



State of Oregon Department of Environmental Quality

Proposed pH Criteria Revisions for the Crooked River and Trout Creek Subbasins, Deschutes Basin, Oregon

Fish and Aquatic Life Use Updates 2022

Background

DEQ is proposing to revise the water quality criteria for pH for the Crooked River and Trout Creek subbasins of the Deschutes River basin to be consistent with the pH criteria in eastern Oregon. The current criteria for these subbasins are the same as the pH criteria for waters in western Oregon and the Cascade Mountains. However, these two basins have the hydrologic and geologic characteristics found in eastern Oregon.

Proposed rule amendment

DEQ proposes to amend *OAR 340-041-0135, Basin Specific Criteria (Deschutes): Water Quality Standards for this Basin*, to revise the pH criteria for the Crooked River and Trout Creek sub-basins from 6.5 – 8.5 to 6.5 – 9. This revision will make the criteria for these subbasins consistent with the pH criteria for other eastern Oregon basins, including the John Day and Grande Ronde basins, which also have salmon and steelhead use (see Figure 2). The proposed pH standard includes an action level of 8.7 (see Option 1 in “Options Considered” section below.) This action level triggers a review or study to determine whether the higher pH values are due to anthropogenic impacts.

The following is the current criteria language from the Grande Ronde basin and other eastern Oregon basins:

- (1) pH (hydrogen ion concentration). pH values may not fall outside the following range: all basin streams (other than main stem Snake River): 6.5–9.0. When greater than 25 percent of ambient measurements taken between June and September are greater than pH 8.7, and as resources are available according to priorities set by the Department, the Department will determine whether the values higher than 8.7 are anthropogenic or natural in origin.

Justification

The EQC adopted Oregon’s current pH criteria in 1996. The pH criteria vary throughout the state, with a range of 6.5 – 8.5 in coastal and Cascade streams, and 6.5 – 9.0 or 7.0 – 9.0 in most central and eastern Oregon streams (Figure 1). The 9.0 upper end of the pH range is due to natural pH levels in eastern Oregon basins, which are commonly above 8.5¹. The criteria range for the Deschutes River Basin is currently consistent with western Oregon and Cascades Mountain basins. While much of the Deschutes watershed flow comes from the Cascade Mountains, the Crooked River and Trout Creek subbasins originate in more arid ecoregions of eastern Oregon, not from the Cascade Range. The Crooked River and Trout Creek subbasins are similar in ecological setting and character to other central and eastern Oregon streams, including the adjacent John Day basin. Therefore, it is appropriate that the Crooked River and Trout Creek subbasins have pH criteria consistent with other eastern and central Oregon basins.

¹ See chapter 2, Oregon Department of Environmental Quality. 1995. Final Issue Paper: pH, Hydrogen Ion Concentration. Portland, OR. 44 pp.

The similarities between the Crooked River and Trout Creek watersheds and other central and eastern Oregon watersheds are highlighted by EPA's ecoregion map, which accounts for ecology, landforms, soils, vegetation, climate, land use, wildlife, and hydrology². The Crooked River and Trout Creek watersheds are primarily categorized in the John Day/Clarno Uplands Level IV ecoregion.³ (See Figures 3 and 4.) Most of the John Day basin is also in this ecoregion. Soils in the Crooked River watershed have been characterized as having high amounts of exchangeable sodium, which results in soils with higher pH levels.⁴ The Upper Crooked watershed contains high levels of bentonite, which forms in alkaline conditions; analysis of bentonite in these areas indicates high levels of exchangeable sodium.⁵

The proposed pH criteria of 6.5 – 9.0 protect aquatic life according to EPA's recommended water quality criteria for pH.⁶ There can be concern that increasing acidity (lowering of pH) will release toxic pollutants or make them more toxic to aquatic life. However, this is not typically a concern in the upper pH range of 8.5 to 9.0.

