From: ANR - WSMD Lakes
To: Jensen, Kimberly
Subject: FW: comments
Date: Tuesday, November 7, 2023 12:41:26 PM
Attachments: Permitting Aquatic Herbicide Projects 2022.pdf
ewm mitigation history for Act 57 committee.docx

Thank you,

Kelcie Bean (she/her)

You may now submit permit applications, compliance reports and fee payments through our online form to expedite its receipt and review: ANR Online Intake Form

VERMONT

Kelcie Bean (she/her), Environmental Technician
Vermont Agency of Natural Resources | Department of Environmental Conservation
Watershed Management Division | Business & Operation Support Services (BOSS)
1 National Life Drive, Davis 3 | Montpelier, VT 05620-3522
802-490-6195 (o/c) | Kelcie.bean@vermont.gov
http://dec.vermont.gov/watershed

The Agency of Natural Resources supports telework, and I work primarily remotely. I am available to connect by phone and email.

Public Records Statement: Written communications to and from state officials regarding state business are considered public records and may be subject to public scrutiny.

From: [redacted]
Sent: Monday, November 6, 2023 9:48 PM
To: ANR - WSMD Lakes <ANR.WSMDLakes@vermont.gov>
Subject: comments

To: Act 57 Study Committee,

Please see the attached comments on herbicide use in Salem Lake in Derby, VT.

Gratefully,

[redacted]

[redacted]

November 6, 2023

To: Act 57 Study Committee
Re: Public Comments

These comments and observations are provided by someone actively involved in a lake association's attempts to control Eurasian Water Milfoil (EWM) in Big Salem Lake in Derby from 2019-2022. As a summer cabin owner using lake water for domestic use and consuming fish from the lake, I retain keen interest in the safe use of herbicides here and elsewhere. I currently serve as the lake association's VP and manage our state boat access Greeter Program for boat inspection and boater education.

Brief history: EWM was first discovered in Salem Lake in 2017 by a contractor doing an annual lake survey for invasives. A 50'x50' patch was discovered near the boat access on the east shore and was removed by suction harvesting (DASH) in late October 2018. Observers at the time noted that work was performed in less-than-ideal weather conditions for this kind of work. The contractor was confident that all known EWM had been removed. However, in 2019 I discovered a patch of EWM similar in size to the original while in-water surveying with snorkel and mask just 1-200 yards north of the initial discovery. By 2020-2021 EWM was beginning to show up over a mile away to the northwest. All this time, another volunteer and I collected numerous GPS waypoints during lake surveys, creating a graphic picture of the plant's spread. Hundreds of hours in planning and mitigation efforts by volunteers and a professional diver yielded minimal gains. By 2022 over $70,000 had been spent in mitigation efforts. In 2022 and 2023 we were a net "exporter" of EWM; boats leaving Salem Lake had over 12 times the amount of EWM on them as boats attempting to launch from other lakes and ponds, according to DEC Survey 123 data generated by our Greeters.

It needs to be said that I nor any other volunteer had previous experience managing aquatic invasives. Mistakes were made early on and guidance was sought from numerous private and state sources.

By 2021 I began suggesting to lake peers and other stakeholders that a more powerful tool was needed at Salem. Stakeholders were polled on the herbicide question and information about ProcellaCOR was provided. Consultants green lighted our use of this herbicide because the lake has over 200 acres of robust littoral area (plant growing), in a Mesotrophic-rated lake. ProcellaCOR EC was successfully used here in 2023. One lake neighbor who was thinking of selling his camp because of the milfoil problem is very happy with the results as are many others.

What I've learned so far and suggestions:

- Lakes with abundant native aquatic plant life make searching for and removing invasive EWM by hand or DASH very challenging. From personal observation and experience, a diver is unable to spot EWM two feet away in dense pondweed infiltrated by EWM. Salem hosts 30 different native plants, seven of which are the dominate pondweeds.
- DASH (suction harvesting) also produces fragments.
- To fully remove EWM by hand the root ball must be dug out. Visibility then becomes limited by disturbed sediment. Even our experienced diver could not prevent creating fragments in these conditions, especially when handpulling large quantities of EWM. Large quantities of fragments were released on at least two occasions during diver hand

harvesting while I observed and assisted from a boat. Not all fragments can be removed from the surface. From personal observations, fragments in the water column tend to drift off or settle in the immediate area. Madsen et al. (1997) found that 46% of plant fragments form new plants.

- Bottom barriers work well in new EWM infestations but less well in dense EWM patches that first need to be harvested – very costly according to Salem's lake association analysis when compared to herbicide use.
- A 40% yearly limit on "cumulative surface area of permitted chemical and non-chemical control projects" * seems overly restrictive and not cost effective for lakes where native aquatic plants still dominate.
- A rapid response to a new AIS infestation is critical. Herbicides can serve this purpose.
- Unregulated boat and recreational activity (of all kinds) greatly interferes with EWM mitigation efforts. Jet skis and other impeller driven craft are notorious at Salem Lake for spreading and creating plant fragments. Other watercraft are also culpable when not used carefully in infected areas.
- Vermont does not have enough skilled (and affordable) divers/contractors. Competition with other lakes for diver time results in less timely lake maintenance.
- The vagaries of Vermont weather compounded by a warmer climate greatly increases the challenge. Lower, warmer water increases plant growth and risk of fragmentation by water craft and anglers. Salem's EWM growth soared during draught years 2020-2022. See graph at https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx.
- There is a limit to what volunteers can do. Only one VT lake is known to have irradicated EWM without using herbicides.
- We could use more technical support from all state agencies. DEC staff are very helpful but their time seems stretched thin.

In summary, gaining control of an aggressive invasive such as EWM at Salem Lake required an equally aggressive response. Even experienced contractors find mitigating this plant difficult using only mechanical measures. Salem's lake association concluded that herbicide use is the most cost-effective approach to managing its EWM problem.

Thank you for all of your efforts.

