CHaMP Summer 7dAM Temperature Table

Temperature criteria have been developed to protect various species and life stages of salmonids (U.S. EPA 2003). Maximum temperatures, which typically occur in the summer, have the most potential impact on salmonids (U.S. EPA 2003). Criteria based on weekly maximum temperatures (7dAM) are the basis of water quality standards implemented by the Environmental Protection Agency (EPA) as well as many other state and federal agencies (IDEQ, ODEQ 2008, U.S. EPA 2003, WDC). Weekly maximum temperature rolling averages are used because they fluctuate less, and represent a longer time frame than daily statistics (ODEQ 2008). The metrics listed below evaluate the suitability of summer stream conditions (July 15th – August 31st) for salmonid species and life stages of interest. Each metric is based on a temperature threshold, when 7dAM values exceed this threshold, they are tabulated. Values of 0 are desirable, indicating a threshold was met throughout the summer time frame and that the associated fish species and life stages were protected.

- 7dAM days >12ºC (53.6°F): Bull trout spawning and juvenile rearing. Natural thermal regime and appropriate spawning and incubation temperatures are protected.
- 7dAM days >13ºC (55.4°F): Salmon and Steelhead spawning. Waters that are or could be used for salmon and steelhead spawning, egg incubation, and fry emergence.
- 7dAM days >16ºC (60.8°F): Core cold water habitat. Waters that are expected to maintain temperatures within the range generally considered optimal for salmon and steelhead rearing, or that are suitable for Bull Trout migration, foraging and sub-adult rearing that occurs during the summer.
- 7dAM days >18ºC (64.4°F): Salmon and trout rearing and migration. Thermally suitable rearing habitat for salmon, steelhead, rainbow trout, and cutthroat trout.
- 7dAM days >20ºC (68.0°F): Migration corridor for salmon and steelhead. Applies to waters predominately used for salmon and steelhead migration during the summer and having little or no anadromous salmonid rearing in the months of July and August.
- 7dAM>22ºC (71.6 ºF) Barrier to Salmonid Migration. Exceedance of this threshold suggests a thermal barrier to adult salmonid migration, and temperatures which may limit salmonid distribution (WDC).

Following procedures outlined by the Oregon DEQ, 7dAM values summarize 7 consecutive days of data and are reported on the 7th day (ODEQ 2008). Values based on less than 7 days are not examined for a time frame of interest. This means that 7dAM values for July 15th – July 20th are not evaluated because they incorporate values prior to July 15th. The first 7dAM value evaluated by threshold metrics is July 21st, which summarizes data from July 15th – July 21st. July 15th- August 31st is a 48 day time frame, so the maximum number of 7dAM values that can potentially exceed a given threshold is 42.

These metrics also summarize summer stream temperature conditions (July 15th – August 31st).

- Summer Hourly Average Temp: average of hourly temperature measurements recorded July 15th – August 31st
- Summer Hourly Max Temp: highest hourly temperature measurement recorded between July 15th and August 31st

- Max7dAM: highest 7dAM value from July 21st – August 31st.

Stream temperature metrics should be interpreted carefully. Incomplete data should be scrutinized, and removed for some analyses to prevent false conclusions. July 15th – August 31st is a 48 day time frame, so records having a 'SummerHourCount' less than 1152 are incomplete (48 days * 24 hours = 1152 hours). Temperature thresholds are based on literature, but there is not complete consensus. For example, some agencies use a threshold of 13ºC instead of 12º, for Bull Trout (IDEQ). The first five 7dAM threshold metrics listed above were adopted from the Oregon DEQ, however that agency uses a different time frame to describe summer (June 1st – September 30th). The Salmon and Steelhead spawning metric should be used to evaluate spawning periods, which may occur outside the reported time frame. The 7dAM>22 metric is reported by PIBO for this same time frame, and the State of Washington Department of Ecology also uses a threshold of 22ºC; they use daily, rather than 7dAM values however. Adherence to a threshold does not indicate that a site hosts a particular fish species. Naming conventions for temperature metrics differ among agencies. For example, rather than using the acronym '7dAM', Washington Department of Ecology uses '7-DAD', while the Idaho Department of Environmental Quality (DEQ) and PIBO use 'WMT' to describe the same metrics. The metrics 'Summer Hourly Average Temp', 'Summer Hourly Max Temp', and 'Max7dAM' are reported by PIBO for the same time frame using different names ('AvgTemp', 'MDMT', and 'MWMT').

Citations:

Idaho Department of Environmental Quality. "Temperature". Idaho Department of Environmental Quality. (Online). Available at: http://www.deq.idaho.gov/water-quality/surface-water/temperature.aspx. (March, 2015).

Oregon Department of Environmental Quality. 2008. "Temperature Water Quality Standard Implementation – A DEQ Internal Management Directive". OAR 340-041. Oregon Department of Environmental Quality, Portland, OR.

State of Washington Department of Ecology. "Designated Uses and Criteria". State of Washington Department of Ecology. (Online). Available at: http://www.ecy.wa.gov/programs/wq/swqs/criteria-freshwater/wac173201a_200-temp.html. (March, 2015).

U.S. Environmental Protection Agency. 2003. "EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards". EPA 910-B-03-002. Region 10 Office of Water, Seattle, WA.