

**Aquatic Nuisance Control Individual Permit
Under 10 V.S.A. § 1455**



Permittee Information	
Permittee: United States Fish and Wildlife Service Permit Number: 3051-ANC-C	Control Activity: Pesticide (Lampricide) Waterbody: Lamoille River in Colchester and Milton
a. Specific Conditions	
<p>Based upon the Findings contained in this permit, the Secretary of the Agency of Natural Resources (Secretary) has determined that the proposed aquatic nuisance control activity will comply with 10 V.S.A. § 1455 and is hereby approved. The control activity shall be carried out in accordance with the Approved Application, the additional permit terms and conditions contained herein, and such amendments as may be approved in writing by the Secretary, and the following specific conditions:</p>	
<ol style="list-style-type: none">1. <u>Pesticide Use.</u> The use of lampricides TFM-HP (EPA Registration Number 6704-45 – active ingredient TFM, 3-Trifluoromethyl-4-nitrophenol, sodium salt), TFM-Bar (EPA Registration Number 6704-86 – active ingredient TFM, 3-Trifluoromethyl-4-nitrophenol), and Bayluscide 20% Emulsifiable Concentrate (EPA Registration Number 6704-92 – active ingredient Niclosamide, Aminoethanol Salt) (treatment), are authorized to target sea lamprey, <i>Petromyzon marinus</i>, in the waters of the Lamoille River in Colchester and Milton. These pesticides shall be registered with the U.S. Environmental Protection Agency and the Vermont Agency of Agriculture, Food and Markets at the time of use and handled, applied, and disposed of in conformance with all state and federal regulations.2. <u>Certified Applicator.</u> All applicators of the authorized pesticides shall be certified by the Vermont Agency of Agriculture, Food and Markets in Category Five – Aquatic Pest Control.3. <u>Agency Notification.</u> Notification shall be provided at least 30 days in advance of the scheduled treatment date to the Secretary of the Agency of Natural Resources and to the Agency of Agriculture, Food & Markets to coordinate pesticide use inspection at the time of treatment. The Secretary shall be notified the day prior to the scheduled treatment regarding whether the treatment will proceed as scheduled. The permittee shall contact Erica Cummings, Agrichemical Research and Policy Specialist, of the Agency of Agriculture, Food & Markets at 802-917-2073 or erica.cummings@vermont.gov, or her replacement, to coordinate.4. <u>Treatment Location, Monitoring, & Procedures.</u> Treatment(s) and subsequent lampricide concentration and target/non-target monitoring shall be carried out in the Lamoille River in accordance with the following procedures, or as approved by the Secretary. Except for samples collected for water use advisory purposes, TFM concentrations shall be determined with a photospectrometer accurate to within 0.1 parts per million (ppm). Procedures shall be updated as necessary to minimize potential adverse impacts on the resource and to ensure compliance with this permit. All updates to the following procedures shall be submitted to the Secretary for approval.<ol style="list-style-type: none">A. <i>Treatment Strategy and Methodology</i> under Appendix A – 7 through A – 11 in the Approved Application.B. Standard Operating Procedures (February 2019) in the Approved Application Appendix.C. Contingency Plan for Accidental Spillage of Lampricides during Lake Champlain Sea Lamprey Control Operations (February 2019) in the Approved Application Appendix.D. Water Use Advisory Zone Monitoring Plan for Lampricide Treatments of the Poultney/Hubbardton River, Lewis Creek, LaPlatte River, Winooski River, Lamoille River, Stone Bridge Brook, and the Missisquoi River (June 2019) in the Approved Application Appendix.E. Prior Notification, Posting and Water Supply Plan for Lake Champlain Lampricide Applications (March 2019) in the Approved Application Appendix.	

