Flathead Lake Nutrient Standards Kick-Off Meeting

Monday, April 13, 2015, 1:30 p.m.
Montana Fish, Wildlife & Parks Regional Office, Kalispell

DEQ
Montana Department of Environmental Quality

Meeting Summary

Introductions and Meeting Materials

Christina Staten began the meeting and those in attendance introduced themselves. A list of attendees (both in person and participating via teleconference) is included at the end of this document.

Dr. Michael Suplee then gave a PowerPoint presentation and led a discussion about the process for developing nutrient water quality standards for Flathead Lake. A copy of the presentation and several meeting materials and documents were made available prior to the meeting via a publically accessible wiki site at: http://montanatmdlflathead.pbworks.com/w/page/94836995/Flathead%20Lake%20Nutrient%20Standards. A table of the files posted to the wiki site on April 7, 2015 is included at the end of this document. A meeting reminder email and notice of the available documents was sent to DEQ's list of contacts for this meeting on April 7, 2015. All documents are still available on the wiki site, as well as a copy of this summary.

Topics, Discussion Points, and Questions and Answers

Below is a summary of key points from the presentation, comments from attendees, and questions and answers. All answers and comment responses are by Michael Suplee, unless otherwise stated.

Key Point: Setting water quality standards is about establishing the desired condition of the lake (i.e., where we want it to be, within its natural capabilities).

Question: Thinking within the natural capabilities, does that have implications with the Mysis shrimp introduction? If their introduction somehow created a permanent shift in the lake ecosystem, do we need to be mindful of that in setting standards going forward?

> Answer: To some degree; there are some things outside of our control. This slide is more along the lines of, for example, someone wanting to see Eastern Montana streams support a trout fishery; however, it's beyond their fundamental capability. With the Mysis shrimp, we're getting down to fine details; I would just think about this concept more on the gross level.

Key Point: Flathead Lake is an A-1 waterbody; however, the standards linked to the lake's current beneficial uses (i.e., drinking water after conventional treatment, swimming/recreation, growth and propagation of salmonid fishes and associated aquatic life, waterfowl, agriculture) are less protective than standards which maintain the lake's existing conditions (and also desired conditions).

DEQ is considering a new beneficial use to be incorporated in rule (ARMs) for Flathead Lake: "Unique Scenic Beauty."

Question: So you don't think there's existing latitude for Montana's recreational standard, to customize the recreation standard to a waterbody? People's recreation expectation for Flathead Lake could be more stringent than another, more productive, lake elsewhere.

Answer: The problem with that approach becomes: why is any other A-1 lake different from Flathead? Our thinking is to try to be transparent about what's going on. If you associate a particular use with Flathead Lake's standards that is above and beyond (i.e., "unique scenic beauty"), rather than to have above and beyond standards associated with any A-1 waterbody, it all fits together. Otherwise, we'll have some A-1 aquatic waterbodies protected with much higher levels than other A-1 waterbodies without a clear reason as to why. The question becomes: what are you tying it back to?

Question: Why did you choose lake trout as the trout for the fishery beneficial use for Flathead Lake? (Note: see slide 8 of the presentation)

Answer: Because that's the data DEQ was able to locate when trying find numbers to use to make these kinds of comparisons (i.e., comparisons of criteria thresholds for beneficial uses); not because that is implied as the desired fishery. There isn't much literature on Montana's native species.

<u>Key Point</u>: DEQ is relying on the large body of northern, temperate lake studies to help identify appropriate standards. There's a lot of excellent work on phytoplankton, chlorophyll a, total phosphorus, total nitrogen, and secchi depth. Shoreline algae is another parameter to consider, primarily because we can link that to certain types of remedial actions or regulatory actions that could go into place and be associated with a mechanism to actually implement the standard. (Note: see slide 10 of the presentation)

Comment: I'm finding a little bit of a mismatch because a lot of the stuff we talked about in the 80s and 90s had to do with nearshore clarity and the algae effects in the nearshore shallower depths; that was a lot of what the historical data we talked about. Now we use "Midlake Deep" as the criteria point, but you're still talking historic water clarity. Part of what the Flathead Lake Biological Station talked about the last several years, is that because of the Mysis, there's been a change in trophic levels and things that are happening in the shallow water. So to me, there's a little bit of disconnect when you start talking historic and start talking current conditions.

