State of Oregon
DEQ Department of Environmental Quality

Memorandum

To: DEQ Water Quality Staff

From: Connie Dou, Water Quality Standards Program Manager

Date: Feb. 9, 2026

Subject: Implementation of Cool Water Species Narrative Criterion for the Long Tom River

Executive Summary

This memorandum describes Oregon Department of Environmental Quality's interpretation and application of the cool water species narrative criterion for temperature (Oregon Administrative Rule 340-041-0028(9)) in the Long Tom River (assessment unit: OR_SR_1709000301_02_103791) from Fern Ridge Lake to its confluence with the Willamette River. The designated aquatic life use for this reach is "cool water species" (OAR 340-041-0340, Figure 340A) and this interpretation is based on the native cool water species present and their thermal requirements.

Table 1: Summary of temperature narrative translator values implementing the cool water species narrative in the Long Tom River

Time period	Temperature Narrative Translator Value (°C 7dAM)	Most Temperature Sensitive Species
June 15 – Oct. 31	24.0	Redside shiner (*Richardsonius balteatus*)
Nov. 1 – June 14	18.0	Chinook Salmon (*Oncorhynchus tshawytscha*)

Introduction

The narrative cool water species criterion in OAR 340-041-0028(9)(a) states "No increase in temperature is allowed that would reasonably be expected to impair cool water species." This memorandum describes DEQ's interpretation and application of the Cool Water Species narrative criterion for temperature in the Long Tom River (assessment unit: OR_SR_1709000301_02_103791). This criterion is applicable in the Long Tom River, from Fern Ridge Lake to its confluence with the Willamette River (OAR 340-041, Figure 180A).

DEQ prepared findings in this memo in September 2023 and in the Total Maximum Daily Load for the Willamette Subbasins Technical Support Document, amended in May 2025. Rickreall Creek (Middle Willamette Subbasin) is also designated for cool water use but findings pertaining to Rickreall Creek are found in a separate memo.

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Summary

Under the CWA, states must designate the uses of a waterbody and provide water quality for the protection and propagation of fish, shellfish, and wildlife, where attainable (40 CFR 131.10(j)). The Long Tom River is designated for Fish & Aquatic Life use of Cool Water Species use from the mouth at the confluence with the Willamette River (river mile 0) to Fern Ridge Dam (approximate river mile 24.1). The cool water species temperature standard in rule at OAR 340-041-0028(9)(a) states that "No increase in temperature is allowed that would reasonably be expected to impair cool water species." DEQ bases its evaluations on the best available information and professional judgment. Pertinent information includes the species present and their thermal requirements.

DEQ followed the stepwise procedures outlined in the Temperature Water Quality Standard Implementation IMD to interpret the narrative provision of the cool water species criterion (DEQ, 2008, Section 3.12). DEQ's analysis included the following steps:

1) Evaluate applicability of criterion for trout and salmonid uses
    a. DEQ considered if it would be reasonable to apply the Redband & Lahontan Cutthroat Trout criterion of 20 °C plus the 0.3 degrees Celsius human use allowance to the reach. The value would still support cool water species, which have higher tolerance of warmer temperatures than trout.
    b. DEQ determined applying the Redband or Lahontan Cutthroat Trout criterion would not be reasonable because DEQ does not have enough information at present to determine if 20 degrees Celsius is attainable.
    c. There are periods when Chinook salmon are residing in the Long Tom River, which require temperatures less than 18 degrees Celsius.
2) Identify cool water species and thermal tolerances
    a. DEQ identified the cool water species present in the Long Tom River and compiled information on their thermal tolerance ranges.
    b. Then DEQ identified which of the cool water species has the most sensitive thermal tolerance range.
3) Determine the narrative temperature targets
    a. DEQ determined the narrative temperature translator value by the thermal tolerance range of the most sensitive cool water species using EPA recommended methods. A temperature target was also developed for the peak periods when Spring Chinook salmon are rearing.

Each of these steps are described in greater detail below.

Long Tom River cool water species evaluation

DEQ reviewed the ODFW fish habitat distribution database and life stage timing tables (ODFW, 2023) and consulted with the ODFW district biologist about the fish species in the lower Long Tom River watershed.

