



November 30, 2017

Ms. Ashley Beranek  
DNR Bureau of Water Quality  
101 South Webster St. WQ/3  
Madison, WI 53707

SUBMITTED VIA EMAIL TO: [dnrimpairedwaters@wisconsin.gov](mailto:dnrimpairedwaters@wisconsin.gov)

**RE: Courte Oreilles Lakes Association and Lac Courte Oreilles Tribal Conservation Department comments regarding the Wisconsin Department of Natural Resources proposed draft 2018 impaired waters list.**

Dear Ms. Beranek

The Courte Oreilles Lakes Association (COLA) and the Lac Courte Oreilles Tribal Conservation Department (LCOCD) are providing the following comments regarding the proposed draft Wisconsin 2018 impaired waters list. Specifically, these comments pertain to the listing of Lake Lac Courte Oreilles (LCO), (AUID 15368, WBIC 2390800), for impairment due to low dissolved oxygen (DO) that results in insufficient oxythermal habitat to support the cisco and lake whitefish cold-water fishery in LCO. LCO is designated as a deep (stratified) two-story cold-water fishery lake by the Wisconsin Department of Natural Resources (WDNR), as well as an Outstanding Resource Water (ORW).

We applaud the WDNR on the proposed listing of LCO, in its entirety, as impaired for low DO. As described in the 2018 WisCALM Assessment for Lac Courte Oreilles (May 24, 2017) (attached) provided to WDNR by COLA and the LCOCD and prepared by LimnoTech, LCO is clearly not supporting its designated beneficial use as a two-story cold-water fishery for the resident populations of cisco and lake whitefish. The evidence is overwhelming:

- Insufficient oxythermal habitat as measured by dissolved oxygen in the hypolimnion;
- Insufficient oxythermal habitat as measured by an assessment of TDO5 values;
- Insufficient oxythermal habitat as measured by an assessment of cisco and whitefish habitat quantity;

- Massive fish kill in August of 2016 (attached); and
- Excess total phosphorus concentrations.

However, we take exception to listing the cause of the impairment as “Unknown.” For the reasons below, “total phosphorus” should be listed as the cause of the low DO impairment. As LCO and LCOCD have documented in research previously shared with DNR, phosphorus in the water column drives algal growth in LCO. Algae die and settle to the bottom of the lake. Algal decomposition by microbial activity consumes oxygen in the hypolimnion. At the same time, warmer summer temperatures stratify the lake. Warming surface temperatures and decreasing dissolved oxygen levels in the hypolimnion reduce oxythermal habitat for cisco and lake whitefish. As demonstrated by temperature and dissolved oxygen profile measurements in LCO, and further substantiated by the 2016 fish kill, sufficient oxythermal habitat does not exist to consistently support the resident cisco and lake whitefish.

An important aspect of evaluating biologic conditions in LCO relates to changes in DO in response to changes in total phosphorus concentrations. The rate and extent of depletion of dissolved oxygen in the hypolimnion is clearly linked to the amount of algal growth and, therefore, directly linked to phosphorus levels in the lake. Several literature sources support this claim. One such peer-reviewed literature source documents the link between hypolimnetic oxygen demand (HOD) and total phosphorus (TP), expressing the relationship by the following equation:<sup>1</sup>