At the time, we were seeing very small changes at Midlake Deep, and were seeing more major changes along the shoreline, therefore the State decided Flathead Lake needs to be listed, and thus we need to do this process. Now all of a sudden, we're back to Midlake Deep.

Response: If we were to go back and look at those late 80s and 90s criteria, a lot of them were not nearshore; many of them are associated with Midlake Deep. The nearshore hasn't been ignored, however.

<u>Key Point</u>: Mysis shrimp appear to have fundamentally altered the primary productivity of the lake due to the way the zooplankton graze on the phytoplankton. The phytoplankton are causing the lake to be more productive, but the biomass (i.e., the chlorophyll) is about the same.

The zooplankton eat the larger, slower growing phytoplankton, leaving the smaller, faster growing phytoplankton. This leads to higher productivity (the speed at which the phytoplankton grow), but the biomass (the amount of chlorophyll a in the lake at any given time) is the same as it was historically.

Question: How does Mysis shrimp, which preys on the zooplankton, fundamentally shift the productivity of the lake? I can see if you add nutrients, but how does a predator at the top end drive a productivity shift?

> Answer: They Mysis have grazed on the zooplankton in such a manner that the zooplankton that remain have eaten larger, slower growing phytoplankton. So what remains in the lake are the smaller, faster growing phytoplankton. Since they have a faster turnover rate, essentially, you've boosted primary productivity. The basic mechanism of primary productivity in the lake is how fast they phytoplankton are turning over. This is measured via depth integrated samples at Midlake Deep.

<u>Key Point</u>: Secchi depth is as useful a measurement as primary productivity for protecting the lake and has other useful advantages, such as:

- **It is easy and economical to measure**
- **It links directly to a highly-valued, widely recognized feature of Flathead Lake – its clarity**
- **People really respond to lake clarity, so it makes for a good standard, particularly in accompaniment with chlorophyll a**

It is important to understand that if the State adopts a standard for the lake, the State is also responsible for making sure that the standard can be monitored for. The State is not in a position to measure primary productivity for multiple reasons (for example, it is too expensive, requires radioactive isotopes, and the sampler has to have to have a special license).

Comment: There are a few things that secchi depth doesn't tell you in terms of the dynamics in the lake. If it were to be adopted in place of primary production, those things would need to be addressed. It doesn't address ecological impacts of a secchi depth relative to productivity. There is no way to demonstrate whether the spike in primary productivity is related to a change in the overall ability for phytoplankton to grow, or the rate at which they grow. There are certain things in terms of carbon budget and the overall assessment of the lake health that you learn from primary productivity that is lost from just using a secchi depth. DEQ is right that the cost of using a secchi depth can't be beat, but it's a tough sell for an ecologist, even though it might be great from a standards perspective. I agree that it's too expensive to measure primary productivity, but the point to be made is that secchi depth isn't equivalent and isn't a proxy in terms of ecological function.

> Response by Michael Suplee, DEQ: Primary productivity doesn't work very well for a standard. We cannot reverse a fundamental ecological change. What if we had adopted the 80 mg carbon per meter squared criterion in 1988, right as the Mysis shrimp were coming on? How would we now get back to it? DEQ doesn't believe that the lake will return to that. It's not because of other features of the lake; it's a fundamental ecological change that occurred because of something we can't reverse.
>
> We can certainly keep the lake from becoming over eutrophied and slipping down that slope of increasing phytoplankton chlorophyll a and reduced secchi depth. As a standards setting process, this is a superior approach.

Response by Jason Gildea, EPA: In addition, we have a hard time explaining primary productivity to the public. I think moving to something like secchi depth gains us a lot in terms of public perspective and public buy-in.

Key Point: Well-cited science for northern temperate lakes indicates the candidate criteria DEQ considered in 2014 are generally correct for maintaining the phytoplankton chlorophyll a criterion.

Key Point: Flathead Lake is currently an oligotrophic lake, but the lake's average annual phosphorus load puts the lake near the threshold where movement to mesotrophy can occur with modest phosphorus increases. (Note: see the graph on slide 28 of the presentation).

Question: What would happen if we picked another spot in the lake to measure standards compliance? Like one that has less mixing than the Midlake Deep site?

Answer: It would probably take some years to figure out what the implication of that would be. If out in the middle of the lake in deep water, my guess is that in a couple of years, we would realize that they are almost the same. But if near the shore, or upgradient where the turbidity plume has more of an influence on water clarity, you may not be able to get a comparable point right away. May take some years to know what the relationship is between them so you could back-calculate what that meant to all the older data you had. Therefore, this is not a preferred option.