Gratefully,

[redacted]

*Permitting Aquatic Herbicide Projects in VT, October 2022 (see PDF, pg. 10)

Permitting Aquatic Herbicide Projects in Vermont

VERMONT
AGENCY OF NATURAL RESOURCES

Vermont Department of Environmental Conservation
Watershed Management Division
Lakes and Ponds Management and Protection Program

I. Introduction

Under Chapter 50 of Title 10 of the Vermont Statutes, the Vermont General Assembly created the regulatory framework for reviewing projects proposing to control an aquatic nuisance. An aquatic nuisance is defined in statute as undesirable (e.g., a non-native invasive species) or excessive substances or populations that interfere with the recreational potential (e.g., an excessively abundant aquatic plant population that interferes with boating or swimming, cyanobacteria blooms) or aquatic habitat of a body of water, including rooted aquatic plants and animal and algal populations. Non-biological entities (e.g., sediment, nutrients) are not considered to be an aquatic nuisance regulated under Chapter 50. This statute states that almost all projects that propose to control an aquatic nuisance in waters of the State, including use of an aquatic herbicide, require an Aquatic Nuisance Control (ANC) permit.

The Department of Environmental Conservation's (DEC) Lake and Ponds Management and Protection Program oversees the permitting process for ANC projects. The DEC does not apply for or carry out permitted ANC projects. Projects are implemented by permittees, not DEC, in accordance with ANC permit conditions. Most permits are issued to lake associations, municipalities, and property owners seeking to control and limit the spread of aquatic invasive plant species, like Eurasian watermilfoil or water chestnut, using non-chemical means (e.g., bottom barriers, Diver-Assisted Suction Harvesting, mechanical harvesting, etc.). Projects that target an aquatic invasive species are more likely to be permitted, since invasive species are considered one of the ten major stressors on Vermont's surface waters as identified under the Vermont Surface Water Management Strategy (for more specific information on aquatic invasive species, please visit the Aquatic Invasive Species Program webpage). Control projects for native aquatic plant species are typically not permitted or are limited in scope because the related risk to the non-target environment is often unacceptable.

In 2019, the first ANC permits for the aquatic herbicide, ProcellaCOR EC (specimen label, safety data sheet) were issued to control Eurasian watermilfoil. Eurasian watermilfoil is an aquatic invasive species with populations documented in more than 80 Vermont waterbodies. ProcellaCOR is a relatively new aquatic herbicide that was registered with the US Environmental Protection Agency (EPA Reg. No. 67690-80) and the Vermont Agency of Agriculture, Food and Markets in 2018. This herbicide is selective at controlling Eurasian watermilfoil at low concentrations. Since 2019, ProcellaCOR has been the only aquatic herbicide that has been used in Vermont. To date (October 2022), ProcellaCOR treatments have occurred in the following waterbodies: Lake Hortonia, Lake St. Catherine (including Lily Pond and Little Lake), Burr Pond, Lake Beebe, Lake Dunmore, Sunrise Lake (Benson), Lake Pinneo, Lake Morey, Lake Iroquois, and Lake Fairlee (see Section V. Answer 11 for more details on this point).

Use of ProcellaCOR in Vermont lakes and ponds has generated significant public interest. The purpose of this document is to:

1. Provide background information about DEC's ANC permitting program, with a specific focus on aquatic herbicide projects;
2. Identify some of the recent findings related to ProcellaCOR; and
3. Provide a Q&A section on this topic reflecting common questions that DEC receives about our ANC permitting program

II. Aquatic Nuisance Control Application Process

Pursuant to statute, anyone may submit an ANC application to the DEC as there are no restrictions on who may apply. Upon receipt of an ANC application for use of an herbicide in waters of the State, the application undergoes a public notice process as specified under 10 V.S.A. Chapter 170 (ANC applications follow Type 3 Procedures, 10 V.S.A. § 7714). This process includes:

- Public notice of the application is posted on the Environmental Notice Bulletin (ENB).
- Public notice of the draft decision is posted on the ENB, which includes a minimum 30-day public comment period. A draft decision is either a draft permit or draft denial.
- A public meeting on the draft decision is held whenever any person files a written request for such a meeting or at the discretion of the Lakes and Ponds Program. Information related to the date, time, and location of the public meeting is posted to the ENB.
- Public notice of the final decision is posted on the ENB. If comments are made on the draft decision during the public comment period, the final decision posted on the ENB includes a response to public comments document that addresses the comments made during this period.

III. Aquatic Nuisance Control Technical Review Process for an Aquatic Herbicide

Prior to a draft decision being posted on the ENB (the second bullet point above), the Lake and Ponds Program conducts the following technical review of the application to determine whether the project meets the following statutory criteria (10 V.S.A. § 1455(d)):

(1) there is no reasonable nonchemical alternative available;
(2) there is acceptable risk to the nontarget environment;
(3) there is negligible risk to public health;
(4) a long-range management plan has been developed which incorporates a schedule of pesticide minimization; and
(5) there is a public benefit to be achieved from the application of a pesticide or, in the case of a pond located entirely on a landowner's property, no undue adverse effect upon the public good.

ANC Internal Review Procedure: As a part of the technical review of the application, the Lake and Ponds Program solicits comments from various other experts within the State. DEC proactively and voluntarily invites ANC Internal Technical Experts to review and comment on how the proposed project interacts with the ANC statutory criteria through the lens of their expertise. For example, the Lake and Ponds Program seeks input from the Vermont Department of Health (VDH) to review the proposed herbicide to determine whether there's a negligible risk to public health and from the Vermont Fish and Wildlife Department (FWD) to determine whether there's an acceptable risk to the non-target environment. While DEC actively solicits input from State-experts on the potential impacts of a proposed project, DEC ultimately makes the decision whether a proposal satisfies the statutory criteria.

Upon completion of the technical review of the application, the Lake and Ponds Program drafts a decision either approving or denying the proposed project. The draft decision is then posted to the ENB for public comment. Once the public comment period is complete, DEC responds to comments, determines if modifications to the draft permit are needed based on the comments and any new and relevant information brought to light during the public comment period, and then typically issues a permit, although in rare cases the public comment process can lead to a permit denial. The application and technical review process for ANC herbicide applications can take 180 days or longer, depending on the complexity of the project.

