Message from the President

by Don Weaver, FOVLAP President

The Vernal Equinox occurred March 20, 2018 at 12:16 P.M. meaning spring has arrived, a welcomed event. Many nor-eastern storms took place in the last days of winter; however, with the sun now in the northern hemisphere, more daylight than darkness, the ice will soon be gone from the ponds and lakes, snow will melt, grass will soon turn green, flowers will start blooming, attitudes will improve, and so on!! With all that said, FOVLAP had a very busy winter season.

As reported in our fall 2017 newsletter (available on our website; vermontlakes.org/news-events/newsletter/) ACT 67 was signed into law June 8, 2017. FOVLAP directors reached out to Vermont Agency of Natural Resources (ANR) Secretary Julie Moore in November to urge that Fish &Wildlife issue fines, and not just warnings, to people who violate the law. ANR assigned a committee to review our concerns. Secretary Moore has replied, stating the agency's position and agreeing, "a strong educational program and robust law enforcement are both critical in the protection of the state's waters from aquatic invasive species, as well as a host of other looming threats".

ACT 67 is currently under review by the House Committee on Natural Resources, Fish & Wildlife and the Senate Committee on Natural Resources & Energy. The main concern is enforcement of the law. FOVLAP is currently addressing effective methods of education on preventing the spread of Aquatic Invasive Species (AIS).

Lake Seminar 2018 - The FOVLAP / DEC Lakes Seminar will be held on Friday June 1, 2018 at the Vermont College of Fine Arts, Noble Hall, 39 College Street Montpelier, Vermont. The theme this year will be, "*Partners for Healthy Lakes: Exploring Science, Data and Tools Together."* The seminar will run from 9:00-4:00 with registration and light breakfast starting at 8:30. The morning session will be *"Lakes 101, all you wanted to know"*. After lunch there will be three options: (1). *Lake 101continued with more in depth information with status and trends in Vermont Lakes*. (2). *Partnerships and purposes of grant writing*. (3). *Exploring Data and Tools* – bring your laptop or tablet. During lunch you will have the opportunity to join in a group discussion on current lake issues and concerns and what others have learned.

Please mark your calendar and plan to attend; check our website, vermontlakes.org/about-us/lake-seminar/ for more information.

The Annual Meeting 2018 - The Annual Meeting will be July 23, 2018 and will be held at the Steak House on the Barre – Montpelier Road. Please check our website, vermontlakes.org/about-us/annual-meetings/ for information.

Communication For the past couple of months, FOVLAP has been receiving a weekly update from DEC. This includes answers to questions, new legislation, staff involvement in conferences, grant-in-aid information, revision of Program Strategic Plans, and the list continues. This has been interesting and mainly very helpful in planning our programs and meeting agendas. Thank you, Perry Thomas, Lakes and Ponds Program Manager.

Lake Treatment for Eurasian watermilfoil – There has been, and still is a concern about using the herbicide Sonar A.S. (with the active ingredient fluridone). Here's the good news: PercellaCOR, a new herbicide has just been approved by the EPA. For more information on this herbicide, please contact Misha Cetner (misha.cetner@vermont.gov) or Josh Mulhollem (josh.mulhollem@vermont.gov).

Best Defense Against Aquatic Invasive Species Is to Prevent Their Spread from Other Lakes

by Cynthia Stevens, FOVLAP Director

Many Vermonters know how demoralizing it is to look out on masses of Eurasian Watermilfoil that tarnish the natural beauty of our lakes and ponds. Not only do dense milfoil mats impede swimming, boating, and fishing: they also shade out more beneficial native plants and negatively impact biodiversity. The state's Department of Environmental Conservation (DEC) outlines a variety of techniques to deal with this plant – from hand pulling to suction harvesting – but argues the most successful efforts are the ones that prevent invasives from taking root in the first place.

Barely 9 % of Vermont's 800 lakes and ponds (of at least 10 acres) are infested with Eurasian Watermilfoil, according to the DEC. Most of more than $400,000 allocated in 2015-2016 to Lakes and Pond Management was spent to address that particular species. Josh Mulhollem and Kim Jensen, environmental scientists in DEC's Aquatic Invasive Species Management program, credit the team effort with municipalities, FOVLAP, and individual lake associations to stop it from spreading. Still, that's little consolation to lakefront property owners who do have to deal with it.

