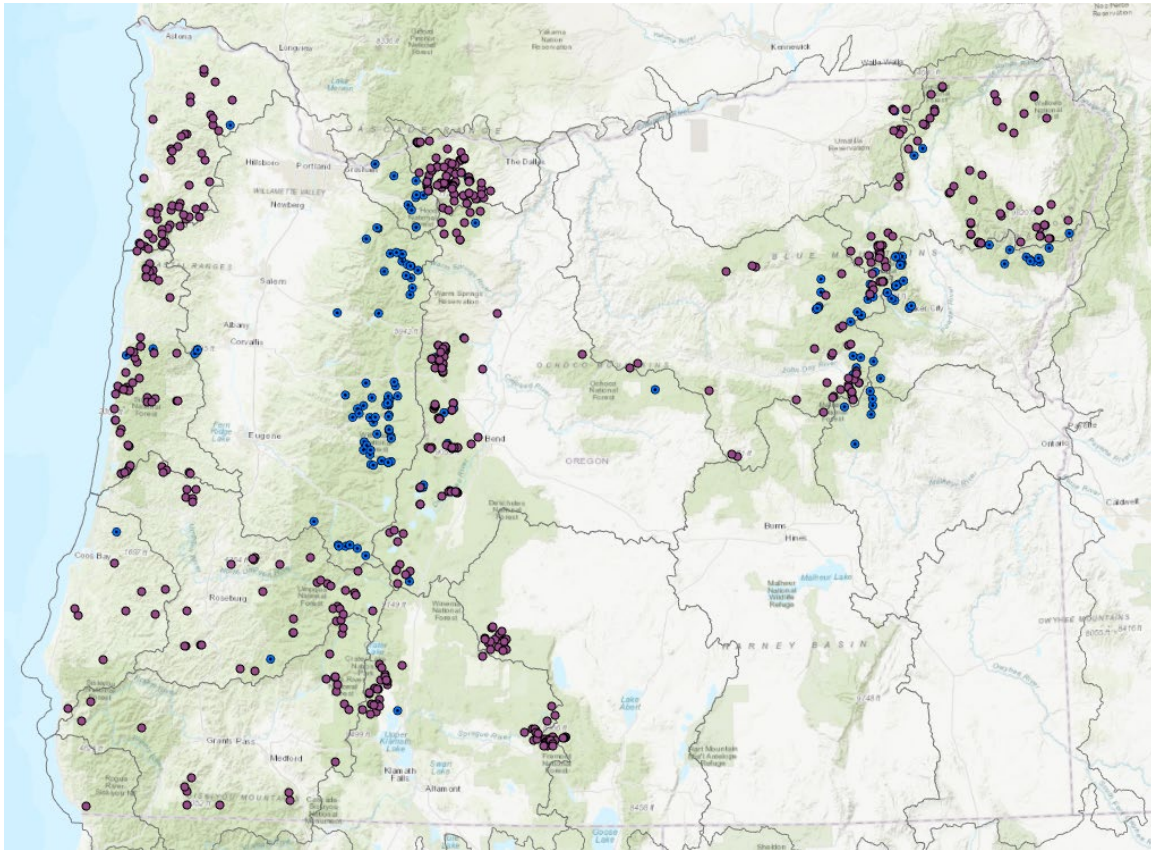


Figure 6 Temperature monitoring stations that meet DEQ’s data requirements for ‘Core Cold Water Habitat’.

	Originator	Data Set
	U.S. Forest Service	NorWeST Observed Temperature Regional Database
	Oregon DEQ	2020 & 2022 Integrated Report



3.1.4 Bull Trout Spawning and Juvenile Rearing

In 2003, DEQ designated additional spawning habitat beyond that identified in the USFWS draft critical habitat designation. DEQ believed it was necessary to designate additional areas as potential bull trout rearing and spawning habitat beyond where current spawning habitat occurs to protect and recover the Threatened & Endangered Bull Trout populations in Oregon. Identifying potential Bull Trout spawning habitat allows for DEQ to protect additional habitat necessary for reconnection of local populations, increase resilience to natural disturbance, and enhance genetic diversity to support healthy reproduction.

For this rulemaking, DEQ engaged with the Statewide Bull Trout Working Groups to review the potential habitat identified in 2003 and provide input based on the current state of the science and conservation goals. The statewide working groups are organized jointly by ODFW and the U.S. Fish and Wildlife Service and coordinated for the agencies by Stephanie Gunckel. They are comprised of Bull Trout biologists from state, federal, tribal, academic, and private institutions.

The working groups reviewed the Potential Bull Trout Spawning Habitat that was identified by a Bull Trout Technical Committee organized by DEQ for the original 2003 rulemaking process (DEQ 2003). They provided input on what potential habitat DEQ should still consider high potential for restoration and reintroduction or high value for connectivity to existing habitat, what potential habitat they would no longer consider as having high potential for restoration or reintroduction, and any additional habitat that should be added for consideration as potential spawning habitat.

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Working Group	Meeting Date	Participating Agencies
Klamath Basin	February 7, 2022	ODFW, USFWS, USGS, USFS, TNC, NPS, Klamath Tribe, Green Diamond Resource Company, Klamath Watershed Partnership
Upper Willamette	April 14, 2022	ODFW. *Not discussed a formal working group meeting. Conference of ODFW district and research biologists only.
Clackamas	February 23, 2022	ODFW, USFWS, USFS, PGE, TU
Hood	March 7, 2022	ODFW, USFWS, USFS, CTWSR, MFID, HRWC, Meridian Environmental
Upper & Lower Deschutes	January 31, 2022	ODFW, USFWS, USFS, CTWSR, PGE, Mt Hood Environmental
Odell Lake	March 8, 2022	ODFW, USFWS, USFS, Native Fish Society
John Day	February, 2022	ODFW, USFWS, BLM, CTUIR, USFS, CTWSR
Umatilla – Walla Walla	December 6, 2021	ODFW, USFWS, USFS, CTUIR, BOR, ACOE, WDFW, OSP, Tri-State Steelheaders, OWRD, SRSRB
Grande Ronde – Imnaha	January 12, 2022	ODFW, USFWS, USFS, PGE, CTUIR, Nez Perce, IPC
Powder – Pine	January 11, 2022	ODFW, USFWS, USFS, BOR, IDFG, IPC
Malheur	April 14, 2022	ODFW, USFWS, USFS, Burns Paiute Tribe, BPA, BOR

For the 2022 aquatic life use updates, DEQ worked with Stephanie Gunckel (ODFW/USFWS) the coordinator of statewide working groups of Bull Trout biologists from ODFW and USFWS. The working groups reviewed DEQ's 2003 'Potential Bull Trout Spawning Habitat' and advised DEQ on changes to consider. Their review identified which habitats are still consistent with near-term restoration goals and recent feasibility studies and should be retained, any habitats that should be added, and any habitat that will not support bull trout spawning and should be removed as potential spawning habitat. The additional potential spawning habitat identified by the working groups includes newly occupied spawning habitat from reintroductions and restoration that are not included in the federal critical habitat designation.

Habitat identified in 2003 as Potential Bull Trout Spawning that was subsequently classified in the Final 2010 Federal Critical Habitat Rule for Bull Trout as Spawning-Rearing (SR) or Foraging, Migration, and Overwintering (FMO); or classified as Primarily Spawning, Primarily Rearing, or Foraging, Migration, and Overwintering (FMO) Habitat in the 2022 ODFW -FHD is no longer considered potential habitat. Those habitat uses are integrated into DEQ's Bull Trout Spawning and Juvenile Rearing use subcategory designation as determined by the decision rule methodology. Because the potential habitat was used to designate the Bull Trout Spawning and Juvenile Rearing use in 2003, areas that are no longer considered potential spawning habitat, and are not indicated as spawning habitat in the Federal Critical Habitat Rule or ODFW's database, would be reclassified to a subcategory with less stringent criteria. The rationale and supporting information for any changes resulting in application of less stringent criteria are detailed in the Use Attainability Analysis accompanying this rulemaking.

Table 9 Summary of the conclusions on Potential Bull Trout Spawning Habitat from the statewide Bull Trout working groups.

Administrative Basin	Retain	Add	Remove
Malheur River	<ul style="list-style-type: none"> • Deadhorse Creek • McCoy Creek • Bosenberg Creek • Upper Summit Creek 	<ul style="list-style-type: none"> • Spring Creek – downstream of Flat Creek • Corral Basin Creek 	<ul style="list-style-type: none"> • North Fork Malheur River • Upper Malheur River to confluence of Big Creek • Lake Creek
Umatilla	<ul style="list-style-type: none"> • Meacham Creek • East Fork Meacham Creek • Umatilla River 	<ul style="list-style-type: none"> • Shimmiehorn Creek (Buchanan et al. 1997) • Spring Creek 	
Walla Walla	<ul style="list-style-type: none"> • All from 2003 		
Powder River	<ul style="list-style-type: none"> • All from 2003 		
Grande Ronde	<ul style="list-style-type: none"> • All from 2003 	<ul style="list-style-type: none"> • Hoodoo Creek • Little Minam River downstream of critical habitat to confluence with Minam River • BC Creek upstream for 400m from mouth 	
John Day River	<ul style="list-style-type: none"> • All from 2003 	<ul style="list-style-type: none"> • Strawberry Creek • Slide Creek • Junkens Creek 	
Hood River Basin	<ul style="list-style-type: none"> • All from 2003 		
Deschutes River Basin	<ul style="list-style-type: none"> • Lake Creek – Blue Lake and Link Creek • Upper portion Big Marsh Creek • Fall River • Crystal Creek • Maklaks Creek 	<ul style="list-style-type: none"> • Spruce Creek • Hemlock Creek • Refrigerator Creek • Tumalo Creek upstream of Shevlin Park • Cold Creek • Cultus River 	<ul style="list-style-type: none"> • Suttle Lake • Lower portion Big Marsh Creek • Crescent Creek and Lake • Whitefish Creek • Upper Deschutes River including Wikiup Reservoir, Lava Lake and Big Lava Lake • Crane Prairie • North Davis Creek
Lower Willamette		<ul style="list-style-type: none"> • Clackamas River at Big Bottom • Pinhead Creek • Clackamas River above Cub Creek 	

Administrative Basin	Retain	Add	Remove
		<ul style="list-style-type: none"> • Cub Creek • Hunter Creek • Rhododendron Creek 	
Upper Willamette	<ul style="list-style-type: none"> • Lost Creek • Salmon Creek above Black Creek • Upper Middle Fork Willamette River 	<ul style="list-style-type: none"> • Upper McKenzie River to Tomlitch Falls • McKenzie River Trail Bridge Dam to Belknap Springs • Anderson Creek to FR 830 • Separation Creek mouth to Rainbow Creek to • South Fork McKenzie River from Augusta Creek to Elk Creek • Elk Creek • Fisher Creek to 7km from mouth • Furnish Creek mouth to FR 248 • Eagle Creek • Swift Creek upstream of FR21 	<ul style="list-style-type: none"> • Salmon Creek between Wall Creek and Black Creek • Smith River and Reservoir • Wall Creek • North Fork Willamette River including Waldo Lake • Salt Creek • South Fork Salt Creek
Klamath Lake	<ul style="list-style-type: none"> • North Fork Sprague River • Boulder Creek • Sheepy Creek • Leonard Creek • Coyote Creek • Callahan Creek 	<ul style="list-style-type: none"> • Unnamed creek upstream of Corral Creek • Annie Creek • Rock Creek • Sevenmile Creek to confluence with Short Creek • Short Creek 	<ul style="list-style-type: none"> • South Fork Sprague River

Figure 7 Statewide map of updated 'potential Bull Trout spawning habitat' determined by the statewide Bull Trout working groups.