It is important to note that, as stated above, DEC's ANC permits require a long-range aquatic nuisance management plan which incorporates a schedule of pesticide minimization. In other words, applicants need to demonstrate how they will address a given waterbody's aquatic nuisance issues using an integrated management approach. This must include one or a combination of non-chemical control projects and/or efforts that reduce the likelihood of aquatic nuisance populations from developing (e.g., watershed interventions to reduce nutrient loading). Only applications that include a long-range aquatic nuisance management plan with pesticide minimization measures can receive a permit.

IV. Summary of Key Findings on ProcellaCOR

Prior to the first ANC permit for ProcellaCOR being approved, DEC worked in collaboration with the Vermont Pesticide Advisory Council, the Vermont Agency of Agriculture, Food and Markets, the VDH, and the FWD on reviewing the technical merits of this new aquatic herbicide. After extensive review, ProcellaCOR was found to be an aquatic herbicide that could likely fit within the current suite of Eurasian watermilfoil management tools that are used in Vermont. After several years of permittees implementing ProcellaCOR projects, the DEC continues to assess ProcellaCOR as a Eurasian watermilfoil management tool to determine whether the assumptions made on ProcellaCOR were accurate and to determine if there needs to be any changes to how ProcellaCOR projects are permitted. To date, ProcellaCOR projects have been approved for the following reasons:

- ProcellaCOR is highly specific to controlling Eurasian watermilfoil, an aquatic invasive species, when used at low concentrations, which is the approach used to date in Vermont's waters.
- Negative impacts on beneficial native aquatic plants are anticipated to be minimal to none (i.e., an acceptable risk) while it's anticipated that there will be an overall benefit for the native aquatic plant community.
- To evaluate this determination using data collected in Vermont, DEC's Lakes and Ponds Program conducted a pre- and post-treatment statistical analysis of the aquatic plant survey data from Vermont waterbodies treated with ProcellaCOR, which is available on our ANC webpage. In summary, the analysis showed that after a ProcellaCOR treatment, there was a statistically significant decrease of the lake-wide frequency of occurrence for Eurasian watermilfoil (target aquatic invasive species) and coontail (non-target native species) as well as there being a statistically significant increase of the lake-wide frequency of occurrence for the beneficial native species Illinois pondweed and American eelgrass. The impact on coontail was anticipated as that is a species that is listed as being controlled on the ProcellaCOR product label. However, this impact has been determined to be an acceptable risk for several reasons:

    i. The product label identifies that higher treatment concentrations may be required to control coontail, meaning that treatment concentrations can be reduced in areas where a treatment may overlap with a coontail population;

ii. Treatment areas can be delineated to avoid known locations of coontail populations; &
iii. While there was an observed decline in the frequency of occurrence for coontail post-treatment, coontail populations continue to persist and have not been extirpated from a waterbody.

Regarding the statistically significant increase in several beneficial native aquatic plant species and the remainder of native aquatic plant species having no observable impact, this is viewed as a positive impact on the overall biological integrity of native aquatic plant community. These results demonstrate that targeted Eurasian watermilfoil control projects are not resulting in the suppression of all aquatic plant species lake wide, that native plant species can reestablish in areas once dominated by Eurasian watermilfoil, and that the benefits of the structural habitat provided by aquatic plants remain.

- ProcellaCOR rapidly degrades in the environment. Using a minimum concentration detection limit of 1 part per billion (ppb), nearly 100% of post treatment sampling found that ProcellaCOR is undetectable in the water 48 hours after treatment.
- The potential for acute and chronic risks to fish, aquatic invertebrates, amphibians, and other aquatic animals is considered low at application rates of 3 – 5 Prescription Done Units (PDU) / per acre-foot (range 5.79 – 9.65 ppb/acre foot). Any potential chronic toxicity of concern would be short lived due to dissipation in the environment. Acute and chronic risks are further limited by the functional solubility of the product. ProcellaCOR exhibits low water solubility (~15 ppb), and in laboratory aquatic ecotoxicity studies, the highest concentration that could be dissolved in the test water was approximately 40-60 ppb. This review was performed by a DEC Environmental Scientist, where the detailed review can be found here.
- The potential for acute risk to macroinvertebrates is expected to be low, and this finding has been confirmed for invertebrates based on a study conducted by the New York DEC on a Peconic River ProcellaCOR treatment area. See this website for general information about the treatment and the specific study is available here.
- VDH has on multiple occasions provided a more favorable review of ProcellaCOR compared to other older herbicides that have previously been approved. This latest review that was performed by VDH's State Toxicologist in March 2022 in specific response to the Lake Bomoseen Association's Permit Application for ProcellaCOR, which includes the following statement:
  - *Based on a review of the confidential statement of formulation, it is reasonable to conclude that human exposure to the inert compounds contained in ProcellaCOR at the concentrations that would result under the conditions proposed by the applicants, is not likely to result in an increase in the level of concern for public health. Thus, the proposed treatment of Lake Bomoseen with ProcellaCOR is expected to result in negligible risk to public health, from both the active and inert compounds in ProcellaCOR.*
- The DEC's Drinking Water & Groundwater Protection Division (DWGWPD) acknowledges the presence of public and private drinking water systems that draw waters treated with ProcellaCOR as well as groundwater drinking water systems that may be adjacent to a treated. DWGWPD does not have concerns with the use of ProcellaCOR provided the conclusions from VDH have not changed and that treatment concentrations do not exceed 5 PDUs.

V. Frequently Asked Questions

Question 1: What are the goals of the ANC permitting program?
Answer 1: As charged by the Vermont General Assembly, the goals of this program are to allow for ANC activities to occur provided that adequate measures are taken to preserve and protect the quality of the

receiving waters, to protect the public health, and to minimize the impact of the ANC activity on the non-target environment. ANC activities are, in turn, intended to reduce the extent to which these aquatic nuisances interfere with the recreational potential or aquatic habitat of a body of water.