Eurasian Water Milfoil

VERMONT
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Although milfoil is currently our biggest headache, Josh says that the impact of other species, like hydrilla and zebra mussels, would be far worse were they to infest our waterbodies. He describes hydrilla as "Eurasian Watermilfoil on steroids" because it grows faster, is thicker and denser. Hydrilla is an existential threat because it's found in nearby Maine, New York, Massachusetts and Connecticut. Zebra mussels, though the size of a fingernail, can destroy a food chain by eating tiny particles that fish and other animals depend on. In the process, they render the water system so clear that invasive plants like milfoil thrive in the sunlight.

Lake Champlain, which Josh calls "Vermont's epicenter of invasives," already has zebra mussels, along with 49 other known invasives. The Lake Champlain Committee reports that "Zebra mussels entered Lake Champlain around 1993 and have proliferated, smothering native mussel species, coating water intake pipes, and slicing the feet of unsuspecting swimmers." It also has spiny water flea, which was first found in Lake Champlain in the summer of 2014. Its long spine makes it hard for small fish to ingest. Plus, spiny water flea hooks onto anglers' lines in the hundreds, making fishing difficult.

Lake Bomoseen is the first, and so far, the only Vermont lake to document Asian clams, which like zebra mussels, are filter feeding organisms that can deplete resources needed by native species and increase algae blooms. They can also form dense populations very quickly, clogging intake pipes to lakeside homes, industrial water systems, and irrigation canals.

The point is that we don't want these exotic species to go any further, which is why we look to the Vermont Department of Fish & Wildlife to strongly enforce Act 67 which strengthens the existing law that prohibits the transport of invasive species and allows for fines. There are Public Access Greeter Programs, partly funded by the DEC, at 30 lakes where trained personnel employed by the towns check incoming boats to make sure they are not bringing with them any unwanted plants or animals. However, the greeter programs don't have any enforcement authority.

Editor's Note: The report to the legislature on Lake Champlain's inspection stations is available on Vermont's legislative website. To find it, search for "Report regarding the state's aquatic invasive species spread prevention efforts, and how to control the transport of aquatic nuisances to and from Lake Champlain." Lake managers might enjoy the DEC's new Invasive Aquatic Species Management Manual:http://dec.vermont.gov/sites/dec/files/wsm/lakes/ans/docs/Managing%20Aquatic%20Invasive%20Species%202018.pdf

Act 67 Aims to Prevent Spread of AIS

by Ann Bove, FOVLAP volunteer, with Perry Thomas and Josh Mulhollem of the DEC

Preventing the spread of aquatic invasive species (AIS) is important to the health of Vermont's lakes. Recently, long-standing legislation prohibiting transport of AIS was strengthened through passage of S. 75, now Act 67. The new language does the following:

* Requires boat owners to inspect their boats and remove any aquatic plants or invasive species upon entering and leaving waters, and to drain ballast tanks and bilge areas when transporting vessels.
* Authorizes law enforcement officers to issue judicial bureau tickets to boat owners for violations of Vermont's aquatic invasive species laws
* Requires ANR to establish a training program for inspecting and decontaminating boats; to provide signage to marinas regarding aquatic invasive species; to report back to the legislature on the effectiveness of Lake Champlain's inspection stations; and to promulgate a general permit for nonchemical aquatic nuisance control activities.

Do transport violations carry penalties?

As of July 2017, violators of Vermont's aquatic nuisance species transport law (10 V.S.A. § 1454a-d) – transporting an aquatic plant, aquatic plant part or aquatic nuisance species, not inspecting for aquatic nuisance species, failure to have vessel inspected/decontaminated, or failure to drain a vessel - could be subject to fines of up to $1,197 (combined fine and fees). Under Act 67, law enforcement officers now have the authorization to issue Judicial Bureau civil violation complaints, or tickets, for transport law violations. The waiver penalty, or ticketable fine, is currently set at $392.

Under Vermont's Noxious Weed Quarantine #3, prohibited plant violations could result in fines of up to $1,000 for each violation, continuing violations could result in penalties of up to $25,000.

Aquatic *nuisance* species versus aquatic *invasive* species…what's the difference?

Vermont law defines an *aquatic nuisance* as "undesirable or excessive substances or populations that interfere with the recreational potential or aquatic habitat of a body of water, including rooted aquatic plants and animal and algal populations."

Executive Order 13112, signed by President Clinton on February 3, 1999, established the National Invasive Species Council and defines an *invasive species* as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health."

