Missouri
Department of
Natural Resources

Notes from Nutrient Criteria Technical Subcommittee – July 23, 2012

In Attendance: Karen Bataille, MDC; Nick Bauer, St Louis MSD; Brandy Bergthold, MDNR-ESP; Robert Brundage, Norman, Comley & Ruth, PC; Mohsen Dkhili, MDNR-WPP; Eric Dove, Olsson Consulting; Suzanne Femmer – USGS; Ed Galbraith, Barr Engineering; John Hoke, MDNR-WPP; Dave Michaelson, MDNR-ESP; Lynn Milberg, MDNR-ESP; Rebecca O'Hearn, MDC; Mark Osborn, MDNR-WPP; Trent Stober, Geosyntec; Steve Taylor, MO-AG; Chris Zell, Geosyntec.

On Conference Telephone: Peter Goode, Washington U/MCE.

Proposed Rule and Rationale

Mark presented the latest proposal for lake nutrient criteria and the reasoning behind it. He reminded the group of previously proposed criteria, outlined in the following Table 1. These criteria had been derived lines of evidence that had been developed by EPA, MDNR, and the Regional Technical Assistance Group (RTAG) that had made benchmark recommendations for EPA Region VII (IA, KS, MO, NE).

Table 1: Previously Proposed Criteria.

	TP (µg/L)	TN (µg/L)	Chl-a (µg/L)
Plains	50	1000	10.0
Ozarks	20	500	6.0

There had been objections to these criteria raised by UMC and MDC staff, among others, due to concerns on impact to lake fisheries. Recent research showed that in Missouri reservoirs, higher nutrient concentrations are needed to support healthy fish populations. Therefore MDNR requested specific recommendations from these entities, and specified that response criteria (Chl-a and Secchi depth) were of primary concern. UMC and MDC staff obliged and provided the recommendations as shown in Table 2.

Table 2: UMC and MDC recommendations.

	Chl-a (µg/L)	Secchi Depth
Plains	30.0	0.6
Ozark Border	22.0	0.7
Ozark Highland	15.0	0.9

Rationale for these numbers were based on a number of factors, including findings that fish biomass and production increase with higher concentrations of TP and Chl-a, and that nutrient reductions have led to declines in sport fisheries. A central component of these findings was a 2012 study by Michaletz, Obrecht, and Jones that supported these findings for small impoundments (<1000 acres). It determined a threshold range of 40-60 µg/L Chl-a, beyond which sport fishery growth and structure ceased to benefit.

However, it must be kept in mind that sport fishing, while important, is not the only designated or existing use for these water bodies. Other types of recreation, such as whole body contact, are more optimal when Chl-a levels are lower and Secchi depth readings are greater than what is suggested in Table 2. Also, the frequency and intensities of algae blooms that are associated with higher Chl-a levels can pose a risk to drinking water systems.

Mark determined that the most practical way to resolve this conflict was to utilize lake classification in assigning criteria. The State has assigned three classifications to lakes. L1 lakes are used as sources for drinking water. L2 are the large reservoirs, generally with an area greater than 1,000 acres. L3 are the remaining lakes, most of which are smaller in size, and which are managed primarily for recreational fishing.

Drinking water supplies need to be protected against conditions that can lead to taste and odor problems, potential health problems, and strains on water treatment systems. L1 lakes were therefore assigned more conservative limits for Chl-a, as well as TN and TP.

L2 lakes, due to their size, have more complex morphologies than other lakes, as well as a broader variety of common existing uses, including whole body and secondary contact. The area near the dam, being the deepest part of the lake, tends to be at relatively low trophic levels when compared with the upper reaches of the lake. Since water quality samples that are used for assessment purposes are taken at the deeper end, a conservative criterion for these lakes, based on the aforementioned lines of evidence, is appropriate.

For the L3 lakes, which are generally smaller and managed primarily for the optimization of fisheries, the recommendations from UMC and MDC were considered to be the most appropriate. There would be more latitude given for nutrient concentrations, but not so much as to run the risk of hyper-eutrophic conditions.