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5. Treatment Frequency. During the effective period of this permit, two treatments are authorized; the first between Labor Day 2020 and by the end of December 31, 2020 and the second between Labor Day 2024 and December 31, 2024, unless approved otherwise by the Secretary. If the 2020 or 2024 treatment must be postponed until 2021 or 2025, that rescheduled treatment must occur between Labor Day and by the end of December 31 provided the permit is still in effect.
6. Treatment Concentration & Duration. As determined by an on-site toxicity test conducted on or after September 1 of the year of the treatment, lampricide shall be applied to maintain a 9-hour lethal concentration (1.0 x Minimum Lethal Concentration (MLC) or greater) in all downstream areas from the primary application point within the treatment area. The treatment shall not exceed 1.3 x MLC to sea lamprey. TFM shall not be applied into the Lamoille River at a single location for longer than 14 consecutive hours. If applicable, a sodium chloride (NaCl) pulse used to conduct a time travel analysis to refine TFM concentrations shall not exceed the Vermont Water Quality Standard of 230 mg/L.
7. Water Temperature. On the day of treatment, the water temperature at the primary application point must be at or above 2° C or the treatment shall not proceed.
8. Stream Flow. The river flow rate shall be monitored from the [USGS 04292500 LAMOILLE RIVER AT EAST GEORGIA, VT](#) gauge during a treatment. River flow downstream of Peterson Dam shall be maintained below 1,800 cubic feet per second (cfs), if feasible, until completion of the post mortality survey.
9. Lake Level. The treatment shall not occur unless the surface elevation of Lake Champlain is at or below 98.0 feet National Geodetic Vertical Datum (NGVD) 1929 as measured at [USGS 04294500 LAKE CHAMPLAIN AT BURLINGTON, VT](#).
10. Water Use Advisories and Recommendations. Beginning on the day of treatment, the following water use advisories and recommendations apply to the zones of the Lamoille River as identified within the *Water Use Advisory Zone Monitoring Plan for Lampricide Treatments of the Poultney/Hubbardton River, Lewis Creek, LaPlatte River, Winooski River, Lamoille River, Stone Bridge Brook, and the Missisquoi River* (June 2019), or its approved replacement:
 - A. Public Water Supplies: The water should not be used for drinking or food or beverage preparation until measurements of TFM are below the reporting limit of 100 parts per billion (ppb) in any public water supply finished water sample.
 - B. Private Water Supplies: The water should not be used for drinking or food or beverage preparation until measurements of TFM are below the reporting limit of 100 ppb in areas where there may be private water supplies.
 - C. The water should not be used for swimming until measurements of TFM are below 3.9 ppm.
 - D. The permittee shall inform the public of the water use advisories and recommendation contained in this section in accordance with the plans as identified under conditions a.5.D. and a.5.E. of this permit.
 - E. All laboratory analyses for TFM regarding public use advisories and notifications shall be conducted with a minimum detection limit of 5 parts per billion (ppb) or less.
 - F. A website shall be maintained (https://www.fws.gov/lcfwro/sealamprey/lamprey_control_information.html) and a toll-free phone line (1-888-596-0611) for the public to check on the current status of the public water use advisories and recommendations.
11. Post-Treatment Surveys. Post-treatment non-target/target surveys shall occur in accordance with condition a.4. of this permit. In addition, preliminary results shall be made available to the Secretary within 24 hours of

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completion. If preliminary results indicate a significant level of impact on non-target organisms, then a full reach survey may be requested by the Secretary. When possible, all specimen of mudpuppy (*Necturus maculosus*) mortalities shall be collected and preserved in a manner to ensure continued study.

12. Potable Water. On the day of treatment and until water use advisories identified under condition a.10.B. have lifted, the permittee shall supply potable water upon request to those who depend upon the treated waters for domestic use to prepare food or drink within the advisory zones as identified within the *Water Use Advisory Zone Monitoring Plan for Lampricide Treatments of the Poultney/Hubbardton River, Lewis Creek, LaPlatte River, Winooski River, Lamoille River, Stone Bridge Brook, and the Missisquoi River* (June 2019), or its approved replacement.

13. Annual Reporting.

- A. An annual report shall be submitted to the Secretary by May 1st of the year following a treatment and shall include at a minimum:
 - i. Batch numbers and the quantity used of TFM HP, TFM Bar, and Bayluscide 20% Emulsifiable Concentrate.
 - ii. Results from the on-site toxicity test and MLC determination.
 - iii. Total treatment duration.
 - iv. Summary of water chemistry monitoring data.
 - v. Summary of stream flow data.
 - vi. All non-target, non-lamprey post-treatment mortality survey data.
 - vii. A proportional representation of each lamprey species in post treatment collections.
 - viii. Other observations, corrective actions taken; and recommendations (if any).
- B. Post treatment larval survey results shall be submitted to the Secretary by December 31st of the year following the year of treatment.

14. Mudpuppy Population Assessment Study. The permittee shall develop and implement a mudpuppy population assessment study (e.g., mark-recapture method) in the Lamoille River downstream of the Peterson Dam. The draft parameters and methodologies of the mudpuppy population assessment study shall be submitted to the Secretary for approval by January 31, 2021, unless identified otherwise by the Secretary. In accordance with the plan approved by the Secretary, surveying for mudpuppies shall occur annually until expiration of this permit. A final report of the findings of the study shall be submitted to the Secretary by December 31, 2025, unless identified otherwise by the Secretary.

b. Standard Conditions

- 1. Co-Permittee Status. Any individual or entity other than the permittee that is engaging in the permitted jurisdictional activity shall notify the Secretary to obtain co-permittee status prior to any such work. Notification of the addition or termination of co-permittee status shall occur using a form provided by the Secretary. A co-permittee shall be subject to all terms and conditions in this permit.
- 2. Aquatic Species Spread Prevention. Prior to any control activity occurring, all equipment, including but not limited to boats, trailers, vehicle, and gear, that has been in or on any other waterbody, shall be decontaminated in accordance with the [Voluntary Guidelines to Prevent the Spread of Aquatic Invasive Species through Recreational Activities](#), Aquatic Nuisance Species Task Force, November 2013, or its replacement.

