

Pacific salmon populations have historically fluctuated dramatically due to climatic conditions, ocean conditions, and other disturbances. High water temperatures during drought conditions likely affected the historical abundance of salmon. In general, the increased exposure to stressful water temperatures and the reduction of suitable habitat caused by drought conditions reduce the abundance of salmon. Human-caused elevated water temperatures significantly increase the magnitude, duration, and extent of thermal conditions unsuitable for salmonids.

The freshwater life histories of salmonids are closely tied to water temperatures. Cooling rivers in the autumn serve as a signal for upstream migrations. Fall spawning is initiated when water temperatures decrease to suitable temperatures. Eggs generally incubate over the winter or in early spring when temperatures are coolest. Rising springtime water temperatures may serve as a cue for downstream migration. Temperature can also influence the life histories of salmonid prey and allow a competitive advantage for non-native species such as pikeminnow.

Because of the overall importance of water temperature for salmonids in the Pacific Northwest, human-caused changes to natural temperature patterns have the potential to significantly reduce the size of salmonid populations. Of particular concern are human activities that have led to the excess warming of rivers and the loss of temperature diversity.

Different salmonid species have evolved to take advantage of the Pacific Northwest's cold-water environment in different ways. Each species has a unique pattern of when and where they use the rivers, and even for a specific species this pattern of use may change from year to year. This diversity in freshwater life history is a critical evolutionary trait that has allowed salmonids to persist in a freshwater environment that naturally fluctuates and has natural disturbances.

Therefore, EPA's proposed water quality standards for temperature include protective criteria that account for the natural thermal diversity of streams and rivers. In proposing temperature criteria for salmonids uses, EPA recognizes that (1) Salmonids need specific water temperature ranges for their various life stages; (2) the natural thermal temperature regime of the rivers and streams of the Pacific Northwest were naturally thermally diverse, varying spatially and temporally; and (3) salmonids evolved specific life

history strategies to find and thrive in the cold water provided by these thermally diverse river systems. EPA believes that water quality standards for temperature should take this natural thermal diversity into account in addition to setting the appropriate temperature thresholds necessary to protect the various life stages of salmonids. The water quality criteria EPA is proposing today address both of these concepts in the form of generally applicable numeric criteria corresponding to specific use designations, and two alternative criteria that, if promulgated, would apply instead of the numeric criteria on a site-specific basis. The first proposed alternative criterion addresses naturally warm conditions: when the natural thermal condition of the stream is naturally warmer than the otherwise applicable numeric temperature criterion, the natural temperature becomes the criterion. The second proposed alternative criterion concerns waters that are currently cold: if the current summer maximum stream temperature is colder than the otherwise applicable numeric criterion, the current summer maximum temperature becomes the criterion.

## 2. EPA's Basis for the Proposed Numeric Criteria

Water quality criteria must protect the associated designated use(s). See CWA section 303(c)(2)(A), 33 U.S.C. 1313(c)(2)(A), and 40 CFR 131.5(a)(2), 131.6(c) and 131.11(a)(1). Therefore, a criterion should apply to the whole extent of a water body or segment for which a particular use is designated, including, in the case of flowing water bodies, the lowest point downstream where the use is designated. Because streams generally warm progressively in the downstream direction, waters upstream of that point will generally need to be cooler in order to ensure that the criterion is met throughout the segment, including the furthest point downstream. Thus, a water body that meets a temperature criterion at the furthest downstream extent of the water body segment where the use is designated will, in many cases, provide water cooler than the criterion at the upstream extent of the segment. EPA took this into consideration when it formulated the proposed numeric temperature criteria contained in today's proposed rule.

EPA regulations also require that water quality standards provide for the attainment and maintenance of downstream uses. 40 CFR 131.10(b). Thus, the designated use and associated numeric criteria should apply upstream

of the areas of actual use because temperatures in upstream waters significantly affect the water temperatures where the actual use occurs and upstream waters are usually colder. Of course, if a more sensitive use is designated upstream, the more protective criterion associated with that use would apply upstream. See 40 CFR 131.11(a).

The numeric temperature criteria EPA is proposing to protect the salmonid designated uses are the same criteria recommended in the Temperature Guidance. The Guidance included two tables summarizing the temperature considerations for each life stage of Pacific salmon and trout and bull trout that are described in detail in the technical issue papers that are the basis for the Temperature Guidance. See the record for this proposed rule to view the issue papers. These temperature considerations, summarized in Tables III-1 and III-2 at the end of this section, form the scientific basis for EPA's proposed numeric temperature criteria.

EPA requests comment on the proposed temperature criteria and methodology and scientific judgments that led to the recommendations in the Temperature Guidance and the criteria in this proposed rule. Specifically, EPA requests comment on the level of conservatism associated with proposing numeric criteria, considering the temperature ranges identified by studies that were evaluated in the Temperature Guidance. The level of conservatism should be considered along with the conservative approach of applying the criteria as the 7DADM of the second warmest year of ten years at the downstream end of the affected segment; see discussion below).

The metric EPA is proposing for all the numeric criteria is the maximum seven-day average of the daily maximum temperatures (7DADM). A 7DADM value is calculated by adding the daily maximum temperatures recorded at a site on seven consecutive days and dividing by seven. The maximum 7DADM is the highest recorded 7DADM for the year (*i.e.*, the warmest week).

The 7DADM is similar to the maximum weekly average temperature metric used previously by EPA for its national temperature criteria recommendations. However, EPA proposes to use the 7DADM metric because it describes the maximum temperatures in a stream, but is not overly influenced by the maximum temperature of a single day. Thus, it reflects an average of maximum temperatures that fish are exposed to over a week-long period. Since this