Appendix B: Seasonal Variation and Critical Conditions

Contents

Figures

1. Overview

This appendix provides information on seasonal variation and temperature critical conditions for the Umpqua River and its tributaries. Graphs show seasonal variation in the 7-day average daily maximum temperature for a given site, summarized by two-week periods. Values are plotted against the numeric water quality criteria to determine whether exceedances of the criteria have occurred in a given half-month. The critical time periods for the TMDL are evaluated based on these graphs.

It is noted that seasonal changes of river temperature is also a key element of the water quality modeling analysis for the TMDL. That analysis focuses on distinct seasonal periods of time and evaluates source impacts during the seasonal time period. See Appendix G for modeling information.

2. Analysis of Seasonal Variation and Critical Conditions

In this evaluation, EPA considered results collected at multiple river monitoring locations (Figure 1, Table 1).

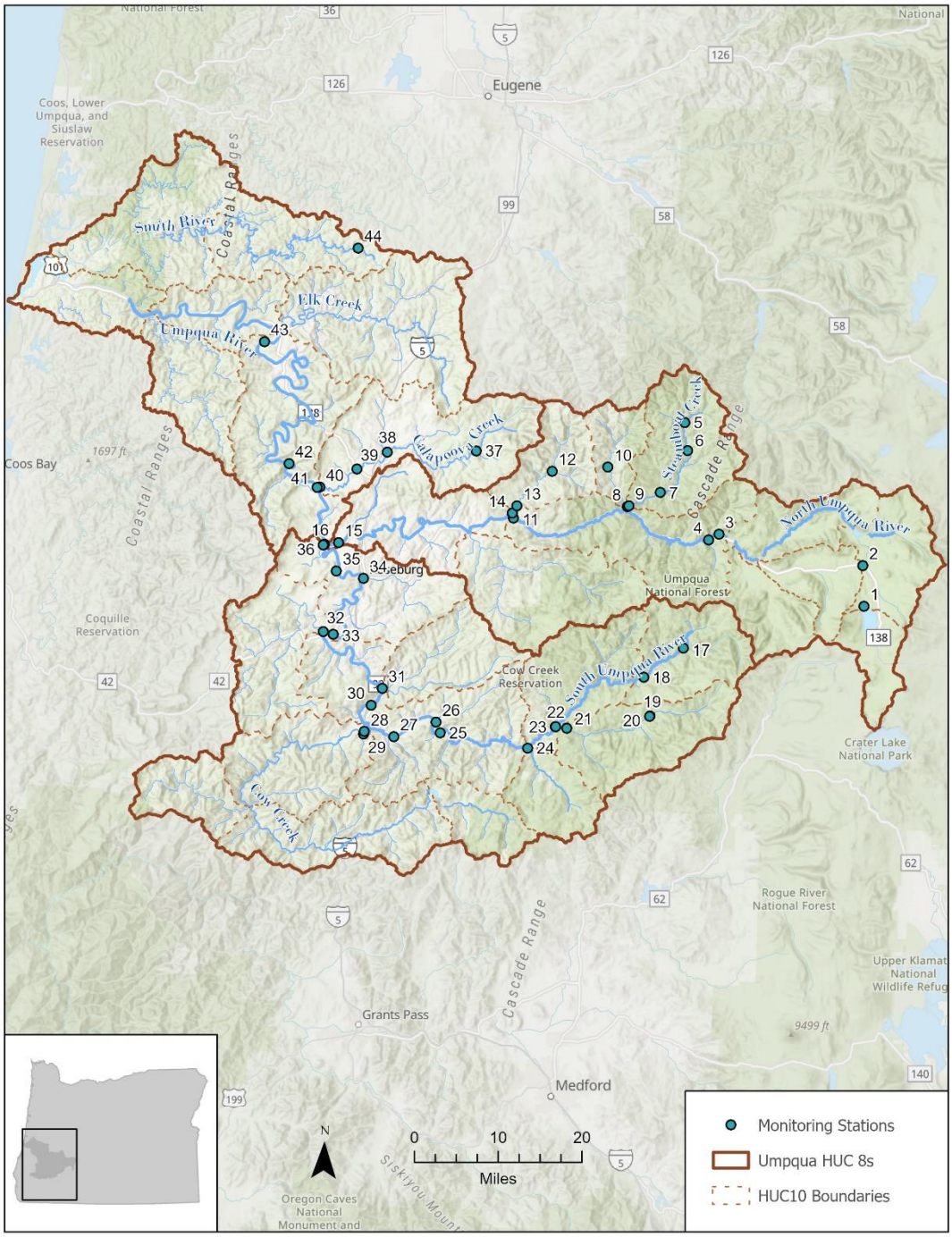

Figure 1 Monitoring locations selected to evaluate critical conditions in the South Umpqua, North Umpqua, and Umpqua River basins, station names in table 1 below.

Table 1 Map number associated monitoring station descriptions for figure 1.

Map Number	Monitoring Station Description
1	Lake Creek below Diamond Lake_LTWT
2	LAKE CREEK AT HIGHWAY 138 NEAR DIAMOND LAKE, OR
3	NORTH UMPQUA R AT SODA SPGS, NR TOKETEE FALLS, OR
4	N UMPQUA RIVER ABV COPELAND CK NR TOKETEE FALLS,OR
5	Upper Steamboat below Little Rock_LTWT
6	Cedar Creek at the Mouth_LTWT
7	Steelhead Creek at the Mouth_LTWT
8	Canton Creek at the mouth_LTWT
9	Steamboat above Canton_LTWT
10	Canton Creek
11	NORTH UMPQUA RIVER NEAR IDLEYLD PARK, OR
12	Rock Creek upstream of East Fork Rock Creek
13	ROCK CREEK NEAR GLIDE, OREG.
14	Rock Creek at mouth
15	NORTH UMPQUA RIVER AT WINCHESTER, OR
16	North Umpqua River at mouth
17	Black Rock Fork at the Mouth_LTWT
18	South Umpqua River above South Umpqua Falls_LTWT
19	Jackson Creek above Luck Creek Fish Structure WT
20	Jackson Creek below Luck Creek Fish Structure WT
21	Jackson Creek near the Mouth_LTWT
22	South Umpqua at Three C Rock SIde Channel WT
23	South Umpqua at Three C Rock WT
24	South Umpqua at Tiller Ranger Station_LTWT
25	South Umpqua River at RM 60
26	S. UMPQUA RIVER @ DAYS CREEK, OR
27	South Umpqua at Canyonville Park
28	S Umpqua upstream of ODOT Lawson Bar
29	Cow Creek at mouth
30	South Umpqua River 0 M DS I5
31	South Umpqua 100 m US of Myrtle CR
32	Lookingglass Creek upstream of Applegate Creek
33	South Umpqua River at Old Hwy 99 Bridge Crossing, River Mile 24.6
34	South Umpqua at Oak Ave. Bridge
35	S. UMPQUA RIVER NR ROSEBURG OR, OR
36	South Umpqua River above mouth
37	Calapooya Creek at Hinkle Creek Road
38	Calapooya Creek above Cabin Creek
39	Calapooya Creek at Driver Valley Rd bridge
40	Calapooya Creek at Umpqua

Map Number	Monitoring Station Description
41	Calapooya at Umpqua Landing
42	Umpqua River at James Wood Boat Ramp
43	Umpqua River at RM 49.58

Temperature data were grouped by the first and second half of each month. The month was split on the 15th with the first group including all results measured on the 1st through the 14th day and the second group including all results measured on the 15th through the end of the month. The boxplots are Tukey style boxplots with the middle line representing the median and the lower and upper ends of the box representing the temperature range between the first and third quartiles (25th – 75th percentile). The whiskers extend to values no further than 1.5 times the interquartile 7DADM temperature range (i.e., 1.5 times the difference between 25th and 75th percentiles). Any points beyond the whiskers represent individual 7DADM values beyond 1.5 times the interquartile range. The dashed line corresponds to the applicable temperature criteria. The shaded yellow area identifies the period when maximum 7DADM temperatures exceeded the applicable temperature criteria.

The period of temperature criteria exceedance varies based on monitoring location. The plots show that maximum stream temperatures typically occur in July or August. This period usually coincides with the lowest annual stream flows, maximum solar radiation fluxes, and warmest ambient air temperature conditions. There are several locations where the median 7DADM temperature exceeds 25°C (Figures x-y and Appendix X). Typically, the greatest magnitude and frequency of exceedances occurs from May 1 through October 31st. This period is identified as the critical period due to the frequency and magnitude of criteria exceedances and this period also coincides when natural environmental conditions (e.g., decreased annual stream flow, increased solar radiation) that reduce thermal assimilative capacity.

3. 7-day Average Daily Maximum Temperature Graphs

The remainder of this appendix presents monthly statistical box plots of the available 7DADM temperature results at each site alongside the applicable numeric temperature criteria.