Criteria for TN and TP are based on their relationship to the desired levels of Chl-a. The model that EPA used for the development of nutrient criteria in Florida was employed for this purpose. This involves the regression relationship between the nutrient (x-axis) and Chl-a (y-axis). With the Chl-a criteria set for each of the lake classifications within each eco-region, the standard criteria for TN and TP is the point on the x-axis that corresponds where the 75th percentile of the prediction interval of the regression line is equal to the Chl-a criterion.

This results in a conservative value for the nutrient (TN or TP), which can be allowed an alternative criteria if and only if the lake in question has been in compliance with the Chl-a criteria for the previous

three years. The alternative criterion is a range that spans from the standard criterion to the point on the x-axis that corresponds to where the Chl-a limit meets the 25th percentile of the prediction interval. Nutrient criteria that are derived from this model are in Table 3.

Table 3: General Ecoregional Nutrient Criteria [Alternative Criteria in Brackets]

Lake Ecoregion	Lake Class	Chl-α	TP	TN
Plains	L1	10.0	20 [20-34]	490 [490-660]
	L2	12.0	29 [29-45]	600 [600-900]
	L3	30.0	58 [58-101]	900 [900-1400]
Ozark Border	L1	10.0	20 [20-34]	490 [490-660]
	L3	22.0	42 [42-76]	700 [700-1100]
Ozark Highlands	L1 & L2	6.0	13 [13-21]	370 [370-500]
	L3	15.0	29 [29-50]	550 [550-850]

Comments and Discussion

- Why, if the ideal range of Chl-a for sport fish is 40-60 µg/L, should Chl-a criteria be lower than that.
  Response: The Michaletz study is a major consideration, but it is not the only one. A number of other factors went into the decision, including regional conditions and the previously cited lines of evidence. Other studies are cited following the table of recommendations provided by MDC. They will be posted in the Nutrient Criteria web page.
- The table of recommendations lists the primary fish species in small impoundments and large reservoirs. There does not appear to be any differences between the ecoregions for the small impoundments, so why is this listed?
  Response: The small impoundments were generally originally stocked with similar arrays of species statewide. Most of these species are self-sustaining, except for channel catfish, which need to be restocked regularly. In the large reservoirs, there is a greater diversity and divergence between the Plains and Ozark regions. This is due, in part, to the biological nature of the rivers that feed these reservoirs.
- Mark Twain Lake generally has Chl-a levels that go up to 15 µg/L near the dam. It also includes a drinking water supply system in one of the tributary arms. Forcing that level to 10 µg/L may not result in any significant benefit to that system.
  Response: Mark Twain, like other L2 reservoirs, includes a wide diversity of uses which must be taken into consideration when setting the criteria. If it can be demonstrated that there is no

impairment of these uses, including drinking water supply, site specific criteria or use attainability analysis may be employed.

- The Chl-a criteria for L1 lakes is based on general literature concerning drinking water source quality. But there is no local evidence cited that demonstrates the issue in Missouri.
  Response: Staff will check with the Public Drinking Water Program for information on which source water lakes in Missouri may have been associated with taste and odor problems, as well as any extraordinary costs to treatment systems due to source water conditions.
- The L3 criteria were derived from a single regression, which included geomeans for cause and response variables in individual lakes across all three ecoregions. The data point distribution appears to be skewed in certain areas.
  Response: Staff will re-examine the regression and divide it between eco-regions.
- TN is a less reliable causative indicator than TP, and the use of the regression approach may result in excessively wide range for criteria.
  Response: The alternative criteria for TN were calculated using the same method as for TP. Whether the range is too wide is open to interpretation, but the numbers appear to be within a reasonable margin of error.
- Table M "Lakes with site specific criteria" should be renamed to "enhanced protection", or something like that. This would be so that the "site specific " term can be applied to criteria resulting from site-specific studies, which may be lower or higher than the general criteria.

<u>Follow-up</u>

Staff will write further refinements to the rule and rationale, taking into account the comments presented here. The next meeting will be scheduled after this is acted on.

A general stakeholders meeting is scheduled for August 13, in which the main topic will be the Regulatory Impact Report.