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3. Modification. This permit may be modified or amended upon request by the permittee or by the Secretary. If the Secretary determines that modification is appropriate, only the conditions subject to modification shall be reopened. Any modification under this condition shall be pursuant to 10 V.S.A. Chapter 170 and any rules adopted thereunder.
4. Notice of Termination. The permittee may terminate the control activity as approved by this permit by submitting a notice of termination. The notice of termination shall include, at a minimum, the permit number for which termination is sought; the basis for the notice; the permittee's name and contact information; and a signed and dated certification statement by an authorized representative of the permittee confirming the notice of termination.
5. Rare, Threatened, or Endangered Species. Encounters with any rare, threatened, or endangered species shall be reported to the Secretary immediately. If determined necessary by the Secretary, an Endangered & Threatened Species Taking Permit, per 10 V.S.A. § 5408, shall be obtained prior to commencement or continuance of the control activity.
6. Duty to Comply and Enforcement. The permittee(s) shall comply with all terms and conditions of this permit. Any permit noncompliance shall constitute a violation of 10 V.S.A. § 1455 and may be cause for any enforcement action and revocation, modification, or suspension of the permit. It shall not be a defense for the permittee(s) in an enforcement action that it would have been necessary to halt or reduce the permitted activity to maintain compliance with the conditions of this permit.
7. Twenty-Four Hour Non-compliance Reporting. Unless provided otherwise by this permit, the permittee shall report any noncompliance which may endanger public health or the environment. Any such information shall be provided within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance, its cause; the period of noncompliance including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; as well as steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
8. Reporting & Correspondence. All requisite correspondence directed to the Secretary pertaining to this permit, including notifications, surveys and reports, shall be submitted via email to ANR.WSMDShoreland@vermont.gov or mailed to the following address:

Lake & Shoreland Permitting
Watershed Management Division
1 National Life Drive, Davis 3
Montpelier, VT 05620-3522
9. Compliance with Other Regulations. This permit does not relieve the permittee from obtaining all other approvals and permits prior to commencement of activity, or from the responsibility to comply with all other applicable federal, state, and local laws or regulations. In accordance with Fish and Wildlife Board Rule 641, adopted pursuant to 10 V.S.A. § 4145(a), a Special Use Permit from the Commissioner of Fish and Wildlife is required if a Vermont Department of Fish & Wildlife Access Area is used for the access of equipment or removal of aquatic plants associated with conducting an authorized control activity under this permit.
10. Duty to Reapply. If the authorized activity is anticipated to continue after the expiration date of this permit, the permittee shall reapply for coverage under a new permit at least 75 days prior to the expiration date of this permit.

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11. Access to Property. By acceptance of this permit, the permittee agrees to allow representatives of the state of Vermont, at reasonable times and upon presentation of credentials, to enter upon the permittee's property, or to otherwise access the authorized control activity, to inspect to determine compliance with this permit.
12. Legal Responsibilities for Damages. The Secretary, by issuing this individual permit, accepts no legal responsibility for any damage direct or indirect of whatever nature and by whoever suffered arising out of the approved activity.
13. Reopener. If after granting this permit the Secretary determines that there is evidence indicating that an authorized activity does not comply with the requirements of 10 V.S.A. Chapter 50, the Secretary may reopen and modify this permit to include different limitations and requirements.
14. Revocation. This permit is subject to the conditions and specifications herein and may be suspended or revoked at any time for cause including: failure by the permittee to disclose all relevant facts during the application process which were known at that time; misrepresentation of any relevant fact at any time; non-compliance with the conditions and specifications of the permit; or a change in the factors associated with the control activity such that the Secretary can no longer make all applicable findings.
15. Rights and Privileges. This permit does not authorize any damage to public or private property or invasion of private rights or the violation of federal, state, or local laws or regulations. In addition, this permit does not convey any title or interest to the lands lying under public waters or waters affected.
16. Appeals. Pursuant to 10 V.S.A. Chapter 220 and the Vermont Rules for Environmental Court Proceedings, any appeal of this decision must be filed with the clerk of the Environmental Division of the Superior Court within 30 days of the date of the decision. An aggrieved person shall not appeal this permit unless the person submitted to the Secretary a written comment during the applicable public comment period or an oral comment at the public meeting conducted by the Secretary. Absent a determination of the Environmental judge to the contrary, an aggrieved person may only appeal issues related to the person's comments to the Secretary as prescribed by 10 V.S.A. § 8504(d)(2). The Notice of Appeal must specify the parties taking the appeal and the statutory provision under which each party claims party status; must designate the act or decision appealed from; must name the Environmental Division; and must be signed by the appellant or the appellant's attorney. The appeal must give the address or location and description of the property, project, or facility with which the appeal is concerned and the name of the applicant or any permit involved in the appeal. The appellant must also serve a copy of the Notice of Appeal in accordance with Rule 5(b)(4)(B) of the Vermont Rules for Environmental Court Proceedings. For further information, see the Vermont Rules for Environmental Court Proceedings available at www.vermontjudiciary.org. The address for the Environmental Division is: 32 Cherry Street; 2nd Floor, Suite 303; Burlington, VT 05401 Telephone #: 802-951-1740.

c. Findings

1. Jurisdiction - 10 V.S.A. § 1455(a). Within waters of the State, no person may use pesticides, chemicals other than pesticides, biological controls, bottom barriers, structural barriers, structural controls, or powered mechanical devices to control nuisance aquatic plants, insects, or other aquatic nuisances, including lamprey, unless that person has been issued a permit by the Secretary. The control activity, as described in permit application #3051-ANC-C, involves the use of a pesticide, TFM-HP, TFM-BAR, and Bayluscide 20% Emulsifiable Concentrate (lampricide), to control sea lamprey, *Petromyzon marinus*, within the waters of the Lamoille River in Colchester and Milton. Therefore, the Secretary has jurisdiction under 10 V.S.A. Chapter 50.
2. Application Receipt & Review. An Aquatic Nuisance Control Individual Permit application submitted by the United States Fish and Wildlife Service (permittee) was received on March 10, 2020. It was reviewed in

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accordance with the Department of Environmental Conservation's Permit Application Review Guidance, adopted March 14, 2019. The Secretary can issue an Aquatic Nuisance Control permit for the use of pesticides in waters of the State for the control of aquatic nuisances pursuant to 10 V.S.A. § 1455 (d) if the following findings can be made:

- (1) there is no reasonable non-chemical alternative available;
- (2) there is acceptable risk to the non-target 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.

