

From green to blue: Working together to restore Lake Kanasatka's crystal clear water

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Lake Kanasatka is a 353-acre body of water in the Lakes Region of New Hampshire. This lake and other lakes across the 4,528-acre watershed have had a long history of excellent water quality. In August of 2020, Lake Kanasatka residents and visitors alike, noticed something concerning about the water quality throughout the lake. Unlike more common cyanobacteria blooms, with telltale signs of colored scums near or along shore, Kanasatka had turned a bright fluorescent green (Figure 1). Water clarity was also negatively impacted. After testing water samples, New Hampshire Department of Environmental Services (NHDES) issued a cyanobacteria advisory based on cell concentrations exceeding the 70,000 cells/ml threshold. Over the next three years, Kanasatka experienced cyanobacteria advisories ranging from 24 days up to 121 days in a given year, culminating in a thick lake-wide bloom in October 2023 which spilled over a dam and into Lake Winnepesaukee, the state's largest lake (Figure 2 and Figure 3).

The Lake Kanasatka Watershed Association (LKWA) Board of Directors, committee members, and many local residents understood the need to address this growing problem quickly. With financial support from the Town of Moultonborough and a GoFundMe page, a Watershed Based Management Plan (WBMP) took shape and was completed in August of 2022.

The WBMP clearly showed Kanasatka had two problems: phosphorus coming in from the surrounding watershed, and internal loading from a build-up of legacy phosphorus in the lake's bottom sediments. Across the watershed, the WBMP identified 22 problem sites and 121 (66 percent of the



Figure 1. Lake Kanasatka from a helicopter. Photo credit: John Stephens

182) shoreline parcels contributing excess phosphorus and in need of remediation. Internal/legacy phosphorus found in core sediment samples showed significant amounts available for release over the summer months. Both external and internal sources were feeding the cyanobacteria, and each needed to be addressed.

Homeowners and volunteer teams of neighbors got to work implementing solutions throughout the watershed to meet phosphorus reduction requirements

specified in the WBMP, with the first round completed by the end of 2023. As the cyanobacteria blooms continued, residents learned that external phosphorus loading had to be reduced even more widely. To that end, LKWA's traditional July 4th boat parade, which included a lively display of boats big and small, transitioned to a smaller, "human-powered" boat parade, thereby tempering the damaging wave action produced by such a cluster of larger boats, which was uprooting shoreline vegetation and



Figure 2. Cyanobacteria bloom accumulating above the Lake Kanasatka Dam.



Figure 3. Blackey Cove in Lake Winnepesaukee, downstream of Lake Winnepesaukee, viewed from helicopter: Photo credit: John Stephens

depositing nutrient-rich sediment into the lake.

After much of the watershed work was completed or at least underway, LKWA completed an alum treatment (Figure 4) with funds raised by the lake community and with a grant from the State of New Hampshire in May of 2024. The aluminum compound settles on the bottom sediments and binds to the phosphorus, preventing it from being released back into the water column. The alum treatment successfully achieved its goal through the first season, and monitoring will continue to ensure that a durable reduction of internal loading is maintained (again, with the understanding that continued watershed work was necessary to implement and maintain). Throughout the remaining 2024 season, Kanasatka experienced beautifully clear water (up to 9.3 meters) with no cyanobacteria advisories. The longevity of the treatment depends on us. Lake



Figure 4. Lake Kanasatka aluminum treatment. Photo Credit: Bill Gassman

stewardship never ends. We know we must remain active and vigilant.

Our strategy and approach

Our strategy, and the key to our success to date, is getting as many community members as possible engaged and involved as soon as possible on many fronts. We found remediation is not necessarily difficult or complicated, but we needed to set examples, share success stories, and help others get started on their own journey to protect the lake. While several of these programs are detailed later in this article, the following actions have also been instrumental to the recovery of Kanasatka's water quality.

- Employing multiple modes of communication to reach as many of our community members as possible, including:
 - Making our website more user-friendly, and including practical how-to information/resources
 - Targeting our posts on Facebook (updates, lake-friendly living, boating practices, and homeowner projects)
 - Emailing out regular newsletters full of informative articles and updates from the board and the community
 - Hosting a community forum on the findings in the WBMP, including next steps, and making the recorded session available for anyone who could not attend in person
 - Providing each property owner with their personalized shoreline survey results, along with helpful remediation sources and links to the WBMP information
 - Running a Capital Campaign, to fund the steps identified in the WBMP mailed to all residents of our watershed, as well as nearby residents on downstream Lake Winnepesaukee
 - Continually promoting NH Lakes LakeSmart Program, leading by example, understanding that as more properties gain certification, many others will follow.
 - Proactively expanding our monitoring program with the University of New Hampshire Lakes Lay Monitoring Program

(LLMP) to inform the WBMP and track progress. Kanasatka has participated in this citizen-scientist-based program for over 40 years.

We enhanced testing and increased frequency; added more community volunteers, more sampling locations in the watershed (including an upstream pond), and more parameters and samples at multiple sites.