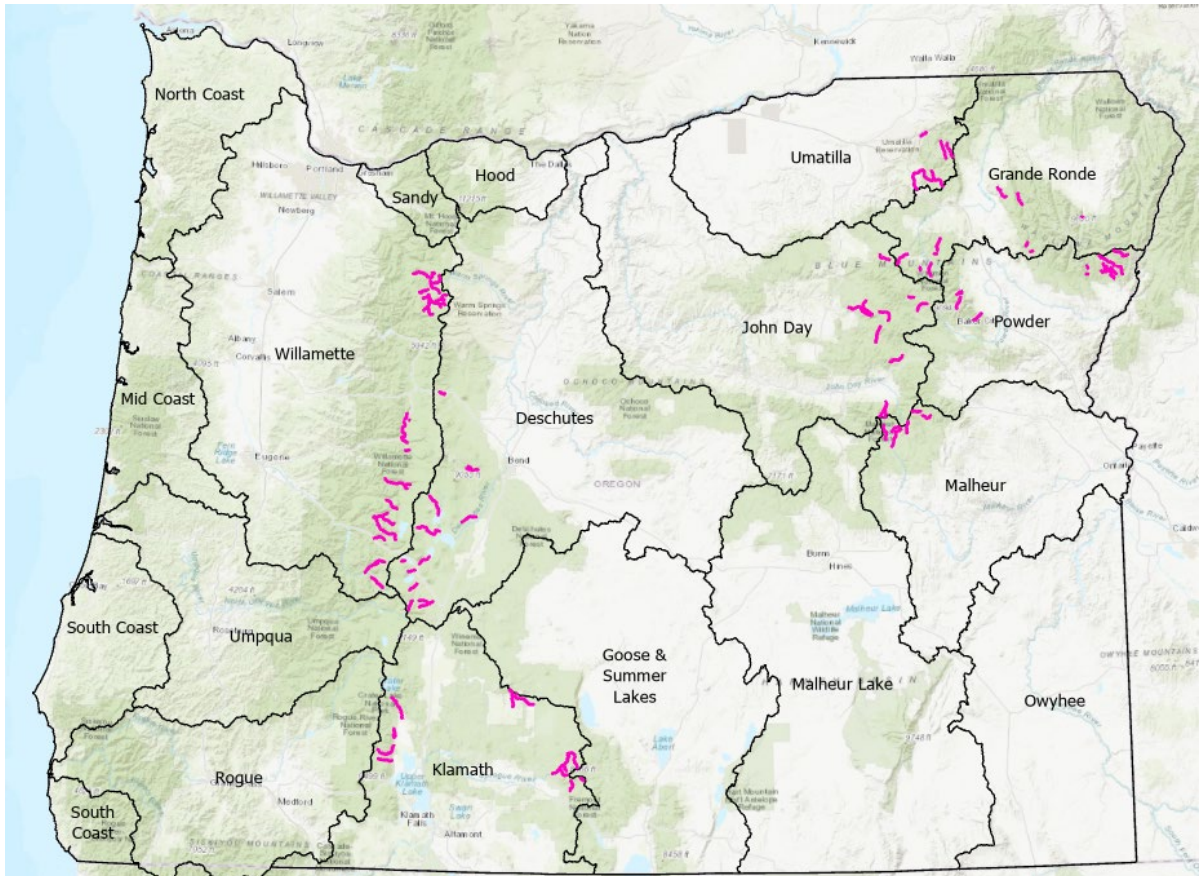
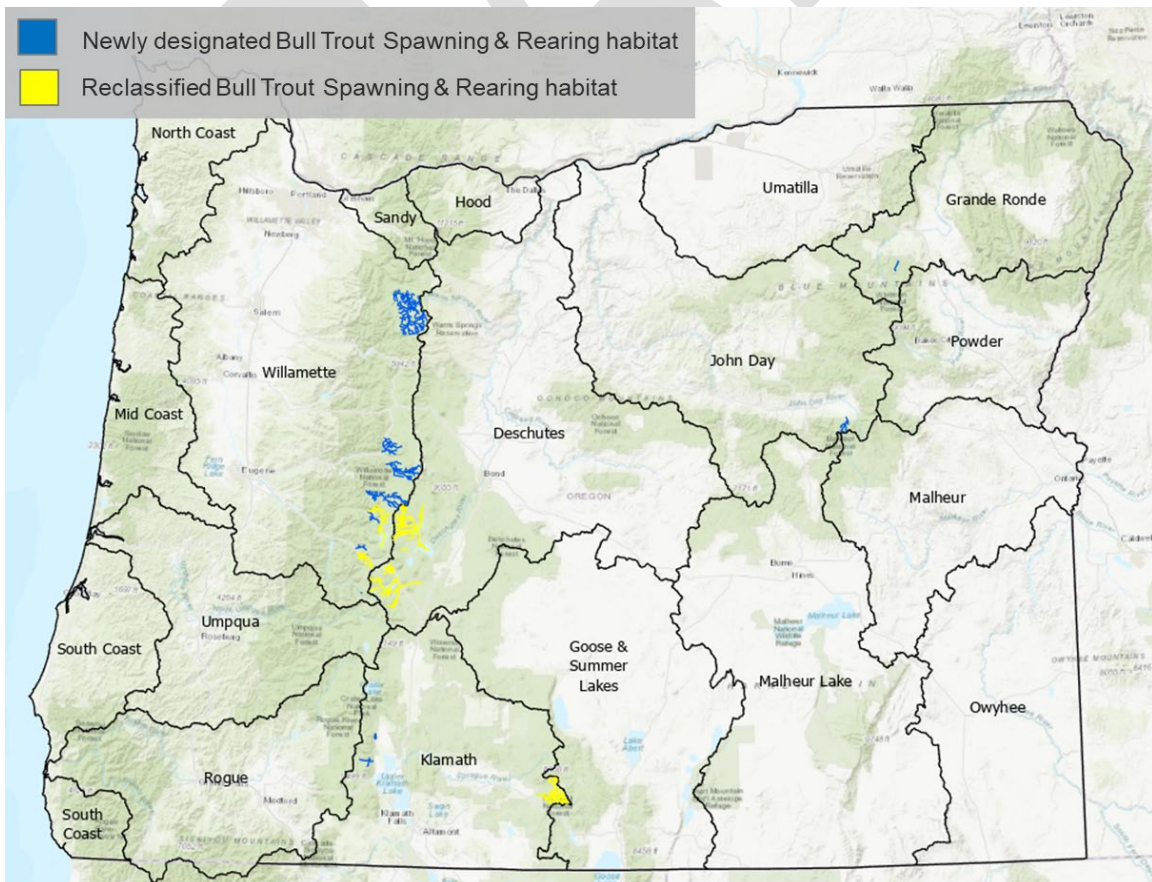


Figure 8 Habitat added and removed from 'Bull Trout Spawning & Juvenile Rearing' designation based on the input of the Bull Trout working groups.



3.1.5 Redband and Lahontan Cutthroat Trout

No additional analyses at this time.

3.1.6 Salmon and Steelhead Migration Corridors

3.1.6.1 Methods

Waters that are candidates for the 'Salmon and Steelhead Migration Corridor Use' are those used primarily for migration of anadromous salmon and steelhead species, with limited rearing use at other times of the year, especially during the summer.

To identify these waters, DEQ applied the methods outlined in Section 2.3.5, above to habitat for anadromous salmon & steelhead to the ODFW FHD:

1. Migration corridor reaches designated and approved in 2003.
2. Where ODFW's FHD indicates a reach is "Primarily migration" for an anadromous salmon or steelhead species.
3. Where ODFW's life-stage activity timing tables indicate no peak salmonid rearing use or peak salmonid spawning or emergence use in July-August, inclusive of resident trout species.
4. There is evidence indicating that the reach naturally exceeds 18°C 7-dADM.

3.1.6.2 Data Analysis

Primarily Migration Reaches

To evaluate waters for designation under the Migration Corridor use, DEQ extracted waters with habitat use of "Primary Migration" from the ODFW-FHD for at least one of the five anadromous salmonid species native to Oregon: Chum Salmon, Coho Salmon, fall Chinook Salmon, spring Chinook Salmon, Sockeye Salmon, summer steelhead and winter steelhead.

Use the ODFW timing tables (2022) to extract a list of timing units that contain peak habitat use for adult upstream migration, adult holding, adult spawning, or egg incubation and fry emergence, by the anadromous or resident salmonid species native to Oregon that occurs during July 1- August 31. Create a layer of timing units that have peak use by these salmonid species in July and August.

The reaches identified "Primary Migration" were then overlaid with the timing units showing no use in July or August to extract the migration reaches where there is no peak use for salmonids in July and August.

Overlay these reaches with data from the USDA-FS current temperature data to identify reaches that are currently attaining temperatures of 18°C or less.

3.1.6.3 Temperature Evidence for reaches achieving current summer maximum temperatures of 18°C or less

Average maximum August stream temperature data from the USDA-Forest Service NorWeST stream temperature observations database (1993-2011) was cross-referenced with the distribution of waters

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classified as Primarily Migration to identify migration reaches that can currently attain temperatures of 18°C or less.

Potential migration waterbodies that currently do not exceed 18°C in the summer and are therefore disqualified:

- Alsea River
- Beaver Slough
- Camas Creek
- Clackamas River
- Clatskanie River
- Millicoma River
- Eightmile Creek (near The Dalles, OR)
- Fivemile Creek (near Siltcoos Bay, OR)
- Fivemile Lake (Fivemile Lake)
- Leitell Creek (Fivemile Lake)
- Bell Creek (Fivemile Lake)
- Tahkenitch Lake
- Mill Creek (Salem)
- Salem Ditch
- Siltcoos Bay
- Siltcoos River
- Maple Creek (Siltcoos Bay)
- Siltcoos Lake
- Fiddle Creek
- Miller Creek
- Sidney Power Ditch (Ankeny National Wildlife Refuge)
- South Scappoose Creek (near Scappoose, OR)
- Westport Slough (near Clatskanie, OR)
- Willamette River (from above Harrisburgh to Eugene)

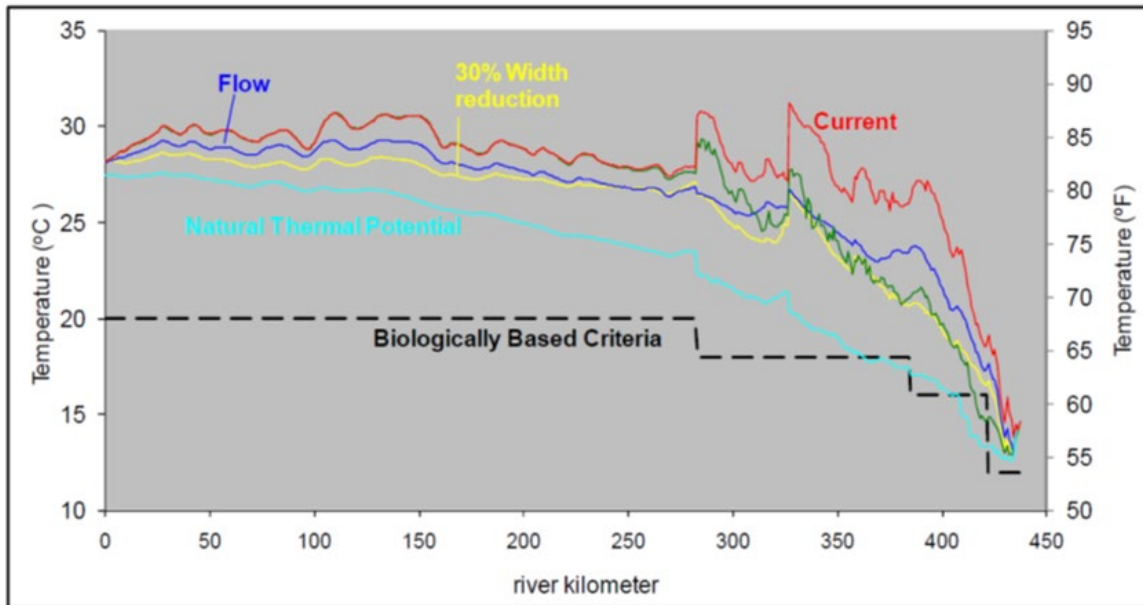
3.1.6.4 Evidence for natural conditions exceeding 18°C as a summer maximum

John Day River (RM 0 ~184 / Rkm 0~296)

This waterbody has a TMDL, and the natural thermal potential is expected to exceed 18°C for the entirety of the potential primary migration reach. This reach is currently designated as a Migration Corridor and DEQ expects to maintain the current designation.

Figure 9 Natural thermal potential of the John Day River

Figure 2.1-3. Simulated maximum 7DADM temperature, John Day River from described scenarios during the model period, warm season 2004 (recall of Figure B-3, Appendix B)



Willamette River RM 0-50 (Rkm 0 – 80.4)

This migration corridor reach contains some adult holding and juvenile rearing use by Spring and Fall Chinook Salmon. A TMDL has been issued and natural thermal potential for this reach has been determined to exceed 18°C in July and August. This reach is currently designated as a Migration Corridor and DEQ expects to maintain the current designation.

Figure 10 Natural thermal potential of the Willamette River showing maximum 7-dadm temperature sin July (top) and August (bottom).

Figure 4. July 2001 Willamette River natural thermal potential and biological criteria temperatures.

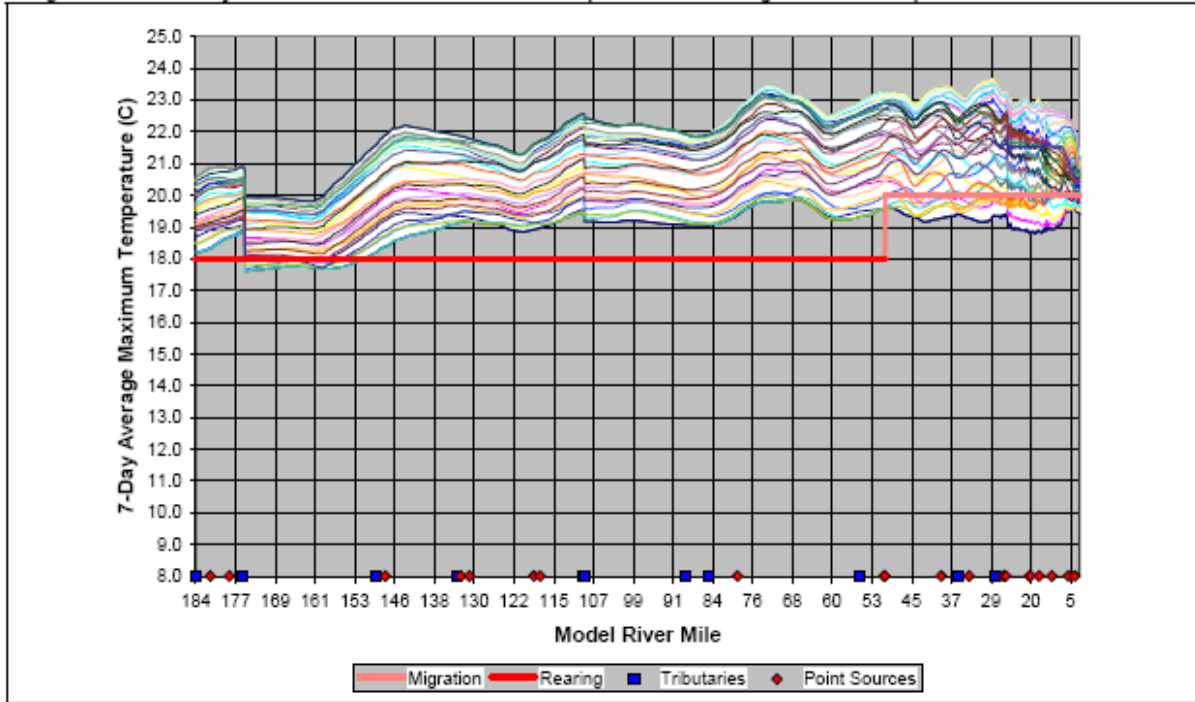
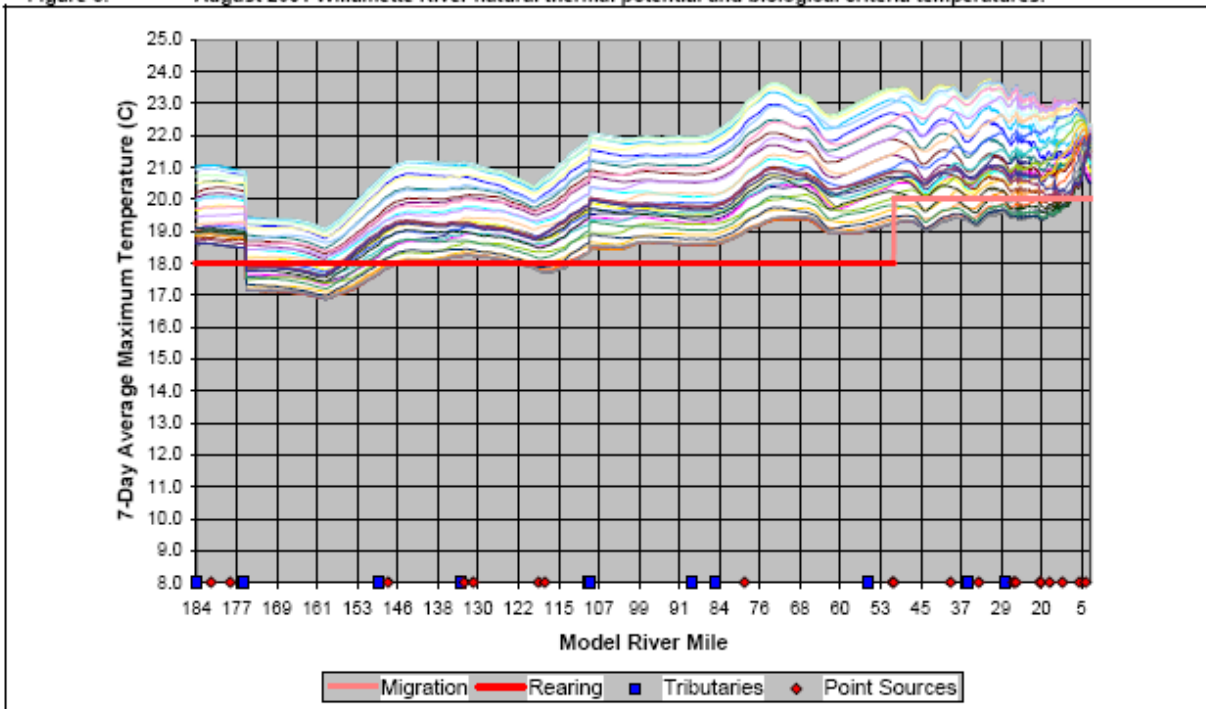


