

Addressing Temperature Impairments

Cross-Program Coordination Meeting

June, 2024

Freshwater Designated Uses	Protection
Char Spawning and Rearing	Spawning or early juvenile rearing by native char (bull trout and Dolly Varden) or other species dependent on such cold waters.
Core Summer Salmonid Habitat	Summer (Jun 15 – Sep 15) spawning or emergence or adult holding, foraging by adult and subadult native char, and important summer rearing habitat for salmonids.
Salmonid Spawning, Rearing, and Migration	Salmon or trout spawning and emergence outside of summer season, rearing and migration by salmonids.
Salmonid Rearing and Migration Only	Rearing or migration by salmonids.
Nonanadromous Interior Redband Trout	Only trout species is Nonanadromous form of self-reproducing interior redband trout (<i>O. mykiss</i>) and other aquatic life.
Indigenous Warm Water Species	Dominant species under natural conditions would be temperature tolerant indigenous nonsalmonid species (e.g., dace, sucker).

Washington's WQS

- All surface waters protected by:
 - Numeric and Narrative Criteria
 - Designated Uses
 - Antidegradation Policy
- For some criteria in freshwaters, there are separate lake-specific criteria.

EPA's 2003/2006 WQS Approval for WA

Table 200 (1) (c)
Aquatic Life Temperature Criteria in Fresh Water

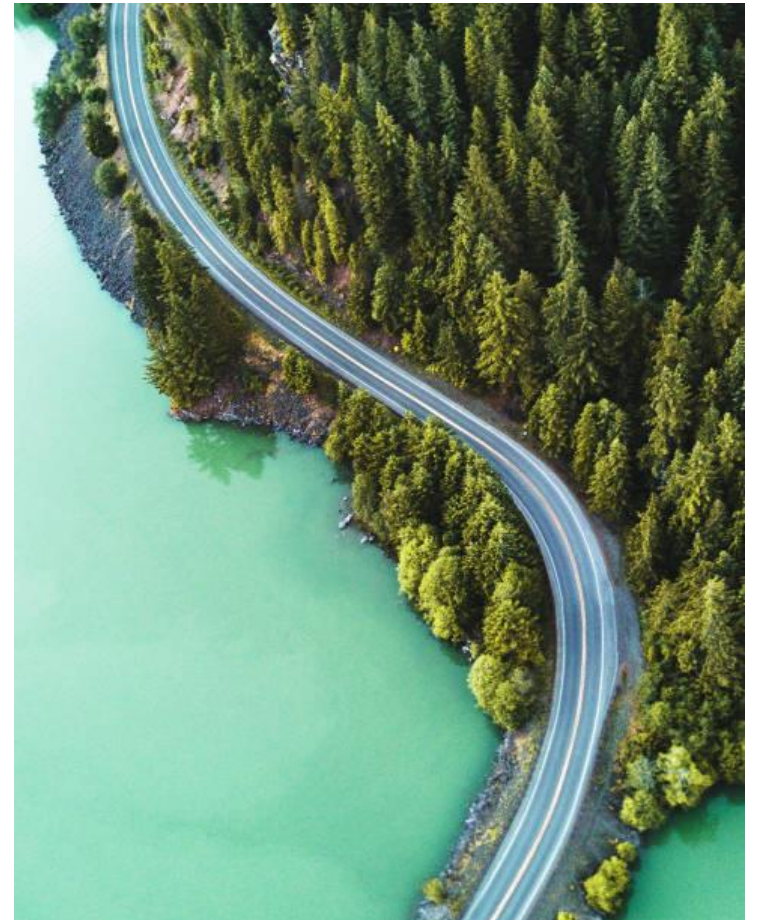
Category	Highest 7-DADMax
Char Spawning and Rearing*	12°C (53.6°F)
Core Summer Salmonid Habitat*	16°C (60.8°F)
Salmonid Spawning, Rearing, and Migration*	17.5°C (63.5°F)
Salmonid Rearing and Migration Only	17.5°C (63.5°F)
Nonanadromous Interior Redband Trout	18°C (64.4°F)
Indigenous Warm Water Species	20°C (68°F)

*Note: Some streams have a more stringent temperature criterion that is applied seasonally to further protect salmonid spawning and egg incubation. See (c)(iv) of this subsection.