What aquatic species are prohibited in Vermont?

Act 67 added four animals to the existing list of prohibited aquatic nuisance species: Asian clam (*Corbicula fluminea*), fishhook waterflea (*Cercopagis pengoi*), rusty crayfish (*Orconectes rusticus*) and spiny waterflea (*Bythotrephes longimanus*). The transport of ANY aquatic plant or plant parts - invasive or not - as well as zebra and quagga mussels, remains prohibited. All six prohibited animal species are considered invasive.

In addition, the Vermont Agency of Agriculture, Food and Market's Noxious Weed Quarantine #3 prohibits the sale, movement, distribution, and in some cases, possession or cultivation of certain species of plants that have been recognized as invasive in Vermont or adjacent states. Many of these prohibited plant species are aquatic.

Are individuals now required to inspect their water-based equipment?

Any person transporting a vessel to or from a body of water is now required to visually inspect the vessel, the transport vehicle, trailer, and other equipment used, and remove any aquatic plants, aquatic plant parts, and other aquatic nuisance species. The act also now requires removal of drain plugs, bailers, valves, and all other devices designed to control the drainage of water from a vessel while transporting it. All draining of contained water must occur in a manner that avoids discharge into a water of the state.

What about watercraft inspection and decontamination stations? Are they mandatory now?

Boat inspection and decontamination are mandatory at all *authorized* Vermont watercraft inspection stations provided the inspection station is maintained where the vessel is entering or leaving the water; the inspection station is open; and an individual operating the inspection station identifies the vessel for decontamination.

What designates a VT watercraft inspection and decontamination station as authorized?

A lake association, a municipality or the Vermont Department of Environmental Conservation (DEC) can set up an authorized watercraft inspection station as long as a representative from the operating organization attends a training program developed by the Secretary of the Vermont Agency of Natural Resources (ANR). Beginning this year, Public Access Greeter Program trainings cover information related to the new laws and the authority that watercraft inspectors now have. As long as a representative from your lake association or municipality attends a Greeter Program training, they can request and be awarded status as an authorized watercraft inspection station. A schedule of upcoming Public Access Greeter Program trainings will be listed on the VTDEC Public Access Greeter Program website.

Are any Vermont watercraft inspection and decontamination stations currently authorized?

Only those operated directly by VTDEC. The first Public Access Greeter Trainings to include information on the new laws will be held in May of this year. Lake associations and municipalities will be able to receive authorization immediately afterwards.

Where should aquatic nuisance species transport violations be reported?

Report aquatic nuisance species violations to Vermont Department of Fish and Wildlife wardens. Wardens can be reached by calling their home or the nearest State Police dispatcher. Individual warden contact information for wardens in your region can be obtained:

- in the Vermont Fishing Guide and Regulations;
- on the Vermont Department of Fish and Wildlife website; or
- by calling one of the Vermont Department of Fish and Wildlife Law Enforcement main telephone numbers, (802) 828-1529 or (802) 828-1483.

Managing Invasive Plants at the Shoreline

Shoreline invasives like Japanese Knotweed, phragmites, and purple loosestrife are pretty but threaten the environment by smothering native species so critical to biodiversity. It's important to recognize when these plants exist on your individual properties, and near water bodies in general, so you can create a strategy to control them. Early detection is key.

The DEC has this advice:

1. The most prevalent way shoreline invasives spread is by using fill from an infested area; obviously do not take fill from such places.
2. Identify the objectionable plants and map the areas around your lake or pond so you know what you're dealing with.
3. Develop a long-term treatment plan because control can take years.
4. The agency recommends herbicides only as a "last resort." There are rules regarding the safe use of these toxic substances, and state regulations for applying them near water bodies. Permits are essential and the public comment period often stirs a lot of controversy.
5. Once you have a plan, stick to it and track each remediation and your progress.

https://vtinvasives.org/news-events/news/making-an-invasive-plant-management-plan-part-1-getting-started-and-setting-priorities-for

Japanese Knotweed

For mechanical removal, the DEC recommends cutting its stalks preferably twice a month in the Spring season with a scythe, loppers or lawnmower if the topography permits. The plant grows up to 10 feet. Do this for five to ten years, and when the knotweed is much smaller and under control, replant with good-sized natives. Taming the knotweed can take up to 10 years because the roots and rhizomes in the soil are so powerful. Never leave the cuttings on the ground. Dry them on tarps before composting. See Managing Japanese Knotweed:

https://www.agriculture.nh.gov/publications-forms/documents/japanese-knotweed-bmps.pdf

Japanese Knotweed (*Polygonum cuspidatum*) was first introduced to the United States as an ornamental plant. It has subsequently spread into the wild across the majority of the United States, including the Lake Champlain Basin. It spreads via underground rhizomes that easily fragment and spread to other areas. This is especially problematic along streambanks and in riparian zones where natural forces contribute to the spread of knotweed.