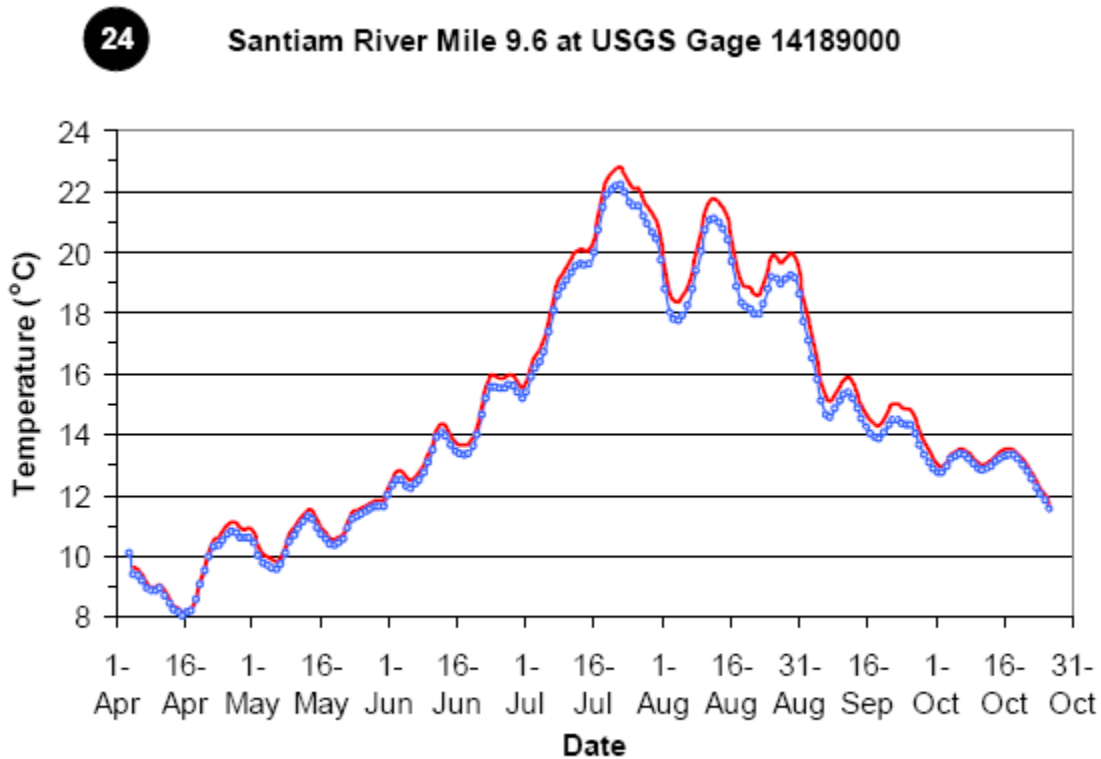
Figure 5. August 2001 Willamette River natural thermal potential and biological criteria temperatures.



Santiam River from the Willamette River to near Jefferson, OR (RM 0 ~ 10 / Rkm 0~16).

Natural thermal potential for this reach of the Santiam River was conducted for the Willamette Basin TMDL. This modeling determined the reach naturally exceeds 18°C in July and August up to river mile 9.8.

Figure 11 Natural thermal potential of the Santiam River at RM 9.6. Current temperature (2003, red) system potential (blue). Willamette Basin TMDL Chapter 4 p.4-160.



D River near Lincoln City, OR.

Current NorWeST temperature observations indicate the reach exceeds 18°C as an August mean and the reach contains no salmonid holding, migration, spawning, or egg incubation through fry emergence use in July and August. No TMDL for this area exists and no third party models or restored thermal potential were identified at this time.

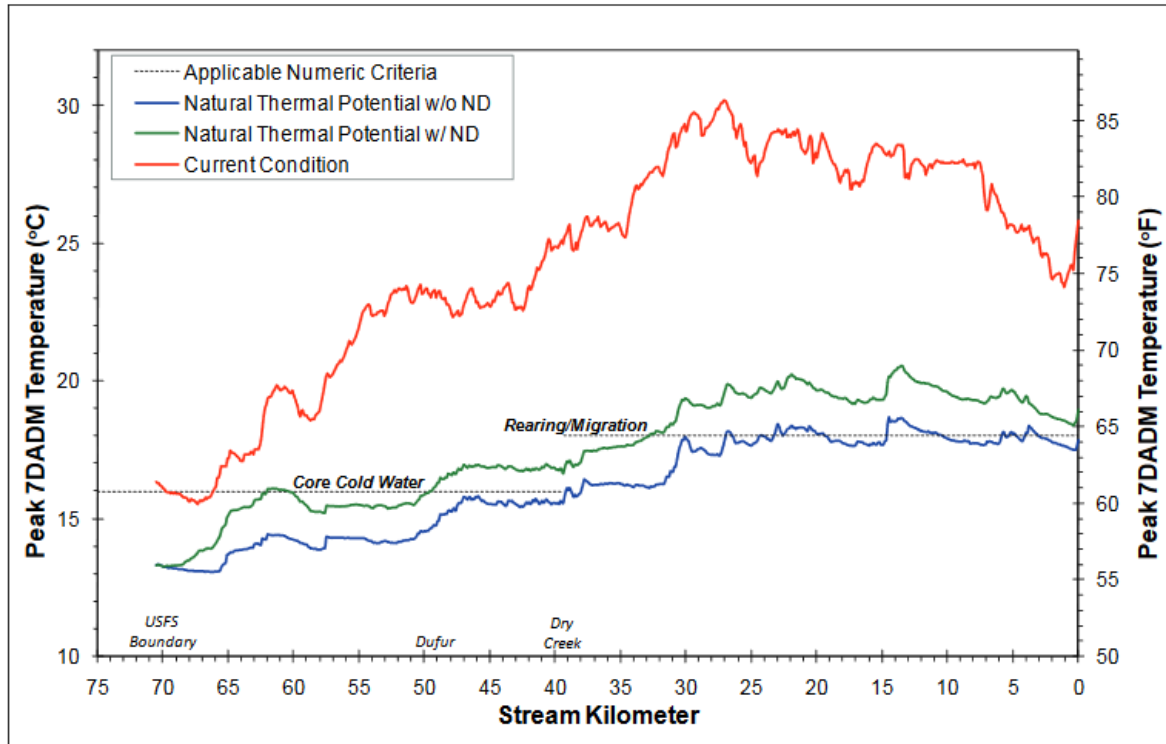
Fifteenmile Creek near The Dalles, OR.

Current NorWeST temperature observations indicate the reach currently exceeds 18°C as an August mean. The lower reach contains no salmonid holding, migration, spawning, or egg incubation through fry emergence use in July and August. The reach is currently designated as salmon and trout rearing and migration and was identified as a minor (providing refuge >18°C) cold-water refuge by the U.S.

EPA.

Fifteenmile Creek is included in the Hood-Mid-Columbia Miles Creek TMDL and its restored thermal potential was modeled in 2005. Results of the TMDL indicate that temperatures of approximately 18°C are attainable with restoration. Given these results and the importance of this reach as providing cold water refuge to fish migrating in the Columbia River, DEQ shall retain the designation as Salmon & Trout Rearing and Migration.

Figure 12 Natural thermal potential of Fifteenmile Creek from river kilometer 0-75.



Multnomah Channel and Scapoose Bay, near Scapoose, OR.

Current temperatures exceed 18-20°C as mean August maximum temperatures. EPA Memorandum *Evaluation of the potential cold water refugia created by tributaries within the Lower/Middle Columbia River based on “NorWeST” temperature modeling project, February 21, 2017*. These reaches were not modeled in the Lower Willamette basin TMDL and no third party models of restored thermal potential specific to these reaches were identified at this time. However, these reaches are tributary, and receive water from both the Willamette River and Columbia River, which do have evidence supporting natural thermal potential exceeds 18°C in July and August. The water current temperatures of these reaches are the same as the nearby Willamette River and Columbia River.

3.2 Salmon & Steelhead Spawning through Emergence Timing

DEQ is maintaining the same general framework for determining applicable spawning start and end dates used since 2003. This framework is consistent with the approach recommended by the Region 10 Temperature Guidance and Technical Support Issue Papers (Poole et al. 2001, U.S. Environmental Protection Agency 2003). The following summarizes the rationale and provides supporting information for determination of spawning start and end dates under the methods carried over from 2003 and newly proposed spawning ends date for reaches where winter spawning species are absent.

1. Spawning start date selection method justification

DEQ's existing salmon and steelhead spawning designations apply the spawning criteria starting on the first two-week period after the start of lesser spawning use, or the start of peak spawning use, whichever is earlier. The rationale for the two-week delay after the first period of lesser spawning use spawning start date is to account for spatial and temporal variability in the dates for spawning in the timing tables and waterbodies within timing units.

The Temperature Technical Advisory Committee (TTAC) (OR-DEQ 2003b) for the 2003 aquatic life use designation rulemaking considered that there is a large amount of spatial and temporal variability in spawning, and in particular interannual variability, in the timing of the onset of spawning. There is also a fair amount of plasticity in when salmon spawn, as they respond to local conditions. Salmon and steelhead wait for cues of temperature drop or rise, within limits, depending on whether they spawn in the fall or spring. When stream temperatures drop varies from year to year, but they tend to drop quickly. The EPA recommended that spawning use apply from the average date that spawning begins to the average date incubation ends (EPA 2003).

The resolution of the data in the ODFW timing tables is two week intervals and applies to a "timing unit," which in many cases is a large catchment. Often spawning starts in colder waters within a timing unit and gradually progresses to the rest of the spawning habitat as the spawning season begins. Consequently, not all waters within the timing unit would be expected to be able to meet the spawning criteria on the first day of spawning.

The two-week delay only applies where the spawning use is identified as "lesser use" by ODFW. Generally, ODFW considers at least 90% of the population to spawn during the "peak use" time. For some populations peak use may apply to as little as 70% of the population if there is extended lesser use before or after the peak, such that each two-week period of lesser use represents 10% or less of activity by the population. To protect at least 90% of the Spawning, use dates begin no later than the onset of "peak" spawning use.

The National Marine Fisheries Service Biological Opinion on EPA's approval of Oregon's water temperature standards (NMFS 2015), found that application of the spawning criteria for salmon and steelhead after two weeks into the initial period of lesser use was appropriate because the highest water temperatures allowed under the spawning and incubation criterion (13.0°C) were likely to occur during one of the earliest weeks in the spawning periods. Generally, this is between September and November when non-peak spawning usually occurs. Water temperatures are cooling rapidly during the start of spawning season and coincide with the start of autumn precipitation and increased stream flows.

NMFS also determined that temperatures during the day would be cooler than the daily maximum due to daily temperature fluctuations between nighttime and daytime. Therefore, spawning adult fish and

embryos are likely to be exposed to temperatures approaching 13°C for only a few hours a day during the warmest week of the entire incubation period.

Finally, NMFS considered the number of fish affected at the start of lesser use was likely to be small. If 10% of the population is represented during a period of lesser spawning use the period at the start of incubation and at the end of each represent roughly 5% of the population. Of the 5% of the population potentially exposed to daily maximum above the criterion, only a small percentage of these were expected to be at risk of mortality (5% or less) if temperatures attained the criterion by the designated start date. The proportion of the population exposed would be even less if divided among more periods of lesser use. This risk was considered similar to natural rates of mortality, because water temperatures likely were not optimal for salmon at all places and times, even prior to human disturbance of the landscape (Reeves et al. 1995, Poole et al. 2001)(NMFS 2015 pp. 137–143).

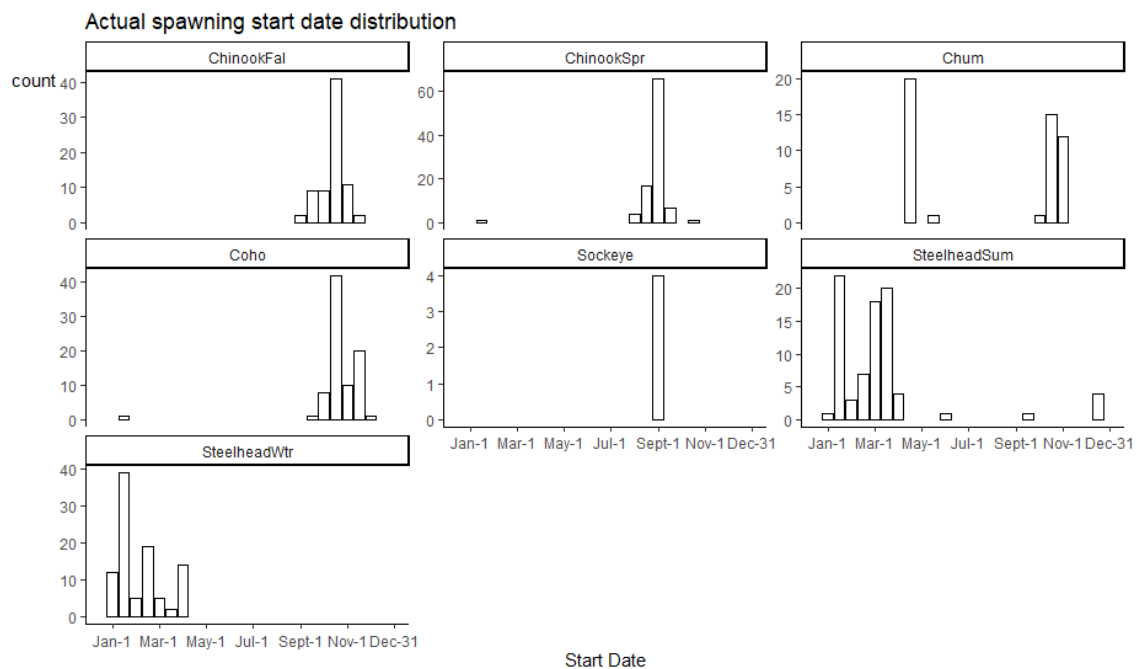
3.2.1 Rationale to Shifting Spawning Start Date Cutoff from October 15 to November 1

To leverage increased availability of information on the actual start of spawn timing for salmon populations since 2003, DEQ is proposing to start spawning in reaches where salmon spawning occurs on the actual start or peak spawning use, or two weeks after the start of lesser use, whichever is earlier according to ODFW's updated timing table information, but no later than November 1. Or as an alternate option, to use the timing table data and not have a no later than date.