The Secretary has determined that findings c.6.-c.10. can be made. Therefore, the Secretary shall issue a permit for the use of pesticides in waters of the State for the control of aquatic nuisances.

3. Background; Aquatic Nuisance Control Permit History. Permits #2009-C05 (expired 9/11/2014) and #2010-C05 (expired 9/13/2015) have previously been issued for the use of lampricide to control sea lamprey in the Lamoille River.
4. Project Description. The project is for the use of the aquatic pesticide TFM-HP (EPA Registration Number 6704-45 – active ingredient TFM, 3-Trifluoromethyl-4-nitrophenol, sodium salt), TFM-Bar (EPA Registration Number 6704-86 – active ingredient TFM, 3-Trifluoromethyl-4-nitrophenol), and Bayluscide 20% Emulsifiable Concentrate (EPA Registration Number 6704-92 – active ingredient Niclosamide, Aminoethanol Salt) to control sea lamprey ammocoetes (larvae) in the Lamoille River. The sea lamprey (*Petromyzon marinus*) is a fish that parasitizes other fish, scarring or killing its host. Data indicates that sea lamprey populations negatively impact coldwater and some warmwater fisheries in Lake Champlain.

An eight-year experimental sea lamprey control program, co-sponsored by the permittee, the Vermont Department of Fish and Wildlife, and the New York State Department of Environmental Conservation (NYSDEC), was conducted in Lake Champlain between 1990 and 1997. The experimental program illustrated the efficacy of TFM in effectively reducing numbers of sea lamprey to levels resulting in an enhancement of the Lake Champlain salmonid fishery.

The permittee has established wounding rate goals of 15 or fewer lamprey wounds per 100 Atlantic salmon (*Salmo salar*) and 25 or fewer lamprey wounds per 100 lake trout (*Salvelinus namaycush*). These wounding rate goals were set in 1990 as described in the [Final Supplemental Environmental Impact Statement – A Long-Term Program of Sea Lamprey Control in Lake Champlain](#) (FSEIS), page 4. These wounding rate goals are based on experience and historic data that indicated these species could withstand and persist at those levels of lamprey wounds. The most recent lamprey wounding data is from November 2019, which are 20 wounds per 100 Atlantic salmon and 57 wounds per 100 lake trout. While lamprey wounds have been reduced since their high mark in 2006, target wounding rates to achieve the project purpose are not being met.

The Lamoille River is a tributary of Lake Champlain where sea lamprey control is used here as a part of the long-term sea lamprey control program for Lake Champlain. The Lamoille River was previously treated with lampricide in 2009 and 2013. A larval survey for sea lamprey was conducted in 2019 and spanned the length of Lamoille River between the Peterson Dam to where it flows into Lake Champlain. The survey found 19 sea lamprey within approximately 0.025% of potential habitat.

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To conduct a treatment in the Lamoille River, a target in-stream TFM concentration of no greater than 1.3 times the minimum lethal concentration (MLC) to sea lamprey is proposed during the 12 to 14-hour treatment period as determined by an on-site toxicity test is. The MLC is defined as the minimum concentration of TFM required to kill 99.9 percent of sea lamprey ammocoetes (larvae) during a 9-hour exposure time. The previously issued Aquatic Nuisance Control permits for lampricide in the Lamoille River (2009-C05 and 2010-C05) both approved a target in-stream TFM concentration of no greater than 1.3 x MLC while the actual MLC for the 2009 lampricide treatment occurred at 1.2 x MLC and the 2013 lampricide treatment occurred at 1.1 x MLC. Optimum control of TFM toxicity to sea lamprey is achieved when water temperature is above 2° C, the surface elevation of Lake Champlain is at or below 98 feet 1929 NGVD, and the Lamoille River does not discharge more than 1,800 cubic feet per second (cfs) below the Peterson Dam.

The permittee intends on conducting two treatments, each one after Labor Day in 2020 and in 2024. The proposed application point for TFM is at the Peterson Dam in Milton. TFM has been shown to degrade in water in the presence of sunlight to a concentration of one-half strength in a period of three to four days at pH levels similar to those encountered in the Lamoille River and Lake Champlain.

5. Control Activity Purpose. The purpose of the control activity is to manage sea lamprey populations within Lake Champlain to improve fishing opportunities.
6. No Reasonable Non-Chemical Alternative Available – 10 V.S.A. 1455(d)(1). The USFWS uses an integrated pest management approach to determine appropriate long-term control strategies on a stream-specific basis (Section V. of the FSEIS). A brief summary and overview of the wide variety of new and emerging non-chemical alternative control techniques that are being investigated and invested in can be found on the Commission's [Future of Sea Lamprey Control website](#).