Figure 2: Black Rock Fork

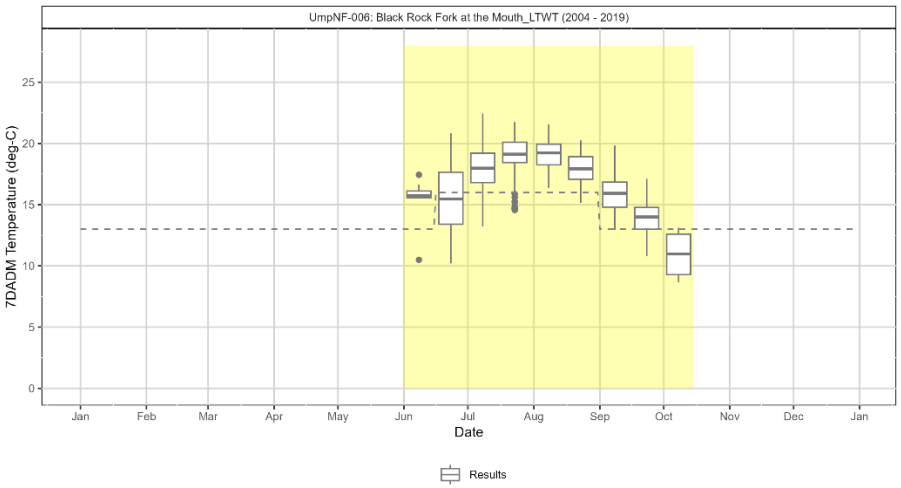

Figure 3: Calapooya Creek at Umpqua

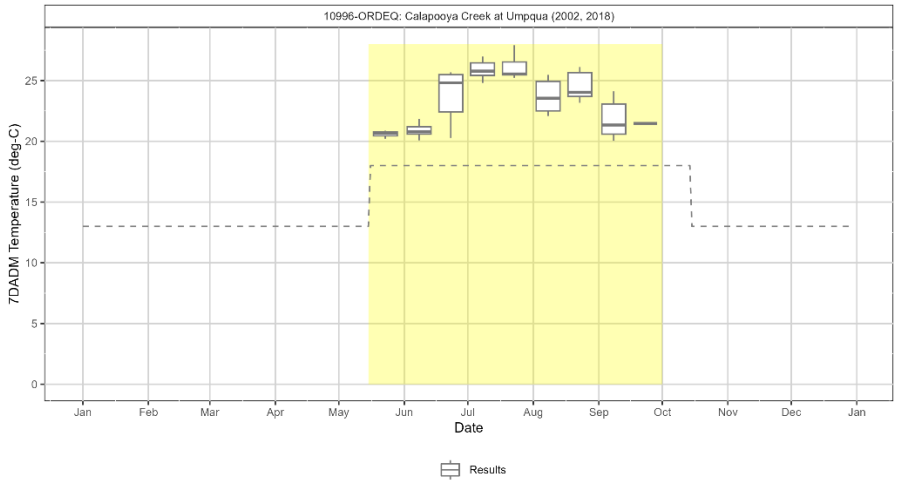

Figure 4: Calapooya Creek at Umpqua Landing

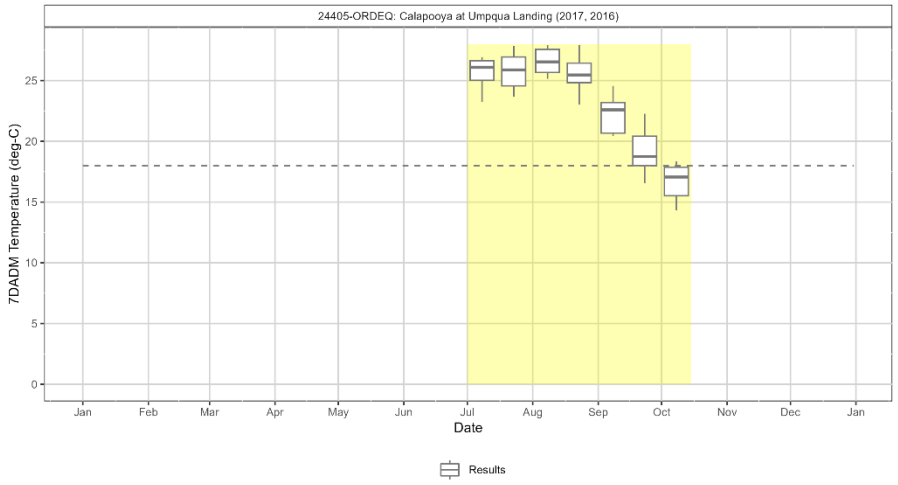

Figure 5: Calapooya Creek abv Cabin Creek

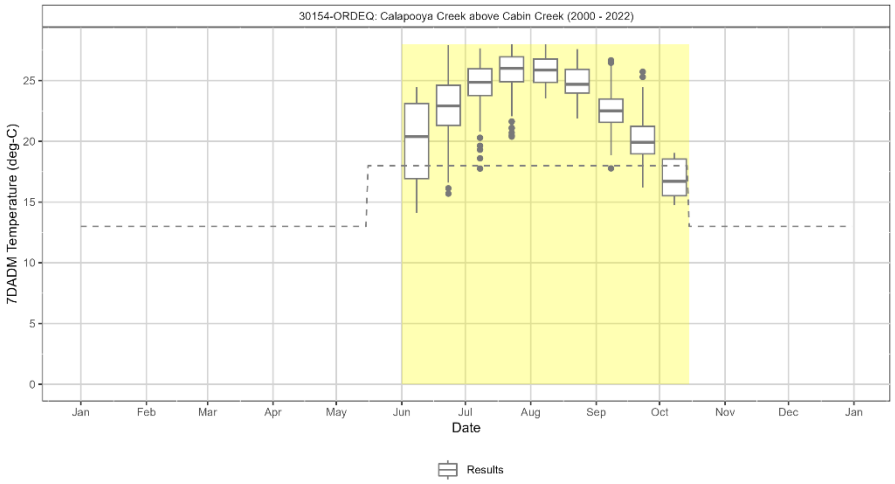

Figure 6: Calapooya Creek at Hinkle Cr Road

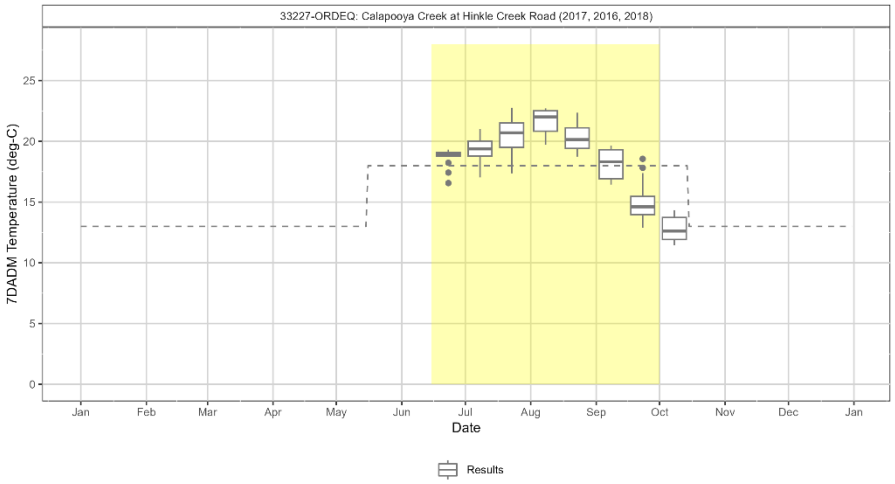

Figure 7: Calapooya Creek at Driver Valley Rd bridge

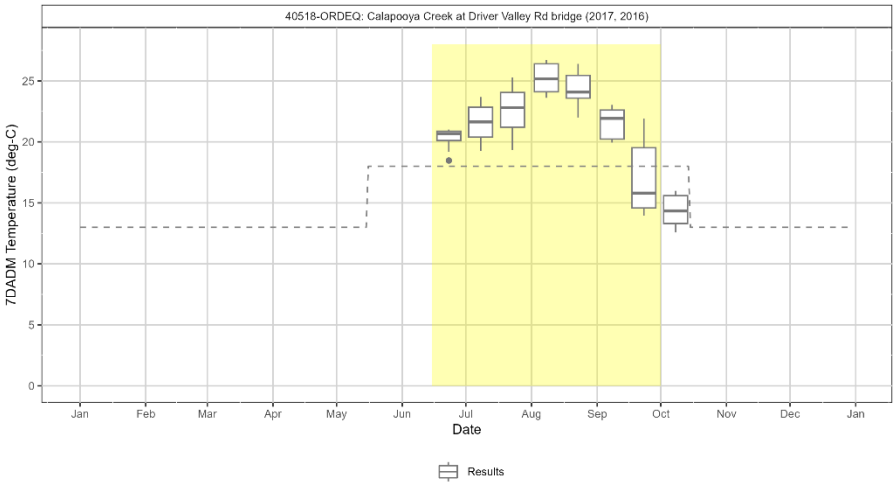