In the 2003 designations DEQ used a cutoff for start of spawning dates no later than October 15. This was an attempt to simplify the number of date ranges for spawning by applying the spawning criteria starting October 15 for all late-fall spawning species. The October 15 date was based on information about dates of Fall Chinook spawning available at the time. In the absence of specific data about timing for other salmon species, this date was assumed to be broadly applicable to spawn timing for other salmon populations statewide. It was assumed that most salmon populations would begin spawning before this date. There was also an assumption, absent wide availability of temperature data for waterbodies across the state, that most waterbodies in Oregon could readily attain the spawning criterion by this date.

With the increased availability and accuracy of spawning timing available from ODFW, DEQ analyzed actual start timing for spawning of native salmon populations and found the Oct. 15 (bi-week 20) is approximately the median start date for salmon populations across the state. Many specific populations of salmon including fall Chinook, and especially Coho and Chum, average a Nov. 1 start (bi-week 21) or later (See Fig. 1. Below). The nearly 20 years of implementing spawning criteria using the October 15 cutoff date has also revealed that many waterbodies that support spawning do not cool to a 7-day average of the daily maximum stream temperature of 13°C by October 15 as assumed. And therefore, using October 15 as a cutoff date is both too conservative and unattainable in many habitats where spawning starts late in the season. This shift only occurs in certain instances where October 15 was applied in place of a later start date as shown in ODFW's timing tables. Under the new proposal, shifting the spawning start date to a later date is first and foremost set by the information actually shown in ODFW's timing table for a specific timing unit.

Figure 1. Distribution of dates for the start of spawning activity in ODFW timing units. Bi-week 1 = weeks starting January 1 and bi-week 2 = weeks starting January 15, etc.



3.2.2 Spawning period end date selection method justification

DEQ's framework for determining the dates for spawning periods supports the sensitive early life stages of egg incubation (eggs and larval stages) according to the spawning criterion (DEQ 1995b, EPA 2003). To simplify the number of date ranges for spawning, DEQ developed a policy to apply the spawning criteria until either May 15 or June 15. The later June 15 date is applied to salmon and steelhead spawning habitat in waters designated as Core Cold-Water Habitat.

The Temperature Technical Advisory Committee (TTAC) (OR-DEQ 2003b) for the 2003 aquatic life use designation rulemaking considered that there was a lack of good data on emergence, and high spatial and temporal variability and plasticity in egg incubation and emergence timing. Egg incubation and the majority of fry emergence from the gravels for spring spawning steelhead is expected to conclude by May 15 in most systems and June 15 in typical colder systems. Although steelhead fry may emerge even later than June 15 in some waters, those waters are typically colder, high elevation, or groundwater-fed habitats. To attain the spawning criterion on June 15 in the downstream extent of spawning reaches, temperatures would necessarily remain colder in the upstream waters. Egg incubation is expected to conclude well before these dates under a natural thermal regime.

The biological endpoint for the numeric salmon & steelhead spawning criterion is based on thermal requirements for egg incubation and embryonic development (DEQ 1995b). Fry survival and fitness at emergence is very high when initial egg incubation occurs at temperatures equal to or less than the threshold adopted as Oregon's numeric criterion (13°C) for salmon & steelhead spawning through fry emergence (McCullough et al. 2001). Water temperatures optimal to fry and juvenile growth occur at 12°C – 20°C and are within the range of the year-round criteria for Salmon & Trout Rearing and

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Migration and Core Cold Water Use (EPA 2003). Therefore, application of the spawning criteria beyond the stage of egg incubation and larval development is not required to protect fry and early juvenile development.

Meeting this criterion at the onset of spawning for salmon and at the end of incubation for steelhead trout is expected to provide protective temperatures for egg incubation (6 - 10°C) that occurs over the winter (salmon) and spring (steelhead, resident trout), and subsequent emergence, assuming typical annual thermal patterns (EPA 2003). Some salmon populations naturally adapted to spawning and incubating larvae in warmer temperatures and reduce their potential for exposure to warm water in the spring by accelerating incubation and emergence in warm conditions (NMFS 2015 p. 142). Artificially extending the period when spawning criteria are applied is not necessarily beneficial to all salmon populations, and they do not automatically seek the coldest temperatures for egg incubation. Some salmon seek warmer areas of substrate and may select warmer redd locations to protect eggs from freezing and to ensure earlier emergence from the substrate, giving young a competitive advantage (Geist et al. 2002, 2008, Arntzen et al. 2009) *in* (NMFS 2015 pp. 137–143).

For these reasons, DEQ's original technical advisory committee recommended application of spawning criteria until May or June 15. Therefore, DEQ is not proposing to change the method for spawning end date designation in this rulemaking.

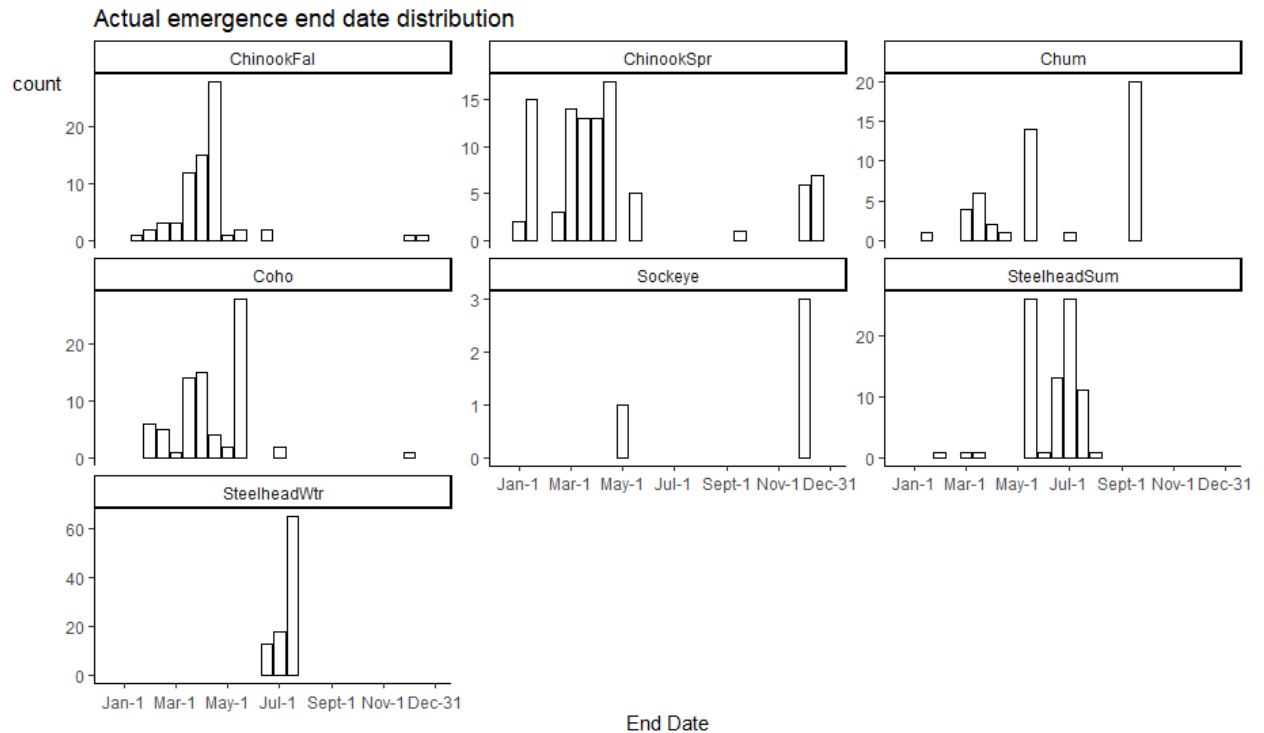
3.2.2.1 Spawning period end date analysis for waters with fall spawning uses

DEQ specified the end of periods when salmon & steelhead spawning criteria would apply to reaches where spring spawning populations (winter /summer steelhead) occurred until May 15, and until June 15 if the reaches were also designated for the Core Cold-Water use subcategory. However, using ODFW's most up to date habitat distribution data and life-stage timing information, DEQ has identified multiple reaches where spring spawning populations (salmon) do not co-occur with fall spawning populations (steelhead). The end dates for applying spawning criteria extend several months beyond the end of emergence for fall-spawning salmon in those waterbodies. An end date for reaches containing only salmon spawning was not specified in 2003.

DEQ analyzed the timing of egg incubation through fry emergence in ODFW's draft 2022 timing tables (Figure 13). These showed the majority of fry emergence, let alone egg incubation, for fall-spawning salmon species Chinook, Chum, Coho, and Sockeye, are concluded by April 30. As the spawning criteria are designed to protect the more sensitive spawning adults and egg incubation stages, assigning a default spawning end date of April 30 should be more than sufficient to protect the last stages of egg and larval development upon which the spawning criteria is based for these species. Even if in some reaches maturing fry are present after that date.

DEQ is proposing to apply a spawning use end date of April 30, instead of May 15, in waters with spawning habitat for only fall spawning populations, i.e., only salmon. This will better match the timing for sensitive life stages of egg and larval development of salmon species when these are the only type of spawning phenology in the reach.

Figure 13 Distribution of dates for the end of emergence activity by species in ODFW timing units.



3.2.3 Site-Specific Adjustments

To protect existing uses, DEQ made the following site-specific adjustment for designating Salmon and Steelhead Spawning habitat or the start and end dates for applying spawning criteria.

John Day River

ODFW identifies the mainstem below John Day, the Middle Fork and North Fork John Day River below Hwy 395 in the FHD as "primarily rearing" habitat. These reaches are currently designated by DEQ for the Salmon & Steelhead Spawning use subcategory. ODFW considers some incidental spawning use occurs in these portions of the John Day at a very low level, but not by a portion of the population large enough to consider it primarily spawning habitat on the FHD. Even though these reaches did not fit the methodology for classification as salmon and steelhead spawning habitat, DEQ could not demonstrate that the spawning use currently designated is not attainable. As DEQ currently designates this reach for spawning even though the FHD does not classify it as a "primary spawning" reach, no reclassification of these reaches is considered at this time.

Snake River

A specific date range for Fall Chinook spawning in the Snake River mainstem was developed in conjunction with the U.S. Fish and Wildlife Service for implementation of the Snake River TMDL. DEQ designated this spawning date range, October 23 to April 15, into rule. These dates specifically consider peak spawning for fall chinook and the end of larval development in that

system. DEQ will continue to apply the date range as determined by the U.S. Fish and Wildlife Service to remain consistent with the dates specified in the Snake River TMDL and 401 Certifications.

3.2.4 GIS Processing Methods for assigning spawning timing

DEQ applied the following GIS processing steps to derive the spawning start and end dates from ODFW's timing tables. This timing information was applied to the extent of spawning habitat for anadromous salmon and steelhead populations contained in ODFW's FHD database.

- 1) Using Arc GIS Pro (Esri Inc. 2021) the extent of 'Primarily Spawning' habitat for Chum, Coho, Fall and Spring Chinook, Sockeye, and Summer and Winter steelhead salmon was extracted from the ODFW FHD database.
- 2) The reaches from the DEQ Fish Use maps that coincide to these extents were extracted and formed the basis for a new DEQ spawning use layer.
- 3) Using the intersect tool, the DEQ spawning use layer was re-segmented along the ODFW Timing Unit boundaries. This identifies the timing unit to which each segment in the DEQ spawning use layer belongs.
- 4) Using an iterative select by location, the identity of each species with spawning habitat was assigned to each segment of the DEQ spawning use layer. This identifies whether spawning habitat for only one or multiple species occurs within each segment of the DEQ spawning use layer.
- 5) The identity of species present in each segment was concatenated to create a key that identifies the timing unit + species present in each segment of the DEQ spawning use layer.
- 6) Using R (R Core Team 2021), the ODFW timing table database was analyzed to provide the start date of spawning for each species within each timing unit, following the decision rule methodology for spawning timing described above in Section 2.4. The start date that applies to protect the earliest species in each possible combination of species was calculated and assigned a timing unit + species key that match the DEQ spawning use layer key created in the previous step.
- 7) Using a table join on the keys, the protective spawning use start date from the timing database was assigned to each reach in the DEQ spawning use layer.

3.3 Framework for Designating Salmonid Spawning Uses for dissolved oxygen.

The salmonid spawning criteria for dissolved oxygen (OAR-340-041-0016(1)) apply to active spawning areas used by anadromous salmon, steelhead and char, in addition to active spawning areas used by resident trout, which includes native whitefish.

DEQ identifies the spawning habitat used by anadromous salmon, steelhead, and Bull Trout (char) in OAR 340-041-0101 to 340-041-0340: Tables 101B, 121B, and 190B, and Figures 130B, 151B, 160B, 170B, 180A, 201A, 220B, 230B, 260A, 271B, 286B, 300B, 310B, 320B, and 340B. These are based on the 'primarily spawning' habitat identified in ODFW's-FHD for each species. In addition, ODFW has identified some areas of 'primarily spawning' habitat identified by ODFW for some populations of cutthroat and rainbow trout. However, these remain a small proportion of the total range of resident trout distribution.

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To ensure protection of resident trout spawning where it occurs as an existing use, given uncertainty about the specific waterbodies that support active spawning areas for resident trout, DEQ is proposing to identify *presumed* resident trout spawning areas, even though there is insufficient statewide data to identify specific waterbodies that support resident trout spawning at this time.

In the decision rules in Section 2.6.3 DEQ identified some habitat factors which can be found using readily available data sets to indicate resident trout spawning is not a use that could be supported in some specific waterbodies. In conjunction with decision rule in 2.6.3 above, DEQ is considering adopting a policy where site-specific determinations of the occurrence of active spawning habitat can be incorporated to accurately apply, or not apply, salmonid spawning criteria waters to where active native trout spawning does or does not occur.

The framework has two components:

Designated salmonid spawning use, where DEQ has specific data that indicates salmonid spawning is an existing use. Most often this is 'primarily spawning' habitat identified by ODFW on the FHD.