- Washington revised its aquatic life temperature criteria for freshwaters based on the new aquatic life use categories.
 - Temperature is measured by 7-DADMax.
- EPA approved the metric (7-DADMax) and numeric criteria values.
 - EPA noted that the values are the same or slightly more stringent than those EPA recommended in its Temperature Guidance (2003).

EPA's 2003/2006 WQS Approval for WA

- Washington revised its WQS in 2003 and 2006. These revisions included:
 - New freshwater use designations for salmon and other aquatic life.
 - Freshwater temperature and DO criteria.
 - Natural conditions and other WQ criteria applications.
- EPA acted and approved these revisions in February 2008.
 - <https://www.epa.gov/sites/default/files/2017-10/documents/wawqs-letter-02112008.pdf>
- EPA also completed ESA consultation.



Disapproval of Previous Natural Conditions

- As a result of litigation, EPA reconsidered previously-approved standards regarding our natural and irreversible human conditions.
- **No change (remain approved):**
 - -200(1)(c)(v): Narrative temperature for lakes
 - -200(1)(d)(ii): Narrative DO for lakes
- **Disapproved:**
 - -260(1)(a): Natural conditions provision
 - -200(1)(c)(i): Human use allowance for temperature, fresh waters
 - -210(1)(c)(i): Human use allowance for temperature, marine waters
 - -200(1)(d)(i): Human use allowance for DO, fresh waters
 - -210(1)(d)(i): Human use allowance for DO, marine waters



Rulemaking to Reestablish NCC: Performance Based Approach



1,324 Temperature Listings

Table 5. Number of Category 5 listings for each region by parameter group.

Parameter	CRO	ERO	NWRO	SWRO	Total
Bacteria	58	173	600	491	1,322
Temperature	266	234	256	568	1,324
Toxics ¹¹	266	200	569	256	1,291
Dissolved Oxygen	60	216	464	297	1,037
pH	62	169	119	73	423
Other ¹²	3	15	169	53	240
Total	715	1,007	2,177	1,738	5637

The following figures summarize Category 5 candidate listings by pollutants for each of the four regions at Ecology. The candidate 2018 WQA was submitted to EPA in August 2021, including **5,530** Category 5 listings. The corresponding text boxes summarize the most common media and chemicals representing the toxics listings in each region. These regional statistics reflect the distinct geographies, human population centers, and development patterns present in each region of the state.

TMDLs

- Completed 32 TMDLs (922 listings)
- Future: 150 plus clean-up projects



What we have learned?

- Nonpoint sources are the primary cause of these impairments
- Shade is the biggest driver
- But other things impact temperature too:
 - In stream flow
 - Microclimate
 - Groundwater/Cold water refugia
 - Dams
 - Widening and shallowing of streams
 - Point sources
 - Etc.

What is working?

- Forest practice rules and the adaptive management process
- Nonpoint program-watershed evaluations (Snake River tributaries and Hangman Creek examples)
- New funding approaches

Challenges

- Water Quality Standards-Natural conditions
- Climate Change
- Agriculture
- Restoration of degraded riparian areas
- Dams
- Causes outside of the CWA
- Are we adequately responding to Treaty Rights at Risk?
- CWA-Lack of nonpoint regulation

Thoughts on Cross Program Coordination

- Importance of standards team working with TMDL team (NCC development).
- TMDL program working with Nonpoint Program.
- Permit Program and Nonpoint Program (if nonpoint isn't implemented, the burden falls on point sources).
- TMDL/Nonpoint programs working with geographic programs (e.g. NEP).
- TMDL/Nonpoint programs working with external implementors.

Questions?