Long Tom River cool water species

Based on this information, DEQ determined the resident cool water species that may be present in the lower Long Tom River are:

- Chiselmouth *(Acrocheilus alutaceus)* (An EPA RIS "Representative Important Species" for Oregon)

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- Northern Pikeminnow *(Ptychocheilus oregonensis)*
- Redside Shiner *(Richardsonius balteatus)*
- Peamouth *(Mylocheilus caurinus)*
- Largescale Sucker (*Catostomus macrocheilus*)
- Mountain Sucker *(Catostomus platyrhynchus)*
- Sand Roller *(Percopsis transmontana)*
- Pacific Lamprey (*Entosphenus tridentatus*)

ODFW's information also shows that juvenile Spring Chinook salmon (*Oncorhynchus tshawytscha* may be present at least part of the year and Coastal Cutthroat trout (*Oncorhynchus clarkii*) are resident in tributaries to the lower reach and may utilize it for at least part of the year. Additionally, western pearlshell mussel (*Margaritifera falcata*) and western ridged mussel (*Gonidea angulate*) are present in the Willamette River side channels formed by the mouth of the Long Tom River, although these side channels receive flow from the Willamette mainstem and most of the side channel is designated for the 18.0ºC criterion for salmon and trout rearing and migration.

Based on review of available studies, Sand Roller and Redside shiner are the most temperature sensitive cool water species based on adult thermal tolerance and observed presence. Redside shiner has an upper lethal temperature threshold between 22.8°C and 27.7°C (Black, 1953) and Sand Roller have preference temperatures of up 24.0 degrees Celsius and a recommended acute threshold of 27.0°C (Gray and Dauble 1979; Parsley et al. 1989, Tiffan et al. 2017).

Spawning of Chiselmouth, Northern Pikeminnow, Peamouth, and Mountain Sucker could occur in the lower reach between April and July, based on observations of spawning timing from the Columbia River, British Columbia, Montana, and Nevada. However, exact spawning timing for these species in the lower reach is unknown. These species initiate spawning when water temperatures exceed 12°C -18°C (Gadomski et al. 2001; Gray and Dauble 2001, Montana FWP, 2023, Roberge et al. 2001, Roberge et al. 2002, and Snyder 1983). Spawning habitat within the lower reach between Monroe and Fern Ridge Reservoir may also be limited (Hutchison 1966). DEQ could not identify documentation of lethal maximum temperatures for egg incubation for these species. Spawning in these species appears to be initiated as temperatures warm to a certain level, and the species may shift spawning to times when temperatures are favorable (Gadomski et al. 2001). Moodie found there was no survival of incubated Chiselmouth eggs unless temperatures were greater than 12°C (Moodie, 1966). Minimum, rather than maximum, thermal requirements may be the limiting factor for distribution of Chiselmouth (Rosenfeld, 2003).

No thermal tolerance studies for western pearlshell and western ridged mussels are available. Studies of thermal tolerance for 28 North American species belonging to the same order (*Unionida*) of freshwater mussels as the native Oregon species indicate a wide range of thermal tolerance between 21.4°C and 42.6°C with a mean tolerance of 32.8°C for juvenile and 36.3°C for adult life stages (Pandolfo et al. 2010, Fogelman et al. 2023). Black et al. documented western pearlshell growth in western Oregon, where maximum temperature averaged 25.1°C at one site, with annual range from 14.7°C to 26.8°C (Black et al. 2010). Western pearlshell and western ridged mussels are adapted to a wide geographic distribution on the west coast, from California to Alaska. They also have the capacity to burrow, enabling them to occupy cooler micro-habitats or access thermal refuge, allowing them to tolerate unfavorable water temperature conditions to an extent (Blevins et al. 2019).

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Table 2: Temperature tolerance endpoints for Long Tom River cool water species as reported in literature reviewed by DEQ.

Species	Acclimation Temperature (°C)	Endpoint	Endpoint Temperature (°C)	Source
Chiselmouth *(Acrocheilus alutaceus)*	NA	Observed absence in field	<20	Rosenfeld et. al. 2003
	NA	Adult preference	>20	Gray and Dauble, 2001
	NA	Spawning initiation	15	Gray and Dauble, 2001
	NA	Spawning peak	13 – 20	Gray and Dauble, 2001, Moodie 1966
	NA	100% mortality, eggs	≤12	Moodie 1966
Redside shiner *(Richardsonius balteatus)*	14	100% survival after 24 hours, adult	22.8	Black, 1953
		50% survival after 24 hours, adult	27.6	
		No survival after 24 hours, adult	30.3	
	NA	Spawning Initiation	14.5 – 18	Gray and Dauble, 2001
	NA	100% survival, egg incubation	21 – 23	Scharpf, 2008
Northern Pikeminnow *(Ptychocheilus oregonensis)*	19-22	50% survival after 24 hours, adult	29.3	Black 1953
	NA	Spawning Initiation (Columbia R. populations, May - June)	14 – 18	Gadomski et al. 2001, Gray and Dauble, 2001, Roberge et al. 2002
	NA	Adult preference	21.7 (“warmest available”)	Bartoo, 1972
Peamouth *(Mylocheilus caurinus)*	NA	Spawning Initiation	10 – 11	Gray and Dauble 2001
	NA	Spawning Initiation (Western Montana, May or June)	10 – 18	Roberge et al. 2001, Montana FWP 2023
	14	50% mortality after 24 hours	26.6	Black, 1953
	11.5	50% mortality after 24 hours, adult	27	
Largescale Sucker (*Catostomus macrocheilus*)	19	100% survival after 24 hours, adult	25.7	Black, 1953
	19	50% survival after 24 hours, adult	29.4	
	19	0% survival after 24 hours, adult	32.2	
	NA	Observed occurrence in field	10 – 28	Smith, 1966

