



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
FIVE POST OFFICE SQUARE – SUITE 100
BOSTON, MASSACHUSETTS 02109-3912**

November 6, 2019

Mr. Ted Diers, Administrator
Watershed Management Bureau
New Hampshire Department of Environmental Services
29 Hazen Drive
Concord, NH 03302

Re: Response to October 23, 2019 letter regarding the sound science rationale for the amendments to State water quality standards regarding dissolved oxygen percent saturation

Dear Mr. Diers:

Thank you for your letter of October 23, 2019 in response to EPA's July 3, 2019 letter which requested the sound scientific rationale for amendments to State water quality standards regarding dissolved oxygen (DO). Your letter provided some additional information; however, it raised additional questions.

The purpose of this and our prior request for information is to ensure that as EPA reviews the water quality standards submitted to us we can determine, consistent with 40 C.F.R. 131.5(a)(2), whether New Hampshire has adopted criteria that protect the designated use, and whether those criteria are based on a sound scientific rationale as required by 40 C.F.R. 131.11(a).

The EPA-approved DO criteria currently in effect for Clean Water Act purposes for Class B waters in New Hampshire are at least 75% of saturation, based on a daily average, and an instantaneous minimum dissolved oxygen concentration of at least 5 mg/l.

Both EPA and DES (email from DES to EPA 10/28/19) calculated the DO concentration that is equivalent to 75% saturation, which depends on ambient water temperature, salinity and altitude. According to DES, DO concentrations at 75% saturation range from 6.4 to 7.2 mg/l across the Great Bay assessment units based on August median temperatures for the period 1990-2018. The equivalent DO for spring conditions is slightly higher. Thus the 75% saturation criterion has the potential to provide a higher level of protection for aquatic species than the 5 mg/l concentration alone. Although the 75% saturation criterion applies as a daily average and, in contrast, the 5 mg/L criterion applies as an acute threshold, the effect of this difference on the expected level of protection given current assessment procedures has not been addressed. Given

the possibility that aquatic life protection could be decreased for Class B estuarine water by utilizing the 5 mg/l concentration alone, a scientific basis for asserting that the 5 mg/L concentration is fully protective of the designated use is necessary.

Class B warm water

New Hampshire currently affords a higher level of protection for early life stages for cold water species. In Class B cold water from Oct 1 to May 14, DO limits are ≥ 9.5 mg/L as a 7-day average and ≥ 8 mg/L as an instantaneous minimum. These values appear to be based on cold water criteria to protect early life stages, as recommended by EPA (Table 1; Environmental Protection Agency, 1986¹). This same table also recommends warm water DO early life stage criteria of 6.0 mg/l as a 7 day mean and 5.5 mg/l for other life stages as a 30-day mean. The 75% saturation, adjusted to ambient temperature and salinity conditions, would afford protection to these warm water life stages that the 5 mg/l alone does not. EPA asks that DES provide any additional scientific justification that shows that how removal of the 75% DO criterion, without the addition of early life stage DO criteria of 6.0 mg/l as a 7 day mean and 5.5 mg/l for other life stages as a 30-day mean, adequately protects aquatic life uses in Class B warm water.

Class B estuarine water

A majority of Great Bay, NH is designated by NOAA Fisheries as critical habitat for the federally listed Atlantic sturgeon². NOAA Fisheries reports that a DO concentration of 6 mg/l supports habitat use by all age groups and is therefore essential for recruitment and reproduction. Similarly, EPA's guidance on ambient water quality criteria for the Chesapeake Bay recommends a concentration of greater than 6 mg/l for the growth of larval and juvenile tidal-fresh resident fish such as the Atlantic sturgeon.

Retaining the 75% saturation criterion would continue to maintain aquatic life protection for Class B estuarine and warm waters. EPA asks that DES provide any additional scientific justification that shows that how removal of the 75% DO criterion adequately protects aquatic life uses in these waters.

Percent saturation vs. concentration

Your letter states that “percent saturation is neither a necessary nor preferred metric for DO related criteria,” and that DO criteria are expressed as concentrations in several EPA marine DO

¹ US Environmental Protection Agency. 1986. Quality Criteria for Water 1986. EPA 440/5-86-001. EPA Office of Water, Washington, D.C.

² National Marine Fisheries Service. 2017. Designation of Critical Habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon ESA Section 4(b)(2) Impact Analysis and Biological Source Document with the Economic Analysis and Final Regulatory Flexibility Analysis. Greater Atlantic Fisheries Office, National Marine Fisheries Service, Gloucester, MA.

documents (EPA 2000³; EPA 2003⁴). While we acknowledge these documents, we also note that the state of Florida recently concluded after careful technical review that DO percent saturation criteria were preferred for Florida (NMFS 2016⁵; FDEP 2013⁶). While this doesn't mean that they must also be better for New Hampshire, this indicates that reasonable experts considered the criticisms levied by EPA (1986) and found that they do not apply in every case today.

One reason to consider DO percent saturation is that it is no longer true that percent saturation is more complex to measure or apply as a criterion than instream DO concentration. Both parameters are extremely easy to measure and apply as criteria since modern DO sensors require contemporaneous water temperature and salinity measurements to calculate DO concentration. Further, percent saturation criteria do not result in unnecessarily stringent criteria in cold months because physiologically, animals respond to partial pressure, which is the same as percent saturation except in the case of high-altitude waters. Moreover, DO criteria exceedances almost never occur in the cold months when DO saturation is very likely close to 100% so this point is moot. Lastly, if criteria are set at an appropriate percent saturation level, then summer criteria will be protective.

EPA is interested in resolving this issue by November 18, 2019. Please contact me at (617) 918-1629 if you have any questions.

Sincerely,



Ralph Abele

Chief, Water Quality Standards Section
Water Division

³ US Environmental Protection Agency. 2000. Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hatteras. EPA Office of Water, Washington DC

⁴ US Environmental Protection Agency. 2003. Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and Its Tidal Tributaries. EPA 903-R-03-002. EPA Region 3 Chesapeake Bay Program Office in coordination with the Office of Water/Office of Science and Technology, Washington, DC

⁵ National Marine Fisheries Service. 2016. Biological Opinion on EPA Approval of Water Quality Standards Under Section 303 of the Clean Water Act. FPR-2015-9234. Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service.

⁶ Florida Department of Environmental Protection. 2013. Technical Support Document: Derivation of Dissolved Oxygen Criteria to Protect Aquatic Life in Florida's Fresh and Marine Waters. Division of Environmental Assessment and Restoration, Florida Department of Environmental Protection.