When DEQ revised the pH criteria for basins in central and eastern Oregon in 1996, a technical advisory committee evaluated available information and data. The Technical Advisory Committee concluded that pH levels up to 9.0 protect aquatic life and that streams in this region naturally reach pH's above 8.5 and up to 9. They noted that waters impacted by excessive algal growth could be distinguished by pH levels higher than 9.0, which could have impacts to aquatic life, and by diurnal fluctuations in pH. Therefore, the committee recommended an increase in the upper end of the pH criteria range for eastern Oregon basins to 9.0. The committee also recommended that DEQ adopt an action level of pH 8.7 to determine whether the high pH levels result from anthropogenic sources.

In 1999, EPA approved the pH criteria of 6.5 – 9.0 for eastern Oregon basins following ESA consultation with the USFWS and NOAA Fisheries. This rulemaking simply applies the same criteria to the Crooked River and Trout creek subbasins, which are similar in character to the other eastern Oregon basins.

² Omernik, J.M. and G.E. Griffith. 2014. Ecoregions of the conterminous United States: evolution of a hierarchical spatial framework. *Environmental Management* 54(6):1249-1266.

³ <https://www.epa.gov/eco-research/ecoregions>. Visited January 4, 2022. See https://gaftp.epa.gov/EPADataCommons/ORD/Ecoregions/reg10/pnw_map.pdf for a copy of the map and legend.

⁴ Mayko, R. W. and G. K. Smith. 1966. *Soil Survey: Prineville, Oregon Area*. Soil Conservation Service, in cooperation with Oregon Agricultural Experimental Station. U.S. Department of Agriculture. 1966. 95 pp.

⁵ Gray, J.J., R.P. Geitgey, and G.L. Baxter. 1989. *Bentonite in Oregon: Occurrences, Analyses, and Economic Potential*. Special Paper 20. Oregon Department of Geology and Mineral Industries. Portland, OR. 36 pp.

⁶ *Quality Criteria for Water* 1986. EPA, May 1, 1986.