Japanese Knotweed has already altered the natural characteristics of the Lake Champlain Basin's riparian zones. Knotweed grows early in the season and is very dense which excludes the growth of the Basin's native plant species, decreasing diversity and altering wildlife habitat. It also quickly rebounds from disturbances such as flooding. In the fall, when the plant dies back, the dead stems and leaf litter form a dense mat that decomposes slowly, further inhibiting native plant growth. Dense growth in riparian zones also excludes recreational uses such as swimming, fishing and boat access. When dense stands are removed from river banks there is an increased risk of erosion until native plants are able to reestablish themselves. Japanese Knotweed continues to spread throughout the Lake Champlain Basin. The spring flooding in Lake Champlain in 2011 and more frequent and intense storms such as tropical storm Irene and Lee in 2012 caused the significant spread of this species along the lake shoreline and along stream corridors. This information is taken practically verbatim from the Champlain Lake Basin Program.

http://www.lcbp.org/water-environment/aquatic-invasive-species/ais-in-the-lak/

Purple Loosestrife

The DEC says small infestations can be manually treated by grabbing each stem at the base and pulling it out slowly. Loosestrife's beautiful magenta blooms can grow up to five feet, and should be broken off before they go to seed. All the discarded vegetation should be disposed of in a plastic bag and not put into a mulch pile.

Purple loosestrife (*Lythrum salicaria*) is native to Eurasia and has been present in New England for almost 100 years. It now can be found throughout the temperate portions of the United States and Canada. It has no natural predators in North America. Although it adds vibrant swaths of color to roadside ditches and wetlands, purple loosestrife is an unwanted alien. It crowds out native wetlands and vegetation such as cattails, grasses, sedges, and rushes, and is of little or no value to wildlife. Loosestrife is quick to invade many habitats, including wet meadows, marshes, river banks, and the edges of ponds and reservoirs. Gardeners can accidentally increase its spread by planting it in home gardens. Even sterile varieties, often sold by nurseries, are now considered a problem and should never be planted.

The VT DEC and NY partners have been working for several years to determine whether an introduced beetle (*Galerucella*) that eats loosestrife can help control the plant's spread. This beetle has

been placed in several test wetlands throughout Vermont and New York and has shown promising results. This information is taken verbatim from the Champlain Lake Basin Program. http://www.lcbp.org/water-environment/aquatic-invasive-species/ais-in-the-lak/

Phragmites

Flowering Phragmites
Photo by Rhonda Shippee.

The DEC recommends hand cutting the individual stems below the lowest leaf at the end of July before the flowers produce seed. At that point, most of its food reserves have gone to the top of the plant. Use hand-held cutters, gas-powered hedge trimmers and weed whackers with a circular blade to leave a six-inch stump. The harvested plant material should be burned or dried on tarps before composting

Elizabeth Spinney of the Vermont Department of Forest, Parks and Recreation provides outreach on the impact of non-aquatic invasive plants and connects communities and the public to resources to take action. Phragmites, like Japanese Knotweed and purple loosestrife, crosses over into both terrestrial and aquatic realms. She cites an interesting experiment in a state forest where black plastic weighted with sandbags was placed over a dense patch of Phragmites after it had been cut to the ground. After three years, there were barely 100 strands left from what was close to a quarter acre. If you try this method, be sure to repair the plastic when the Phragmites stubs poke through. According to the U.S. Fish & Wildlife website, non-native phragmites, also known as common reed, is a perennial, aggressive non-native Phragmites, also known as common reed, is a perennial, aggressive wetland grass that outcompetes native plants and displaces native animals. Because of its height and its distinctive, fluffy seedheads, Phragmites is easy to spot, even by traveling motorists. In the early 19th century, the non-native variety, most likely European in origin, appeared in coastal ports in the eastern United States. The rapid spread of Phragmites in the 20th century was probably related to the construction of railroads and major roadways, habitat disturbance, shoreline development, pollution and eutrophication.