Presumed resident trout spawning, which continues DEQ's existing policy of applying dissolved criteria to waters that support resident trout but specific use and suitability of the habitat for spawning has not been determined.

- 1) DEQ shall designate **salmonid spawning use** in the basin specific rules (OAR-340-041-0101 to OAR-340-041-0345) where spawning by anadromous salmon and steelhead, char, resident trout, or whitefish has been identified by ODFW or another authoritative source.
- 2) DEQ shall identify, but does not designate as an existing use, **presumed resident trout spawning** for waterbodies where native trout are resident, but the status of waters as active spawning habitat has not been determined.
- 3) DEQ shall maintain a publicly available inventory of "Presumed Resident Trout Spawning Habitat" that indicates the waters where resident trout are resident and utilize habitat for multiple uses or are present but specific habitat uses have not been determined.
- 4) Salmonid spawning criteria shall be applied to the "Presumed Resident Trout Spawning Habitat" until a determination is made whether spawning is an existing use in a waterbody. Data quality for such determinations shall be consistent with ODFW's requirements for addition to the statewide FHD as primarily spawning habitat (Bowers 2020). DEQ will likely need to adopt guidelines into rule outlining the types of data or information, based on ODFW's field methods and data stewardship policies, that are suitable for making a determination about the status of active resident trout spawning for a waterbody.
- 5) When active spawning use is positively identified in waters with **presumed resident trout spawning**, they shall be identified as an existing use on the publicly available presumed resident trout spawning inventory, upon consultation with ODFW.
- 6) When spawning use is positively ruled out as an existing use in waters with **presumed resident trout spawning**, they shall be identified as 'non-spawning habitat' for resident trout on the publicly available presumed resident trout spawning inventory, upon consultation with ODFW.
- 7) Rulemaking to update the status of waters as either active spawning or non-spawning resident trout habitat into the designated **salmonid spawning use** in the basin specific rules shall be conducted as soon as practicable. DEQ could consider necessary updates during the triennial

review cycle, or as significant updates are made to ODFW's FHD. Newly identified salmonid spawning habitat shall be protected as an existing use under Oregon's anti-degradation policy (OAR 340-041-0004) until such time it can be adopted into the basin-specific rules.

- 8) The inventory of presumed resident trout spawning habitat shall be maintained as a publicly accessible web map or list of waterbodies and shall be revised on a bi-annual schedule parallel to DEQ's Integrated Report cycle.

3.4 Presumed Resident Trout Spawning for Dissolved Oxygen

Unlike the anadromous salmon and Bull Trout (char) populations in Oregon, there is a lack of specific data that identifies the location of "active spawning" by resident trout. In a letter to EPA on February 4, 2004, DEQ submitted a letter acknowledging a lack of site-specific information on spawning locations and times for resident species. That communication noted that in the absence of specific information, spawning criteria for dissolved oxygen would be applied to particular dates throughout the range of waterbodies where resident trout habitat could occur²³. This was a distinction from salmon and steelhead and bull trout, which have varied date ranges in different basins. DEQ agreed to apply the DO spawning criteria conservatively with the intent that the assumption could be updated once data was available to determine whether the reach was an "active spawning" area for resident trout. In the absence of specific information about spawning habitat for resident trout species, DEQ used the guidelines in the 2004 Memorandum to apply the dissolved oxygen spawning criteria to waterbodies for protection of resident species such as Rainbow, Redband, Westslope, and Coastal Cutthroat Trout, and Char species such as Bull Trout.

In the absence of information about existing uses, the Idaho Department of Environmental Quality has provisions in its water quality standards to protect uses that are presumed to occur in a waterbody but are not designated uses or known to be existing uses:

[...] undesignated waters shall be protected for beneficial uses, which includes all recreational use in and on the water and the protection and propagation of fish, shellfish, and wildlife, wherever attainable. (IDAPA 58.01.02.101)

If insufficient information is available to determine the existing uses, Idaho applies cold water aquatic life and contact recreation as presumed uses for all undesignated waters. Idaho DEQ does not consider salmonid spawning a presumed use.

Faced with a similar lack of statewide data on spawning locations for native resident salmonids, Idaho DEQ conducted a study to identify potential spawning habitat for resident trout based on a set of mapping rules that narrowed the number of waters that could be potential spawning areas based on stream size and gradient (Miller et al. 2014). This habitat was designated for salmonid spawning use in Idaho's rules (IDAPA 58.01.02).

The Washington Department of Ecology has a similar aquatic life use category for salmonid spawning to Oregon. It includes protection for both anadromous salmon and resident trout species. Ecology's spawning uses are designated on a basin-wide basis and not for specific waterbodies within the basins (WAC 173-201A-600 and WAC 173-201A-602).

²³ DEQ Letter to EPA of February 4, 2004, <https://www.oregon.gov/deq/FilterDocs/standardsclar.pdf>

3.5 Resident Trout Spawning Through Emergence Timing (Dissolved Oxygen)

Since 2004²⁴, DEQ has used January 1 as the assumed start date for spawning of resident trout species. It is based on the data for steelhead trout, which are a form of Rainbow Trout and spawn in the spring like other native trout species of Oregon. DEQ assumed that given a lack of information, waterbodies that support resident trout spawning would be able to attain the dissolved oxygen criterion by this date.

Analysis of new updated data for resident trout species in ODFW's timing tables shows resident trout populations initiate spawning between Nov. 1 and March 15. January 1 is the most common start date for resident trout spawning across the state. Only 22 populations of resident trout identified by timing unit statewide (1.5%) start spawning before January 1. DEQ proposes to start application of the spawning criteria by the beginning of peak spawning for these particularly early populations and continue to apply the current implementation procedure of January 1 for the rest. This is a slight modification of the current implementation procedures for applying the salmonid spawning criteria.

No revisions to the established implementation procedures currently used to identify resident trout spawning end dates are being considered at this time. The method for applying spawning criteria is the same as for the 'Salmon & Steelhead Spawning' use subcategory for temperature. End dates for resident trout species are the same that apply to steelhead, which are also spring spawners and a subspecies of *Oncorhynchus mykiss* along with Rainbow and Redband trout. Following the decision rules methodology for assigning spawning use end dates described above in Section 2.4.1, the reaches that overlay with the Core Cold Water Habitat subcategory were assigned a June 15 end date, and all other reaches were assigned a May 15 end date.

Like the temperature criteria for salmon & steelhead spawning, the salmonid spawning criteria for the dissolved oxygen use are based on the biological requirements for adult spawning and egg incubation as the most sensitive life stages of salmon, trout, and related species in the salmonid family. These requirements are based on attaining the required 8 mg/L minimum Intergravel-Dissolved Oxygen (IGDO). The EPA concluded that the embryonic and larval stages of salmonid development will experience no impairment when water column dissolved oxygen concentrations are 11 mg/L (EPA 1986b). There is an assumed drop from water column D.O. to IGDO of 2-3 mg/L. The 3 mg/L drop was considered conservative and was therefore the general recommendation. These concentrations are expected to be protective of all native salmonid species in Oregon.

DEQ's salmonid spawning criteria were developed based on protection of adult spawning and incubation of embryos (Rombough 1988; Hammor and Garside, 1976; Sowden and Power, 1985; Phillips and Campbell 1982) *in* (DEQ 1995a). EPA's national criteria for dissolved oxygen also recognize that most studies have emphasized embryonic development (EPA 1986b). NMFS also acknowledged that the dissolved oxygen criteria for spawning are relevant to salmonid eggs and larvae.

The greatest D.O. needs for developing eggs occur just prior to hatching (Rombough 1988, Carlson 1980). After hatch, the D.O. requirements for newly hatched alevin and fry decline significantly to

²⁴ DEQ Letter to EPA Region 10 of February 4, 2004. <https://www.oregon.gov/deq/FilterDocs/standardsclar.pdf>

levels within the range of DEQ's year-round criteria for Cold and Cool Water Aquatic Life, 8–6.5 mg/L or less (Figure 14) (Rombough 1988). Unlike incubating eggs, salmonid alevin and fry are motile, and able to detect and migrate to areas of higher dissolved oxygen before they emerge from the gravels (Fast and Stober, 1984, Stober et al. 1982) in (DEQ 1995a).

Because of these factors, DEQ determined that application of the spawning criteria for dissolved oxygen until May 15, or June 15 in waters designated for Core Cold Water Habitat, would protect adult spawning and egg incubation for all populations of salmon, steelhead, char and resident trout species present in Oregon. In addition, DEQ analyzed the end of spawning for all resident trout populations in Oregon based on information in ODFW's life stage timing tables (Figure 15). All but four native resident trout populations in Oregon begin peak spawning before May 1. These late-spawning populations occur in Core Cold Water Habitat areas where the salmonid spawning criteria are applied until June 15. This means this framework provides 30 or more days post fertilization for hatch to occur for 98% of the populations of native resident trout.

Therefore, DEQ is not proposing any changes to the methods for determining dates for applying dissolved oxygen spawning criteria for the protection of salmonid spawning.

Figure 14 Critical dissolved oxygen levels for steelhead embryos and alevin (Rombough 1988)

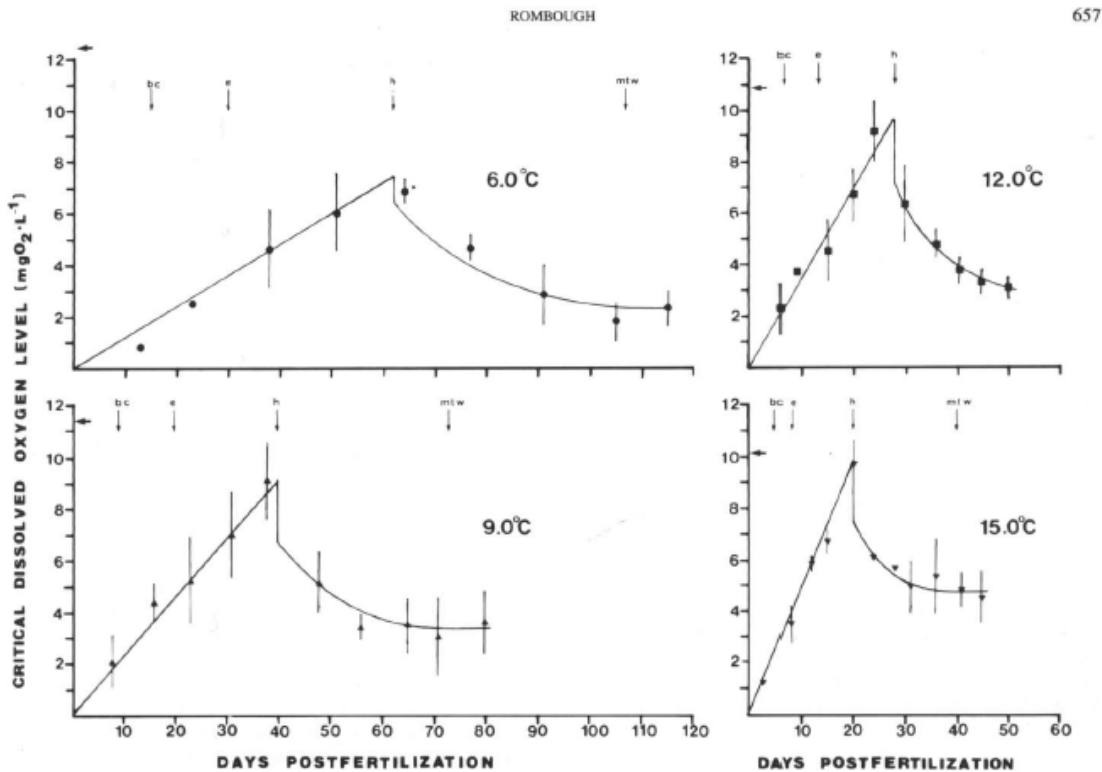
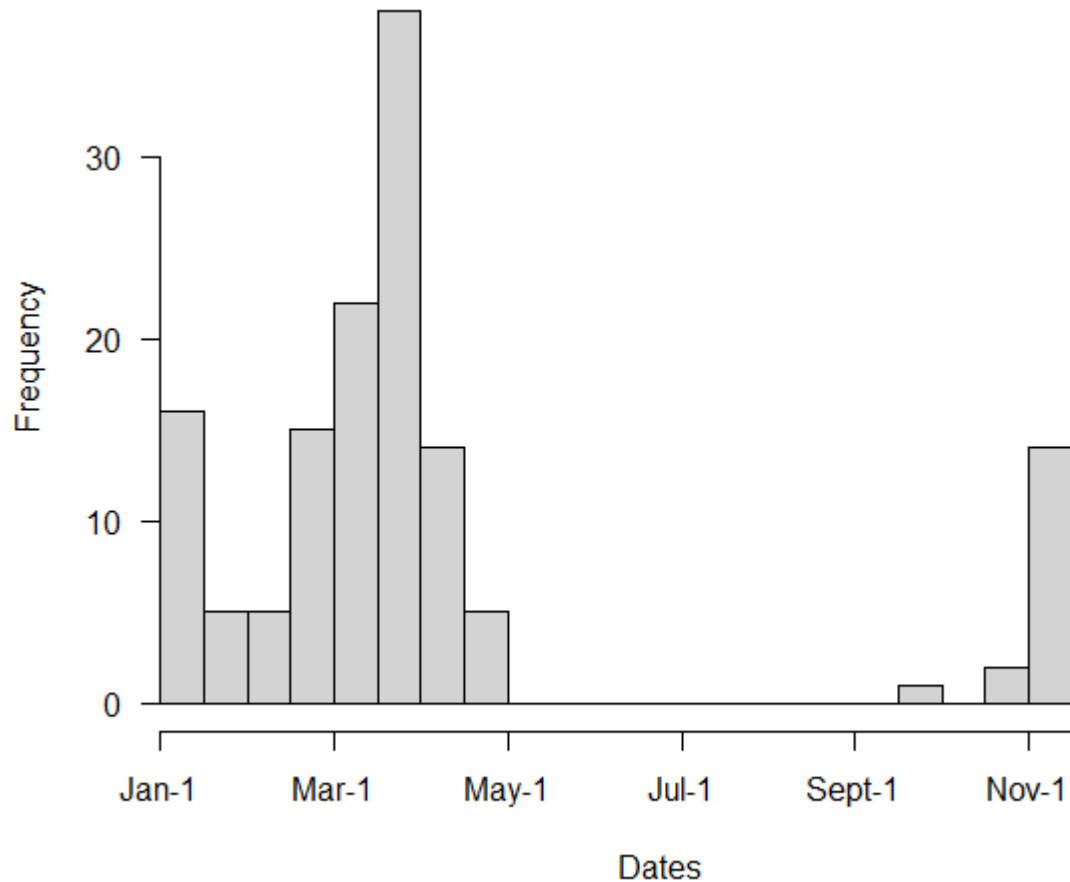


FIG. 7. Critical dissolved oxygen levels (P_c) for steelhead embryos and alevins incubated at 6, 9, 12, and 15°C. *bc*, blastopore closure; *e*, eyed; *h*, hatch; *mtw*, maximum tissue wet weight. Error bars give 95% confidence limits for P_c . Horizontal arrows indicate oxygen concentrations at 100% ASV.

