

## Title: The Eutrophication of Lake Kanasatka: Aluminum Sulfate Injection Treatment

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Date: May 1st, 2024

Lake Kanasatka, located between the watersheds of Lake Winnepesaukee and Squam Lake, has faced challenges in regards to its overall health and water quality in recent years. Since the summer months of 2020, residents of the surrounding community have reported intense and persistent algal blooms covering the surface of Lake Kanasatka (*New Hampshire Department of Environmental Services, 2024*). These blooms have since been a recurring issue each summer since they were first reported in 2020. Harmful algal blooms, also known as HAB's, are largely caused by the presence of excess nutrients such as nitrogen and phosphorus, as well as the presence of cyanobacteria within the water column of freshwater systems (*Merel et al., 2013*). This excess nutrient loading of nitrogen and phosphorus, often sourced from fertilizer and agricultural runoff or septic system leakage, accelerates a process known as eutrophication. Eutrophic lakes often have an overall clarity of less than 2.5 meters, elevated nutrient concentrations, and low dissolved oxygen, creating a less than ideal environment for native wildlife to thrive (*The University of New Hampshire Extension, 2022*). Eutrophic lakes with active algal blooms are easily recognizable by a vibrant green scum floating along the surface of the lake, foul smelling water, and large quantities of fish kills due to the extreme anoxic conditions within the lake itself (*Merel et al., 2013*).



**Figure 1.** An algal bloom photographed on Winona Lake located in Center Harbor and New Hampton, NH during the summer months of 2020 (*New Hampshire Union Leader, 2020*).

Harmful algal blooms are not only toxic to local wildlife, but are also harmful to human health. Cyanotoxins are produced as cyanobacteria exponentially reproduce and can cause a

variety of human health implications from skin irritation to severe neurological issues from prolonged exposure (*Merel et al., 2013*). If left untreated, algal blooms will continue to spread and kill off any aquatic species within the lake itself.

To mitigate the harmful algal blooms of this lake, the Lake Kanasatka Watershed Association (LKWA) submitted a proposal for a long-term aluminum injection treatment to the New Hampshire Department of Environmental Services (NHDES) in the spring of 2023. This treatment would involve a complex process of applying aluminum sulfate, also known as alum, and sodium aluminate salts over a 150 acre area of Lake Kanasatka (*Diemer, 2024*). Current estimates expect the treatment to reduce the available phosphorus found in the water column of Lake Kanasatka by roughly 80 to 90%, in turn reducing the likelihood of intense and persistent cyanobacteria blooms for an estimated 20 to 30 year period (*Diemer, 2024*). This treatment is set to begin a pilot trial period on April 30th, 2024 while the full treatment will be applied throughout mid-May, 2024 (*Diemer, 2024*). The application of the alum injections would make Lake Kanasatka the third lake in the state of New Hampshire to receive this form of treatment, following the treatment of Kezar Lake of Sutton, NH in 1984 and Nippo Lake of Barrington, NH in 2021.

When applying a permanent treatment as intensive as an aluminum salt injection to a waterbody, ecological and human health must be taken into consideration. Aluminum in high concentrations and under specific environmental conditions such as in acidic environments, is toxic to most wildlife. Aluminum sulfate quickly becomes non-toxic once it forms a “floc” that appears as a fluffy, white substance floating along the surface of the water (*Diemer, 2024*). As a precaution during the application process of the aluminum sulfate injections, SOLitude Lake Management, an external contractor, will apply several doses of 25 g/m<sup>2</sup> of aluminum sulfate to a given treatment area per day (*New Hampshire Department of Environmental Services, 2024*). This lower dosage will allow for native wildlife of Lake Kanasatka to not be exposed to excessive concentrations of aluminum sulfate. As a precautionary measure, the Lakes Lay Monitoring Program (LLMP) extension through the University of New Hampshire will collect routine water quality data, including pH readings, to ensure that Lake Kanasatka does not undergo any unintended reactions that could have adverse effects on local wildlife as a result of the alum treatment. As an additional precaution, homeowners and local community members looking to use Lake Kanasatka for recreational purposes should refrain from being on or in the water for the duration of the treatment period.

The upcoming Lake Kanasatka alum injection treatment may potentially reduce the intensity and size of algal blooms for decades to come. Depending on the effectiveness of this initial treatment, a further supplemental treatment may be needed in the future. Further information on the Lake Kanasatka Aluminum Treatment Project can be found in the [Lake Kanasatka Watershed-Based Management Plan](#) and the [Alum Treatment Plan](#).

## References

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