Not yet flowering Phragmites
Photo by Rhonda Shippee

Phragmites can grow up to 18 feet tall, obscuring views for landowners, nearby residents and visitors. Walking even a few feet into a stand of non-native Phragmites can be difficult because the growth can be exceptionally dense and tall, and the vegetation can cut your skin. Phragmites can also reduce native fish and wildlife populations, limiting recreational values for birdwatchers, walkers, naturalists, boaters and hunters.

Phragmites grows rapidly, and each fall, plant material dies back, creating large concentrations of tinder-dry vegetation that increase the potential for fast-spreading fires that can threaten residential and commercial developments on surrounding uplands.

This information was taken verbatim from sections of the U.S. Fish & Wildlife website:
https://www.fws.gov/GOMCP/pdfs/phragmitesQA_factsheet.pdf

VTinvasives.org Offers Methods to Develop a Management Plan

A three-part series on how to develop a management plan for invasive terrestial plants was compiled for the VTinvasives.org website by Elizabeth Spinney of the Department of Forests, Parks & Recreation and includes templates designed by The Nature Conservancy as well as information on how to become a "citizen scientist" by using free mapping tools at iMapinvasives.org and inaturalist.org. VTinvasives.org is a collaboration between the University of Vermont extension and the Vermont Agency of Natural Resources.

The series includes guidance on how to set priorities for restoration; outlining your purpose, priorities and resources; then finally how to map the invasives. Here are the links:

https://VTinvasives.org/news-events/news/making-an-invasive-plant-management-plan-part-1-getting-started-and-setting-priorities-for

https://VTinvasives.org/news-events/news/making-an-invasive-plant-management-plan-part-2-outlining-purpose-priorities-and-resources

https://VTinvasives.org/news-events/news/writing-an-invasive-plant-management-plan-part-3-mapping-invasive-plants

2018 Aquatic Nuisance Control Grant-in-Aid Program

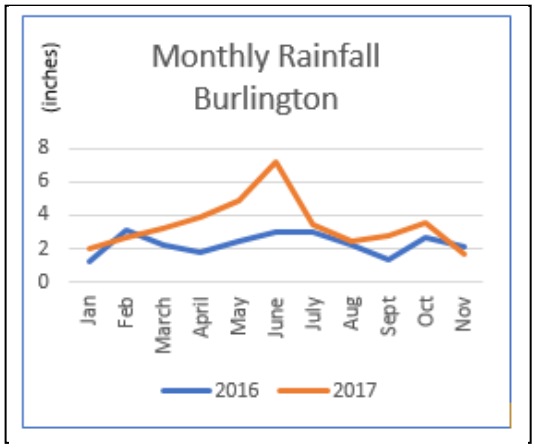
The DEC announced it had over $446,000 available for Aquatic Nuisance Control Grant-in-Aid projects to be implemented in 2018. These funds, derived from state motorboat registration funds and supplemented by federal dollars, will contribute to the 47 successful applications summarized below. Note that the total projected cost of all projects statewide for the upcoming year was approximately $1.75 million.

Municipality	Waterbody	Description of the Project	Award
Barnet	Harveys Lake	Harvey's Lake Public Access Greeter Program	$8,340
Barton	Crystal Lake	Crystal Lake Public Access Greeter Program and Eurasian Watermilfoil Management Project.	$5,397
Calais	Curtis Pond	Curtis Pond Public Access Greeter Program	$2,966
Charleston	Echo Lake	Echo Lake Aquatic Nuisance Prevention Project	$11,904
Concord	Miles Pond	Miles Pond Public Access Greeter Program	$8,348
Danville	Joes Pond	Joe's Pond Public Access Greeter Program	$1,850
Derby	Big and Little Salem Lakes	Salem Lakes AIS Management Project	$15,967
Elmore	Lake Elmore	Lake Elmore Aquatic Invasive Species Management Project	$20,928
Fairfield	Fairfield Pond	Fairfield Pond Eurasian Watermilfoil Assessment, raking from beach, and education and outreach initiatives	$2,806
Fairlee	Lake Morey	Lake Morey Aquatic Invasive Species Management Program	$18,769
Franklin	Lake Carmi	Lake Carmi Eurasian Watermilfoil Management Project	$2,147
Glover	Shadow Lake	Shadow Lake Public Access Greeter Program and Eurasian Watermilfoil Management Project	$13,427
Greensboro	Caspian Lake	Caspian Lake Public Access Greeter Program	$7,306
Hartford	Deweys Mill Pond	Deweys Mill Pond Eurasian Watermilfoil Control with contracted DASH and volunteer hand pulling, and education and outreach initiatives.	$11,644
Hubbardton	Echo Lake	Echo Lake Eurasian watermilfoil management project	$5,136
Hubbardton	Lake Beebe	Lake Beebe Eurasian Watermilfoil Management Project	$3,887
Hubbardton	Lake Bomoseen	Lake Bomoseen Public Access Greeter Program	$16,287

