

Marianne-

Thanks for keeping me posted on the situation at Newman. Per your request in our conversation yesterday, I put together the following to help people understand the situation with the Blue-Greens (BG).

Many BG can secrete toxins that can cause sickness and even fatalities when ingested in sufficient quantities. Human poisonings are rare in the US because we generally obtain our drinking water from treated sources. Researchers also believe that we probably have less toxic strains compared to some other parts of the world, such as parts of Africa. Most at risk are pets that may drink directly from affected waters or children who might ingest water while swimming.

Because of potential toxicity, high levels of BGs should prompt testing, as was done on the samples taken along the southeastern shoreline. Observations and sampling over the past month have shown that the high algae concentrations in Newman have been confined to a narrow band along the southern shoreline. This is typical, as the outlet flow and prevailing winds tend to push surface scums and floating materials to that shore.

I attached some aerial photographs of the lake taken on September 19, as well as some taken on the same day at Liberty Lake. The very confined southern shoreline scum at Newman is in stark contrast with the situation at Liberty, in which there was a lake-wide bloom, most of *Anabaena* and *Gleotrichia*. General BG blooms have been reported throughout eastern Washington lakes this late summer.

Actually, late summer BG blooms are common with the prevailing weather conditions such as we have recently experienced in the region, and with a number of interacting factors at this time of year. First of all, dissolved nutrients, including nitrogen and phosphorus are typically at very low levels due to algae growth through the spring/summer growing season. Most nutrients are in particulate form, tied up in algae tissues. Many BG species do well when dissolved inorganic nitrogen (ammonia and nitrate) concentrations are low, as they can utilize (or "fix") nitrogen gas as their nitrogen source. No other algae can do this. Secondly, many BGs can store phosphorus, unlike other algae. The BG layer phosphate granules in their cells, so that they have a reserve for growth later in the season, when dissolved phosphorus is in short supply. Thirdly, BG's also thrive on relatively warmer temperatures compared to other forms. Lastly, the quiescent wind conditions such as we have recently had result in settling of other algae, which depend on mixing to keep their cells suspended in the water column. BG's have gas vacuoles, gelatinous coatings, and some other adaptations that permit them to regulate buoyancy. Therefore, they can rise to the top of the water column, layering on the surface to get access to light and shade out other forms.

Interestingly, Newman did not experience a generalized BG bloom like these other lakes. Another factor that puts Newman at special risk for late season BG blooms is the "injection" of phosphorus into the photic zone from hypolimnetic accumulation when fall turnover occurs. This event was in mid-August this year, as is typical. As you know, we have tracked Secchi depths before and after turnover, as well as TP concentrations and alum injection rates (from Jane's and your data) for over 20 years. Without exception, Secchi decreased prior to alum injection with the additional nutrient availability in the upper waters due to increased algae growth. Also without exception, Secchi in Newman has increased after alum addition. There are probably 2 mechanisms for this- one is direct precipitation of algae cells and the other is reduction of available phosphorus. In short, I would have expected that we would have a generalized bloom throughout the lake, similar to Liberty Lake, perhaps even more intense had the alum injection not been utilized. Secchi yesterday was 3m at all stations.

As for people who live along the southern shoreline, it is certainly prudent to advise keeping pets and small children away from the water until the samples come back clear. Recreation and swimming on all other parts of the lake does not pose a risk. One other point is that production of BG toxins is poorly understood, and there is no clear relationship between algae concentration and toxin levels. High concentrations of visible algae cause concern and should trigger testing, as you have done. In all likelihood, the toxins have declined along with the localized scum, but we should confirm with the lab before giving an "all clear".

We are examining the phytoplankton samples taken yesterday by our crew at the regular stations, and by you along the western shoreline. Our initial observations are that the samples are very clear, with low concentrations of algae. I looked at your shoreline sample and was not able to find any algae, only fragments of large plants. Overall, it is particularly encouraging that Newman did not experience a true BG bloom this year, as did other regional lakes.



Liberty Lake mid 9/08



Liberty Lake mid 9/08



Liberty Lake North Shore 9/08



Newman Lake Northeast 9/08



Newman Lake Southeast 9/08



Newman Lake Southeast Shore 9/08



Newman Lake Southeast Shore 9/08