Figure 8: Cedar Creek at Mouth

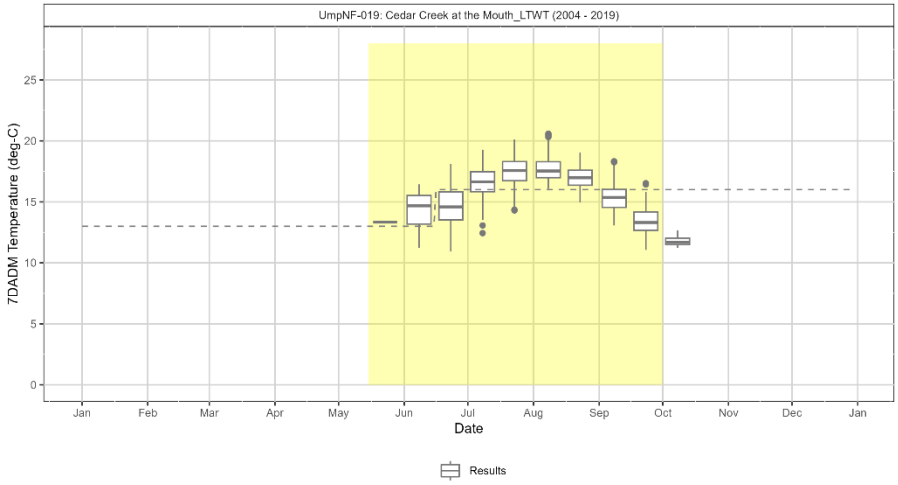

Figure 9: Canton Creek

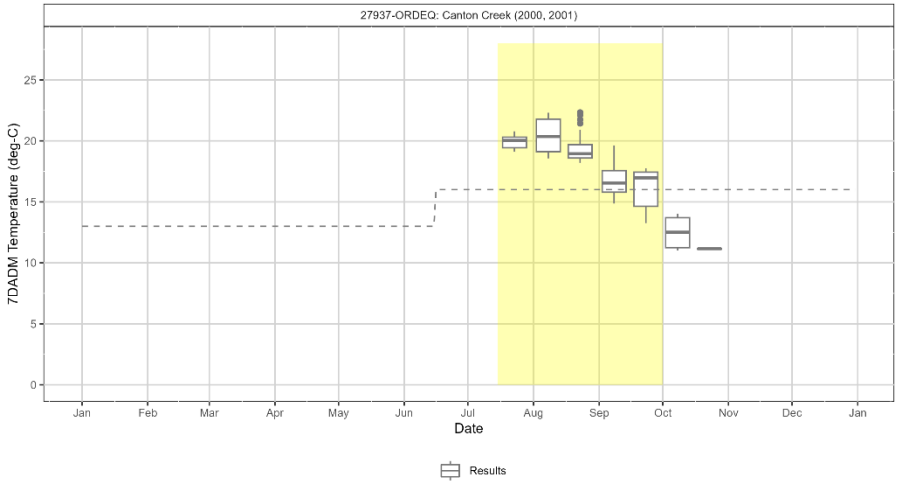

Figure 10: Canton Creek at mouth

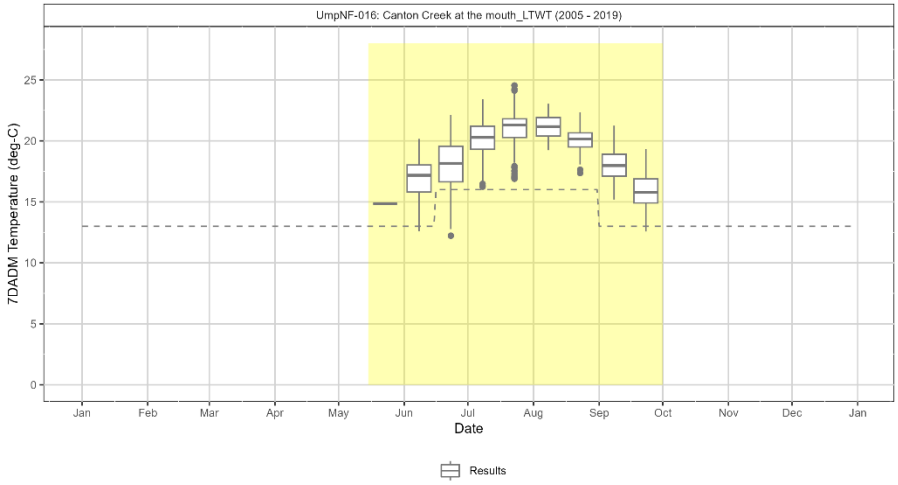

Figure 11: Cow Creek at mouth

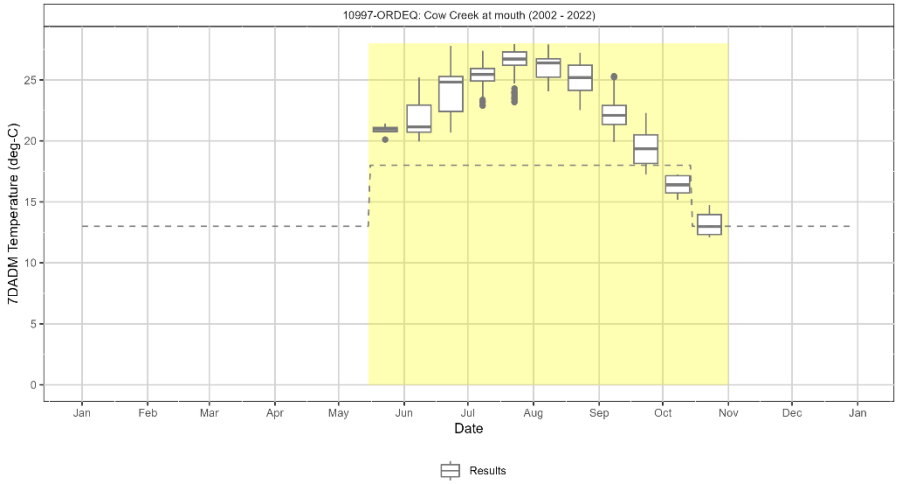

Figure 12: Jackson Creek above Luck Creek fish structure

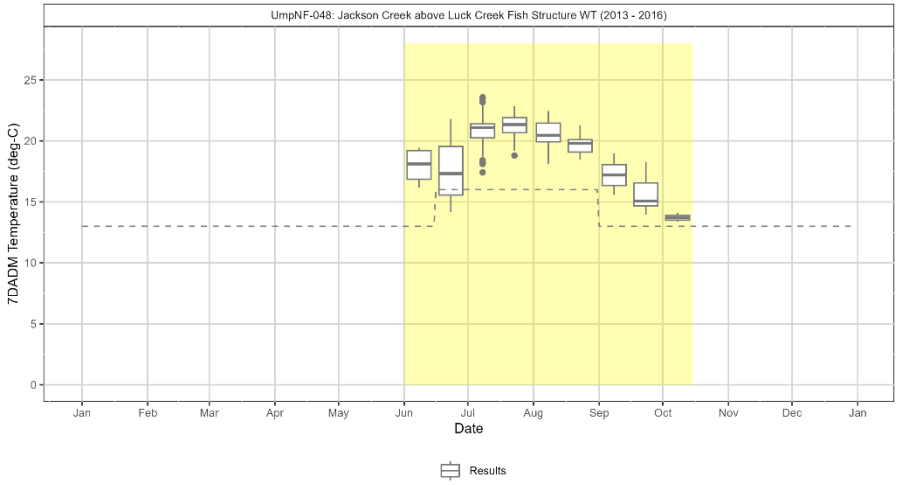

Figure 13: Jackson Creek below Luck Creek fish structure

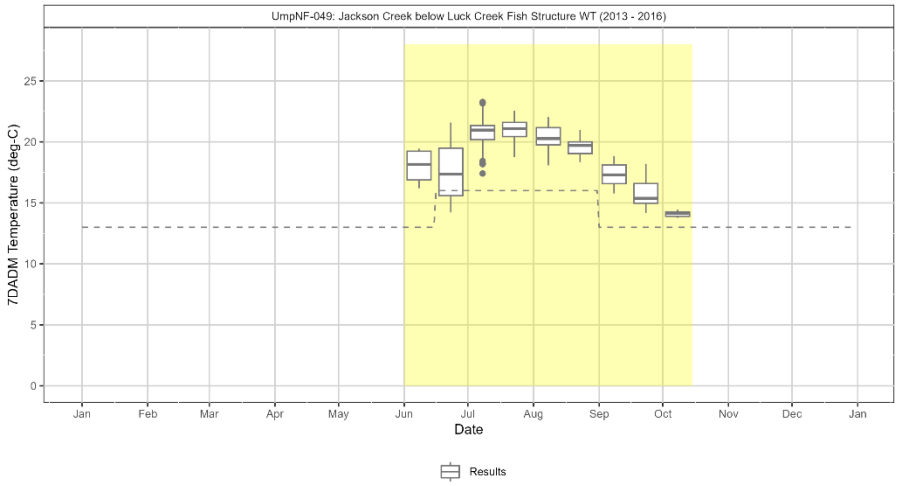