Municipality	Waterbody	Description of the Project	Award
Hubbardton	Lake Bomoseen	Lake Bomoseen Mechanical Harvesting Project	$4,222
Leicester	Lakes Dunmore and Fern	Dunmore and Fern Lakes AIS management project	$44,600
Ludlow	Lake Rescue	Lake Rescue EWM Control Project and Public Access Greeter Program	$7,698
Maidstone	Maidstone Lake	Maidstone Lake Public Access Greeter Program and Volunteer Monitoring Project	$4,144
Morgan	Seymour Lake	Seymour Lake Public Access Greeter Program and Volunteer Monitoring Project	$17,248
Mount Holly	Lake Ninevah	Lake Ninevah Public Access Greeter Program and Long-term Monitoring Project	$10,689
Newbury	Halls Lake	Halls Lake Eurasian Watermilfoil Control Project	$2,084
Newport	Lake Memphremagog	2018 Lake Memphremagog "Clean, Drain, and Dry" AIS education, outreach, and Eurasian watermilfoil removal project.	$17,105
North Hero	Lake Champlain N. Hero area	Pelots and Carry Bays Mechanical Harvesting Project	$3,795
Peacham	Peacham Pond	Peacham Pond Greeter Program	$3,384
Poultney	Lake St. Catherine	Lake St. Catherine Public Access Greeter Program and Eurasian Watermilfoil Management Plan	$33,920
Ryegate	Ticklenaked Pond	Ticklenaked Pond Eurasian watermilfoil removal project	$10,830
St. Albans	Lake Champlain St. Albans Bay	St. Albans Bay Mechanical Harvesting Project	$5,938
Sudbury	Huff Pond	Management Plan for Huff Pond	$1,111
Sudbury	Lake Hortonia	Lake Hortonia Eurasian Watermilfoil Management Plan	$11,035
Tinmouth	Tinmouth Pond	Tinmouth Pond Aquatic Invasive Species Control Project	$7,343
Village of Derby Center	Derby Pond	Lake Derby Eurasian Watermilfoil Management Project	$6,821
Village of North Bennington	Lake Paran	Lake Paran Aquatic Plant Survey	$2,267
VT Dept. of FPR	Lake Champlain Basin	Department of Forests, Parks, and Recreation AIS initiatives	$11,000
Waterbury	Waterbury Reservoir	Waterbury Reservoir Public Access Greeter Program	$2,563
Wells	Little Lake	Little Lake Mechanical Harvesting Project	$11,397
Westmore	Lake Willoughby	Lake Willoughby Eurasian Watermilfoil Management Project	$8,457
White River NRCD	Lake Fairlee	Lake Fairlee Aquatic Nuisance Control and Greeter Program	$21,600
Whitingham	Sadawga Lake	Sadawga Lake Plant Survey	$1,463
Williston	Lake Iroquois	Lake Iroquois AIS Management Program	$13,481
Wilmington	Lake Raponda	Lake Raponda Public Access Greeter Program	$6,957
Windham County NRCD	CT River watershed	Southeast Vermont Aquatic Invasive Plant Educational Outreach Surveying and Harvesting Project	$5,756
Winooski Valley Park District	Colchester Pond	Colchester Pond Public Access Greeter Program	$707
Winooski Valley Park District	Lake Champlain Basin	Lake Champlain Asian Clam Early Detection and Outreach Project	$11,965
		TOTAL	**$446,689**