Question 2: What is an aquatic nuisance?
Answer 2: An aquatic nuisance is considered any form of a biological organism that is undesirable (e.g., non-native invasive species) or a biological organism that interferes with the recreational potential or aquatic habitat of a body of water (e.g., an excessively abundant aquatic plant population that interferes with boating or swimming, cyanobacteria blooms). Non-biological entities (e.g., sediment, nutrients) are not considered to be an aquatic nuisance.

Question 3: Why does DEC try to minimize the impact of ANC projects on native plants?
Answer 3: Minimizing impacts on native aquatic plant species is important because:

- Native aquatic plants can improve water clarity. Aquatic plants dampen wave energy, which slows shoreline erosion and allows fine particles to settle out of the water column. Rooted aquatic plants help to hold lakebed sediments in place. These actions can both improve water clarity and quality.
- Native aquatic plants are required by fish and wildlife and provide high-quality habitat and physical structure. Fish and wildlife use aquatic plants as a place to nest, lay eggs, feed, and hide from predators.
- Native aquatic plants can help prevent algae or cyanobacteria blooms. Aquatic plants help maintain stable lake ecosystems. Lakes with robust populations of aquatic plants help maintain a clear water stable state by being the primary point of uptake for nutrients. Without the presence of aquatic plants, nutrients can fuel algae or cyanobacteria growth instead.

Question 4: Who can apply for ANC permits in Vermont?
Answer 4: As per statute, any person, including a private landowner, municipality, or organization, can apply for an aquatic nuisance control permit in Vermont.

Question 5: What approach does DEC use to review permit applications for aquatic herbicide projects?
Answer 5: See the previous section defining the *Aquatic Nuisance Control Technical Review Process.*

Question 6: Does the DEC implement chemical projects to control aquatic nuisances?
Answer 6: The DEC does not apply for or carry out permitted ANC Individual Permit[1] projects. Projects are applied for and carried out by permittees (e.g., municipalities, lake associations, shoreline property owners), not DEC, in accordance with ANC permit conditions. All Individual Permit projects, once approved, are implemented by the permittees. DEC's role is to review the permit applications against the defined statutory criteria, issue permits when the applications demonstrate compliance, and oversee the permittee's compliance with permit conditions. In short, DEC is the regulatory authority, not the applicant, project proponent, or project implementer.

Question 7: Is Eurasian watermilfoil an invasive species in Vermont?

[1] Under 10 V.S.A. § 1456(b), both the DEC and the FWD have been granted the ability by the Vermont General Assembly to initiate rapid response control activities under a General Permit for nonindigenous new aquatic species when there is an emergency situation (e.g., a control project for an invasive species of significant concern that has not previously existed in Vermont).

Answer 7: Yes. The US Department of Agriculture National Invasive Species Information Center clearly lists Eurasian watermilfoil as an invasive species. The US Geological Survey has placed Eurasian watermilfoil on its list of Nonindigenous Aquatic Species, which lists the impacts of Eurasian watermilfoil infestations as follows:

- Now considered a major nuisance species throughout the Northeast, Northern Midwest, and Pacific Northwest of the US (Couch and Nelson 1985; Patten 1956; White et al. 1993), Eurasian watermilfoil competes aggressively to displace and reduce the diversity of native aquatic plants. It elongates from shoots initiated in the fall, beginning spring growth earlier than other aquatic plants. Tolerant of low water temperatures, it quickly grows to the surface, forming dense canopies that overtop and shade the surrounding vegetation (Madsen et al. 1991). Canopy formation and light reduction are significant factors in the decline of native plant abundance and diversity observed when Eurasian watermilfoil invades healthy plant communities (Smith and Barko 1990; Madsen 1994).
- Eurasian watermilfoil has less value as a food source for waterfowl than the native plants it replaces (Aiken et al. 1979). And although fish may initially experience a favorable edge effect, the characteristics of Eurasian watermilfoil's overabundant growth negate any short-term benefits it may provide fish in healthy waters. At high densities, its foliage supports a lower abundance and diversity of invertebrates, organisms that serve as fish food (Keast 1984). Dense cover allows high survival rates of young fish; however, larger predator fish lose foraging space and are less efficient at obtaining their prey (Lillie and Budd 1992; Engel 1995). Madsen et al. (1995) found growth and vigor of a warm-water fishery reduced by dense Eurasian watermilfoil cover. The growth and senescence of thick vegetation degrades water quality and depletes dissolved oxygen levels (Honnell 1992; Engel 1995). Typical dense beds restrict swimming, fishing, and boating, clog water intakes and result in decaying mats that foul lakeside beaches.

More locally, the Vermont Agency of Agriculture, Food and Markets also designates Eurasian watermilfoil as a Class B Noxious Weed under the Noxious Weeds Quarantine Rule. Eurasian watermilfoil first appeared in Vermont in 1962 and is now in over 100 waterbodies. Given these considerations, the DEC considers Eurasian watermilfoil as meeting the definition of an aquatic nuisance in relevant Vermont statute, and is therefore eligible for ANC control projects.

Question 8: How does the DEC make a public good determination for projects proposing an aquatic herbicide in public waters.
Answer 8: The DEC considered the following criteria in determining whether there is a public benefit to be achieved from the application of the pesticide in public waters:

- Whether carrying out the control activity produces tangible benefits to public good uses, such as boating, fishing, and swimming, that outweigh potential impacts on the water resource.
- Whether the potential cumulative impacts from carrying out the control activity adversely affect the water resource and the public that utilizes that resource.
- Whether measures to reduce impacts on the water resource have been taken.
- Whether the control activity is excessive for the stated purpose.

This approach for making a public good determination is informed by the "Interim Procedures for the Issuance or Denial of Lake Encroachment Permits."

Question 9: Can DEC still issue a permit if abutting municipalities oppose the proposed project?

Answer 9: Public comment and input on permit applications is an important part of the overall permit application review process. DEC will consider municipal input to a permit application; however, the DEC is still required to evaluate any applications it received according to the standards articulated in statute.