Figure 14: Jackson Creek near mouth

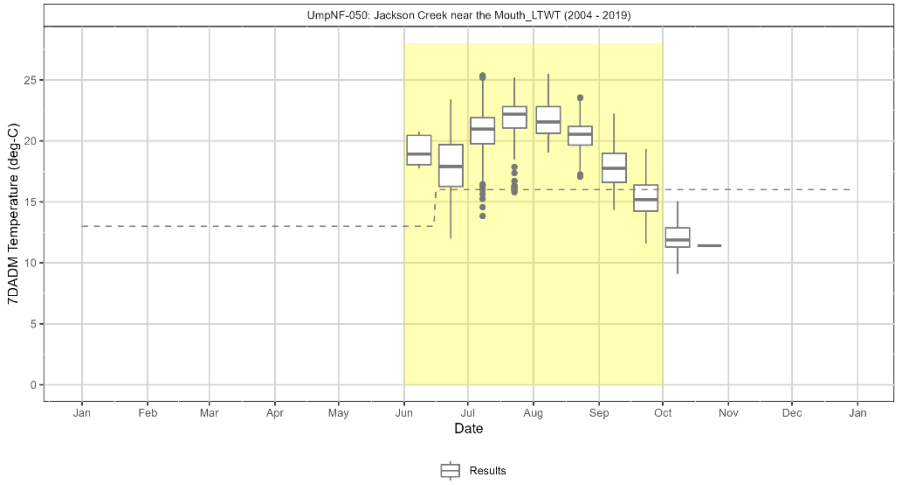

Figure 15: Lake Creek at Hwy 138 near Diamond Lake

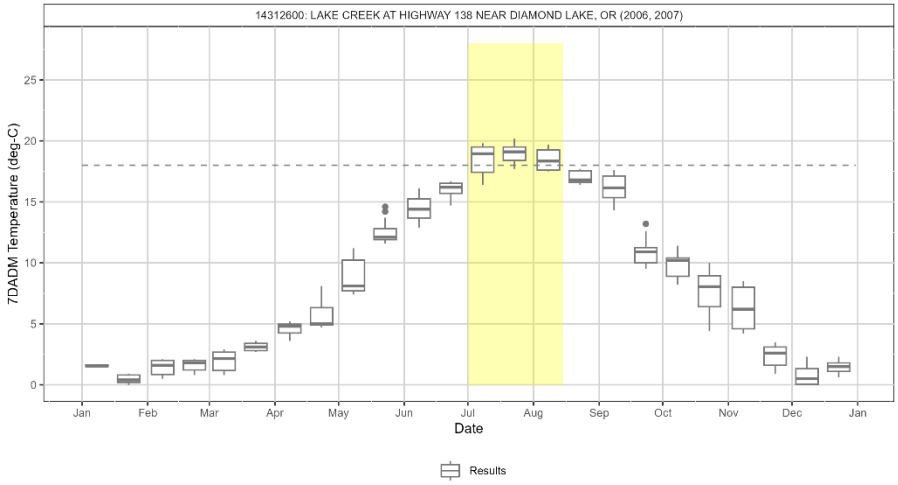

Figure 16: Lake Creek below Diamond Lake

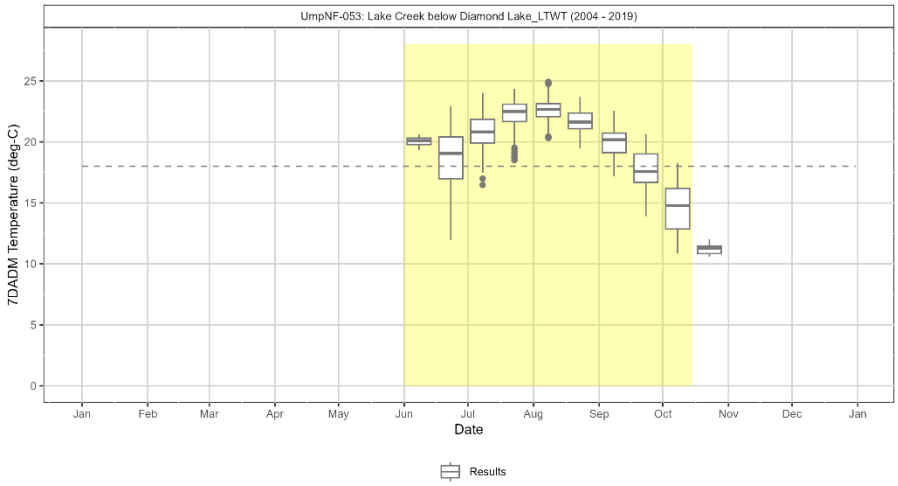

Figure 17: Lookingglass Creek upstream of Applegate Creek

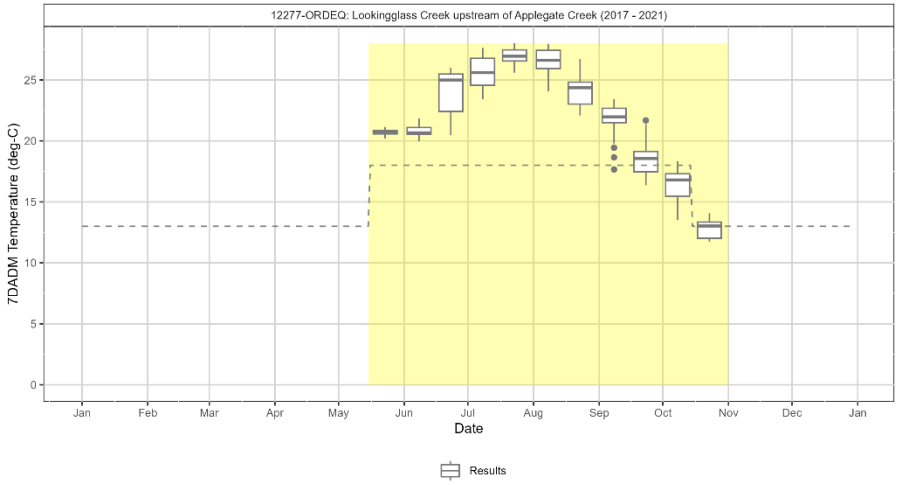

Figure 18: North Umpqua River at mouth

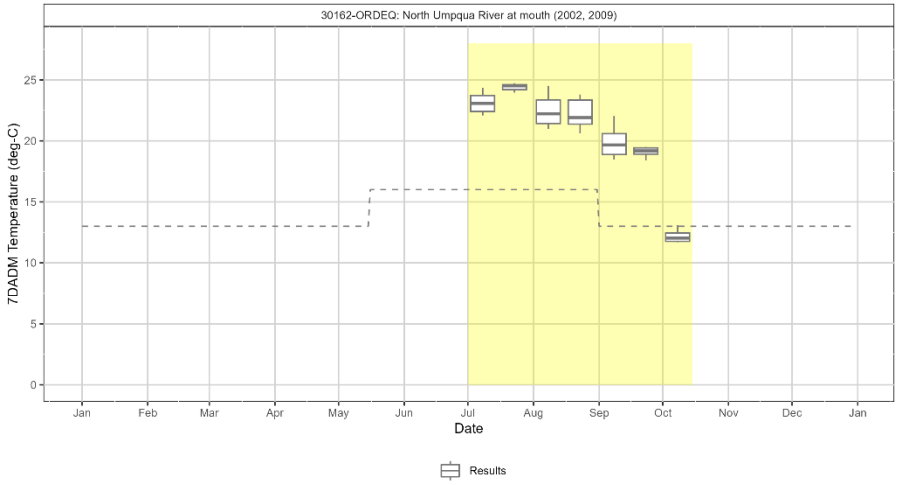

Figure 19: North Umpqua at Soda Springs near Toketee Falls

