Lake Organization Guide to Collection of Lake Assessment Data- DRAFT

Lake Impairment Assessment

In order to determine if a lake should be listed as an *impaired water* it is important to determine the relationship between the impairment and pollutant. The field-measurements most commonly collected by lake organizations or citizen volunteers that can be used for this type of lake assessment are phosphorus and chlorophyll, which both can be used to indicate lake eutrophication[1]. The information below discusses considerations to be taken when collecting information to be used for impairment listing decisions.

Location of Sample Collection

Samples collected for lake assessment should typically be collected from the "deep spot" in the lake. Check with DNR to see if there is already a designated sampling location. If there are other or multiple places on the lake that will better represent overall lake conditions this should be discussed with the regional DNR Lake Coordinator before collecting data at these places to be used for lake assessment.

Sampling Method

Field collection, preservation and storage should follow procedures outlined in the Citizen Lake Monitoring Manual (http://WDNR.wi.gov/lakes/CLMN/manuals). **Only samples taken from the top 2 meters of the lake with a depth-integrated sampler will be used.** Samples must be taken at least 1 foot down to avoid any scum at the surface.

Period of Record

Samples collected during the most recent *five* year period will be used if available as they will be most representative of current conditions. Samples from additional years, back to the most recent *ten* years, will be used if not enough data is available for the past five years. If it is determined that samples have been collected from an extreme weather year (including abnormal drought or precipitation years) then an additional year of data may be required.

Timing of Sample Collection

Samples should be collected during the time periods outlined below approximately once per month. **Samples must be collected at least 15 days apart to be used for assessment.**

- **Total Phosphorus – June 1 – September 15**
- **Chlorophyll-a – July 15 – September 15**

Minimum Data Requirements

For both phosphorus and chlorophyll data, at least six samples over a minimum of two years are required for assessment. Collection of three samples in two different years is preferred, but collection of two samples in each of three years will also be accepted.

- To clearly demonstrate an impairment from phosphorus a biological confirmation using chlorophyll data is needed unless phosphorus is greater than 1.5 times the applicable phosphorus criterion for the lake type. In such a case it is considered an "overwhelming exceedance" and biological confirmation is not required to list it as impaired.
    - If chlorophyll data is being used as bio-confirmation on a waterbody that exceeds the phosphorus criteria, a minimum of *three* chlorophyll samples from at least one year is required.
- If chlorophyll data is being used alone to indicate a biological impairment then a minimum of six samples over at least two years are required.

[1] A point-intercept survey of the macrophyte (aquatic plant) community can also be done if it is suspected that macrophytes are indicating an impairment. These results can be used as biological response metrics, along with chlorophyll.

How Will the Data be Used?

Determining whether a lake will be listed as impaired, and if so, which impairment category it should be placed in, is a two-step process. First, it must be determined whether either TP or chlorophyll exceed impairment thresholds. Second, the TP and biological results are reviewed in combination to determine which listing category the lake should be placed in.

Step 1. Determine whether any impairment thresholds are exceeded.