- Septic systems are calculated at 10 percent of phosphorus load in the WBMP. Phosphorus and other nutrients can enter the lake from old, overloaded, or poorly maintained septic systems through groundwater, stormwater runoff, and overflow. Of the 41 percent of property records found during the WBMP research, only 25 percent had septic systems newer than 25 years old. Our research showed many older (circa 1950s and 1960s) systems on the lake. However, incentivizing residents to get their septic systems inspected by a licensed professional is having a positive impact. The LKWA Board, using monies raised from a community yard sale, funded an initial \$5,000 to cover half of the cost, or up to \$250 of a certified inspection for any member of

LKWA. This program was fully subscribed in 2024, and the Board has already approved an extension of the program for 2025.

- A unique stormwater management technique being used to divert stormwater from gravel driveways and foot paths, into suitable infiltration, was discovered when two residents were visiting an Audubon facility in Maine. These devices are called water razors, rubber razors, or water bars (Figure 5). They consist of a rubber "blade" made from recycled conveyor belt material that is sandwiched between and supported by two 2"x6" pressure treated wooden boards. The device is embedded in the surface of a gravel or dirt driveway or path so that only the four-inch blade is exposed (Figure 6). The rubber blade can be driven over, then it will spring back to its upright position. A razor is installed at a 30-degree angle across the path, so that it intercepts runoff and diverts it to an area where it can naturally infiltrate or flow to an existing structure like a rain garden, vegetated swale or dry well. Water razors are typically spaced 30 feet apart. They do require periodic sediment removal on the uphill side and are not recommended for areas managed by



Figure 5. Lake resident installing a razor for runoff control.



Figure 6. Lake resident installing a razor for runoff control.

snowplows. At the request of a homeowner, our lead watershed implementation volunteer evaluates the property for stormwater diversion opportunities, then fabricates the razors, and ensures proper installation. Property owners are charged for the cost of materials only, which is approximately \$5 per linear foot. If the property owner is not able to install the razor, volunteers do the work at no further cost. To date, our lead volunteer has supplied 37 water razors totaling nearly 400 linear feet to 16 separate properties.

LakeSmart activities

NH LAKES is a non-profit organization dedicated to preserving and restoring New Hampshire's estimated 1,000 lakes and ponds. They offer a program called "LakeSmart," adopted from other model programs from Maine and other states. LakeSmart is a voluntary, no-cost, and non-regulatory education and recognition program encouraging community members to take action to

loading to the lake. Following are some examples of LakeSmart directed projects.

One couple's property is a great example of how helpful LakeSmart can be. They moved into their Lake Kanasatka home just as the cyanobacteria blooms began. To do their part in restoring the lake's health, they requested a LakeSmart property assessment. LakeSmart recommended a professional septic system inspection. The inspection revealed their system was in complete failure. A second abandoned tank, still full of untreated waste, was also discovered on the property. They had a new state-of-the-art system installed. They did not stop there. They paid close attention to how stormwater was impacting their property and took steps to divert and infiltrate it. They increased the vegetated buffer along the waterfront, stabilized and "perched" their small beach area, installed stepping stones and thick mulch on pathways, then created a rain garden for infiltration.

Another shoreline resident is an exemplary example of a lake friendly

protect lake water quality, habitat, and property values. Stormwater control can be overwhelming for the average homeowner, but this user-friendly program simplifies the steps.

To date, 29 of the 180 Lake Kanasatka properties have earned the prestigious LakeSmart Award, and at least 11 others are currently in the process. As a result, LKWA was presented with the Community LakeSmart Award in July of 2024. This shows that individual efforts can motivate an entire community and reduce total phosphorus (TP)

property owner. She moved into her Lake Kanasatka cottage in 2020. Her immediate concern was the lack of septic system records available for this 1950s home. She had the system inspected and it was found to be in fair condition and functioning as intended. Fair condition was not good enough for her, so she upgraded the distribution box and a connector pipe. After completing a number of projects to divert and control runoff, she next turned to her true passion- landscaping and gardening. The waterfront was mostly bare of vegetation and had a sandy beach that was vulnerable to erosion. In her words, this became a reclamation project with the challenge of determining which plants would grow in such sandy soil. The result of her work is a wide vegetated buffer along the waterfront. Wood chips and pine needles were used for erosion control and soil amendment. She chooses native plants whenever possible because they grow deeper roots and become the best erosion and runoff control of all. She has since emerged as a leader in our lakefront community by writing numerous articles for our publications about the benefit of native plants, where to purchase them and the best practices for planting and yard maintenance (Figure 7). She consults one-on-one with others who seek the LakeSmart designation. Most recently, she has begun collecting and trading seeds from native plants. She also grows native perennials and gives them away to other Lake Kanasatka residents. While not a formal program, she fondly refers to her contribution to the lake community as "Plants in the Ground," a follow-on to another Lake Kanasatka program called "Boots on the Ground," mentioned later in this article. The estimated estimated TP reduction is 0.22 kg/yr.