Vermont's lakes and ponds are a public trust resource managed for the benefit of all Vermonters. They are not owned by the State or any other regulatory, municipal, or private entity; rather the Agency is the trustee of Vermont's surface waters. It is the policy of the State that Vermont's water resources shall be protected, regulated, and where necessary controlled under the authority of the State in the public interest to promote the general welfare and to protect public health and the environment. As the trustee, the Agency alone is charged with implementing this policy. In the context of aquatic nuisance control, the Agency is explicitly charged with implementing a permitting program that oversees pesticide projects proposing to control aquatic nuisances; authority over aquatic nuisance control permitting cannot be delegated to any other entity, including municipalities. Further and as mentioned, any person, including a private landowner or organization, can apply for an ANC permit.

Additionally, the DEC administers the ANC permitting program. When evaluating applications for ANC permits, the DEC will issue a permit as long as certain criteria are met, regardless of the applicant. Because lakes and ponds are public trust resources, one of the criteria the DEC considers when making permitting decisions on a pesticide application is whether the proposed activity serves a public benefit. The DEC considers all public comments received, including comments from municipalities, when considering whether a proposed project provides a public benefit, but ultimately the DEC is responsible for making a permitting decision that reflects the statewide policy interest in preventing the proliferation of aquatic nuisance species that result in negative environmental, social, and economic impacts as well as impacts to public health and safety.

Question 10: What are the requirements for ANC permittees to notify the public of a scheduled ProcellaCOR treatment and why were they developed?
Answer 10: Public notification of a scheduled ProcellaCOR treatment is not required under statute, and there is no requirement to notify the public of a treatment on the product label nor does the VT Agency of Agriculture, Food and Markets require signage when one uses ProcellaCOR. However, to promote transparency and awareness of permitted activities in Waters of the State, DEC proactively requires public notification of a scheduled ProcellaCOR treatment as an ANC permit condition. The public notification required by DEC consists of a combination of posting treatment related information on physical signage around the lake to be treated as well as posting information on a publicly available website. Physical signage has been a required part of Aquatic Nuisance Control permits for herbicide since the first herbicide permit for Eurasian watermilfoil control was issued in 1999 while posting information on a website is a relatively new requirement. These requirements have been in all 10 ANC permits for ProcellaCOR since 2019. During the public notice periods for those 10 applications, DEC received no public comments regarding the adequacy or inadequacy of these requirements.

The DEC has the authority to add this public notification requirement based on this section of statute:

- *10 V.S.A. § 1455(i)(3) contain additional conditions, requirements, and restrictions as the Secretary deems necessary to preserve and protect the quality of the receiving waters, to protect the public health, and to minimize the impact on the nontarget environment. Such conditions may include requirements concerning recording, reporting, and monitoring*

This statutory language is very broad and does not have any specific requirements for public notification purposes, so the permit requirements were created by DEC to ensure compliance with both this language and the statutory review criteria (10 V.S.A. § 1455(d)).

Question 11: What waterbodies have already been treated with ProcellaCOR to address Eurasian watermilfoil infestations?
Answer 11: DEC approved ProcellaCOR treatments on ten lakes and ponds since 2019, as follows below (note that Lake St. Catherine and Little Lake are hydrologically connected and therefore considered as one waterbody for the purposes of this table):

Treatment Date	Waterbody	Herbicide Used	Herbicide Concentration	Acres Treated	Total Acres per year
6/11/2019	Morey	ProcellaCOR	3 PDU	39.1	
6/17/2019	Hortonia	ProcellaCOR	3-4 PDU	43.9	
7/10/2019	St. Catherine	ProcellaCOR	3 PDU	38.1	
7/22/2019	Burr	ProcellaCOR	2 PDU	24.6	145.7
6/16/2020	Hortonia	ProcellaCOR	3 PDU	13.6	
6/16/2020	Beebe	ProcellaCOR	3 PDU	13.6	
6/17/2020	Dunmore	ProcellaCOR	3 PDU	40.5	
6/24/2020	St. Catherine	ProcellaCOR	3 PDU	10.3	
6/24/2020	Lily (Poultney)	ProcellaCOR	2 PDU	8.1	
8/4/2020	Sunrise (Benson)	ProcellaCOR	3 PDU	8.8	111.9
9/8/2020	Pinneo	ProcellaCOR	3 PDU	17	
6/16/2021	Morey	ProcellaCOR	4.167 PDU	26.4	
6/16/2021	Pinneo	ProcellaCOR	3 PDU	16.85	
6/17/2021	Hortonia	ProcellaCOR	3.5-4 PDU	45.1	
6/17/2021	Beebe	ProcellaCOR	4 PDU	4.4	
6/22/2021	St. Catherine	ProcellaCOR	2-3 PDU	22.6	
6/22/2021	Little (Wells)	ProcellaCOR	2 PDU	70.2	222.55
6/28/2021	Iroquois	ProcellaCOR	3 PDU	37	
6/20/2022	St. Catherine	ProcellaCOR	2-3 PDU	8.7	
6/20/2022	Little (Wells)	ProcellaCOR	2 PDU	35.4	
6/20/2022	Fairlee	ProcellaCOR	3-4 PDU	13.8	
6/21/2022	Beebe	ProcellaCOR	3-4 PDU	10.2	
6/27/2022	Hortonia	ProcellaCOR	3 PDU	32.4	100.5

Question 12: Is ProcellaCOR the only herbicide or pesticide permitted by DEC and found in Vermont's waters?
Answer 12: ProcellaCOR is the only aquatic herbicide that DEC has permitted since July 2019. DEC previously issued permits for herbicides known as Renovate OTF, Renovate 3, or Sonar AS. Since the introduction of ProcellaCOR, these other aquatic herbicides have largely fallen out of favor and are no longer actively applied for.