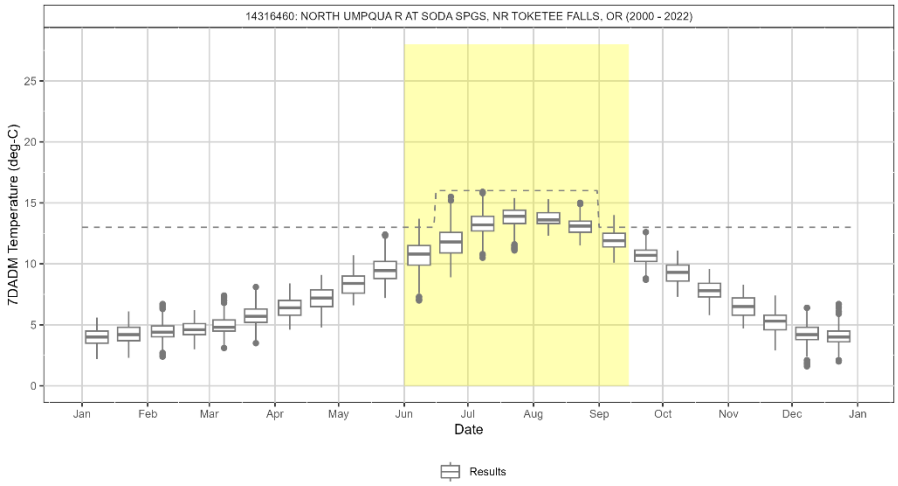

Figure 20: North Umpqua above Copeland Creek near Toketee Falls

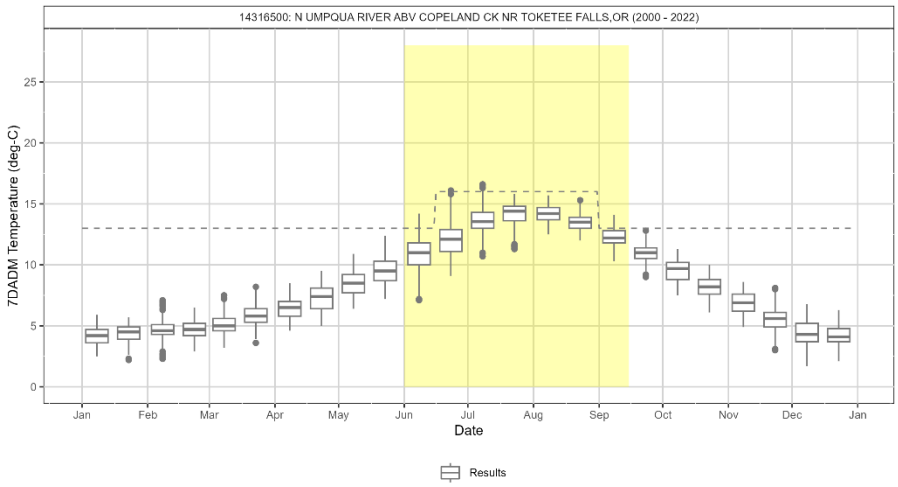

Figure 21: North Umpqua near Idleyld Park

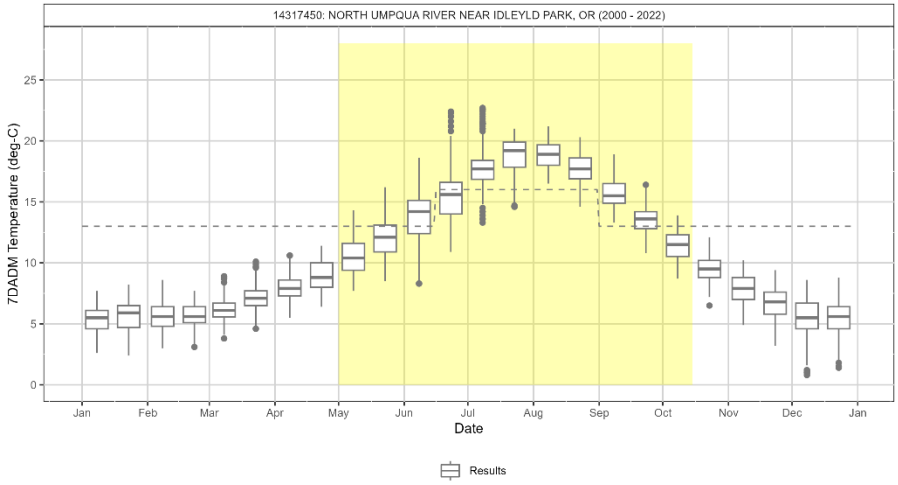

Figure 22: North Umpqua at Winchester

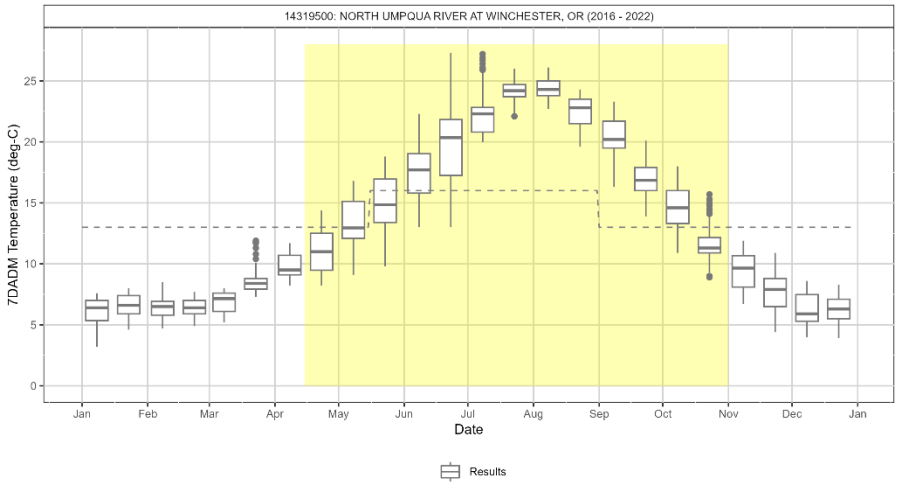

Figure 23: Rock Creek upstream of East Fork Rock Creek

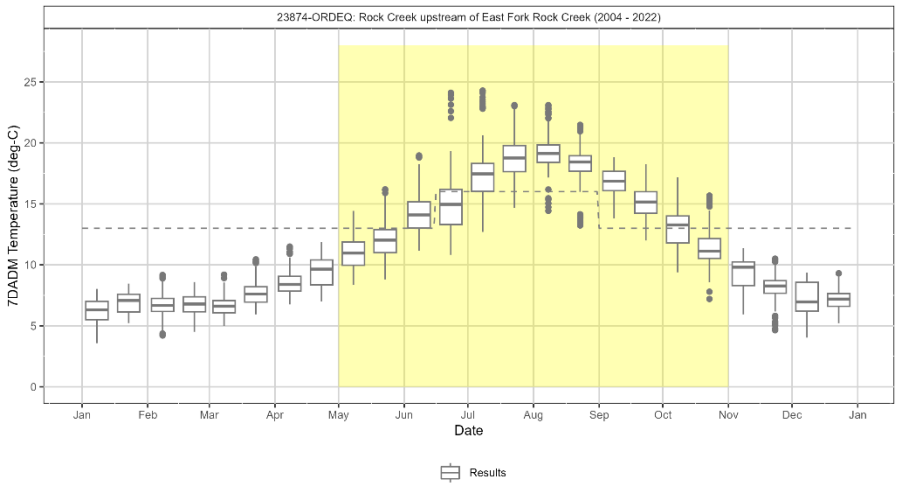

Figure 24: Rock Creek at mouth

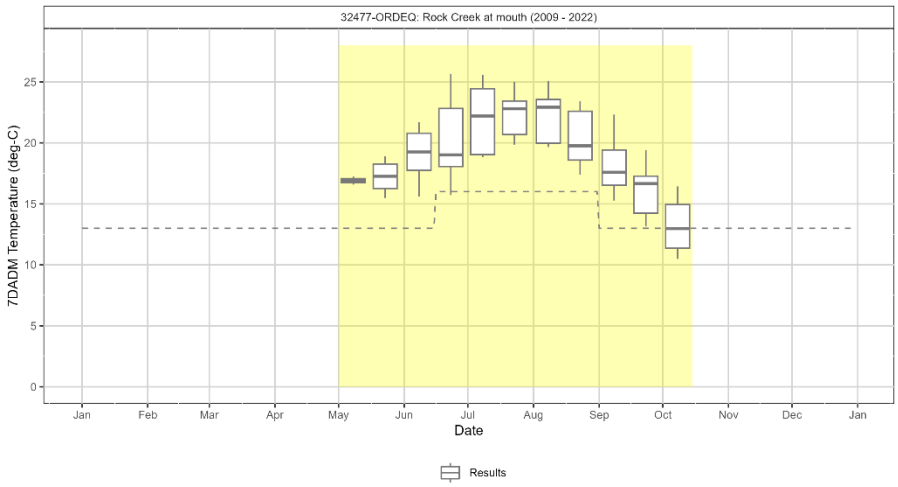

Figure 25: Rock Creek near Glide, OR