The Status Report for the Lake Champlain Sea Lamprey Alternatives Workgroup summarizes nine studies conducted from 2002 through 2006 which assess potential alternatives to lampricide. Since then, projects such as pheromone-assisted trapping, micro-elemental natal stream statolith signatures, and identifying cross-sectional flow patterns in streams to target the trapping of out-migrating transformers have been undertaken. To date, these efforts have not resulted in development of additional, feasible alternative control methods. In addition, recent studies conducted in Lake Champlain and the Great Lakes, focusing on the use of pheromones as attractants to manipulate spawning runs, have not progressed to the point of an applicable management technique.

Despite the completed and ongoing research on non-chemical controls methods, the use of barriers and traps to block and intercept spawning-phase sea lamprey remains the only currently feasible, non-pesticide control alternative in the Lake Champlain Basin. The use of barriers (both seasonal and permanent) is limited to streams where suitable sites are available and where significant adverse impacts of barriers on other aquatic organisms can be mitigated. Barriers are being used in Vermont's tributaries to Lake Champlain under Aquatic Nuisance Control permit #2014-S01. Under that permit, barriers and traps are installed seasonally in Pond Brook, Trout Brook, and Sunderland Brook. While barriers and traps can reasonably be used in smaller tributaries, chemical lampricide application remains the only feasible method of control within large tributaries.

The Secretary has determined there is no reasonable non-chemical alternative available.

7. Acceptable Risk to the Non-Target Environment – 10 V.S.A. 1455(d)(2). The Secretary considers the following as the non-target environment:
 - Aquatic plants and animals within the waters of the treatment area.
 - Wetlands within the waterbody proposed for treatment.

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- Human use of waters treated with the pesticide.
- The ecological integrity of the waterbody, which is the culmination of how the biological, chemical, and physical integrity of the waterbody interact. The concept of ecological integrity is identified in the [Vermont Department of Environmental Conservation Watershed Management Division's Statewide Surface Water Management Strategy](#).

For determining what might be considered an acceptable risk to the non-target environment from a proposed treatment, the Secretary made several baseline assumptions related to the non-target environments potentially affected by the proposed treatment:

- A control activity for sea lamprey will have an impact on the ecological integrity of the waterbody as the non-target environment cannot be avoided completely.
- The following threatened and endangered aquatic animal species have been recorded as being present in the Lamoille River. For threatened and endangered species, the Secretary will require that an Endangered and Threatened Species Takings Permit be obtained by the permittee prior to any treatment taking place.
 - Cylindrical papershell (*Anodontooides ferussacianus*), S1S2 – Endangered – Species of Greatest Conservation Need
 - Eastern Sand Darter (*Ammocrypta pellucida*), S1 – Threatened – Species of Greatest Conservation Need
 - Fluted-shell (*Lasmigona costata*), S2 – Endangered – Species of Greatest Conservation Need
 - Fragile papershell (*Leptodea fragilis*), S2 – Endangered – Species of Greatest Conservation Need
 - Giant floater (*Pyganodon grandis*), S2S3 – Threatened – Species of Greatest Conservation Need
 - Lake sturgeon (*Acipenser fulvescens*), S1 – Endangered – Species of Greatest Conservation Need
 - Pink heelsplitter (*Potamilus alatus*), S2 – Endangered – Species of Greatest Conservation Need
 - Pocketbook (*Lampsilis ovata*), S2 – Endangered – Species of Greatest Conservation Need
- The following rare aquatic animal species have been recorded as being present in the Lamoille River:
 - Mudpuppy (*Necturus maculosus*), S2 – Special Concern – Species of Greatest Conservation Need
 - Silver lamprey (*Ichthyomyzon unicuspis*), S2? – Special Concern – Species of Greatest Conservation Need
- Mapped Class II wetlands border portions of the shoreline downstream of the primary lampricide application point in the Lamoille River. As the Lamoille River flows into Lake Champlain, it flows through the Class I Sandbar wetland.
- The Lamoille River and its waters are public, and it is reasonable to assume that all public waters may be used for irrigation.
- Impacts of lampricides on the non-target environment are explained in Section VII. A. of the FSEIS and are summarized below.

Consideration of the eleven state-listed threatened or endangered species is included in a separate review of the Endangered and Threatened Species Takings Permit application for the use of lampricide within the

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Lamoille River. An Endangered and Threatened Species Takings Permit from the Agency of Natural Resources must be obtained prior to using lampricide within the Lamoille River.

Benefits of the sea lamprey control program to the non-target environment include increased survival and condition of Atlantic salmon (*Salmo salar*) and lake trout (*Salvelinus namaycush*).

All lampricide treatments permitted in Vermont tributaries to Lake Champlain from 1990 to the present were administered at levels between 0.8 and 1.5 x MLC, as determined by on-site toxicity testing. Treatment-caused mortality for aquatic animal non-target species is generally low with a few exceptions. While a few non state-listed aquatic animal species have demonstrated sensitivity to lampricide, the Secretary found that their extensive distributions and/or ample population densities have ensured recolonization following lampricide treatment-caused mortality in Vermont waters.