Comment: The value of having one spot over a long period of time is much more impactful than you might think. When you look at various points in the lake, the values are dependent not only on the day in terms of the weather (the wind especially) but are also dependent on the year. So if you move to another spot in the lake, you lose a lot of the power that you have, congruent in a steady observation point, with an observation point that you have at Midlake Deep. The wind alone can change surface temperatures on either side of the lake. Seeing how things change in terms of nutrients and how mixing occurs. There are big temporal differences day to day and storm event to storm event in Big Arm Bay versus Midlake Deep. Midlake Deep will go back to how it has been on average pretty quickly, as opposed to Big Arm Bay which can have staggering effects.

Response: The Midlake Deep site works really well for some of the models and what the implication is for some of the wastewater plants because it's basically a well-mixed site.

Comment: Public perception will be drawn from turbidity nearshore, not from mid-lake.

Response: It's hard to figure that out. Their perception will probably be based on where they go on the lake all the time. From the State's point, it's easier to use a location where everyone can come to agreement.

Key Point: The Midlake Deep monitoring site is located within the Confederated & Salish Kootenai Tribes (CSKT) jurisdiction of Flathead Lake. The State will want to pursue a memorandum of understanding with the tribes to maintain Midlake Deep as a location for compliance monitoring.

Question: Is CSKT independently looking at this, or previously been looking at criteria for the lake?

Answer by Paula Webster, CSKT: In efforts as we move forward, we want to make sure there is education explaining that there is a CSKT water quality standard, they recognize MDEQ's water quality standards, that we have a joining jurisdiction, and have been quite aware of process and contributed a lot of data to the model development for the TMDL projects. Full intent is to keep coordinated on efforts so there is not a difference to the public.

Question: The trend is that phosphorus is decreasing and nitrogen is increasing (atmospheric), so is the increasing trend in nitrogen a concern, or is it expected?

Answer: There are two camps about controlling nutrients, the phosphorus -only camp, and the phosphorus plus nitrogen camp. I'm part of the phosphorus plus nitrogen camp.

My views on this topic are strongly influenced by the 15 years of work I have done in streams. For streams, you can't just control one and expect to get the results you want. For lake science on the other hand, the argument for the phosphorus-only camp is extremely strong. There have been good results in the great lakes studies bringing phosphorus way down, leaving nitrogen at very high levels. But there are risks associated with that. In a scenario where you're trying to control secchi depth and phytoplankton chlorophyll-a at Midlake Deep, a phosphorus-only policy would probably do a pretty good job. But shoreline areas are subject to wind erosion, more sediment stirring up, phosphorus is going to be more available there, so as nitrogen goes up, they'll have both nitrogen and phosphorus, and you'll see more shoreline problems. That's one argument for some kind of control on nitrogen. For strictly the point of view of looking at the lake as a big batch reactor and a single point of compliance, phosphorus control has been shown to be very effective in the Great Lakes and elsewhere. I'm not convinced that we would see shorelines as clear as they are today with phosphorus-only control, however. I think a nitrogen standard is important, but don't know exactly what it should be set at, and we need to think about it some more.

Question: Since bioavailability of nutrients is low in the lake, is it better to set a total P value or a soluble P value?

Answer: Total P because the models we use are generally built around total phosphorus. We are still measuring bioavailable however, because that's what's in the phytoplankton.

<u>Key Point</u>: DEQ only wants to adopt a standard if we can understand how it's going to be implemented. An in-lake model needs to be developed.

Implementation means we have some kind of a mechanism (e.g., a model) that relates the Midlake Deep values to point and nonpoint sources (i.e., into the Phase II TMDL allocations for the lake and discharge requirements for point sources). We have two out of three pieces: a location to monitor and a watershed LSPC model that tells us how different loads get to the lake. We need an in-lake model that tells us how the loads that are reaching the lake are processed and creating the results we see at Midlake Deep. We also have to set the actual criteria and what magnitude they will be set at.

Three options for an in-lake model (Note: see slide 34 of the presentation). The easiest model uses average annual phosphorus, which is the data set we have, and we could get started on this right away. Down side is that it does not give nitrogen loads that can be backed out to wastewater facilities (we would only know the implication to the municipalities for phosphorus). Another option is to use the Flathead Lake Biostation's food-web model, but unsure if there is money and time for that.