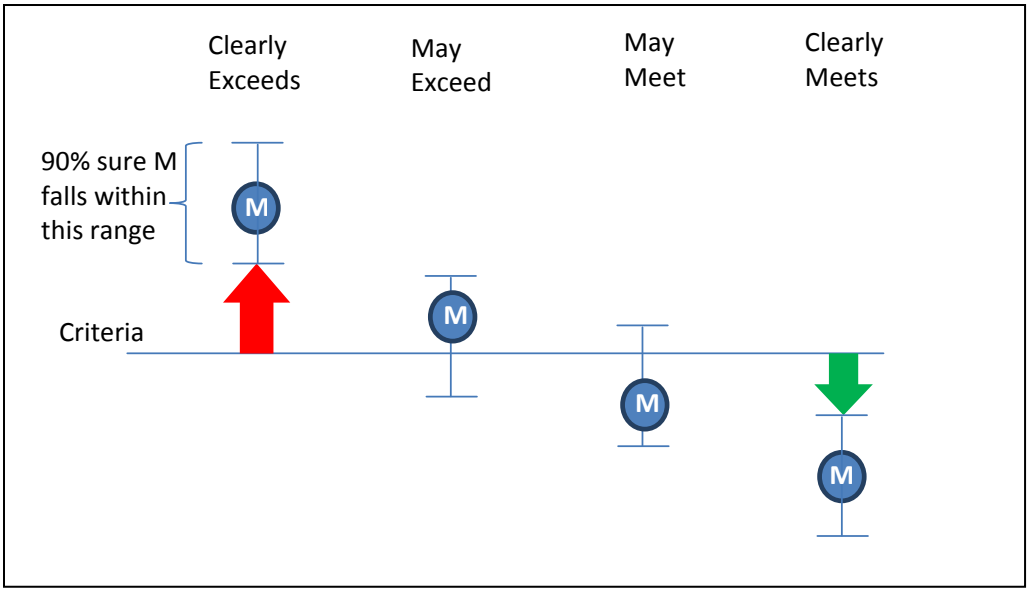
DNR will calculate the average (or mean, M) and 90% confidence intervals (CI) of sample data collected over the appropriate time period, and will compare them to DNR impairment thresholds for the lake type. There are different impairment thresholds for Recreational Uses (REC) and for Fish and Aquatic Life Uses (FAL). Most impairment thresholds are based on a simple concentration. However, to determine whether a lake is impaired for recreation, the number of days that the lake experiences nuisance algal blooms is determined.

	Impairment Thresholds by Lake Type						
	Shallow			Deep			
Assessment Type	Headwater Drainage	Lowland Drainage	Seepage	Headwater Drainage	Lowland Drainage	Seepage	Two-Story Fishery
TP REC	≥40 ug/L			≥30 ug/L		≥20 ug/L	≥15 ug/L
TP FAL	≥100 ug/L			≥60 ug/L			≥15 ug/L
CHL FAL	≥60 ug/L			≥27 ug/L			≥10 ug/L
CHL REC	>30% of days > 20 ug/L chl a*			>5% of days > 20 ug/L chl a			

*20 ug/L chl a corresponds to a "nuisance" algal bloom.

DNR will determine if the data shows that the lake clearly exceeds the impairment criteria, may exceed the criteria, may meet the criteria or clearly meets the criteria.

- If Lower 90% CI > criteria = "Clearly Exceeds".
- If Upper 90% CI > criteria = "Clearly Meets".
- If Mean > criteria AND lower CI < criteria = "May Exceed".
- If Mean < criteria, AND upper CI > criteria = "May Meet".



If the data indicate that the criteria have been clearly exceeded or met then further data collection will not be needed unless some change in the lake or management takes place. If the data is inconclusive (indicating that the criteria may be met or may be exceeded) an additional year or more of sampling will be needed.

Step 2: Review TP and biological data in combination to determine listing category

Once it has been determined whether TP or biological metrics such as chlorophyll have exceeded either REC or FAL impairment thresholds, the results are reviewed in combination with one another to determine which listing category (if any) the lake should be placed in. See the table below.

Table 1. Assessing phosphorus and biology in combination to determine impairment status and pollutant.

	Biological Response Indicators	Overall Assessment Result	Pollutant
Clearly meets TP criteria	None indicate impairment	Not Impaired (Fully Supporting) Category 2	NA
	One or more indicate impairment	Impaired – Biology Alone (Not Supporting) Category 5A	Unknown
Clearly exceeds TP criteria (but not by 1.5x)	One or more indicate impairment	Impaired – TP & Bioconfirmation (Not Supporting) Category 5A	TP
	None indicate impairment	Impaired – Exceeds TP but has insufficient or conflicting biological data (Not Supporting) Category 5P	TP
Exceeds TP criteria by 1.5x	None needed	Impaired – TP Alone (a.k.a. Overwhelming exceedance) (Not Supporting) Category 5A	TP