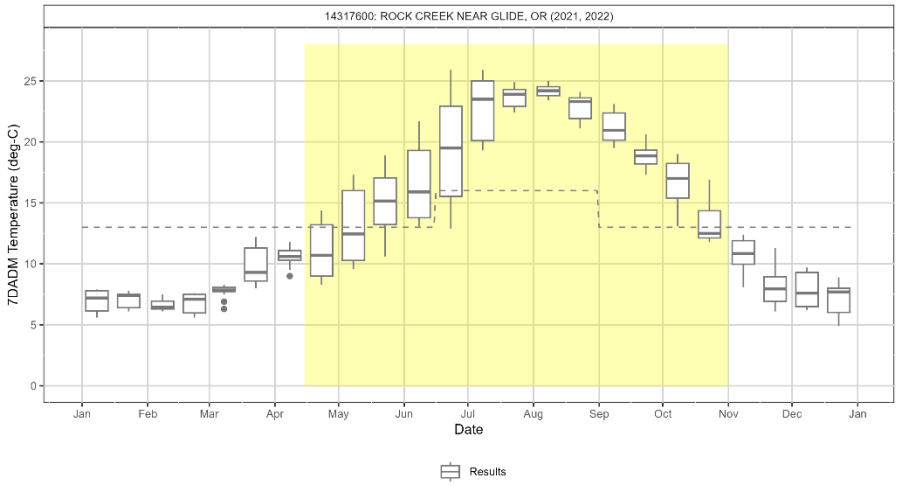

Figure 26: South Umpqua River above mouth

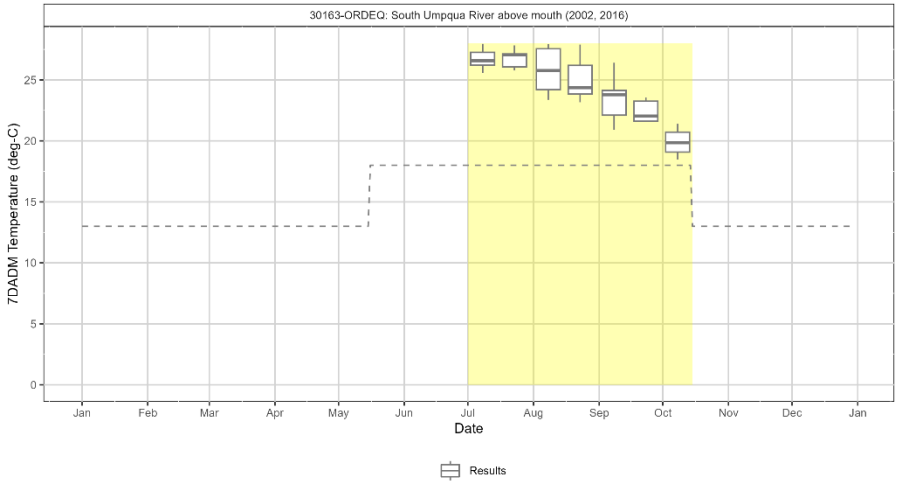

Figure 27: South Umpqua River at Old Hwy Bridge Crossing

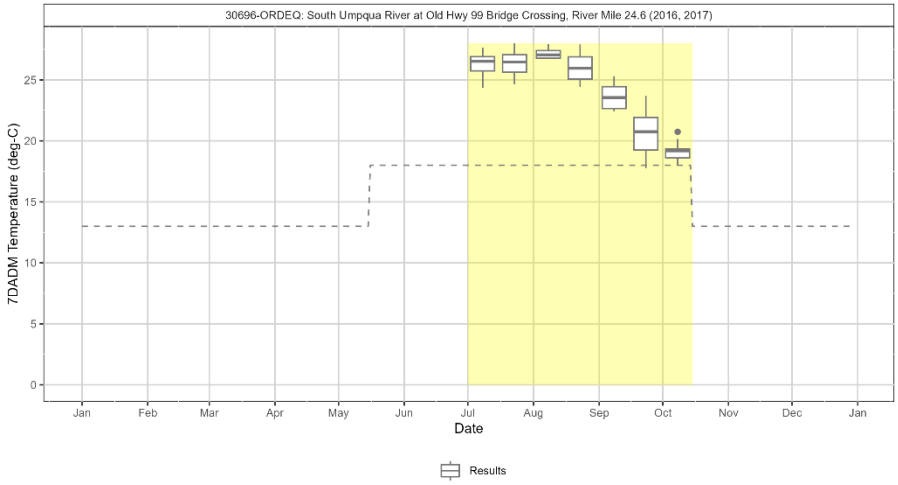

Figure 28: South Umpqua at Canyonville Park

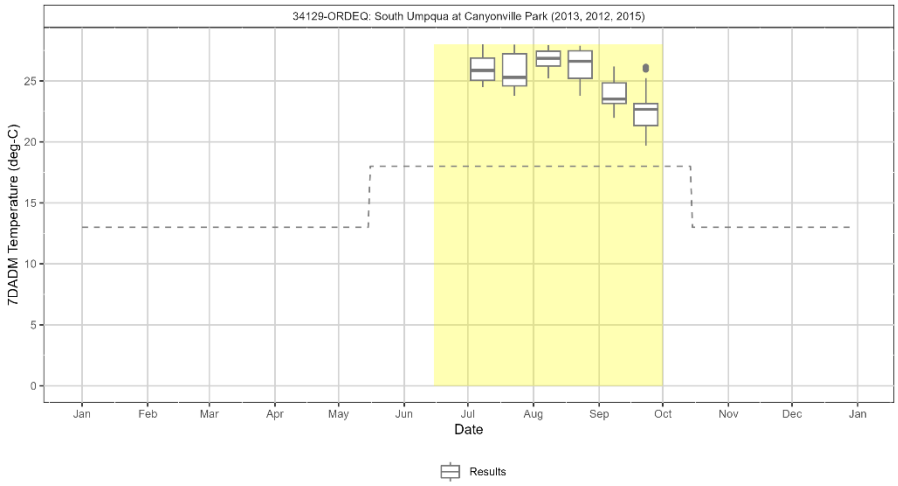

Figure 29: South Umpqua upstream of ODOT Lawson Bar

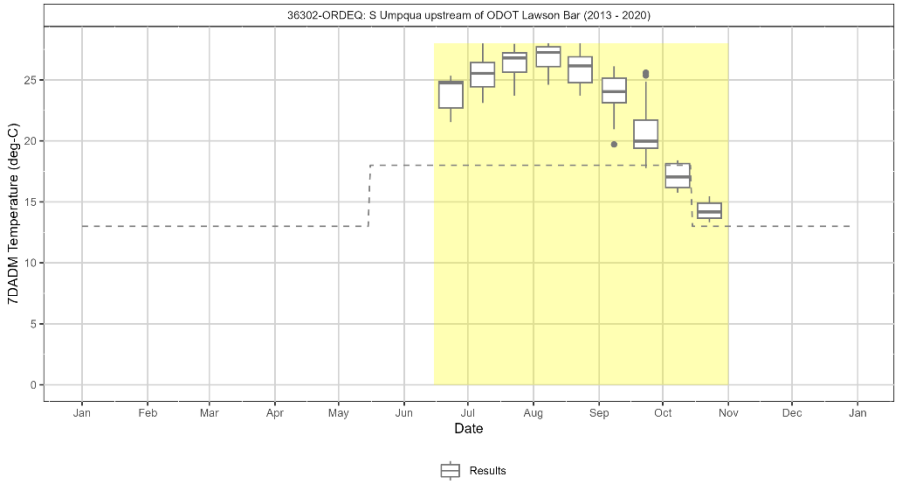

Figure 30: South Umpqua River at RM 60

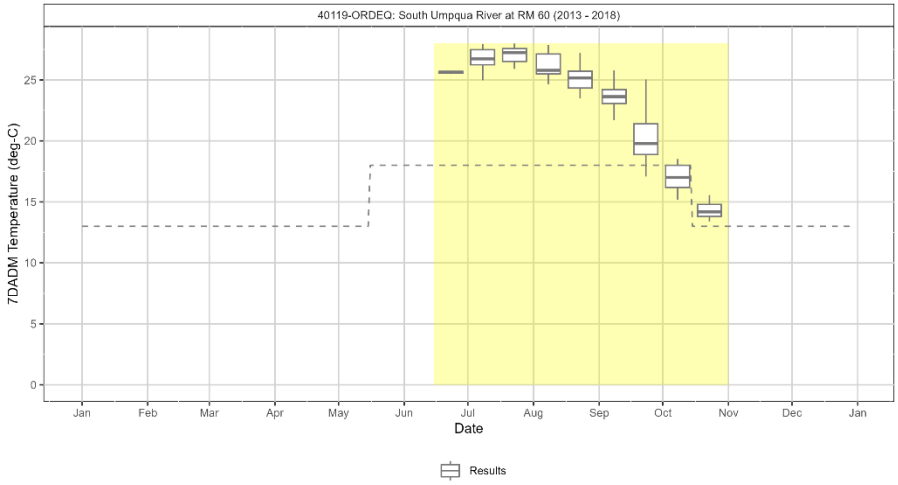