DEC has also permitted the use of other pesticides (lampricide) under an ANC permit, known as TFM (3-trifluoromethyl-4-nitrophenol), intended to kill sea lampreys in tributaries of Lake Champlain, as part of a regional sea lamprey control program led by the US Fish and Wildlife Service. TFM targets sea lamprey larvae in their nursery tributaries, and in the concentrations used, kills larvae before they develop mouths and migrate to Lake Champlain to feed on fish. While there have been impacts on other native aquatic animal species, such as common mudpuppy (*Necturus maculosus*) mortality, DEC has determined that there is an acceptable risk to the non-target environment for these projects. The following links provide more information about the Sea Lamprey Control Program and TFM:

- US Fish and Wildlife website about the Sea Lamprey Control Program
- Great Lakes Fisheries Commission website about the Sea Lamprey Control Program
- EPA Registration Eligibility Decision for TFM
- Journal article about the toxicity of TFM to sturgeon and mudpuppies

The VT Agency of Agriculture, Food and Markets regulates the use of pesticides, insecticides, and herbicides on agricultural lands and DEC and AAFM perform surface water testing to determine the concentrations of certain pesticides in Lake Champlain and its tributaries as part of the Lake Champlain Long-Term Monitoring Project. Some additional information about the presence of pesticides in Vermont's waters is available here:

- USGS Synoptic Study of Selected Pesticides in Streams Draining to Lake Champlain
- Study on Glyphosate Based Herbicides
- Pesticide Use in Vermont presentation by Nat Shambaugh from January 2022

Question 13: Do the DEC and the Fish and Wildlife Department (FWD) have opposing viewpoints about use of ProcellaCOR to control Eurasian watermilfoil in Vermont's lakes and ponds?
Answer 13: DEC and FWD have different mandates regarding management of public waters, the habitat they provide, and the plant and animal species that reside in that habitat.

DEC has a broad mandate of managing waters so that all uses designated in the Federal Clean Water Act (Boating, Fishing, Swimming, Aesthetic Uses, Water Supply, Aquatic Habitat, and Aquatic Biota) can be enjoyed by Vermonters. In regard to aquatic nuisance control, DEC's work is guided by Title 10 – Chapter 50 on Aquatic Nuisance Control, which clearly states that "*It is the policy of the State of Vermont to prevent the infestation and proliferation of invasive species in the State that result in negative environmental impacts, including habitat loss and a reduction in native biodiversity along with adverse social and economic impacts and impacts to the public health and safety*."

FWD's mission is "the conservation of fish, wildlife and plants and their habitats for the people of Vermont" and the Department's fisheries work is focused on managing existing fisheries, fish populations, and fish habitat needs, which in some instances may require different approaches from DEC's broader mandate mentioned above.

Despite these differences in mandate, DEC and FWD work together to find solutions and management approaches for the state's public waters that aim to balance different uses and provide optimal recreational opportunities and habitat. Regarding Eurasian watermilfoil, infestations of this plant in our waters can impede access to or use of these waters and can lead to habitat and water quality deterioration. However, in moderate amounts, Eurasian watermilfoil can also provide habitat for some species of vegetation-dependent fish species. For these reasons, permit applications requesting

authorization for the control of Eurasian watermilfoil need to be reviewed from both DEC and FWD staff to inform permitting decisions.

In 2018 and 2019, DEC and FWD collaboratively reviewed the new herbicide ProcellaCOR to determine how this herbicide might fit within an Aquatic Nuisance Control permit for the control of the aquatic invasive species Eurasian watermilfoil. The broader purpose of these collaborative discussions was to address FWD concerns about whole-lake herbicide treatments that were permitted up to that time. DEC and FWD agreed that it was beneficial to decrease treatment acreage, size, and/or percentage of littoral zone treated for future treatments so as not to create an unacceptable non-target impact on fisheries.

The result from that discussion was a permitting framework for Aquatic Nuisance Control permits for the management of Eurasian watermilfoil that was acceptable to both departments. Specifically, DEC and FWD collaborated to set an upper threshold for annual herbicide treatment areas for the littoral zone of lakes. Based on input from FWD regarding the protection of young bass, DEC limited all combined Eurasian watermilfoil control projects (e.g., cumulative surface area of permitted chemical and non-chemical control projects) to 40% of the littoral zone in any one year, and thereby maintained 60% of the littoral zone. Since 2019, all Aquatic Nuisance Control permits for chemical or nonchemical control projects for managing a well-established lake wide population of Eurasian watermilfoil have used the aforementioned framework, including for the2020 ANC permit application for use of ProcellaCOR at Lake Iroquois, for which a FWD Fish Biologist confirmed that because the application proposed to treat 40% or less of the littoral zone, there were no major concerns with the project.

In 2022, a FWD Fisheries Biologist raised concerns about this 40% threshold, and DEC is open to reconsidering the existing approach if there is evidence that the 40% threshold is determined to have an unacceptable risk on the non-target environment. It should also be noted that the projects that DEC permits only allow for the permittee to target **Eurasian watermilfoil** within 40% of the littoral zone, not **all** aquatic vegetation within the 40% area. Due to this targeted management approach, it is anticipated that aquatic plant populations will remain robust even within the up to 40% control area, meaning that even greater than 60% of the littoral zone would remain completely intact after implementing a control project (see Section IV that includes a summary of a pre- and post-treatment statistical analysis conducted by DEC on the aquatic plant survey data from Vermont waterbodies treated with ProcellaCOR, which corroborates this anticipated outcome).

DEC also proactively developed an ANC Individual Permit Application Internal Review Procedure to guide input from FWD, VDH, and other DEC divisions, such as the Drinking Water and Groundwater Protection Division. VDH and the DEC Drinking Water and Groundwater Protection Division have approved these procedures, and the DEC Lakes and Ponds Program is working with FWD Fisheries Biologists to finalize the procedures.

Question 14: What is the impact of Eurasian watermilfoil infestations on aquatic habitats and fisheries?
Answer 14: The answer is “it depends,” and like many elements of dynamic ecosystems, the relative abundance of any one plant will influence whether it has an impact on the abundance of other species, including fish, and there are other factors like water quality and temperature that influence population dynamics as well. Additionally, one species of fish may thrive under conditions that might be less beneficial to another species of fish.