For each treatment, a post-treatment non-target mortality survey will be conducted within 36 hours of the lampricide block passage within the locations identified in Figure 5 in the Approved Application (Appendix A - 11 / Project Description). All visible river-bottom in each section will be inspected and observations of non-target organism mortalities, except lamprey, will be recorded. Non-target assessment sections comprise 23% of the treated reaches. All dead fish (excluding lampreys), amphibians, mussels, and other large invertebrates encountered will be identified and enumerated, when possible. Organisms not identified in the field will be collected, when possible, and retained for identification. Dead lamprey larvae will not be counted during the post treatment mortality survey. However, the first 30 encountered in each transect will be retained and identified. Assessment of treatment effects on lamprey populations will be accomplished by means of a larval survey completed within one year following the treatment. Larval surveys following treatments provide a more direct and statistically sound means of comparison with pre-treatment population surveys. The Secretary will assess survey results to ensure the acceptable risk to the non-target environment finding can continue to be met.

Amphibians

The distribution of the mudpuppy in Lake Champlain is known largely due to observed mortalities from lampricide treatments. Otherwise there are scattered records of occurrence throughout the Lake Champlain valley of Vermont. This secretive, nocturnally active species is very difficult to sample efficiently, which has contributed to a lack of occurrence and density information for this species.

TFM toxicity tests and treatment cage studies conducted on mudpuppies have indicated that at the proposed treatment concentrations, no mortality should be expected for this species. However, mortalities have been recorded following Vermont TFM treatments. A single dead mudpuppy mortality was observed following the 2008 lampricide treatment in the Missisquoi River. This mortality was the first verified record of this species in the Missisquoi River. Mudpuppy mortality occurred during both the 1990 and 1994 TFM treatments of Lewis Creek. Following the 1990 treatment (1.0 x MLC), 23 dead mudpuppies were found, with 18 found following the 1994 treatment (~1.1 x MLC). No dead mudpuppies were found following the 2002 (1.1-1.3 x MLC), 2006, or 2010 treatments (1.2 x MLC) of Lewis Creek. In the Lamoille River, 508 dead mudpuppies were found after the 2009 treatment (1.2 x MLC), while juveniles comprised 77% of the mortalities, over 100 of these mudpuppies were adults. No dead mudpuppies were found after the 2013 Lamoille River treatment (1.1 x MLC). All 29 dead mudpuppies observed following the 2004 Winooski River lampricide treatment (1.0 x MLC to 1.1 x MLC) as well as the 19 individuals noted following the 2008 Winooski River treatment (1.0 x MLC to 1.3 x MLC) were juveniles ranging from 34 to 169 mm total length. In 2011, the permittee's Marquette Biological Station conducted a cage study with captive, reared mudpuppy juveniles that were approximately 40 mm in length. The study resulted in 3 mortalities among 63 test organisms for an overall

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mortality rate of 4.8%. The mudpuppies were held at 3 separate locations during a TFM treatment that ranged in concentration from 1.3 x MLC to 1.5 x MLC.

The permittee and the Vermont Department of Fish and Wildlife implemented a study in 2002 to determine effective collection methods and provide information on mudpuppy populations in Lewis Creek and the LaPlatte River. No mudpuppies were successfully collected from either river during this study.

The 30-year record of post-treatment mortality survey data in Lake Champlain tributaries provides variable evidence for the effects of lampricide treatments on mudpuppies. Results of post-treatment mortality survey data for TFM treatment concentrations that ranged from 1.0 x MLC to 1.3 x MLC have shown that TFM concentrations as low as 1.0 x MLC have resulted in mudpuppy mortality. These results have also shown both declining mudpuppy numbers, no evidence of decline, or no negative impact from lampricide treatments over time. Due to the many variables that can contribute to mudpuppy population persistence and abundance, and that not every river and lampricide treatment are identical, it is agreed that post-treatment mudpuppy mortality survey data alone is not a reliable tool for assessing mudpuppy population impacts and stability. However, conducting a pre and post lampricide treatment population assessments (e.g., mark-recapture method) would be a more appropriate approach to assess mudpuppy population stability when judging the effects of a lampricide treatment on a population.

While mudpuppies are challenging to sample for, this pre and post lampricide treatment survey approach was successfully conducted in the Lamoille River by the Vermont Cooperative Fish and Wildlife Research Unit using modified minnow traps. Through these efforts, 80 mudpuppies were trapped and released from December 2008 through May 2009; 75 of these were tagged. The Lamoille River was treated with lampricide at 1.2 x MLC on October 1st, 2009. The post-treatment mortality survey found 508 dead mudpuppies of which juveniles (25-200 mm total length) represented 77% of the collection. Following the treatment, with the objective to assess the population-scale impact from the treatment, the trapping effort was repeated from December 2009 through May 2010. This replicated post-treatment survey effort resulted in the collection of 81 mudpuppies. Ten of these mudpuppies were tagged recaptures from the previous effort conducted in the winter of 2009.

Post-treatment mortality survey data show conflicting trends of long-term effects on the numbers of mudpuppies in lampricide-treated rivers and are unreliable as an assessment technique. In the Lamoille River (2009) where localized high mortality occurred during the treatment, a pre and post study showed no appreciable effect on mudpuppy population numbers. Due to concerns over the population stability of mudpuppies in the Lamoille River as a result of lampricide treatments, the Vermont Department of Environmental Conservation consulted with the Vermont Department of Fish and Wildlife on this issue. Based on the available data, the Vermont Department of Fish and Wildlife finds that the proposed treatment concentration of no greater than 1.3 x MLC may cause young-of-year and yearling mudpuppy mortalities but would have limited impacts on older breeding-age classes and that the population of mudpuppies in the Lamoille River should remain stable with ongoing lampricide treatments. As a result, the Secretary can currently make the finding that there is an acceptable risk on the non-target environment in regard to the mudpuppy population in the Lamoille River.