Figure 31: South Umpqua 100 m US of Myrtle Creek

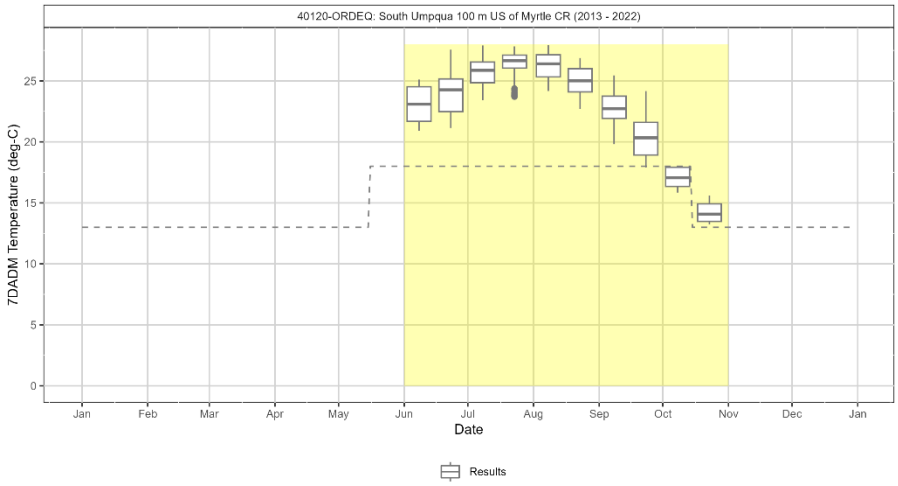

Figure 32: South Umpqua River 0 M DS I5

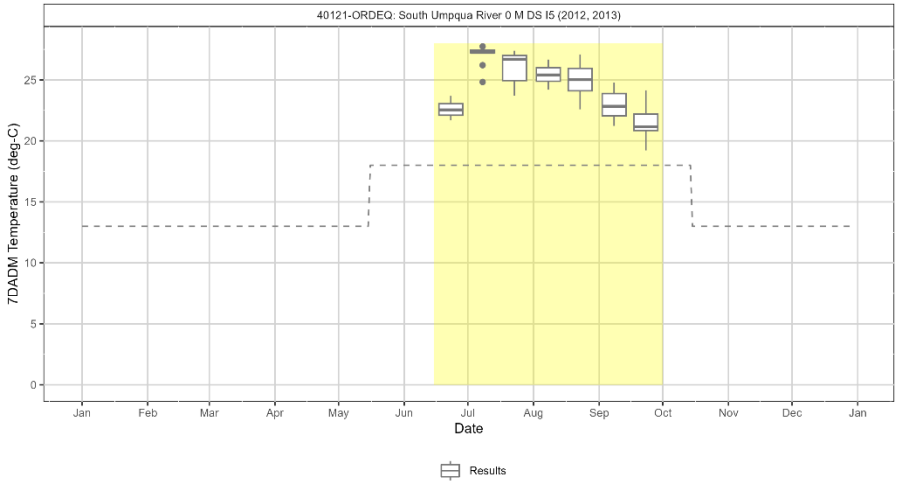

Figure 33: South Umpqua at Oak Ave. Bridge

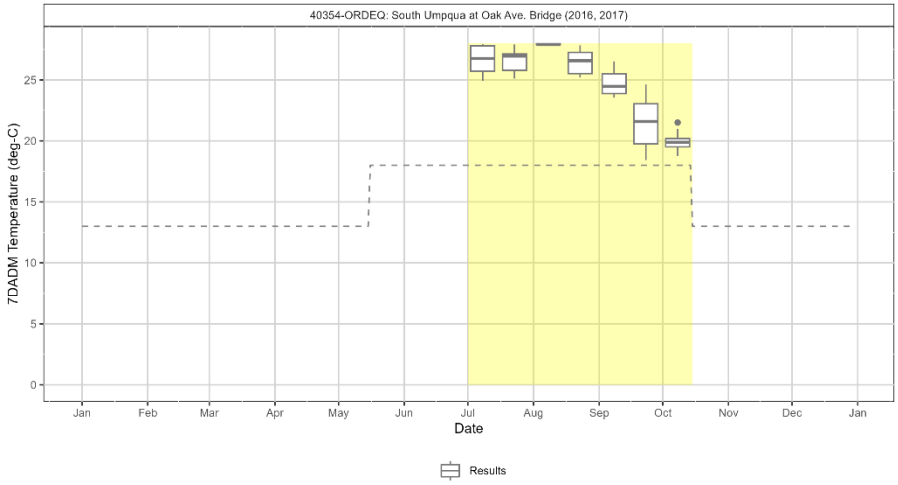

Figure 34: South Umpqua at Three C Rock Side Channel

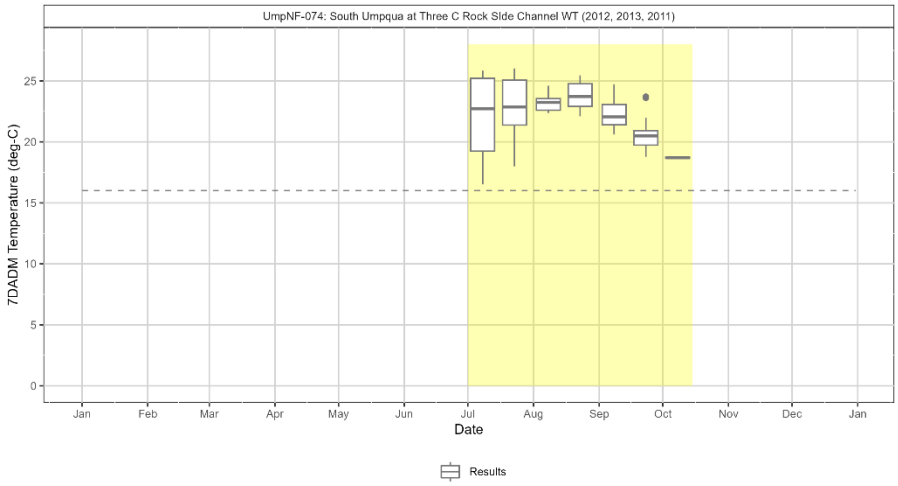

Figure 35: South Umpqua at Three C Rock

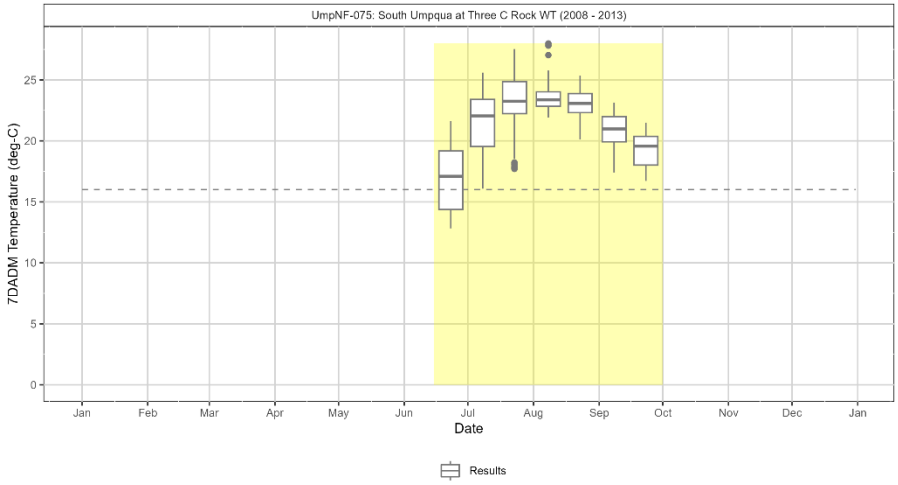

Figure 36: South Umpqua at Tiller Ranger Station