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Species	Acclimation Temperature (°C)	Endpoint	Endpoint Temperature (°C)	Source
Mountain Sucker *(Catostomus platyrhynchus)*	NA	Spawning Initiation (Truckee River, NV, May 1 – August 1)	11 – 19	Snyder, 1983
	20	Loss of Equilibrium	32.3 – 32.9	Schultz, 2011
	22.5	Loss of Equilibrium	32.6 – 33.2	
	25	Loss of Equilibrium	33.6 – 34	
	NA	Recommended Acute Tolerance (MDMT)	28	NVDEP 2016
Sand Roller *(Percopsis transmontana)*	NA	Observed presence in field (Columbia Basin)	2.5 – 24	Gray and Dauble 1979; Parsley et al. 1989
	NA	Adult preference, field observations	18-24	Tiffan et al. 2017

Black (1953) reported the upper lethal temperature for Redside shiner as 27.6°C. The upper lethal temperature was based on 50% survival after 24 hours of exposure to various treatment temperatures. The treatment temperature at which all Redside shiner survived after 24 hours was reported as 22.8°C. These results indicate that Redside shiner have a reasonable margin of safety between complete survival and the point at which half the population died (4.8°C).

Oregon's water quality criteria for temperature are based on a maximum 7DADM that reflects the highest average of maximum temperatures that fish are exposed to over a weeklong period for the year. Since most laboratory studies of thermal tolerance are based on continuous exposure to a single temperature, translation of the lab results to an equivalent 7DADM value is necessary to determine a temperature target consistent with Oregon's water quality standards. Following EPA's guidance for temperature standard development for Pacific Northwest States, a constant lab exposure temperature for 100% survival of Redside shiner at 22.8°C corresponds to a 7DADM temperatures of 24.0°C (EPA 2003). The difference between weekly mean and weekly maximum temperatures in the lower Long Tom River is 2-3°C in the summer. Therefore, under a temperature target of 24.0°C as a 7DADM temperatures, fish would experience daily temperatures above the limit for 100% survival of Redside shiner (22.8°C) for only a small part of the day during the warmest 7-day period of the year. Given the wide margin between temperatures at 50% and 100% survival, exposure to maximum water temperatures greater than 22.8°C for just a few hours a day during this period will not likely cause harm to Redside shiner.

Therefore, DEQ selected 24.0°C expressed as the instream seven-day average maximum temperature target plus an insignificant addition of heat for human use equal to 0.3°C as the target temperature. This target will approximate daily average temperatures that match the constant lab exposure temperature limit for 100% survival and reduce the risk of daily exposure to temperatures that could result in impairment to Redside shiner. This target will also ensure conditions within the preferred range for the next most sensitive species, Sand Roller and Mountain Sucker.

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Long Tom River salmonid uses

ODFW's FHD and timing tables (Table 3 and Table 4) indicate there is some limited Spring Chinook salmon rearing use of the lower reach with peak use from December 1 through May 15 downstream of the City of Monroe to the confluence with the Willamette River. At the time the use was designated, ODFW indicated the Long Tom River likely did not support a natural run of anadromous salmonids and juvenile Cutthroat trout were largely absent downstream of Fern Ridge Reservoir (Hutchison 1966, ODFW 1992). Hutchison et al. identified that Cutthroat trout are resident in tributaries of the lower reach and appeared to have adapted to survive the high summertime temperatures typical of the lower river system. They also noted there is little spawning habitat between Monroe and Fern Ridge Reservoir (Hutchison 1966). Cutthroat trout are resident and regularly tagged in tributaries to the lower Long Tom River. (Bear Creek, Ferguson Creek, Owens Creek, Rattlesnake Creek, and Davidson Creek). Recapture data indicates that a minority of Cutthroat individuals migrate between these tributary creeks via the lower reach of the Long Tom River. However, no fish are sampled from the lower Long Tom River mainstem, and it is uncertain what months of the year these individuals use the lower reach to migrate (LTWC and ODFW, unpublished data).