The following is a summary of the biology and ecological impacts of Eurasian watermilfoil from the VT Invasives website:

- Eurasian watermilfoil competes aggressively to displace and reduce the diversity of native aquatic plants (link). It elongates from shoots initiated in the fall, beginning spring growth earlier than other aquatic plants. Tolerant of low water temperatures, it quickly grows to the surface, forming dense canopies that overtop and shade the surrounding vegetation. Canopy formation and light reduction are significant factors in the decline of native plant abundance and diversity observed when Eurasian watermilfoil invades healthy plant communities. A summary of the impacts of Eurasian Watermilfoil from a literature review can be found here.
- Eurasian watermilfoil has less value as a food source for waterfowl than the native plants it replaces (link). And although fish may initially experience a favorable edge effect, the characteristics of Eurasian watermilfoil's overabundant growth negate any short-term benefits it may provide fish in healthy waters. At high densities, its foliage supports a lower abundance and diversity of invertebrates, organisms that serve as fish food. Dense cover allows high survival rates of young fish; however, larger predator fish lose foraging space and are less efficient at obtaining their prey. Madsen et al. (1995) found growth and vigor of a warm-water fishery reduced by dense Eurasian watermilfoil cover.
- The growth and senescence of thick vegetation degrades water quality and depletes dissolved oxygen levels. Typical dense beds restrict swimming, fishing, and boating, clog water intakes and result in decaying mats that foul lakeside beaches.
- Eurasian Watermilfoil is also known to aggressively displace native vegetation and alter fish and wildlife habitat by forming of impenetrable mats with dense upper canopies that reduce light and decrease water flow. These significant changes in habitat quality quickly affect fish, wildlife, and other aquatic organisms. Over time, Eurasian watermilfoil will out-compete or eliminate more beneficial native aquatic plants, severely reducing natural plant diversity within a lake. Eurasian watermilfoil is rarely used for food by wildlife and can displace many aquatic plants that are valuable food sources for birds, fish, and insects. Dense stands of Eurasian watermilfoil provide habitat for mosquitoes and may increase populations of some species of these insects (*Getsinger et al (2005).*

The following is a summary from the scientific literature on the role of plants, including Eurasian watermilfoil, in providing aquatic habitat for fisheries:

- All life-stages of near-shore dwelling warmwater fish species heavily reliant on abundant and structurally complex aquatic habitat such as aquatic vegetation and submerged coarse woody habitat (Crowder & Cooper 1979; Crowder & Cooper 1982; Weaver et al. 1997; Curtis et al. 2015)
- Aquatic vegetation plays a vital role in maintaining the overall integrity of aquatic ecosystems and in supporting diverse, healthy, and abundant fish (Crowder and Cooper 1979; Savino and Stein 1982; Durocher et al. 1984; Paukert and Willis 2002)
- Optimal vegetative coverage for warmwater fish species such as largemouth bass, bluegill, pumpkinseed sunfish ranges from 40 to 60% of the total surface area of a waterbody. Waterbodies with limited areas of open water and vegetative cover greater than 60% of the surface area can negatively impact fish population size structure due to reduced foraging success for adult fish and increased survival of young fish due to lack of predation pressure, resulting in overabundance and stunting (Savino and Stein 1982; Carpenter and Lodge 1986; Bettoli et al. 1992; Valley et al. 2004; Nagid et al. 2015)
- Evaluating the quality of vegetative habitat for bass can be unintentionally over-simplified if relying purely on measurements of percent cover of aquatic vegetation without including a measure of structural complexity of the aquatic plant community (Hoyer and Canfield 2001). Complex habitat is often described in the literature as being “patchy,” meaning vegetated areas comprise plant species that vary in height and volume (stem/leaf arrangement), providing both vertical and horizontal cover. Quality patchy habitat is also defined as being scattered clumps of submerged aquatic

vegetation with areas of open water (opening in the plant canopy can be as small as 12 inches or up to many feet), creating edges. Structurally complex habitat provides a variety of microhabitats which support a more abundant, diverse, and healthy fish community (Tonn and Magnuson 1982; Eadie and Keast 1984; Engel 1987; Bryan and Scarnecchia 1992; Valley and Bremigan 2002a; Pratt and Smokorowski 2003)

- Structural complexity of aquatic vegetation, not simply vegetation abundance, is a major factor in fish community diversity and species composition and provides particularly high-quality habitat for young-of-year fish (Weaver et al. 1997). Distinct microhabitats found in a structurally complex stand of aquatic vegetation provided optimal foraging areas for a wide range of juvenile game and forage fish species, partly due to the diverse community of aquatic invertebrates that colonize on the vegetation (Chick and Mclvor 1994). Littoral fish species spend more than 80% of their time in stands of aquatic vegetation (Hosn and Downing 1994)
- Quality fish habitat can include non-native aquatic plant species (e.g., Eurasian watermilfoil or curly-leaf pondweed), and plant community structure is often more important than total plant coverage or species present. For example, an area of lake bottom with 100% coverage of a low-growing aquatic plant species such as *Chara* provides much less habitat value to fish than the same 100% coverage of a canopy species such as Eurasian watermilfoil (Valley et al. 2004)
- Alteration or loss of aquatic vegetative habitat may reduce growth, overwinter survival, and recruitment of littoral fish species (Annett and Dibble 1996; Dibble et al. 1996)
- While EWM can provide fish habitat, dense stands of EWM can adversely impact fisheries negatively by degrading fish habitat, impairing feeding, and disrupting predator-prey interactions.[2]
- Fish populations may initially experience a favorable increase when Eurasian watermilfoil first invades a site. However, the abundant and aggressive growth of this weed will counteract any short-term benefits. Its typically dense growth habit makes Eurasian watermilfoil beds poor spawning areas for fish and may lead to populations of small-sized specimens. Loss of oxygen and light caused by the dense mats can also affect the characteristics of fish populations. At high densities, Eurasian watermilfoil's foliage supports a lower abundance and diversity of invertebrates to serve as fish food. While dense cover does allow high survival rates of young fish, larger predator fish lose foraging space and are less efficient at obtaining their prey. Thus, dense Eurasian watermilfoil stands are reported to reduce expansion and vigor of warm-water fisheries. The growth and senescence of dense Eurasian watermilfoil colonies also reduce water quality and water circulation and cause lower levels of dissolved oxygen. (Getsinger et al, 2005).