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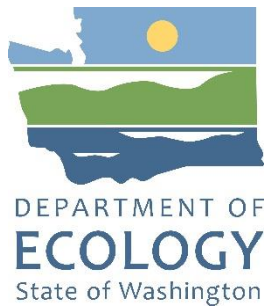
EPA R10 Temperature Guidance

- *EPA Region 10 Guidance For Pacific Northwest State and Tribal Temperature Water Quality Standards*
 - Released April 2003
- Joint effort between IDEQ, ODEQ, WADOE, NMFS, USFWS, Nez Perce Tribe, Columbia River Inter-Tribal Fish Commission, and EPA Region 10.
- Purpose was to assist States and Tribes adopt temperature WQS that EPA can approve consistently with its CWA and ESA obligations.
 - EPA stated actions on State and Tribal WQS consistent with this guidance can be “significantly expediated” because scientific rationale in large part already described and supported by EPA and the Services.

EPA R10 Temperature Guidance



- In establishing alternative site-specific numeric criteria, EPA provided an approach based on estimates of natural background temperatures:
 - *“EPA views numeric criteria that reflect natural background conditions to be protective of salmonid designated uses because river temperatures prior to human impacts clearly supported healthy salmonid populations.” (Page 35)*

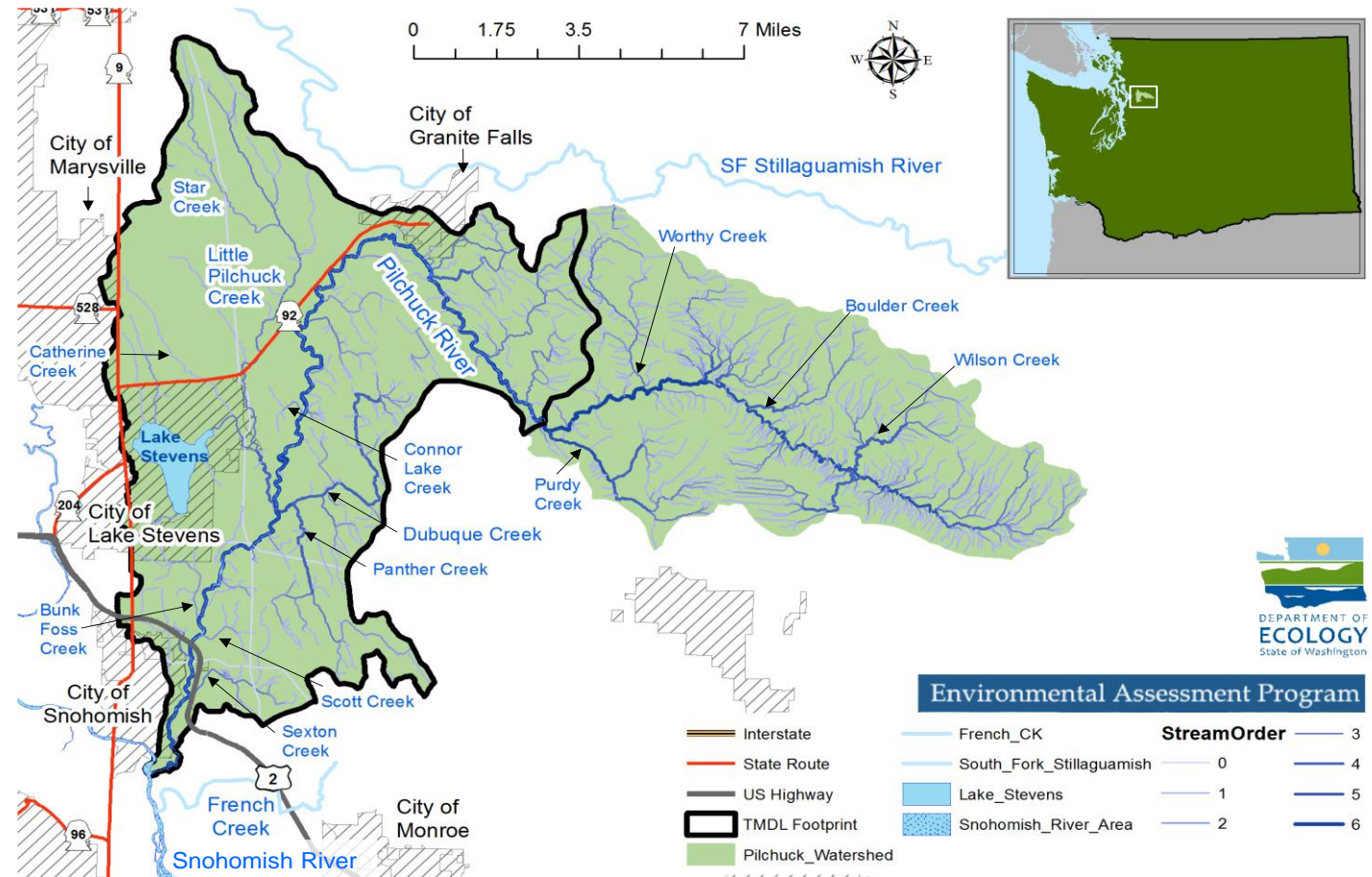


Natural Conditions Case Studies

Assistance provided by Ecology's EAP Modeling and TMDL Unit

Pilchuck River Temp/DO TMDL

- <https://apps.ecology.wa.gov/publications/SummaryPages/2010035.html>
- Temperature and DO listings
- TMDL addresses issues in entire watershed
- TMDL analysis
 - Significant hyporheic flow observed
 - Potential baseflow loss estimated
 - One small WWTP (Granite Falls)
 - Stormwater permittees / allocations