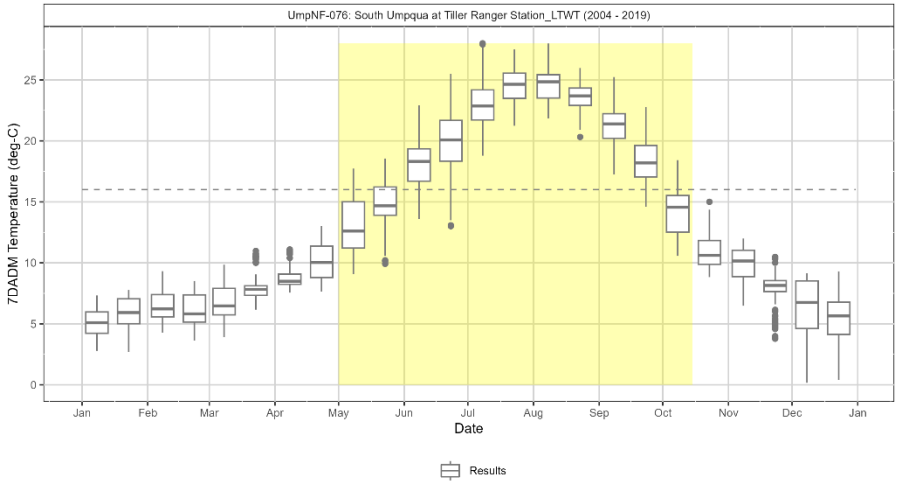

Figure 37: South Umpqua River above South Umpqua Falls

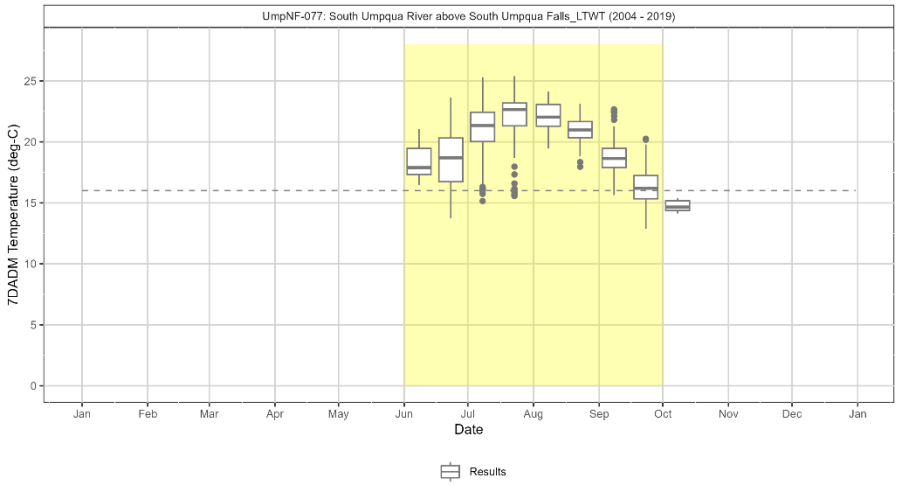

Figure 38: Steamboat above Canton

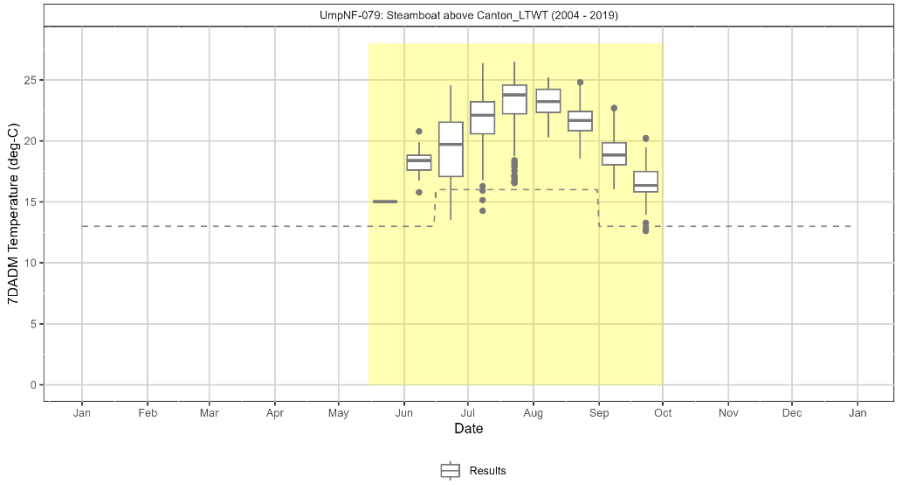

Figure 39: Upper Steamboat below Little Rock

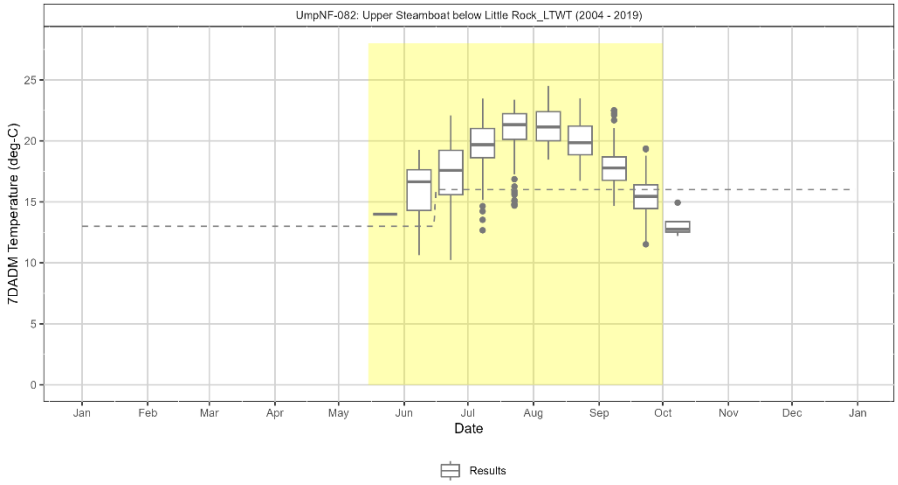

Figure 40: Steelhead Creek at the mouth

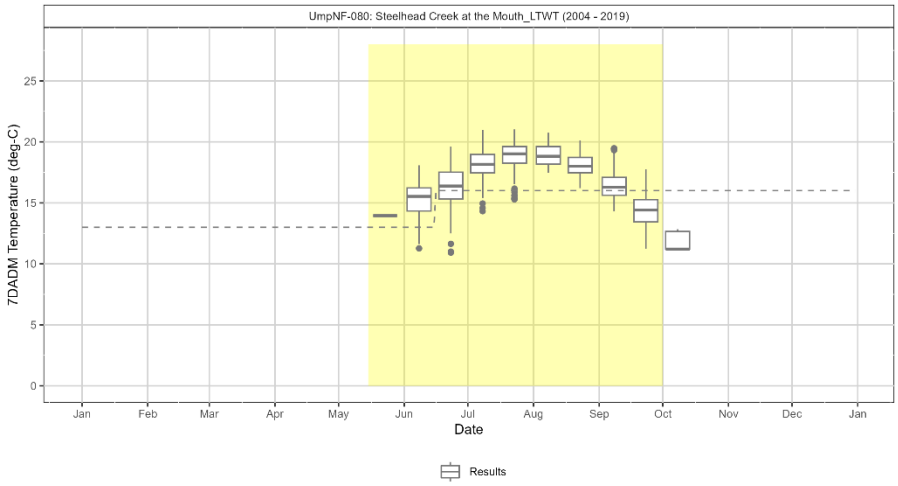

Figure 41: Umpqua River at James Wood Boat Ramp

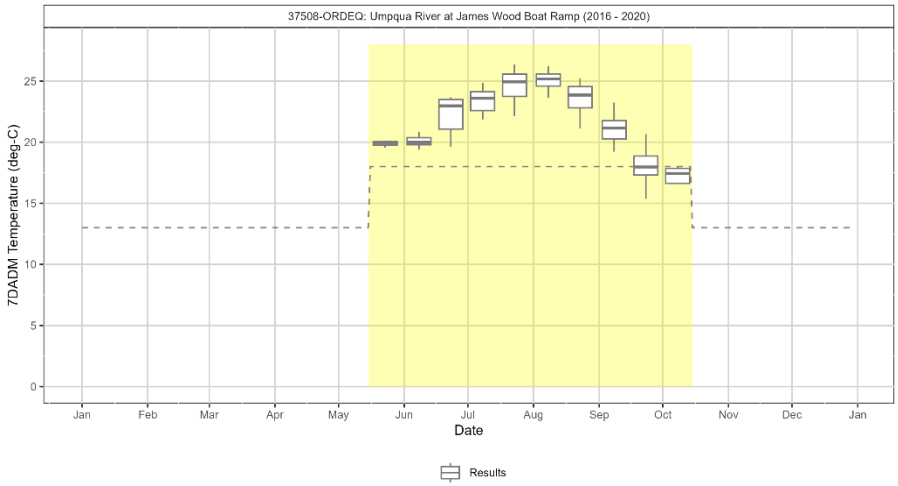

Figure 42: Umpqua River at RM 49.58