However, the 2009 pre and post treatment study on mudpuppies is only one limited study and the results of that, other sampling efforts, and post mortality survey data show that the Lamoille River mudpuppy population, its population variability, and how that population may be impacted by lampricide treatments is not well understood. The long-life spans of mudpuppies and evidence for limited movement (Chellman et al. 2017) suggest that continued mark-recapture monitoring will better detect changes in population structure and abundance. Given that mudpuppies are identified as a State Rare S2 species of Special Concern, a Species of Greatest Conservation Need, and that the Lamoille River is known to have a unique mudpuppy

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population in terms of their abundance and genetics, additional study on the mudpuppy population in the Lamoille River downstream of the Peterson Dam is warranted. A population assessment study will result in a better understanding of the mudpuppy population in the Lamoille River and how that population may be impacted by lampricide treatments. By carrying out this study, the Secretary wants to ensure that extirpation of the mudpuppy population in the Lamoille River will not be a likely outcome from lampricide treatments. The permittee will develop and implement a mudpuppy population assessment study in the Lamoille River downstream of the Peterson Dam. The parameters and methodologies of the mudpuppy population assessment study will be identified over the winter of 2020/2021. The study will begin in 2021 and surveying will occur annually until expiration of this permit, this monitoring data will provide managers with more reliable demographic parameter estimates needed to monitor population status over time. Upon completion of the study, the permittee will consult with the Secretary to assess survey results and to discuss if additional protective measures for mudpuppies are necessary in order for the Secretary to be able to continue to conclude that there is an acceptable risk to the non-target environment.

Regarding other amphibian species, there was one Eastern Newt (*Notophthalmus viridescens*), 3 unidentified adult frogs, and 1 unidentified frog tadpole mortalities observed following the 2009 Lamoille River treatment and no observed mortalities after the 2013 treatment.

Fishes

As a group, non-state-listed fishes present in the Lamoille River are generally more resistant to TFM than are threatened and endangered species. Observed non state-listed, non-target fish mortality has been low in past treatments of Vermont rivers at TFM concentrations of 1.0 to 1.3 x MLC. Toxicity data for the 99% TFM-HP/Bayluscide mix exists for several of the fish species in Lamoille River. Toxicity for the lampricide mix is similar as to TFM alone with these species. Channel catfish appear to be more sensitive to the mix while the remaining species exhibit no observable effect concentrations of over 2.0 x MLC. Northern pike (*Esox lucius*) mortality (61 individuals) was reported near the mouth of Lewis Creek following the 2002 TFM treatment. While the block of TFM at the mouth of Lewis Creek had become diluted, the time of exposure was increased due to the slower stream velocity at lake level, which possibly accounted for this mortality. Northern pike mortality ranged from 0-22 for the other three treatments. No northern pike mortalities were reported following the 2004 Winooski River or 2007 Poultney River treatments. A treatment concentration of 1.3 x MLC in the Lamoille River should not significantly affect northern pike populations because this species is common and widely distributed in the Lake Champlain basin. Two species of darters show sensitivity to TFM: the logperch (*Percina caprodes*) and the tessellated darter (*Etheostoma olmstedi*). There is no available 99:1 TFM/niclosamide mix toxicity data for these two species. Agency population studies on Lewis Creek following the 1990 and 1994 treatments indicated that losses for these two darters were very low in relation to their densities in Lewis Creek. The logperch is considered somewhat common in the Lake Champlain drainage and the tessellated darter is common statewide.

The silver lamprey is not a federally or state-listed species but is classified as a rare species of special concern and a species of greatest conservation need. This species is very sensitive to TFM and it is expected that there will be a significant negative impact to silver lamprey population in the Lamoille River immediately after a lampricide treatment. However, as with sea lamprey, numbers of silver lamprey generally recover during the four-year period following a lampricide treatment. Based on a survey of the Lamoille River in 2019, silver lamprey numbers are currently at their highest sampled densities since records of sampling began in 2005. The permittee routinely monitors all lamprey numbers in tributaries proposed for treatment before and after each treatment and provides the Secretary with that data.

Aquatic Macroinvertebrates

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The Department of Environmental Conservation has conducted impact studies of non-target macroinvertebrate communities from both Lewis Creek and Trout Brook before and after TFM treatments. In general, the studies' findings have shown that short-term impacts to a few sensitive macroinvertebrate species occurred, but all affected macroinvertebrate species were observed to recover to before-treatment densities within one year of a TFM treatment.

As a group, mussels are moderately sensitive to TFM. The non-state-listed mussels found in the Lamoille River, the eastern lamp mussel (*Lampsilus radiata*) and the eastern Elliptio (*Elliptio complanata*), are currently common in the Champlain Valley. While the eastern Elliptio is somewhat more resistant than the eastern lamp mussel to the effects of TFM, the proposed treatment concentration (1.3 x MLC) is not anticipated to cause significant mortality for either species.

Aquatic Plants and Wetlands

TFM was originally patented as an herbicide that required 15-25 ppm in standing water and 100 ppm in flowing water to control common aquatic plants such as *Anacharis* or *Ceratophyllum*. *Elodea* and *Myriophyllum* have also been recorded as being impacted by TFM. Inhibition of up to 50% of the growth of algae populations at sea lamprey control concentrations may occur where diatoms are most sensitive and blue-green algae most tolerant.