Another lake resident lives on a gravel road with a deep stormwater swale along the distant side of the road. Two large culverts convey stormwater under the roadway and onto his property. This concentrated flow eventually created a deep intermittent stream that carried nutrient-rich water and large amounts of sediment directly into the lake. He and his brother-in-law, who lives next door, are both in their eighties, but they fit into the "highly capable" category. The brothers, along with others, have spent countless hours standing in the rain, brainstorming possible solutions. An effective remedy



Figure 7. Lake resident's walkways to limit directional flow down the shoreline.

was to place sediment control socks at regular intervals along the length of the 300' stream, to slow and spread the stormwater for infiltration. Their hard work and diligence resulted in a whopping TP reduction of 1.10 kg/yr, and the LakeSmart Award. The brothers also belong to a private Beach/Road Association. They maintain the sloping roadway leading to the beach. For years, they have employed railroad ties to divert the stormwater into the woods. Last year, they installed several of the custom fabricated water razors, which made the road more vehicle friendly. One of the brothers spray painted the rubber section for increased pedestrian visibility and safety. This project yielded an impressive TP reduction of 1.37 kg/yr. (Note: this road is not plowed in the winter.)

Infiltrate high

Watershed residents are encouraged to contact local lake association leads for assistance with stormwater management. Most of Lake Kanasatka's waterfront properties are sloping toward the lake.

Quite often, homeowners try to fix their runoff problems right at the waterfront, but this is not always effective. One of the local mottos is "infiltrate high," which simply means finding infiltration opportunities on higher ground, as far away from the lake as possible. Accomplishing this quite often reduces problems below. However, experience has taught us that during a rainstorm, stormwater tends to create a new flow approximately every 30 feet. That is why the recommended interval between

water razors is 30 feet. Lake Kanasatka volunteers found that the most effective way to troubleshoot stormwater runoff is to actually "stand in the rain" and observe the flows. After the remediation work is completed, the property is revisited during or after a rainstorm to determine how successful the solutions have been.

Many property owners have been able to install their own water razors and infiltrate their own stormwater effectively, but there were many who needed help. Lake association leads use a tractor/backhoe to aid neighbors around the lake. Some larger projects required more laborers. Requests for volunteers were posted on LKWA's Facebook Page. The response was amazing, and the spirit was contagious. Photos of the work in progress and a group photo taken at the end of the day were posted on LKWA Facebook Page for the entire community to see. The sense of pride, accomplishment and unity was obvious in the photos. Somewhere along the way, the work crews were named "Boots on the Ground" (Figure 8). They work safely, accomplish a lot and make new friends along the way. Some neighbors who have been on the lake for over 40 years met for the first time through Boots on the Ground.

An important factor in LKWA's eligibility for the necessary alum treatment permit was a demonstrated commitment to reducing external phosphorus loading. Through our individual and group efforts, we left no doubts about our commitment. We realize our work will never be finished. Remediated sites require periodic maintenance and new problem areas will appear in the future. The effectiveness and longevity of our 2024 alum treatment is up to us, and LKWA is in this for the long run.



Figure 8. Boots on the Ground crew from Lake Kanasatka.

Kevin Kelly is retired from a public sector executive leadership position. His volunteer experiences include serving as a volunteer in Lake Kanasatka water quality monitoring and stewardship for 41 years; past president of Lake Kanasatka Watershed Association (LKWA); past chair of LKWA Water Quality Monitoring Teams; and member of Implementation Team for LKWA Alum Treatment. Kevin is also currently serving as a member of LKWA board of directors. Kevin established LKWA's "Boots on the Ground," volunteer storm water remediation work crews, and is implementation committee member for LKWA Section 319, CDS Grants and streams assessment project. Kevin also chairs the Moultonborough Cyanobacteria Committee, and volunteers time with the Lakes Region Food Pantry and maintaining Moultonborough Conservation Commission hiking trails. He is a member of Center Harbor Bay (Lake Winnepesaukee) Watershed Based Management Plan Steering Committee, and he actively



participates as a presenter at the NH Lakes Annual Congress (2020, 2024, 2025).

Chris Wallace has a long history in New Hampshire, starting with her birth in the northern forests and then summers spent in the Lakes Region. Four generations of her family have enjoyed more than 65 years on Lake Kanasatka. Chris is mindful of the need to balance the recreational aspects of time spent at the lake with maintaining the land in as close to its natural state as possible – complete with rocks, fallen tree limbs, pine needles, and leaves.



Lisa Hutchinson is a board member of Lake Kanasatka Watershed Association in Moultonborough NH. She has chaired its water quality committee since 2017, leading a



team of volunteer monitors, and has been a volunteer monitor since 2014. She is the key local citizen-scientist water quality resource, deepening collaboration with the University of New Hampshire Lakes Lay Monitoring Program, FB Environmental consulting firm, and New Hampshire Department of Environmental Services. She has been a proactive member of the Watershed Based Management Plan (WBMP) steering committee since 2021, focused on research, development, and implementation of the WBMP, where her involvement most recently includes grants and the 2024 alum treatment. 🌟

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