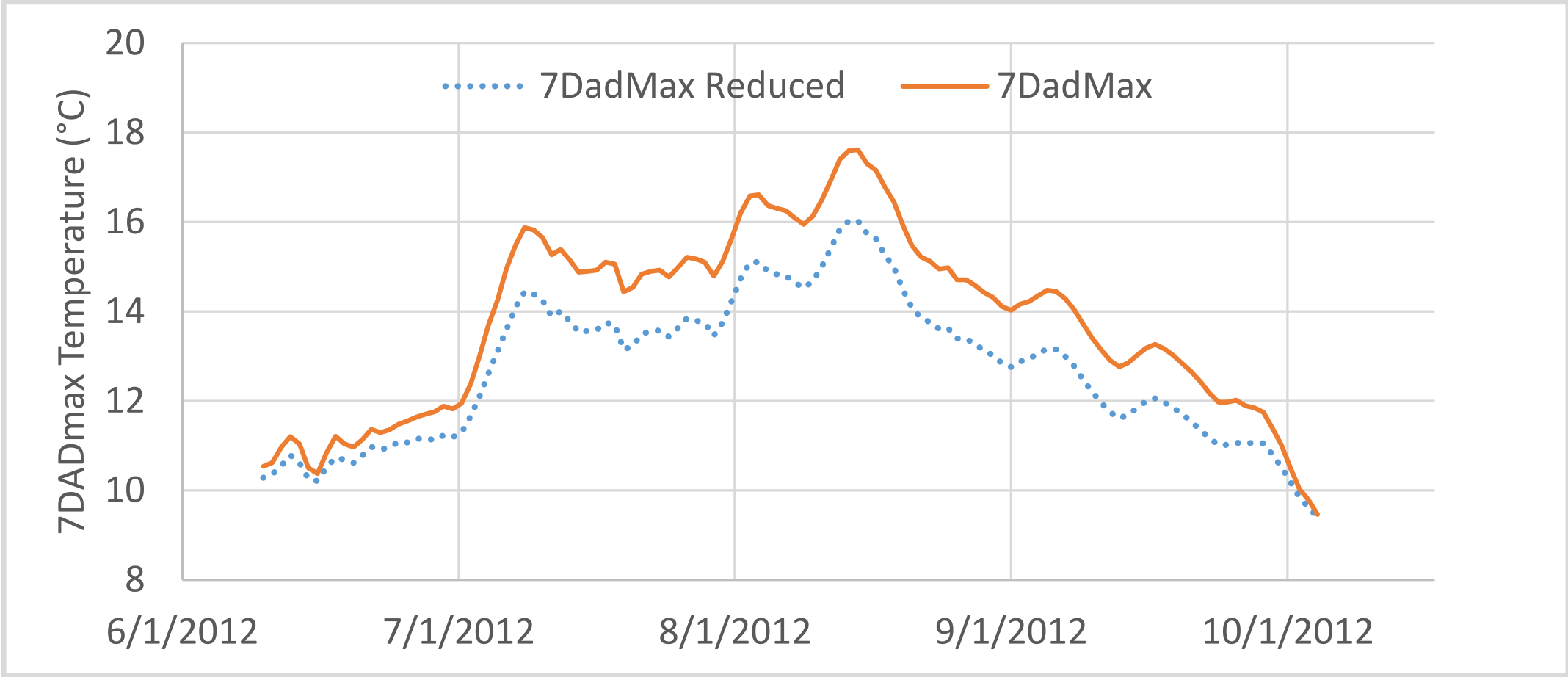


Important checklist considerations

- Flow Reductions / Increases
 - Impact of water use to summer baseflow – increasing summer baseflow important objective of TMDL.
- Boundary Condition
 - Temperature reduced
 - DO increased based on temperature change
- Hydrologic and channel modifications
 - Pilchuck Diversion Dam
 - Hyporheic loss due to bank modifications
- Nutrient Concentrations
- System Potential Shade
 - Microclimate Effects
 - Establishment is most important factor to meeting WQS