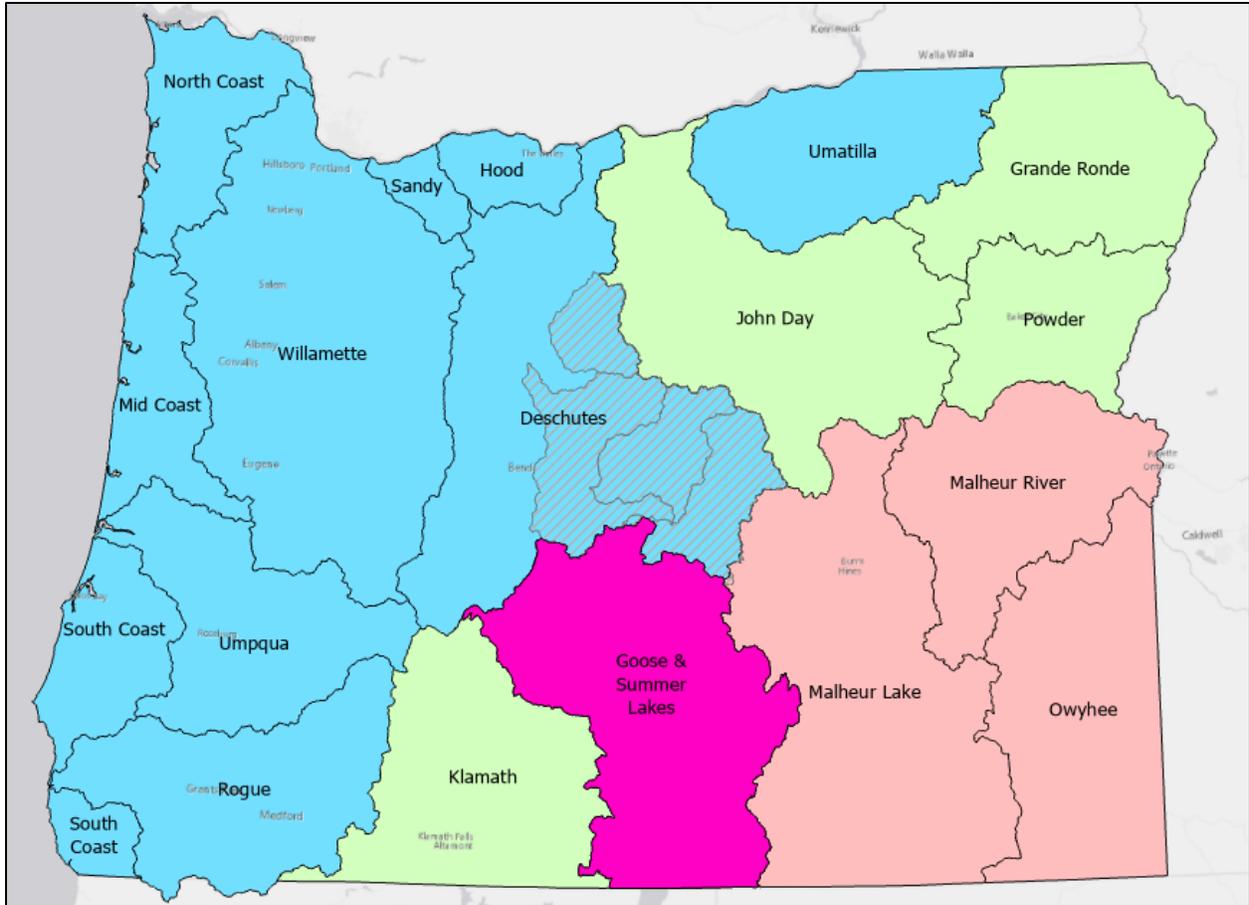


Figure 1. Current pH criteria by Oregon basin. 6.5-8.5 (blue), 6.5-9.0 (green), 7.0-9.0 (red), 7.5-9.5 (pink). The area proposed for change is hatched.