<u>Key Point</u>: We are at the beginning of the standards setting process (i.e., public and stakeholder input) which can be as long as it needs to be so that we can smoothly enter into the timeline-driven part of the process (e.g., input from WPCAC, presentation to the Board of Environmental Review, formal public comment, etc.).

Question: Are we not going to complete the WQS until the model is implemented?

> Answer: Not necessarily implemented, but built so we can have an understanding of what the implications of a particular standard are to the people who are going to be asked to reduce their effluent loads, for example. The development of the standards and the development of the model should proceed simultaneously.

Flathead Lake Biological Station Comment: Our model is one of the best options on the table for getting an accurate picture of what the standards would do at Midlake Deep. Have a pretty solid understanding (at least for 2012 and 2013) of how the spatial and temporal interactions affect the entire food web and therefore, the entire lake. Agree that an N and P approach is the best way to go.

Comment: How much of secchi disc decrease is due to turbidity and how much is due to chlorophyll a?

Question: Have you thought about a suspended solids or a solids standard of some sort? As development continues to occur in the basin, there's going to be more runoff and more suspended solids discharging to the watershed, which ends up in the lake in some degree. Does the model show that, and how would that impact secchi depth, and does it warrant a standard in the lake for turbidity?

> Answer: Haven't thought about it so far. Secchi depth with refinements as to what are the subcomponents that create the secchi depth distance would probably get at the question. Sounds like something we ought to dig into a little further.

Comment: Just as for nutrients, a solids standard would be one that you could control in the watershed.

Comment: I recommend that you correlate Mid-lake secchi disc readings to other sites in the lake. How does that relate to what we're seeing in Lakeside or what we're seeing in Big Arm Bay, for example? Having everything tied to a location that virtually no one visits, is going to create a PR problem.
Also need to take into account what's happened in the lake in the last five years. When the FERC license changed on Kerr Dam, they're lowering the level of the lake significantly more, 4 to 5 feet in winter, causing the alluvial fan area to be significantly larger than what it was before. That shallow water area where you're getting a lot of turbidity with the storms, is dramatically increased. Getting more winter turbidity than we ever did. SRP is going up.

I think you need to consider temperature.

> Response: There is no place for a temperature standard because it isn't something we can control. However, it is incorporated via the modeling process as an input into the model.

Question: What kind of change are we talking for the phosphorus level? Plus or minus 10% of the current condition? Need some perspective – is a 10% change significant, or is it within the noise of the model?

> Answer: Don't have a ready answer. What I can do with the amount of information I've put together so far (these are all simple, empirical models), is to evaluate if we went from 5 µg/L TP

(the number that's been floating around linked to this special use) to 10 µg/L. I wrote a memo about a year ago that basically said that that would be too much. If you allowed it consistently, the annually averaged TP at MidLake Deep to go to 10, because you allowed that much development in the watershed, stopped treating it in wastewater treatment plants, etc., you will see the water clarity drop. For the purpose of keeping the lake where it is, 10 is too much. I think there is some wiggle room around 5 µg/L, but not a lot because what I see as a limnologist is a phosphorus-limited lake, and it's moved in that direction. If one of those two compounds (i.e., phosphorus or nitrogen) is more concerning, it would be phosphorus. So I see less wiggle room around phosphorus, and more wiggle room around nitrogen, at this point.

Question: What's the timeline for this process?

Answer: Operating on a couple of years timescale. The variance process would be immediately applicable for Flathead Lake, but it all depends on where the standards get set. It could result that we're kinda where we need to be with phosphorus. It's more unknown with nitrogen. It's more likely that if we set a standard that's like what's been discussed so far, it's a lot lower than where the lake is currently, which means someone has to cut back. Who is that? Where is that going to happen? That's a bigger question.

Question: How does this tie in with Phase II of the TMDLs for Flathead Lake?

Answer: Phase II is pending the completion of these targets. Can start to run all the "what if" scenarios that the TMDL is supposed to get at, once we have the in-lake model.