To protect juvenile Chinook salmon and Cutthroat Trout that may be migrating or overwintering, DEQ will rely upon the 18.0°C target temperature established for protection of Salmon & Trout Rearing and Migration use suggested by EPA guidance (EPA, 2003) and adopted in Oregon's water quality standards (OAR 340-041-0028 (4)(c)). The 18.0°C temperature target is also fully protective of any life stage of Pacific Lamprey (Meeuwig et al. 2003, Whitesel 2023). This target is also within observed temperature ranges supporting spawning and egg incubation use by the cool water species Mountain Sucker, Peamouth, and Northern Pikeminnow which may occur within that timeframe.

Table 3: Anadromous salmonid species use in the Long Tom River subbasin (Source: ODFW 2003).

Long Tom R - Anadromous Species

Waterway ID: MidWill06

Life Stage/Activity/Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Upstream Adult Migration												
Spring Chinook salmon												
Adult Spawning												
Spring Chinook salmon												
Adult Holding												
Spring Chinook salmon												
Egg Incubation through Fry Emergence												
Spring Chinook salmon												
Juvenile Rearing												
Spring Chinook salmon	■	■	■	■	■	▨				▨	▨	■
Downstream Juvenile Migration												
Spring Chinook salmon	■	■	■	■	▨	▨				▨	▨	■

■ Represents periods of peak use based on professional opinion, survey data, or other inforr

▨ Represents lesser level of use based on professional opinion,survey data, or other informa

Represents periods of presence OR uniformly distributed level of use

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Table 4: Resident salmonid species use of the Long Tom River (Source: ODFW).

Long Tom R - Non-Anadromous Species Waterway ID: MidWill06												
Life Stage/Activity/Species	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Adult Fluvial or Adfluvial Migration												
Cutthroat Trout - Resident	■	■	■	■	▨	▨	▨			▨	▨	■
Adult Spawning												
Cutthroat Trout - Resident	■	■	■	■	▨	▨	▨				▨	■
Adult/Sub-Adult Rearing												
Cutthroat Trout - Resident	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩
Egg Incubation through Fry Emergence												
Cutthroat Trout - Resident	■	■	■	■	■	▨	▨	▨			▨	■
Juvenile Rearing												
Cutthroat Trout - Resident	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩
Juvenile/Sub-Adult Migration												
Cutthroat Trout - Resident	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩	▩
	■ Represents periods of peak use based on professional opinion, survey data, or other inforr											
	▨ Represents lesser level of use based on professional opinion,survey data, or other informa											
	▩ Represents periods of presence OR uniformly distributed level of use											

Standards Interpretation: Cool Water Species Criterion and Human Use Allowance

Water temperatures greater than a 7-day average maximum (7dAM) temperature of 24.0°C would reasonably be expected to impair the cool water species present in the Long Tom River. Therefore, no more than a 0.3°C increase, the human use allowance, shall be permitted when the water temperature is 24.0°C or greater from June 15 to October 31.

Water temperatures greater than a 7-day average maximum (7dAM) temperature of 18°C would reasonably be expected to impair Spring Chinook rearing and juvenile migration that occurs within the Long Tom River. This value is consistent with Oregon's water quality standards for temperature (OAR 340-041-0028 (4)(c)). Therefore, no more than a 0.3°C increase, the human use allowance, shall be permitted when the water temperature is 18°C or greater from November 1 to June 14. This narrative translator value will also protect cool water fish, including spawning temperature preferences for Mountain Sucker, Peamouth, and Chiselmouth.

If ambient 7DADM temperatures trend to always being cooler than both temperature targets presented in Table 1 and all exceptions outlined in OAR 340-41-0028(11)(c) are not applicable, the Protecting Cold Water criterion shall be applied with the 0.3°C HUA based on an increase above the cooler ambient temperature.

Implementing the cool water species narrative criterion

Water quality programs implementing cool water species narrative criterion in the specified reaches will reference the Temperature Narrative Translator Values as listed in Table 1 and in accordance with implementation guidelines described in Oregon Administrative Rule 340-041-0028(12). Programs

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implementing this criterion include water quality permitting, total maximum daily load development, and water quality assessment. Oregon Department of Environmental Quality's will use current assessment methodology to determine if the cool water species narrative criterion is not being attained for purposes of Clean Water Act section 303(d) assessments.

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