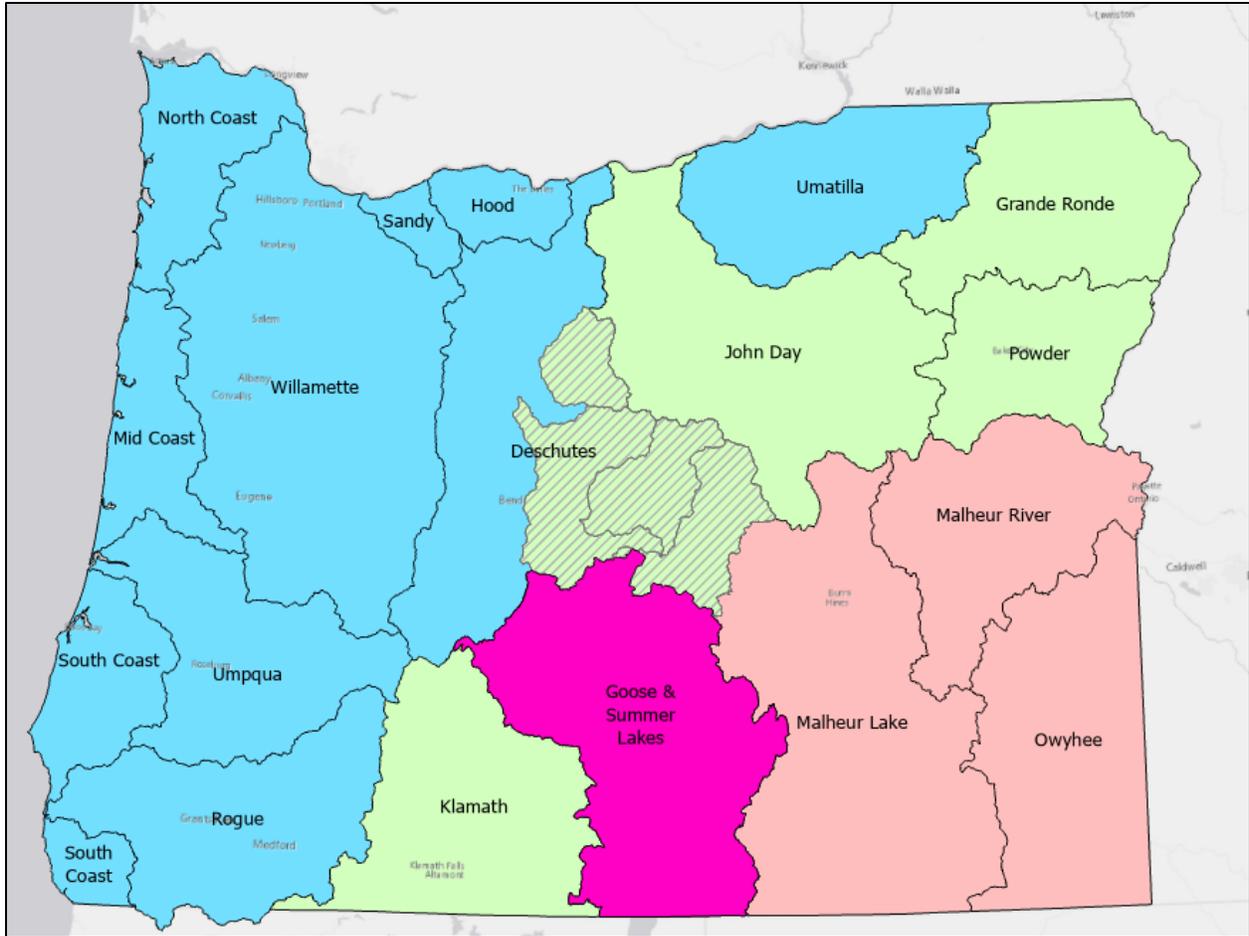


Figure 2. Proposed change to the pH Criteria is shown as hatched. The pH criteria are: 6.5-8.5 (blue), 6.5-9.0 (green), 7.0-9.0 (red), 7.5-9.5 (pink).