Boundary Conditions



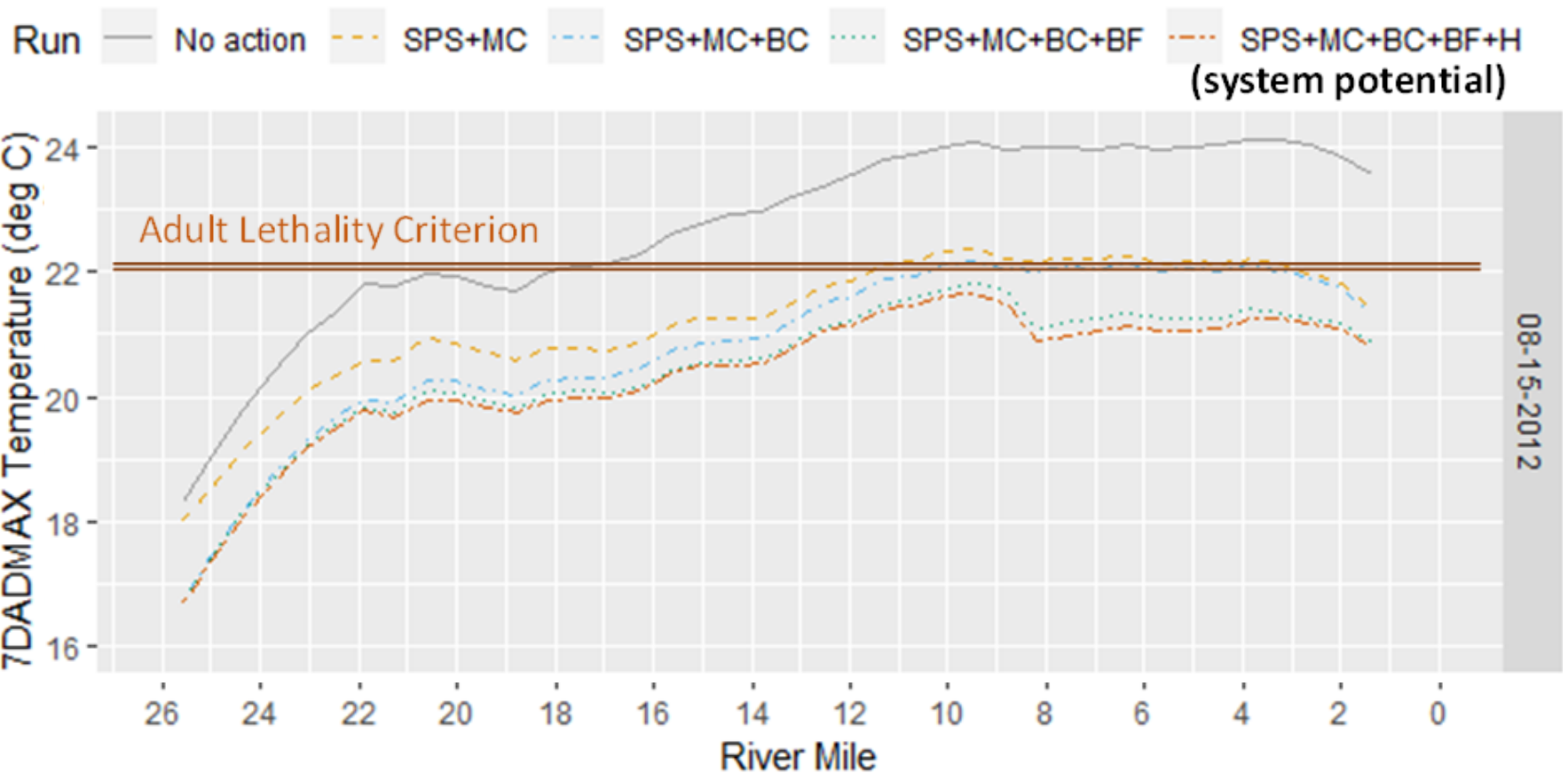
Model Scenarios

Scenario Name	Streamflow	Air Temp	Other Conditions and Modifications
Existing 2012	2012 USGS & ECY	2012 ECY & AWN	Primarily ECY data with some weather data from NWS & AWN
No action - Critical	Adjusted 2009 USGS (7Q10)	Increased to 2009 max	Same as above but with critical flow and air temperatures
System Potential - Critical	Adjusted 2009 USGS (7Q10)	Increased to 2009 max	Estimated changes in shade, microclimate, and other factors
System Potential - Average	2016 USGS	Increased to 2016 max	Same changes as above scenario with 2016 flow and weather
TMDL - Critical	Adjusted 2009 (7Q10)	Increased to 2009 max	Added point sources at WLAs & partially restored baseflow & hyporheic function
TMDL - Average	2016 USGS	Increased to 2016 max	Same as above scenario but with 2016 flows and weather

Existing and No Action Critical model scenarios predicted entire river would fail to meet 7-DADMax criterion for Core Summer Salmonid Habitat (16C) during August (warmest temperatures).