Discussion Points for Next Steps

- What standards to adopt?
  We've talked about TN, TP, Chlorophyll a, Secchi Depth, and Shoreline Algae
- Possibility of parsing out secchi depth into sub-components so we have a better idea of the effect of turbidity versus chlorophyll a, if we use a secchi disc as our main measuring device
- Magnitude of each standard and the potential need to adopt a new beneficial use
- What are the implications of listing or delisting the lake? Some standards we could adopt could say the lake is impaired, others could say the lake is not impaired, or some combination thereof.
- Location of monitoring compliance point (potential MOU with CSKT)
- Model decisions – which in-lake model to use, who does the modeling, and timelines

Send emails with any additional thoughts to Michael Suplee and Christina Staten

Next Meeting

Will probably schedule the next meeting in six to eight weeks

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Attendance List

Attendees (In Person)

Dr. Michael Suplee	DEQ, Water Quality Standards Section – Lead for development of the Flathead Lake nutrient water quality standards
Eric Urban	DEQ, Bureau Chief of the Water Quality Planning Bureau
Christina Staten	DEQ, TMDL Planner - Flathead TMDL Project Coordinator
Paul Kusnierz	DEQ, Senior TMDL Planner – Project Manager of the completed Flathead-Stillwater TMDL Planning Area sediment and temperature TMDLs
Peter Brumm	EPA, Montana Operations Office TMDL Lead
Tina Laidlaw	EPA, Montana Operations Office Water Quality Program, Nutrient standards
Dean Sirucek	Flathead Basin Commission Member, Flathead Conservation District Supervisor
Valarie Kurth	Flathead Conservation District, Resource Conservationist
Grady Jenkins	City of Columbia Falls, Director of Public Works
Susie Turner	City of Kalispell, Director of Public Works
Shari Johnson	City of Polson, City Engineer
Julie Spencer	Bigfork Water & Sewer District
Brian Sugden	Plum Creek Timber Company, Forest Hydrologist
Craig Kendall	U.S. Forest Service, Flathead National Forest, Forest Hydrologist
Robin Steinkraus	Flathead Lakers, Executive Director
Mike Koopal	Whitefish Lake Institute, Executive Director and Founder
Lori Curtis	Whitefish Lake Institute, Science and Education Director
Josh Gubits	Whitefish Lake Institute, Environmental Scientist, Lake Monitoring Volunteer Coordinator
Marc Lorenzen	Flathead Valley resident

Attendees Via Phone

Dean Yashan	DEQ, TMDL Section Supervisor
Eric Trum	DEQ, Nonpoint Source Program Water Quality Specialist – Flathead Basin contact
Dr. Kyle Flynn	DEQ, Water Quality Modeler and Professional Hydrologist
Jason Gildea	EPA Montana Operations Office – Primary EPA contact for the Flathead Lake Watershed TMDL Project & LSPC Water Quality Model Development
Paula Webster	Confederated Salish & Kootenai Tribes, Water Quality Program Manager
Chuck Sutfin	Flathead Lakers
Dr. Shawn Devlin	Flathead Lake Biological Station, Postdoctoral Scientist – Lead for Flathead Lake Food-Web Model Development
David Rouse	

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Meeting Materials & Documents

The following files were posted to the Flathead Lake Nutrient Standards wiki site on April 7, 2015: http://montanatmdlflathead.pbworks.com/w/page/94836995/Flathead%20Lake%20Nutrient%20Standards

File	File Description
Draft April 13, 2015 Presentation	Draft copy of Dr. Michael Suplee's presentation given at the kick-off meeting on April 13, 2015
FlatheadLake_AvgAnnual_ALL.xlsx	Compilation of key average annual data points for Flathead Lake (from Midlake Deep) which DEQ located or calculated
FlatheadSecchi_WY1978-87.xlsx FlatheadSecchi_EPAdata_WY1991-2011.xlsx Flathead_WY1975_EPAdata.xlsx	MS Excel files of DEQ's annual average calculations derived from older secchi depth data
Secchi78-87.tif	Picture file showing graph from which secchi depth data were extracted
FlatheadChla_WY85-96.xlsx	Annual average calculations derived from older Midlake Deep phytoplankton chlorophyll a data
Chlorophylla85-96.tif	Picture file showing the graph from which the chlorophyll a data were extracted
MidLakeDeep_ExceedenceCalc.xlsx	A MS Excel spreadsheet that can be used to calculate the allowable exceedance rate for several different potential lake standards
Models_Chla_TP_Secchi_Carlson.xlsx	A MS Excel file containing various empirical models which can be used to predict lake chlorophyll a, secchi depth, etc.