Figure 15 Histogram of the start of peak spawning for resident trout populations in Oregon: Coastal Cutthroat, Lahontan Cutthroat, Westslope Cutthroat, Rainbow, Redband, and Mountain Whitefish.



3.6 Other Alternatives Considered but not Adopted

3.6.1 Non-salmonid Indicator Species for Core Cold-Water Habitat

3.6.1.1 Native Amphibians

DEQ evaluated the potential of thirteen species of native frogs, salamanders, and turtles to serve as additional biological indicators of Core Cold-Water habitats. Either because their presence would indicate waters that would remain below 16°C throughout the summer, or because they are cold-water obligate species requiring that level of thermal protection.

As many amphibian species are generalists that can inhabit both aquatic and terrestrial habitats, suitability of an amphibian species to serve as an indicator of Core Cold-Water Habitat relies on a few factors. Potential indicator species would be those that are cold water obligate, meaning they require cold aquatic habitats to survive. Their geographic distributions should be limited to, and therefore

indicate, presence of high-quality cold-water habitat that could be expected to remain at or below 16°C throughout the summer in a typical year.

Additionally, otherwise thermally suitable stream habitats remain unoccupied by salamanders due to other ecological factors, such as sediment type, presence of predators or competitors, historical dispersal processes, or other disturbances not related to temperature. Many cold-water salamander distributions appear to overlap with areas in Oregon with high concentrations of existing habitats designated for core cold-water or Bull Trout spawning and rearing in the headwater areas where these species are found.

With input from our technical workgroup and additional input from amphibian experts at the ODFW, DEQ identified several candidate species of native stream associated amphibians whose thermal tolerances might indicate conditions likely to maintain temperatures consistent with the 16°C limit of the core cold-water designation (Table 10).

Based on thermal preference data from the literature, DEQ identified four distinct groups of native amphibians with thermal preferences that potentially overlap with the core cold-water use designation. DEQ made a detailed review of the literature and publicly available data about range habitat within Oregon to further evaluate range and thermal requirements of these species. They are:

1. Tailed frogs (genus *Ascaphus*)
2. Torrent salamanders (genus *Rhyacotriton*)
3. Dunn's and Redback salamanders (genus *Plethodon*)
4. Yellow Legged Frogs (genus *Rana*)

3.6.1.2 Tailed frogs

The thermal tolerance of both the Coastal Tailed Frog *Ascaphus truei* are among the lowest known for North American amphibians. Coastal tailed frogs have a preferred thermal range of less than 16°C for adults and larvae approximately 18°C (Dupuis and Committee on the Status of Endangered Wildlife in Canada 2012). However, Coastal Tailed Frogs are most commonly observed in terrestrial habitats (Welsh and Lind 2002).

3.6.1.3 Giant and Torrent salamanders

The thermal tolerance of the Giant and Torrent Salamanders (*Rhyacotriton*) are also among the lowest North American amphibians. Species in this genus have a preferred thermal range of 12-16°C (Bury, 2008). However, Coastal Tailed Frogs are generalist species that occupy both stream habitats and terrestrial habitats. They are commonly observed occupying terrestrial habitats. The U.S. Fish and Wildlife Service is conducting a status review of the Cascade and Columbia torrent salamanders (*Rhyacotriton cascadae* and *R. kezeri*) as of 2021.

Despite their often low thermal preferences, tailed frogs and giant salamanders appear to be an unsuitable indicator species for core cold-water habitat. ODFW biologists²⁵ indicate they typically

²⁵ Emily VanWyk, Strategy Species Coordinator, Oregon Department of Fish and Wildlife. Personal communications.

occupy specific microhabitats and have limited mobility. For example, this species may be found in deep pools that are cold and thermally suitable, but not characteristic of conditions within the stream reach. The coastal giant has a long terrestrial component to its life cycle and is usually observed when in its terrestrial form. Presence of the terrestrial form does not necessarily indicate cold stream conditions.

3.6.1.4 Dunn's and Western Redback salamanders

There is little data on the full range of thermal tolerance of Dunn's and Western redback salamanders. Preferences may include temperatures as low as 10°C. The remaining native species candidates have a broad thermal tolerance: painted turtles, foothill yellow-legged frogs, and northern red-tailed frogs have thermal preferences greater than the 16°C range.

3.6.1.5 Foothills Yellow Legged Frogs

See analysis under the Cool Water Species designation below.

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Table 10 Thermal tolerances of native freshwater amphibians

Species	Adult preferred (°C)	Adult critical maximum (°C)	Egg/Larvae Preferred (°C)	Egg/Larvae critical maximum (°C)	References
Cascade Torrent Salamander (<i>Rhyacotriton cascadae</i>)	5-16	27.9	N/A	N/A	(Pollett et al 2010) (Bury 2008) (Brattstrom 1963).
Southern Torrent Salamander (<i>Rhyacotriton variegatus</i>)	5-16	27.9	N/A	26.7	(Pollett et al 2010) (Bury 2008) (Brattstrom 1963).
Columbia Torrent Salamander (<i>Rhyacotriton kezeri</i>)	5-16	27.9	N/A	26.7	(Bury 2008) (Brattstrom 1963).
Coastal Tailed Frog (<i>Ascaphus truei</i>)	<16	22-24	5-18	18.5	(Welsh and Lind 2002) (BCME 2015) (COSEWIC 2012).
Rocky Mountain Tailed Frog (<i>Ascaphus montanus</i>)	N/A	16-22	N/A	N/A	(Adams and Frissel 2001)
Cope's Giant Salamander (<i>Dicamptodon copei</i>)	3-16.2	21	N/A	29.1	(Brattstrom 1963) (Wagner 2014) (Bury 2008).
Northern Red-legged Frog (<i>Rana aurora</i>)	"Relatively Low"	"Relatively Low"	N/A	21	(Licht 1971) (Syype 1974).
Coastal Giant Salamander (<i>Dicamptodon tenebrosus</i>)	12-18	N/A	N/A	29.1	(Brattstrom 1963) (Wagner 2014) (Bury 2008).

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Species	Adult preferred (°C)	Adult critical maximum (°C)	Egg/Larvae Preferred (°C)	Egg/Larvae critical maximum (°C)	References
Foothill Yellow-legged Frog (<i>Rana boylei</i>)	17.5-19	N/A	19-24	26.7	(Catenazzi and Kupferberg 2013) (Railsback 2016) (Kupferberg et al 2011)
Painted Turtle (<i>Chrysemys picta</i>)	"Broad"	"Broad"	"Broad" 26-30	"Broad"	(Bodensteiner et al. 2019)
Dunn's salamander (<i>Plethodon dunnii</i>)	7-13	30-31	N/A	N/A	(Dumas 1956) (Brattstrom 1963)
Western Redback Salamander (<i>Plethodon vehiculum</i>)	7-10	30-31	N/A	N/A	(Dumas 1956) (Brattstrom 1963)

3.6.1.6 Pacific Lamprey

Pacific lamprey (*Entosphenus tridentatus*) was listed as an Oregon State sensitive species²⁶ in 1993 and were given further legal protected status by the state in 1996 through restriction of harvest and harvest methods (OAR 635-044-0130). Adult lampreys spend 1 to 3 years in the marine environment, and the Pacific lampreys cease feeding and migrate to freshwater between February and June with the period of highest activity in May. Lacking sufficient knowledge on lamprey life histories, Pacific lampreys were thought to be distributed wherever salmon and steelhead occurred and believed to spawn in similar habitats to salmon- in gravel bottomed streams, at the upstream end of riffle habitat (DEQ 1995b).

Pacific Lamprey are only found above dams if there is adequate fish passage, however adult lamprey may have greater potential for passing small and constricted stream reaches than spawning salmonids. The Salmon & Trout Rearing and Migration, Core Cold-Water, and Bull Trout use subcategories are applied to waters upstream unless a more stringent use applies. Therefore, it is expected that criteria applied to waters with these designations would also protect lamprey upstream in waterbodies otherwise inaccessible to adult salmon, steelhead, and trout.

Table 11 Thermal tolerance of pacific lamprey (*Entosphenus tridentatus*)

Biological Endpoint	Temperature (°C)	References
Adult preference	< 20	(Mallatt 1983)
Adult critical maximum	> 20-25	(Mallatt 1983), (Meeuwig et al. 2003)
Egg preference	10-18	(Meeuwig et al. 2003), Brumo, 2006 and Meeuwig, 2005 <i>in</i> (Luzier et al. 2011), Kan, 1975 <i>in</i> (Close et al. 1995)
Egg critical maximum	22-25	USFS 2007, (Meeuwig et al. 2003), Brumo, 2006 and Meeuwig, 2005 <i>in</i> (Luzier et al. 2011), Mallat, 1975 <i>in</i> (Close et al. 1995).
Larval preference	17.8 – 21.8	Holmes and Lin 1994 and Meeuwig, 2003 <i>in</i> (Close et al. 1995)
Larval critical maximum	22	USFWS, 2007 Meeuwig, 2003 <i>in</i> (Close et al. 1995)

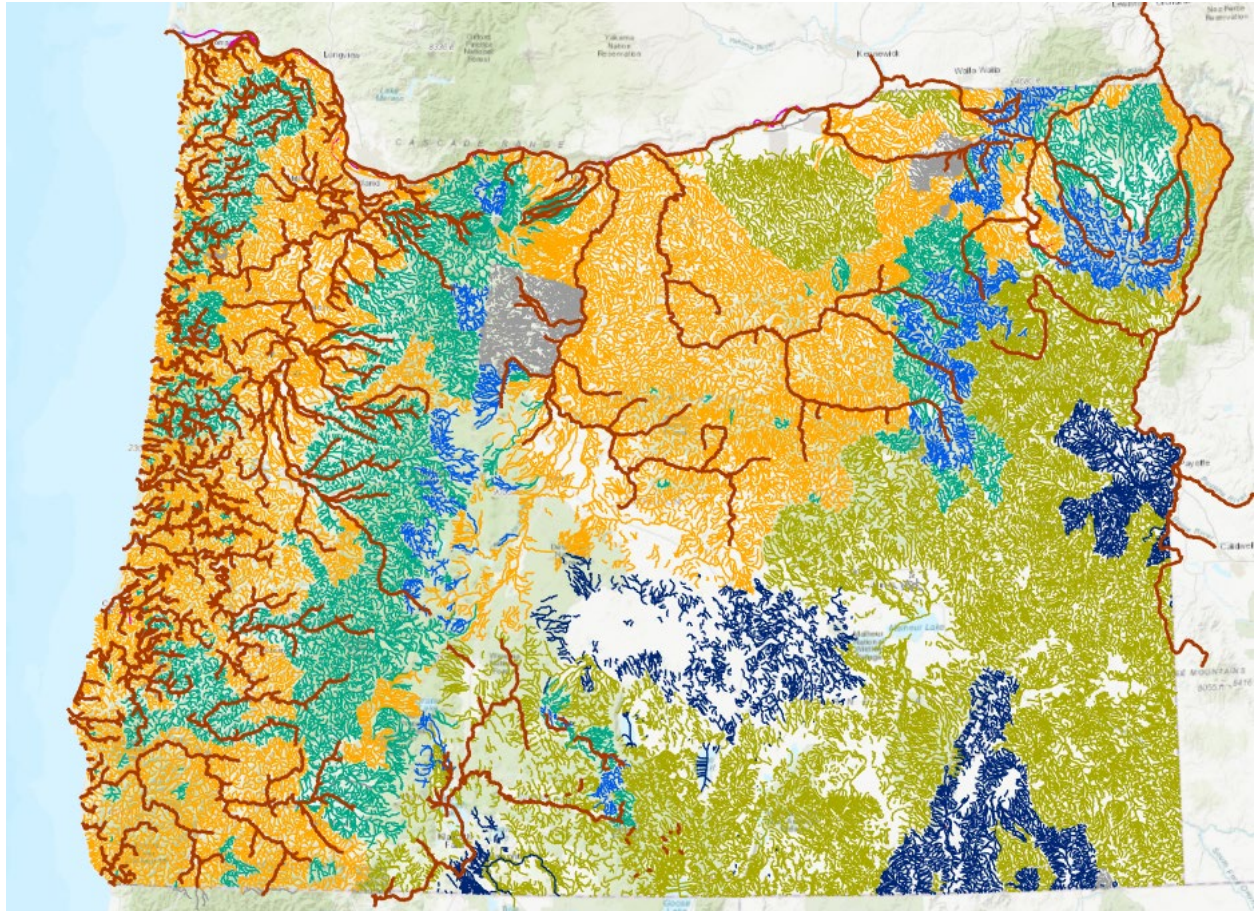
Temperatures for Oregon's "Salmon and Steelhead Spawning through Emergence" criteria of 13°C is within the lower end of the optimal range for lamprey egg and larval survival and development. Application of the Salmon & Steelhead spawning uses would protect co-occurring lamprey spawning where in effect. Additionally, the year-round criteria for salmon and trout rearing and migration of 18°C matches the upper end of the optimal range for eggs and is within the optimal range for larvae and adults. As a worst case, applying the aquatic life use for Salmon & Trout Rearing and Migration, or any of the more stringent year-round aquatic life uses, would be protective of lamprey for spawning, regardless of the specific timing or location.

Therefore, DEQ did not find that pacific lamprey is a suitable indicator species for designating the Core Cold-Water aquatic life use subcategory. Due to a higher thermal tolerance than the most sensitive salmon & steelhead species, suitable protection for lamprey is likely to be provided by any of the temperature fish use subcategories as applied (Figure 16).

²⁶ "Sensitive Species" refers to fish and wildlife that are facing one or more threats to their populations and/or habitats. Consistent with OAR 635-100-0040(2), "Sensitive Species" are defined as having small or declining populations, are at-risk, and/or are of management concern.

https://www.dfw.state.or.us/wildlife/diversity/species/docs/Sensitive_Species_List.pdf

Figure 16 Distribution of Lamprey relative to proposed aquatic life use subcategory designations for temperature. Lamprey (brown, bold), Bull Trout Spawning and Rearing (light blue), Core Cold Water Habitat (green), Salmon and Trout Rearing and Migration (Orange), Redband and Lahontan Cutthroat Trout (olive), Cool Water Species (dark blue).