Temperature System Potential

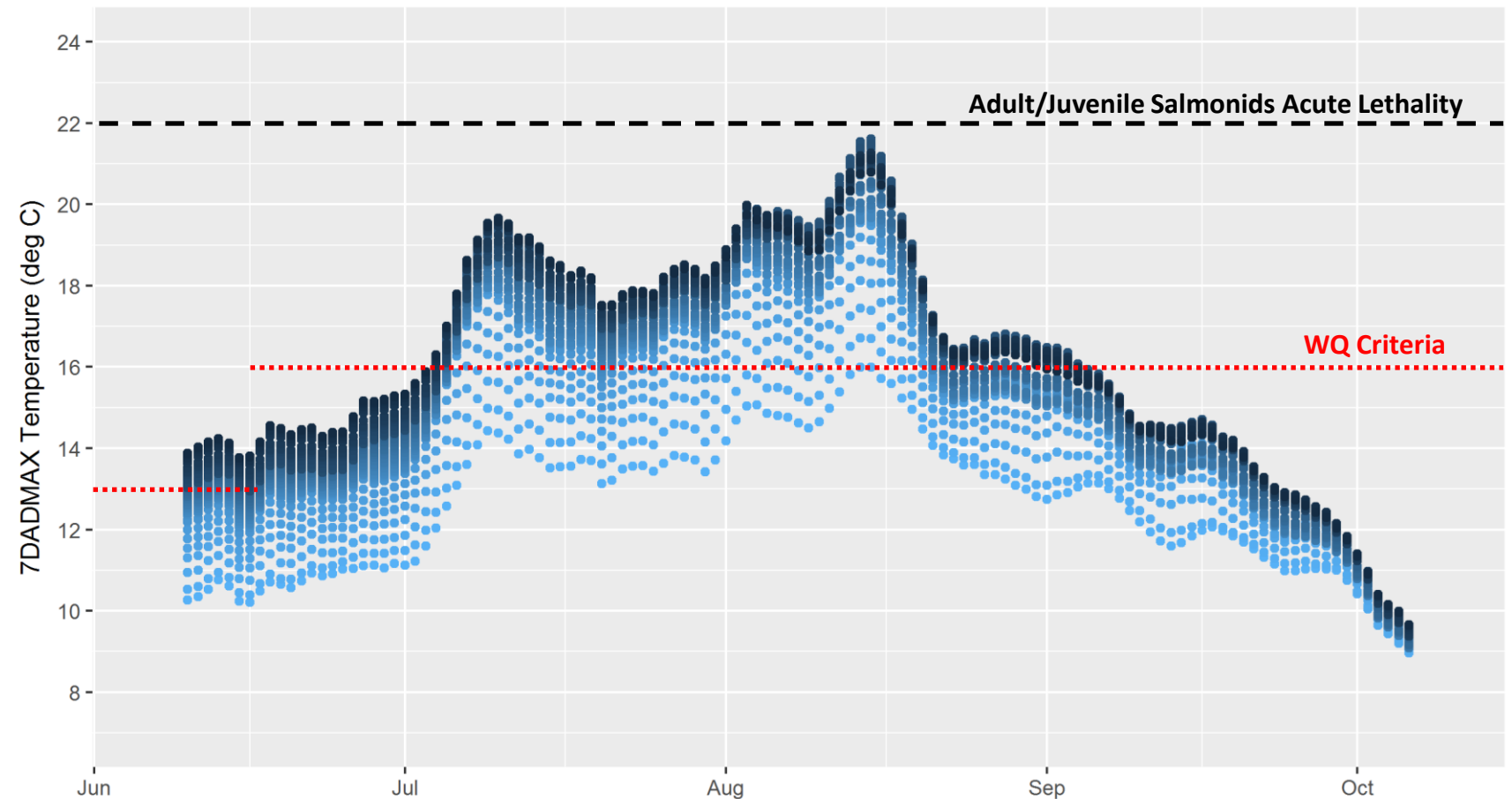
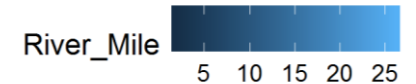
SPS = System Potential Shade; MC = Microclimate effects;
BC= Boundary temperatures decreased; BF = Baseflow restored; H= Increased hyporheic exchange



- 7-DADMax temperatures for no action and system potential scenarios under critical conditions.
- Calibrated / modified QUAL2Kw model.
- System Potential = No human modifications to riparian vegetation, channel modifications, and summer baseflow.
 - Estimate of natural conditions
- Warmest temperatures in August.

Temperature System Potential

*Pilchuck Temperature and Dissolved Oxygen TMDL:
"Critical" (2009) System Potential Model Scenario*



- System potential model-predicted criteria 7-DADMax temperature with 7Q10 (2009) flows.
 - Complete spatial and temporal model domain.
- Critical conditions = highest air temperature (August typically) and low flows.
- In this model, 7-DADMax values in river reduced below threshold for acute lethality in moderately acclimated adult and juvenile salmon.

TMDL load set based on Natural scenario

- Predicted human-induced change to water temperatures in the Pilchuck River for the TMDL.
- System Potential Critical Model Scenario (i.e., 7Q10 critical low flows and high air temperature) used to compare the system potential 7-DADMax temperature to TMDL critical scenario.
- Difference between system potential and TMDL models is used to determine whether TMDL is below load capacity (0.3C increase).