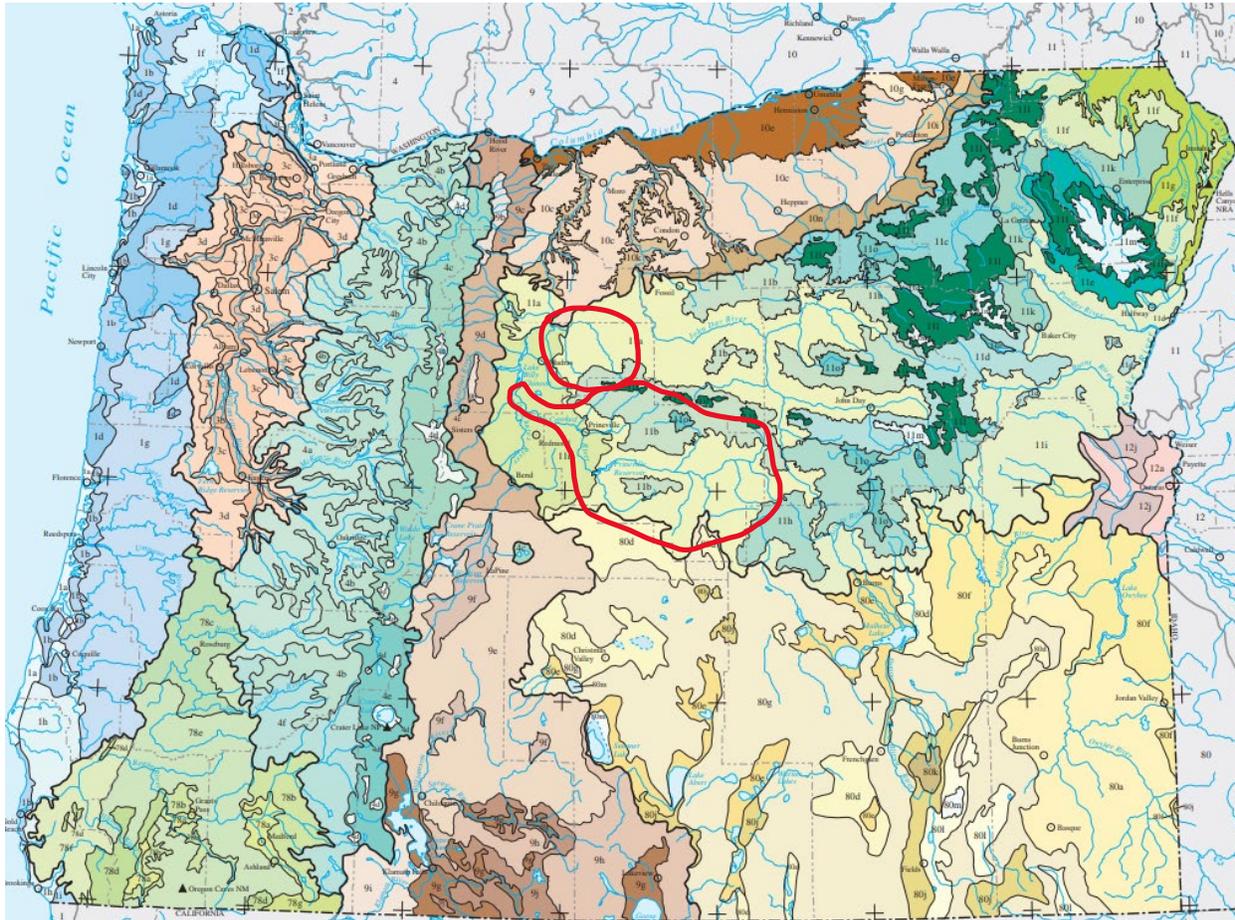


Figure 3. Eco-region map of Oregon highlighting difference between Western Oregon and Cascades eco-systems and eastern Oregon ecosystems. Note Crooked River and Trout Creek subbasins (approximately circled in red) are part of John Day/Clarno Uplands Ecoregion (11a & b on map). <https://www.epa.gov/eco-research/ecoregions>