3.6.1.7 Freshwater Mussels

Four species of freshwater mussels are native to Oregon: Western Pearlshell (*Margaritifera falcata*), Oregon floater (*Anodonta oregonensis*), Western ridged mussel (*Gonidea angulata*), and Winged floater (*Anodonta nuttalliana*) (Nedeau and Xerces Society 2009). All native species but the Oregon Floater are considered vulnerable and have been identified as species of concern for state and federal managers (Blevins et al. 2018).

Most published studies of tolerances for freshwater mussels are for other interior U.S. and Atlantic coast species. Freshwater mussels of the west coast United States have a wide geographic range of distribution. Data on optimal and lethal thermal tolerance specific to the species native to Oregon is not yet available. Spawning and metamorphoses may require temperatures on the order of 15°C (Watters and O’Dee 1999, Taeubert and Geist 2013). Mussels that use salmonid hosts during their life cycle (*Glochidia spp.*) may have similar thermal requirements to the salmonids.

There is a lack of specific habitat distribution data for these species within Oregon (Blevins et al. 2018, Blevins 2020). These species also tend to thermoregulate by burrowing to occupy cooler micro-habitats or thermal refuge, so are not precise indicators of in-stream temperature conditions (Blevins et al. 2019).

DEQ does not find that freshwater mussels are a suitable indicator species for designating the Core Cold-Water aquatic life use subcategory. Due to lack of data about thermal requirements and because of broad latitudinal distribution, the native freshwater mussels are unlikely to be suitable indicators for streams with temperatures consistently below 16°C. Given the broad geographic range, the use subcategories designated to protect salmonid species may be expected to conserve native freshwater mussels as well.

3.6.2 Additional indicator species for designating Cool Water Species

Foothill Yellow-Legged Frog (*Rana boylei*) is a Federal ‘Species of concern’, currently under review for listing under the Endangered Species Act. The species was proposed for 'threatened' status for population segments in California in December 2021, but no critical habitat has been determined at this time. Distinct population segments within Oregon were not proposed for 'threatened' status. The yellow-legged frog is a

warm-water dependent species with a relatively high thermal range of 8-27°C preferred (Olson and Davis 2009, Kupferberg et al. 2011, Catenazzi and Kupferberg 2013, Railsback et al. 2016). Breeding occurs in slow-flowing habitats that are < 70 cm deep with water temperatures 16-22°C on average with a preference for 18-19°C (Wheeler et al. 2015). Below-natural temperatures cause developmental delays that reduce overwinter survival (Lind and Wilson 1996, Railsback et al. 2016), therefore this species is a good candidate for a native, sensitive, biological indicator for the Cool Water aquatic life use subcategory. Thermal stress is not listed as one of the threats contributing to the proposed 'threatened' status for California (Hayes et al. 2016).

Foothill yellow-legged frogs are more common in lower headwater streams, approximately 2nd-6th order. They also occupy slow-moving side channels and near-bank habitats, which are likely to be warmer than the deep, fast flowing areas where temperature measurements for assessing Oregon's temperature criteria are typically collected. The species distribution is relatively limited and their range in Oregon is primarily in SW Oregon west of the Cascade mountain range (Olson and Davis 2009). Foothill yellow-legged frogs co-exist with salmonid species, but thermal requirements for frog and salmonid spawning through emergence occur in contrasting habitats. Frogs require warmer conditions than salmonids for reproduction. Foothill yellow legged frog spawning was naturally separated from salmonid spawning in space or time within watersheds (Railsback et al. 2016), with the frogs often migrating downstream to warmer waters around the time salmonids are migrating upstream for cooler waters to spawn. They are also difficult to detect outside the breeding season, which spans approximately late March to May 1st. Detailed habitat distribution and suitability data is available because of the 2021 federal listing review process.

With the assistance of ODFW, DEQ reviewed the available habitat distribution data for the Foothill Yellow-Legged Frog to evaluate the potential for use as an indicator species providing an additional line of evidence for designation of waters as Cool water aquatic life, in waterbodies where salmonid use, especially spawning through emergence use, are not indicated in July and August. The habitat distribution of the yellow-legged frog does not overlap with any waters being considered for the Cool Water aquatic life designation, so no further action regarding aquatic life use designations that account for this species is considered at this time. DEQ is monitoring the results of federal listings for Oregon and whether any specific thermal requirements for the foothills yellow-legged frog emerge that could be addressed through Oregon's aquatic life use designations.

Appendix A:

Reading-friendly summary of decision rule methods and flow-charts TBD.

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Appendix B: Inventory and crosswalk of data sources and attributes applied to decision rules 2003-2022

Aquatic Life Use Subcategory	Original 2003 Data Sources and Attributes:	Equivalent 2022 Data Sources and Attributes:
Salmon and Trout Juvenile Rearing and Migration	Salmon or steelhead rearing occurs in the summer: <ul style="list-style-type: none"> • ODFW fish distribution database (2003) various salmon or steelhead species (rearing) • ODFW (2003) – Timing tables (rearing occurs July or August) 	<ul style="list-style-type: none"> • ODFW-FHD (2022) – Coho, Chum, Sockeye, spring and fall Chinook salmon; summer and winter steelhead - (Primarily rearing) • ODFW (2022) – Timing tables (Rearing or adult upstream migration occurs in July or August)
	-OR-	
	Resident salmonid rearing occurs in the summer: <ul style="list-style-type: none"> • ODFW database (2003), rainbow or coastal cutthroat trout (resident, rearing) • ODFW (2003) – Timing tables (rearing occurs July or August) 	<ul style="list-style-type: none"> • ODFW-FHD (2022) – Rainbow, Redband, Coastal, West Slope, and Lahontan Cutthroat Trout, and Mountain Whitefish. (Primarily rearing, Resident) • ODFW (2022) – Timing tables (Rearing occurs in July or August)
Core Cold-Water Habitat	Waters where Spring Chinook salmon spawn early, i.e., during the late summer months; August 1 to Sept. 15: <ul style="list-style-type: none"> • ODFW fish distribution database (2003) 	<ul style="list-style-type: none"> • ODFW-FHD (2022) – Spring Chinook salmon (Primarily spawning) • ODFW (2022) – Timing tables (“Peak” or “Lesser” spawning use that starts on or before September 15)

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Aquatic Life Use Subcategory	Original 2003 Data Sources and Attributes:	Equivalent 2022 Data Sources and Attributes:
	<p>spring Chinook (Spawning)</p> <ul style="list-style-type: none"> • ODFW (2003) – Timing tables (Spawning August 1 to September 15) 	
-OR-		
	<p>Waters having sub-adult and adult Bull Trout presence and foraging during July or August:</p> <ul style="list-style-type: none"> • USFWS proposed critical habitat (67 FR 71236, November 29, 2002) for sub-adult and adult Bull Trout use - 'Feeding, migration, overwintering reaches- "FMO") • 2003 ODFW – Timing tables (Bull Trout presence in July or August) 	<ul style="list-style-type: none"> • ODFW-FHD (2022) - Bull Trout - "Primarily Rearing", "Foraging, migration, overwintering", or 'Resident – Multiple Uses' • USFWS Critical Habitat Designation (2010) – Feeding, migration, overwintering reaches- "FMO") • ODFW–Timing tables (2022) (any "peak" or "lesser" or specific "presence" Bull Trout use occurs in July or August)
-OR-		
	<p>Waters where available water temperature data indicate that the current stream temperature for the warmest week of the year is 16.0°C or below:</p> <ul style="list-style-type: none"> • ODEQ LASAR database (2003) - Temperature data 	<ul style="list-style-type: none"> • DEQ Assessment Database –temperature (2018/2020) including DEQ-AWQMS and 3rd party data. • USFS-NorWeST (2019)-observed temperature data.
-OR-		

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Aquatic Life Use Subcategory	Original 2003 Data Sources and Attributes:	Equivalent 2022 Data Sources and Attributes:
	Waters identified as “anchor habitat”: <ul style="list-style-type: none"> EcoTrust (2000) Anchor habitat study 	<ul style="list-style-type: none"> Omitted.
	-OR-	
	N/A	Waters supporting late steelhead spawning: <ul style="list-style-type: none"> ODFW-FHD (2022) – summer/winter steelhead (‘Primarily spawning with some rearing’) ODFW–Timing tables (2022) - ‘Late’ spawning steelhead (“Peak” adult spawning use occurs on June 1 or later)
Bull Trout Spawning & Juvenile Rearing	Waters where ODFW indicates Bull Trout primarily spawning and early life stage rearing habitat occurs: <ul style="list-style-type: none"> <i>Bull Trout Habitat Designation Report: Technical Work Group Recommendations</i> (DEQ, 2003), habitat where Bull Trout spawning occurs or where the dominant age classes include 0, 1, year round use (BTHD1). 	<ul style="list-style-type: none"> ODFW-FHD (2022) - Bull Trout - (‘Primarily spawning with some rearing’)
	-OR-	

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Aquatic Life Use Subcategory	Original 2003 Data Sources and Attributes:	Equivalent 2022 Data Sources and Attributes:
	<p>Waters identified as potential Bull Trout spawning and juvenile rearing habitat that is necessary for long-term health and viability of Bull Trout populations consistent with recovery plans and restoration goals:</p> <ul style="list-style-type: none"> • <i>Bull Trout Habitat Designation Report: Technical Work Group Recommendations</i> (DEQ, 2002), habitat with potential to support spawning or rearing <i>necessary for long-term health and viability of Bull Trout populations ('BTHD3')</i>. 	<ul style="list-style-type: none"> • Includes <i>Bull Trout Habitat Designation Report (2002)</i> potential habitat ('BTHD3'), pending review from joint ODFW-USFWS statewide Bull Trout working group to determine which habitats are "potential Bull Trout spawning habitat necessary for long-term health and viability," consistent with recovery plans and restoration goals. • Addition of some ODFW-FHD (2022) - Bull Trout ('Historical') & ('Resident') habitats if identified by the statewide working groups.
	-OR-	
	<ul style="list-style-type: none"> • USFWS' proposed draft critical habitat for Bull Trout juvenile spawning and rearing (USFWS, 2002) ('SR') critical spawning and rearing habitat. 	<p>Waters identified by the USFWS 2010 final critical habitat rule as Bull Trout spawning and rearing habitat, including 33 miles of habitat USFWS asked DEQ to add in their 2014 Biological Opinion on Oregon's temperature standards:</p> <ul style="list-style-type: none"> • USFWS Final critical habitat rule (2010) - spawning and rearing ('SR') • USFWS 2015 Biological Opinion – RPA specific additions, if different

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Aquatic Life Use Subcategory	Original 2003 Data Sources and Attributes:	Equivalent 2022 Data Sources and Attributes:
<p>Redband and Lahontan Cutthroat Trout</p>	<p><i>Attachment C2: Summary of the Discussion and Findings of the Temperature Technical Advisory Committee</i></p> <ol style="list-style-type: none"> 1. ODFW fish distribution database (2003) resident <i>O. mykiss</i> subspecies “Redband Trout” are resident or present (Redband Trout) 2. USFWS and/or ODFW shows the presence of Lahontan cutthroat trout. 	<ul style="list-style-type: none"> • ODFW-FHD Redband or Lahontan Cutthroat Trout (‘Resident- Multiple Uses’), (‘Foraging, ‘Migration and Overwintering’), (‘Primarily Rearing with some Migration’), (‘Primarily Spawning with some rearing’), and (‘Unknown’) life-stage activities.
	-AND-	
	<ol style="list-style-type: none"> 3. ODFW fish distribution database (2003) - waters that do not currently have anadromous <i>O. mykiss</i> (steelhead) populations 	<ul style="list-style-type: none"> • ODFW-FHD (2022) shows no habitat use by anadromous summer or winter steelhead.
	-AND-	
	<ol style="list-style-type: none"> 4. <i>Oregon Water Resources Department administrative basins</i> in the following basins: <ul style="list-style-type: none"> • Goose and Summer Lakes Basin • Malheur Lake Basin • Powder River Basin • Burnt River Sub-Basin • Malheur River Basin • Owyhee River Basin 	<p>No change.</p>

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Aquatic Life Use Subcategory	Original 2003 Data Sources and Attributes:	Equivalent 2022 Data Sources and Attributes:
	<ul style="list-style-type: none"> • Klamath River Basin • Umatilla River Basin • Walla Walla Sub-Basin 	
Salmon and Steelhead Migration Corridors	<p>Migration is primary use.</p> <ul style="list-style-type: none"> • Professional judgement. 	<ul style="list-style-type: none"> • ODFW-FHD (2022) - Coho, Chum, Sockeye, spring and fall Chinook salmon, or summer and winter steelhead. – (‘Primarily migration’).
	-AND-	
	<p>Limited juvenile salmon & steelhead rearing in July or August.</p> <ul style="list-style-type: none"> • ODFW (2003) – Timing tables (no peak rearing occurs July or August) • Professional judgment. 	<p>ODFW (2022) – Timing tables - Coho, Chum, Sockeye, spring and fall Chinook salmon, or summer and winter steelhead ((no “Peak” juvenile rearing use occurs between July 1 and August 30); Coho, Chum, Sockeye, spring and fall Chinook salmon, or summer and winter steelhead , Rainbow, Redband, Coastal, West Slope, and Lahontan Cutthroat Trout, Bull Trout, and Mountain Whitefish - (no “Peak” adult migration, spawning, holding, or egg incubation & emergence use occurs between July 1 and August 30))</p>
	-AND-	

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Aquatic Life Use Subcategory	Original 2003 Data Sources and Attributes:	Equivalent 2022 Data Sources and Attributes:
	<p>Some evidence to suggest that temperatures would naturally reach or exceed 18°C/64°F.</p> <ul style="list-style-type: none"> • Multiple lines of evidence • Professional judgement • Typically, lower mainstem rivers. 	<p>Estimates of natural or restored thermal potential from:</p> <p>Federal and State agency models</p> <p>OR-DEQ TMDL models (Heatsource)</p> <p>Published studies</p>
Cool Water Species	<p>No salmonid species use.</p> <ul style="list-style-type: none"> • ODFW Database (2003) 	<ul style="list-style-type: none"> • ODFW-FHD (2022) - Coho, Chum, Sockeye, spring and fall Chinook salmon; summer and winter steelhead; Rainbow, Redband, Coastal, West Slope, and Lahontan Cutthroat Trout, Bull Trout, and Mountain Whitefish. – (no habitat uses).
	<p>No salmonid uses in July – August.</p> <ul style="list-style-type: none"> • ODFW (2003) – Timing tables (no uses occurs July or August) 	<p>-OR-</p> <ul style="list-style-type: none"> • ODFW (2022) – Timing tables - Coho, Chum, Sockeye, spring and fall Chinook salmon; summer and winter steelhead; Rainbow, Redband, Coastal, West Slope, and Lahontan Cutthroat Trout, Bull Trout, and Mountain Whitefish (no salmonid use occurs in July or August).