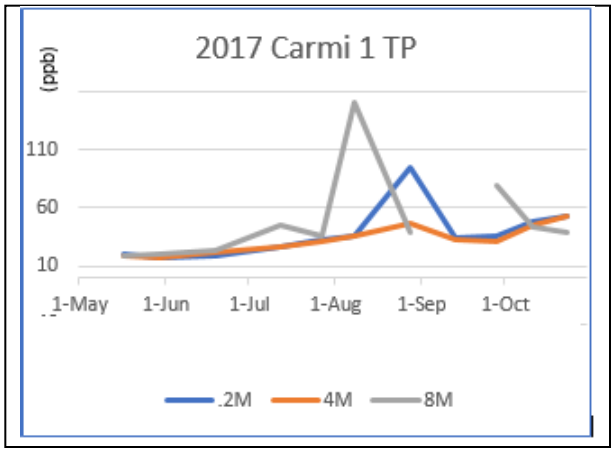
ANR Plans an Aeration System in Lake Carmi to Help Prevent Repeat of 2017 Cyanobacteria Blooms

by
Perry Thomas, Lakes and Ponds Program Manager, Agency of Natural Resources (ANR)
in the
Department of Environmental Conservation



Cyanobacteria (blue-green algae) blooms in Lake Carmi started early last summer and continued late into the fall of 2017. The Lakes and Ponds Program heard many complaints that the blooms were caused by nutrient-rich runoff from across the watershed, but weather and water quality data show runoff was just one part of a much larger story. 2017 brought high levels of rainfall in late spring.

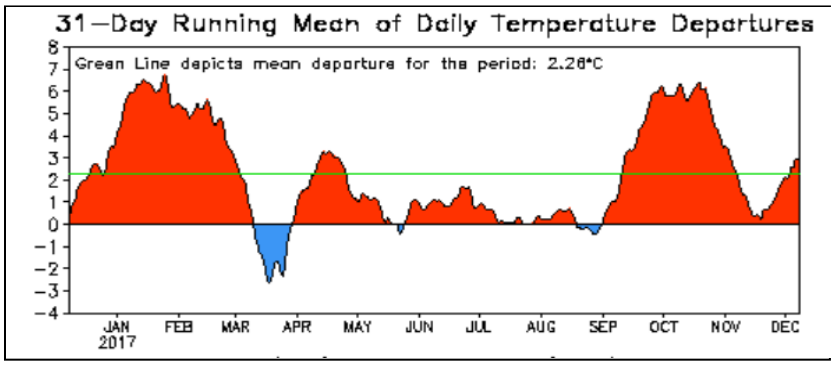
Unusually high levels of rainfall in late spring and early summer caused erosion of phosphorus-laden sediments that triggered early summer algal blooms. Some shoreland residents blamed manure spread during the past year, but recent spreading was just one contributor. Erosion from other sources across the watershed, including poorly maintained private roads, brought to the lake sediments rich in legacy phosphorus. During a mid-summer visit to Lake Carmi with DEC Commissioner Emily Boedecker, Angela Shambaugh Environmental Scientist VI, observed a bloom in progress and alerted the Vermont Department of Health. That was July 14, 2017.



Subsequently, typical summer stratification led to a lack of mixing in the lowest lake layer (the hypolimnion) and depletion of oxygen by biological activity there. Under these conditions, legacy phosphorus was released from sediments along the lake bottom and built up in the hypolimnion.

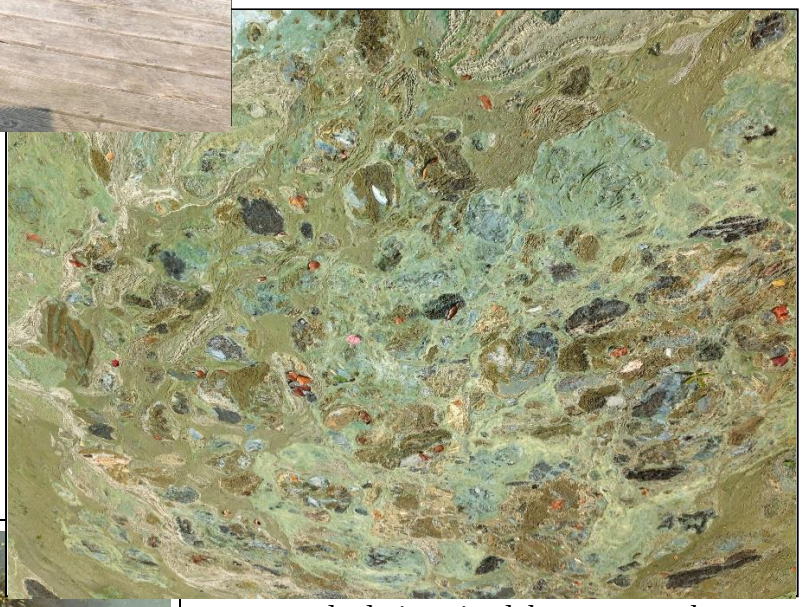
Total phosphorus accumulated at the eight-meter level during late July and early August. Data collected and analyzed by Pete Stangel.