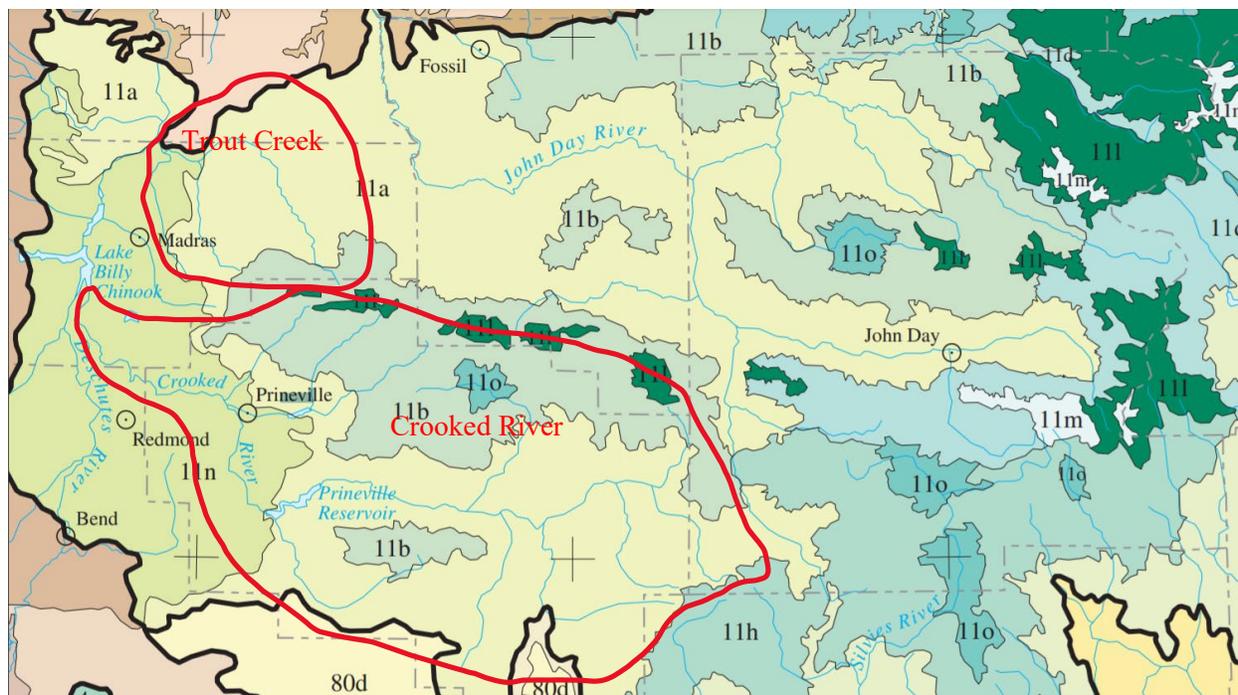


Figure 4. Zoomed-in ecoregion map highlighting ecoregions of Trout Creek and Crooked River basins (approximately outlined in red) within the John Day/Clarno Uplands Ecoregion. <https://www.epa.gov/eco-research/ecoregions>

Options considered

Option 1 (preferred) – Change pH criteria for the Crooked River and Trout Creek using the same language as other eastern Oregon criteria

The pH criteria for the John Day and other eastern Oregon basins all state the same language:

“pH values may not fall outside the following range: 6.5-9.0. When greater than 25 percent of ambient measurements taken between June and September are greater than pH 8.7, and as resources are available according to priorities set by the Department, the Department will determine whether the values higher than 8.7 are anthropogenic or natural in origin.”

The criteria for these basins includes the 8.7 action level.⁷ The action level provides additional protection (through a TMDL or similar study) to the beneficial use if pH values are consistently measured in the high portion of the acceptable range of pH levels, but do not exceed 9.

Option 2 – Change pH criteria for the Crooked River and Trout Creek without an action level

DEQ could also amend the criteria so that the acceptable maximum pH is extended from 8.5 to 9.0, without including the action level. The action level triggers the type of study that would typically be done as part of a TMDL. A TMDL would be required if the waters exceed 9.0 and are listed as impaired for pH. It is unlikely that some locations within the subbasin would consistently exceed 8.7 but none would exceed 9.0. Therefore, the action level is unlikely to be needed.

⁷ See Issue Paper, page 36 (3-2).

Impact of rulemaking

Water quality assessment

The rulemaking will affect water quality assessment of pH in the Crooked River and Trout Creek watersheds if pH in these watersheds falls in the range between 8.5 and 9.0. Under the previous criteria, pH's in this range would exceed the criteria and thus would result in an impairment listing. Under the new criteria, the waterbody would not be listed as impaired unless pH exceeded 9.0, or unless pH levels above 8.7 result in further DEQ investigation.

Five waters are listed as impaired for pH in the Crooked River Basin based on the 2022 Integrated Report. No waters are impaired in the Trout Creek Basin. If the upper limit of the pH criteria was revised to 9.0, Table 1 indicates potential impacts to these listings, based on data in the 2022 integrated report.

Table 1. Potential impact of revised pH criteria to water quality impairments for pH in the Crooked River Basin

Waterbody/Segment	2022 Category	Potential impact of proposed revision to pH standard
Crooked River/ Dry Creek to Lone Pine Creek	5 (Impaired)	Delisting, or might trigger action level of 8.7
Crooked River/Lone Pine Creek to Opal Springs	5 (Impaired)	Delisting, or might trigger action level of 8.7
Horse Heaven Creek/ Bonnieview Dam to confluence with Crooked River	No data	n/a; additional data is needed
North Fork Crooked River/ confluence with Johnson Creek and Howard Creek to Deep Creek	3 (Insufficient information);	n/a; additional data is needed
South Fork Crooked River/ confluence with Crooked River to Twelvemile Creek	5 (Impaired)	2 impaired (based on earlier data; new data would be needed to delist)

NPDES permit

The only NPDES permitted facility that discharges into the effected subbasins is the City of Prineville Wastewater Treatment Facility, which discharges to the Crooked River. The facility currently has permit limits for pH ranging from 6.0 to 9.0.

TMDL development

DEQ expects to begin developing a TMDL for the Crooked River soon. It is important to ensure the criteria are appropriate so that the TMDL implements the correct criteria.

Alternative formats

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email deqinfo@deq.oregon.gov.