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Aquatic Life Use Subcategory	Original 2003 Data Sources and Attributes:	Equivalent 2022 Data Sources and Attributes:
<p>Borax Lake Chub (Warm Water Species)</p>	<p>OAR-340-041-0028 (10):</p> <p>State waters in the Malheur Lake Basin supporting the Borax Lake chub.</p> <ul style="list-style-type: none"> • Designated for Borax Lake and its outlet. 	<p>No change.</p>
<p>Salmon & Steelhead Spawning</p>	<p>In waters designated by ODFW as “Primarily Spawning” for populations of Coho, Spring Chinook, Fall Chinook, Chum, or Sockeye salmon, and summer or winter Steelhead trout.</p> <ul style="list-style-type: none"> • ODFW Database (2003) 	<ul style="list-style-type: none"> • ODFW-FHD (2022) – Coho, Chum, Sockeye, spring and fall Chinook salmon; summer and winter steelhead; - (‘Primarily spawning’)
	<p>-AND-</p>	<p>-AND-</p>
	<p>Spawning through emergence use shall be applied on the following dates:</p> <ul style="list-style-type: none"> • ODFW– Timing tables (2003) - (‘adult spawning’), and (‘egg development through fry emergence’) 	<ul style="list-style-type: none"> • ODFW Timing tables (2022) - Coho, Chum, Sockeye, spring and fall Chinook salmon; summer and winter steelhead; - (‘adult spawning’), and (‘egg development through fry emergence’)

Appendix C: List of data sources

Originator	Data Set	Type	Source
Oregon Department of Fish and Wildlife	Fish Habitat Distribution Database	Habitat surveys, professional opinion, and habitat suitability models	https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=1167.xml
Oregon Department of Fish and Wildlife	Timing / In Water Work Unit Database	Locations of life stage timing	https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=timinggisdata
Oregon Dept. of Fish and Wildlife	Life stage Activity Timing Tables	Observed timing of life stage presence and habitat use	https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=timingtables
U.S. Fish and Wildlife Service	Bull Trout Critical Habitat Designation	Habitat surveys	https://www.fws.gov/pacific/bulltrout/finalcrithab/BT_FCH_GIS_2010.zip
U.S. Forest Service	NorWeST Observed Temperature Data	Observed water temperatures	https://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST/StreamTemperatureDataSummaries.shtml
Oregon Department of Environmental Quality	2020 & 2022 State Final Integrated Report Numeric Databases	Observed water temperatures	https://rstudioconnect.deq.state.or.us/content/0a964958-6ad4-49a4-aca0-54a644b96357/
U.S. Geological Survey	U.S. Geological Survey data release	Occurrence locations and trait data for freshwater fishes, amphibians, and reptiles native to the state of Oregon	https://www.sciencebase.gov/catalog/item/5bbd20f2e4b0fc368eacb96a

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Originator	Data Set	Type	Source
U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center	U.S. Geological Survey data release	Foothill yellow-legged frog (<i>Rana boylei</i>) surveys in Oregon 2019	https://www.sciencebase.gov/catalog/item/5db72623e4b0b0c58b5a48ad

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Literature Cited

- Arntzen, E. V., D. R. Geist, K. J. Murray, J. Vavrinec, E. M. Dawley, and D. E. Schwartz. 2009. Influence of the hyporheic zone on supersaturated gas exposure to incubating chum salmon. *North American Journal of Fisheries Management* 29:1714–1727.
- Blevins, E. 2020. Opportunities for Freshwater Mussel Conservation in the Pacific Northwest and Intermountain West in a Changing Climate:49.
- Blevins, E., L. McMullen, S. Jepsen, M. Blackburn, and A. Code. 2018. Conserving the Gems of Our Waters:116.
- Blevins, E., L. McMullen, S. Jepsen, M. Blackburn, and A. Code. 2019. Mussel-Friendly Restoration:38.
- Bowers, J. 2020. Stewardship Plan for the Oregon Fish Habitat Distribution Database. Oregon Department of Fish and Wildlife, Salem, Oregon.
- Buchanan, D. V., M. L. Hanson, and R. M. Hooton. 1997. Status of Oregon's Bull Trout. Oregon Department of Fish and Wildlife.
- Catenazzi, A., and S. J. Kupferberg. 2013. The importance of thermal conditions to recruitment success in stream-breeding frog populations distributed across a productivity gradient. *Biological Conservation* 168:40–48.
- Close, D., B. Parker, and Gary James. 1995. Status Report of the Pacific Lamprey (*Lampetra Trzdentata*) in the Columbia River Basin.
- DEQ. 1995a. 1992-1994 Water Quality Standards Review Dissolved Oxygen Issue Paper. Oregon Department of Environmental Quality, Technical Advisory Committee, Dissolved Oxygen Technical Subcommittee, Policy Advisory Committee.
- DEQ. 1995b. 1992-1994 Water Quality Standards Review Temperature Issue Paper. Page 126. Oregon Department of Environmental Quality, Technical Advisory Committee, Temperature Technical Subcommittee, Policy Advisory Committee.
- DEQ. 2003. Bull Trout Habitat Designation: Technical Work Group Recommendations. Oregon Department of Environmental Quality, Program, Policy, and Project Assistance Section, Water Quality Division.
- DEQ. 2018. Western Hood Subbasin Temperature Total Maximum Daily Load. Revision to the 2001 Western Hood Subbasin TMDL. Oregon Department of Environmental Quality.
- Dupuis, L. A. and Committee on the Status of Endangered Wildlife in Canada. 2012. COSEWIC assessment and status report on the coastal tailed frog, *Ascaphus truei*, in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa.
- Ecotrust. 2000. A Salmon Anchor Habitat Strategy for the Tillamook and Clatsop State Forests. <https://web.archive.org/web/20160805161700/http://inforain.org/anchorhabitats/index.html>.
- EPA. 1986a. Quality Criteria for Water, 1986 (Gold Book). U.S. Environmental Protection Agency, Office of Water.
- EPA. 1986b. Ambient Water Quality Criteria for Dissolved Oxygen. Page 35pp. U.S. Environmental Protection Agency, Office of Water.
- EPA. 2003. EPA Region 10 Guidance For Pacific Northwest State and Tribal Temperature Water Quality Standards. U.S. Environmental Protection Agency, Region 10, Office of Water, Seattle, WA.
- EPA. 2007. Level III Ecoregions of the Conterminous United States in BASINS. U.S. Environmental Protection Agency, Office of Water/Office of Science and Technology, Washington, D.C.
- Esri Inc. 2021. ArcGIS Pro (Version 2.5).
- Geist, D. R., E. V. Arntzen, C. J. Murray, K. E. McGrath, Y. J. Bott, and T. P. Hanrahan. 2008. Influence of river level on temperature and hydraulic gradients in chum and fall Chinook salmon spawning areas downstream of Bonneville Dam, Columbia River. *North American Journal of Fisheries Management* 28:30–41.
- Geist, D. R., T. P. Hanrahan, E. V. Arntzen, G. A. McMichael, C. J. Murray, and Y. J. Chien. 2002. Physicochemical characteristics of the hyporheic zone affect redd site selection of chum salmon and fall Chinook salmon in the Columbia River. *North American Journal of Fisheries Management* 22:1077–1085.
- Hayes, M. P., C. A. Wheeler, A. J. Lind, G. A. Green, and D. C. Macfarlane. 2016. Foothill yellow-legged frog conservation assessment in California. Gen. Tech. Rep. PSW-GTR-248. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 193 p. 248.
- Hubler, S., D. D. Huff, P. Edwards, and Y. Pan. 2016. The Biological Sediment Tolerance Index: Assessing fine sediments conditions in Oregon streams using macroinvertebrates. *Ecological Indicators* 67:132–145.
- Huff, D. D., S. L. Hubler, Y. Pan, and D. L. Drake. 2006. Detecting Shifts in Macroinvertebrate Assemblage Requirements: Implicating Causes of Impairment in Streams:38.
- Kupferberg, S. J., A. J. Lind, V. Thill, and S. M. Yarnell. 2011. Water Velocity Tolerance in Tadpoles of the Foothill Yellow-legged Frog (*Rana boylei*): Swimming Performance, Growth, and Survival. *Copeia* 2011:141–152.

- Lind, A. J., and R. A. Wilson. 1996. The Effects of a Dam on Breeding Habitat and Egg Survival of the Foothill Yellow-legged Frog (*Rana boylei*) in Northwestern California. *Herpetological Review* 27.
- Luzier, H. A. Schaller, J. K. Brostrom, C. Cook-Tabor, D. Goodman, R. D. Nelle, K. Ostrand, and B. Streif. 2011. Pacific Lamprey (*Entosphenus tridentatus*) Assessment and Template for Conservation Measures. U.S. Fish and Wildlife Service, Portland, Oregon. 282 pp.
- Mallatt, J. 1983. Laboratory growth of larval lampreys (*Lampetra* (*Entosphenus*) *tridentata* Richardson) at different food concentrations and animal densities. *Journal of Fish Biology* 22:293–301.
- McCullough, D., S. Spalding, D. Sturdevant, and M. Hicks. 2001. Issue Paper 5: Summary of Technical Literature Examining the Physiological Effects of Temperature on Salmonids: Prepared as Part of EPA Region 10 Temperature Water Quality Criteria Guidance Development Project. Page 114. U.S. EPA, Region 10, EPA-910-D-01-005.
- Meeuwig, M., J. M. Bayer, and R. A. Reiche. 2003. Identification of Larval Pacific Lampreys (*Lampetra tridentata*), River Lampreys (*L. ayresi*), and Western Brook Lampreys (*L. richardsoni*) and Thermal Requirements of Early Life History Stages of Lampreys, Annual Report 2002-2003. Bonneville Power Administration (BPA), Portland, OR (United States).
- Miller, M., E. Iverson, and D. Essig. 2014. Geography and Timing of Salmonid Spawning in Idaho. Idaho Department of Environmental Quality.
- Mims, M., and D. P. Hockman-Wert. 2018. Occurrence locations and trait data for freshwater fishes, amphibians, and reptiles native to the state of Oregon. U.S. Geological Survey.
- Nedeau, E. J., and Xerces Society, editors. 2009. Freshwater mussels of the Pacific Northwest. 2nd ed. Xerces Society for Invertebrate Conservation, Portland, Or.
- NMFS. 1999. Biological and conference opinion on EPA’s approval of Oregon’s water quality standards for dissolved oxygen, temperature and pH, and accompanying conservation measures.
- NMFS. 2015. Endangered Species Act Biological Opinion on the Environmental Protection Agency’s Proposed Approval of Certain Oregon Water Quality Standards Including Temperature and Intergravel Dissolved Oxygen. Biological Opinion, United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.
- Olson, D. H., and R. J. Davis. 2009. Conservation Assessment for the Foothill Yellow-legged Frog (*Rana boylei*) in Oregon. Page 62. U.S. Department of Agriculture Forest Service Region 6 and U.S. Department of the Interior Oregon/Washington Bureau of Land Management Interagency Special Status Species Program, Portland, OR.
- Omernik, J. M. 1987. Ecoregions of the Conterminous United States. Map (scale 1:7,500,000). *Annals of the Association of American Geographers* 77:118–125.
- OR-DEQ. 2003a. Attachment H - A Description of the Information and Methods Used to Delineate the Proposed Beneficial Fish Use Designations for Oregon’s Water Quality Standards. Oregon Department of Environmental Quality.
- OR-DEQ. 2003b. Attachment C2 - A Summary of the Discussion and Findings of DEQ’s Technical Advisory Committee on Water Quality Criteria for Temperature. Oregon Department of Environmental Quality.
- Poole, G., J. Risley, and M. Hicks. 2001. Issue Paper 3: Spatial and Temporal Patterns of Stream Temperature (revised): Prepared as Part of EPA Region 10 Temperature Water Quality Criteria Guidance Development Project. US EPA, Region 10, p. 33, EPA-910-D-01-003.
- R Core Team. 2021. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.
- Railsback, S. F., B. C. Harvey, S. J. Kupferberg, M. M. Lang, S. McBain, and H. H. Welsh. 2016. Modeling potential river management conflicts between frogs and salmonids. *Canadian Journal of Fisheries and Aquatic Sciences* 73:773–784.
- Reeves, G. H., L. E. Benda, K. M. Burnett, P. A. Bisson, and J. R. Sedell. 1995. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of evolutionarily significant units of anadromous salmonids in the Pacific Northwest. *American Fisheries Society Symposium* 17:334–349.
- Richards, D. C., G. Lester, J. Pfeiffer, and J. Pappani. 2018. Temperature threshold models for benthic macroinvertebrates in Idaho wadeable streams and neighboring ecoregions. *Environmental Monitoring and Assessment* 190:120.
- Rombough, P. J. 1988. Growth, aerobic metabolism, and dissolved oxygen requirements of embryos and alevins of steelhead, *Salmo gairdneri*. *Canadian Journal of Zoology* 66:651–660.
- Taubert, J.-E., and J. Geist. 2013. Critical swimming speed of brown trout (*Salmo trutta*) infested with freshwater pearl mussel (*Margaritifera margaritifera*) glochidia and implications for artificial breeding of an endangered mussel species. *Parasitology Research* 112:1607–1613.
- U.S.EPA. 2007. Disapproval (partial) letter to Washington Department of Ecology on temperature standards.
- USFWS. 2015. U.S. Fish and Wildlife Service Biological Opinion/Letter of Concurrence/Conference Concurrence regarding U.S. Environmental Protection Agency’s Proposed Approval of Revised Oregon Water Quality Standards for Temperature and Intergravel Dissolved Oxygen. U.S. Department of the Interior, Fish and Wildlife Service.

- Watters, G. T., and S. H. O'Dee. 1999. Glochidia of freshwater mussel *Lampsilis* overwintering on fish hosts. *Journal of Molluscan Studies* 65:453–459.
- Welsh, H. H., and A. J. Lind. 2002. Multiscale Habitat Relationships of Stream Amphibians in the Klamath-Siskiyou Region of California and Oregon. *The Journal of Wildlife Management* 66:581.
- Wheeler, C. A., J. B. Bettaso, D. T. Ashton, and H. H. Welsh. 2015. Effects of Water Temperature on Breeding Phenology, Growth, and Metamorphosis of Foothill Yellow-Legged Frogs (*Rana boylei*): A Case Study of the Regulated Mainstem and Unregulated Tributaries of California's Trinity River: *Rana boylei* Reproduction, Development, Growth. *River Research and Applications* 31:1276–1286.

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