Cool temperatures for a short period in August, combined with stiff breezes, allowed mixing of the lake column, and the phosphorus in the lowest layer mixed up through the water column. This extra injection of phosphorus fed the intense algal blooms we witnessed in late August and early September. Finally, an extended period of unusually warm weather from late September through November caused extension of the cyanobacteria bloom.



[1] http://www.cpc.ncep.noaa.gov/products/global_monitoring/temperature/tn72617_1yr.gif

Cooler than normal temperatures in late August allowed Lake Carmi to mix, and then an extended warm spell exacerbated cyanobacteria growth.[1]At the Englehardt camp on Lake Carmi, 16 Sep 2017. Image by Andrea Englehardt.Closeup of the bloom, 16 Sep 2017. Image by Andrea Englehardt.These kinds of cyanobacteria blooms pose several kinds of health risks. First, toxins released by cyanobacterial cells—called cyanotoxins—can cause rashes or stomach problems. Children and pets are at higher risk, since they may drink water while swimming and playing in the water; therefore, beaches are closed when cyanobacteria blooms are present and pet owners are warned to keep dogs away from the water. Second, preliminary research suggests that a toxin produced by some cyanobacteria may be linked to neurogenerative diseases such as amyotrophic lateral sclerosis (ALS) or Lou Gehrig's disease.



Finally, severe blooms lead to oxygen depletion in lake waters that can threaten fishes and other water-dwelling wildlife.

Lake Carmi empties into Mill Pond where this fish kill was photographed on September 13, 2017. The kill was probably caused by a depletion of oxygen, due to the decomposition of cyanobacteria. Photo by Diane Larose.

While the Lakes and Ponds Program is optimistic that summer 2018 will bring more typical summer conditions and less dramatic cyanobacteria blooms, we are doing all we can to make sure the Lake Carmi community never again experiences the extreme blooms of 2017. As reported by the president of the Franklin Watershed Committee, Pete Benevento, at FOVLAP's 2017 Annual Meeting, the Lake Carmi watershed and shoreland have already been the focus of many restoration projects. In 2015, partners working in the watershed formed the Lake Carmi Implementation Team to accelerate progress, bringing work prescribed by the Vermont Clean Water Act to Franklin as soon as possible.

Given the ongoing, concerted effort in the Lake Carmi watershed to address external loading of phosphorus, the Agency of Natural Resources has initiated plans to install an in-lake aeration treatment system. Installing this system is a three-phase process, and we're midway through. The first phase

(scoping) was completed in February, and the design phase will be completed in early May. If funding permits, DEC anticipates installation this summer. The system will be a form of artificial circulation to improve water quality and reduce the likelihood of cyanobacteria blooms. For more information on this problem, see the "Restoring Lake Carmi" web page at:

http://dec.vermont.gov/watershed/cwi/restoring/carmi. A fact sheet on Lake Carmi is available from a link at that site. For more information on this problem, see the "Restoring Lake Carmi" web page at http://dec.vermont.gov/watershed/cwi/restoring/carmi. A fact sheet on Lake Carmi is available from a link at that site.

Editor's Note: Vermont Bill H.730, passed by the House on March 15, 2018, would authorize the Agency of Natural Resources (ANR) to designate a lake as "a lake in crisis" if it meets specific criteria: the lake or lake segment has been listed as impaired; there is potential harm to public health; there is a risk of damage to the environment or natural resources; and the grand list value has been reduced by the municipality. H.730 requires that, within 90 days of designation, ANR adopt a crisis response plan. The Secretary of ANR may, for the purposes of the initial response to the lake in crisis, expend up to $50,000.00 from the Clean Water Fund for authorized contingency spending. H.730 also establishes the "Lake in Crisis Response Program Fund." Lake Carmi is designated a lake in crisis in a second section of the bill.

Please see the FOVLAP website for active links: http://vermontlakes.org

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