$$HOD \propto TP^{0.478}$$

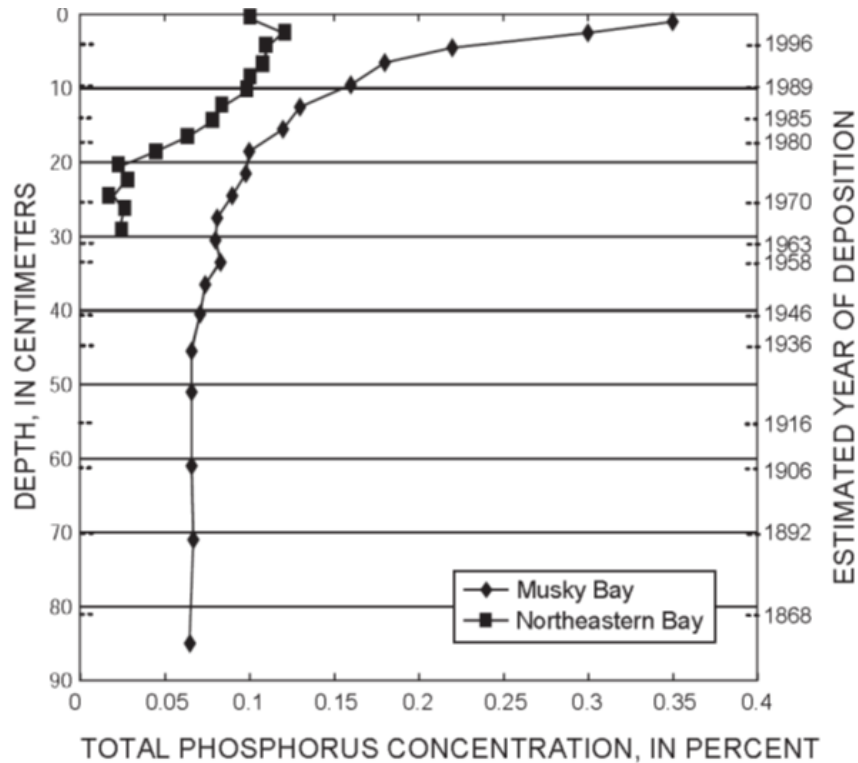
As total phosphorus in the lake increases, so does HOD. As HOD increases with total phosphorus, DO declines. Clearly, excess phosphorus in LCO causes increased dissolved oxygen depletion in the hypolimnion.<sup>2</sup>

Additionally, as an ORW, LCO deserves special protections. Phosphorus concentrations should not exceed historical concentrations. As shown in the figure below, analysis of sediment cores by the United States Geological Survey (USGS) indicate phosphorus concentrations have increased significantly since the late 1970’s and early 1980’s, nearly seven-fold.

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<sup>1</sup> Chapra, S.C. and R. P. Canale. 1991. *Long-Term Phenomenological Model of Phosphorus and Oxygen For Stratified Lakes*. *Wat. Res. Vol. 25, No. 6, pp. 707-715*

<sup>2</sup> Despite these clear signs of impairment, the total phosphorus concentrations in LCO do not exceed 2018 WisCALM impairment thresholds based on the 15 µg/L total phosphorus criterion for two-story lakes. This situation is a clear indication of the need for a site-specific criterion for total phosphorus to protect LCO. To address this need, COLA and LCOCD prepared and proposed a total phosphorus site-specific criterion (SSC) of 10 µg/L on a lake-wide average basis (attached). WDNR is currently considering this evidence in establishing an SSC for the lake.



*Fitzpatrick, F.A., P.J. Garrison, S.A Fitzgerald, and J.F. Elder. 2003. Nutrient, Trace-Element, and Ecological History of Musky Bay, Lac Courte Oreilles, Wisconsin, as Inferred from Sediment Cores. U.S. Geological Survey Water-Resources Investigations Report 02-4225.*

As noted above and in agreement with the proposed draft 2018 impaired waters list, LCO is clearly impaired because of low DO resulting in insufficient oxythermal habitat for cisco and whitefish. Furthermore, the cause-and-effect linkage between phosphorus and depleted hypolimnetic dissolved oxygen levels is universally understood within the scientific community and should be acknowledged in the WDNR’s analysis.

In summary, we fully support the WDNR on the proposed listing of LCO, in its entirety, as impaired due to low DO that results in insufficient habitat for resident cisco and lake whitefish. But for the reasons above, we take exception to listing the cause of the impairment as “Unknown,” and we request that WDNR revise the proposed draft 2018 impaired waters list to include total phosphorus as the cause of the low DO impairment.

We also request that the TMDL Priority be changed to “High” to reflect the urgency for action to preserve the LCO two-story fishery because LCO is one of only five lakes in Wisconsin that currently contain both cisco and lake whitefish.

Finally, we request that “Point Source” (PS) be added to the Source Category to be consistent with the Source Category designation for Musky Bay of Lac Courte Oreilles.

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Thank you for this opportunity to comment on the proposed draft Wisconsin 2018 impaired waters list. If there are any questions, please do not hesitate to call or email.

Sincerely



Kevin Horrocks

COLA, President



Dan Tyrolt

LCO Tribal Conservation Department

Attachments

2018 WisCALM Assessment for Lac Courte Oreilles-May 24, 2017

Report on 2016 Fishkill, Lac Courte Oreilles, Sawyer County-October 6, 2016

Site-Specific Phosphorus Criterion Proposal for Lac Courte Oreilles-March 2016