The VT Department of Fish and Wildlife describes the impact of Eurasian Watermilfoil as follows:

- **Impact:** Eurasian watermilfoil's tolerance of lower temperatures allows it to start growing earlier than other vegetation and form canopies that block light, which inhibits the growth of native plants and can lead to their displacement. It can also reduce the abundance and diversity of invertebrates. In very shallow waterbodies, milfoil can grow from shore-to-shore and blanket the entire lake bottom and surface area of the waterbody, forming dense impenetrable stands with no open water. Only in these extreme and rare circumstances will recreational activities like swimming, boating, and fishing be impacted by Eurasian watermilfoil. Generally, this plant species has little negative impact on fish and wildlife with the greatest concern of this invasive species being on native aquatic plant diversity. Besides the ecological impacts, infestations of milfoil have

[2] (1) Keast, A. 1984. The introduced aquatic macrophyte, Myriophyllum spicatum, as habitat for fish and their invertebrate prey. Canadian Journal of Zoology 62: 1289 – 1303. (2) Engle, S. 1995. Eurasian watermilfoil as a fishery management tool. Fisheries 20 (3):20-27. (3) Getsinger, K., et al, 2005. Aquatic Plant Management: Best Management Practices in Support of Fish and Wildlife Habitat. Aquatic Ecosystem Restoration Foundation, Lansing, MI.

economic impacts through the reduction of property values and the high costs of various treatment options.

Finally, this paragraph from a report called "Impact of Invasive Aquatic Plants on Fish" may be useful in understanding the interrelationships between aquatic plant communities and fish populations:

- **The relationship between fish and aquatic plants**: The abundance of some fish declines with increased plant densities. For example, populations of white bass (*Morone chrysops*), gizzard shad (*Dorosomoa cepedianum*) and inland silverside (*Menidia beryllina*) generally decline where heavy vegetation is present. In contrast, many juvenile and some adult fish prefer habitats with aquatic vegetation; in fact, over 120 different species representing 19 fish families have been collected in aquatic plant beds. Sites with vegetation generally have higher numbers of fish compared to non-vegetated areas. In fact, densities of greater than 1 million fish per acre have been reported in areas containing a diversity of aquatic plants. Very few of these fish, however, survive to become large adults, so high numbers of small fish do not always result in populations of large mature fish. Excessive growth of aquatic plants promotes high populations of small fish in contrast to more diverse and balanced plant populations. Reduced plant densities due to weed management activities, boat traffic and/or natural senescence may change or cause the loss of invertebrate food sources. However, studies of lakes where invasive plants were treated with early applications of herbicides to allow native plants to reestablish have revealed that removal of exotic weeds has little impact on invertebrate populations and no measurable effect on fish communities.

Question 15: What is the impact of Eurasian watermilfoil management on the fishery in Lake St. Catherine?
Answer 15: Overall, Vermont FWD fisheries biologists have stated in writing that the fishery in Lake St. Catherine has not been damaged because of Eurasian watermilfoil management, but it has changed. Eurasian watermilfoil management in Lake St. Catherine has occurred over the past twenty years and has been accompanied by a shift from largemouth bass to smallmouth bass in the lake, according to a Vermont Fish and Wildlife Bass Inventory and Management Report – District 2 covering the period from July 1, 2020 to June 30, 2021. Vermont Fish and Wildlife fisheries biologists have stated that over 20 years of sampling data indicate that smallmouth bass populations have increased while largemouth bass have declined. In most lakes, when these shifts in species occur, it is related to availability of suitable habitat, with largemouth bass requiring more complex vegetated habitats than smallmouth bass. It is therefore reasonable to conclude that Eurasian watermilfoil management is at least partially responsible for this shift, although there may be other factors at play as well. Also, it should be noted that the dataset used in the aforementioned FWD report does not include information about bass populations before 1988. Therefore, it is not known if largemouth bass populations today are any different to those in the lake before the milfoil infestations began in the early 1970s.

It should be noted that while a documented change has occurred, the statutory standard of review for ANC projects is whether there's an *acceptable* risk to the non-target environment and that there is either a benefit to or no undue adverse effect upon the public good. Given the technical findings related to Eurasian watermilfoil management, it's anticipated that environmental changes will occur after treatment, but in a way that presents an acceptable risk to the non-target environment and will either provide a benefit to the public good or have no undue adverse effect on the public good. While FWD is charged with fisheries management, DEC is charged with a broader mandate of managing waters so that all uses designated in the Federal Clean Water Act (Boating, Fishing, Swimming, Aesthetic Uses, Water Supply, Aquatic Habitat, and Aquatic Biota) can be enjoyed by Vermonters, and in some cases

management actions that are intended to maintain all uses will lead to actions with acceptable changes to individual uses.

Question 16: What impact does ProcellaCOR have on public health and drinking water?
Answer 16: As a part of the statutory criteria used to review an ANC permit application, it must be determined that the project poses a negligible risk to public health. When reviewing an Aquatic Nuisance Control permit application, the DEC's Lakes and Ponds Programs works with various other State programs and departments to assist in the review of these applications. This includes review by the Vermont Department of Health and the DEC's Drinking Water Groundwater Protection Division. Based on the review from these technical experts, it has previously been found that the use of ProcellaCOR is anticipated to have a negligible risk to public health, which includes considerations for those that may pull water directly from the lake or those that have a drinking water well nearby. The EPA label for ProcellaCOR does not include any restrictions on use of the treated water for domestic (including drinking and cooking) or recreational use. There is no required isolation distance between treated waters and public or private drinking water sources (e.g., in-lake waterline, nearby well). It is anticipated that the permitted use of ProcellaCOR will result in negligible risk to public health, from both the active and inert compounds.