While aquatic plants can be impacted by TFM, negative impacts on aquatic plants and aquatic plants within wetlands are anticipated to be minor and temporary. Plant productivity is naturally in decline during a fall treatment period, TFM concentrations used are lower than concentrations that will impact aquatic plants, and aquatic plants will only be exposed to a passing block of TFM in a river and a reduced/dissipating concentration of TFM in standing waters.

Human Use of Treated Waters

Human use of waters treated with TFM for irrigation in agricultural fields or gardens may result in damage to certain cultivated crops. Damage has been observed in young cucumber and cantaloupe plants, and minor leaf spotting on young green bean and tomato plants following irrigation for 12 hours with water containing 10 mg/l of TFM. No effect on lettuce, radish, sweet corn, or potato has been observed.

While agricultural fields or gardens could be impacted by TFM, negative impacts are anticipated to be minor and temporary or nonexistent due to a reduced need or no need for irrigation during a fall treatment period.

The Secretary has determined that there is an acceptable risk to the non-target environment.

8. Public Health – 10 V.S.A. 1455(d)(3). At the request of the Secretary, the Vermont Department of Health (VDH), Radiological and Toxicological Sciences Division reviewed the risk of the proposed activity to public health, in which it examined potential concerns for public health that may be associated with exposure to lampricide. The VDH's review of the project is as follows:

"In 2019, the Department received the final report on the 90-day oral toxicity study on TFM. The study was conducted according to the design agreed to by the TFM workgroup and meets the EPA Office of Pesticides 90-day guideline. This study was used to derive an updated drinking water health advisory of 100 ppb, as well as an updated recreational water value of 3.9 ppm for TFM. A description of the study and the process to derive the drinking water health advisory follows:

Male and female rats were given TFM at target doses of 1, 3, 10, 30 and 100 mg/kg/day in drinking water for 90 days and allowed to recover for 28 days. Data were collected on a comprehensive set of endpoints: body weight, functional observation battery and grip strength, locomotor activity, estrus cycle, ophthalmology, clinical pathology, clinical chemistry, hematology, coagulation, urinalysis, macroscopic findings, organ weights, and microscopic findings. There were no adverse findings during the study, and no TFM-related

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changes in any endpoint. In other words, there was no toxicity observed at the highest achieved dose levels in male or female rats (86.5 and 77.2 mg/kg/day, respectively).

Therefore, the highest no observed adverse effect level (NOAEL) is 77.2 mg/kg/day based on the absence of toxicity in female rats after 90 days of exposure to TFM in drinking water. Standard procedure for developing an oral reference dose (RfD) was, followed by dividing the NOAEL by uncertainty factors. The following uncertainty factors are applied to the NOAEL to derive an oral reference dose: UFA= 10 to account for interspecies variation; UFH= 10 to account for intraspecies variation; UFS= 3 to account for the use of a subchronic study; UFD= 10 to account for database uncertainty. The composite UF is 3,000. The NOAEL of 77.2 mg/kg/day divided by the composite UF of 3,000 yields an RfD of 0.02573 mg/kg/day.

In accordance with the Health Department's process for deriving a drinking water health advisory, the RfD is combined with a body weight adjusted water intake rate of 0.175 L/kg/day. A factor of 1000 is used to convert from milligrams per liter (ppm) to micrograms per liter (ppb). A Relative Source Contribution (RSC) of 70% is employed for TFM. There are potential sources of exposure to TFM other than drinking water, such as recreational exposure. The use of 70% RSC leaves 30% of the estimated RfD (mg/kg/day) to come from these other sources of exposure. The equation is: $(0.02573 \text{ mg/kg/day}) \times (1/0.175 \text{ L/kg/day}) \times 1000 \times 0.7 = 103 \text{ ppb} \approx 100 \text{ ppb}$. The drinking water health advisory for TFM is 100 ppb.

Based on the evaluation of impacts to public water systems conducted by the applicant and by DEC, no public water systems in Vermont are expected to exceed 100 ppb of TFM due to the proposed applications. The applicant proposes to notify riparian landowners to offer bottled water if their water source is from the treated rivers. Swimming should not occur in treated waters until the TFM concentrations are below 3.9 ppm.

Thus, the proposed treatments of the two rivers with TFM are expected to result in negligible risk to public health. Based on a review of the confidential statements of formulation, it is reasonable to conclude that human exposure to the inert compounds contained in TFM 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."

To minimize unnecessary pesticide exposure to the public, public use of waters within the treatment advisory zones are not recommended on the day of treatment. The permittee will notify shoreline property owners within the treatment advisory zone, post all public access points adjacent to the treatment area with notification signs, and provide a website for the public to review information on the project and concentration monitoring results. Lampricide will not be applied until after Labor Day to avoid the primarily summer recreation period. Water use advisory zones and the concentration monitoring protocol can be found within the *Water Use Advisory Zone Monitoring Plan for Lampricide Treatments of the Poultney/Hubbardton River, Lewis Creek, LaPlatte River, Winooski River, Lamoille River, Stone Bridge Brook, and the Missisquoi River* as identified in the Approved Application Appendix.

The Secretary accepts the VDH's recommendations, has included permit conditions accordingly, and has determined that there is negligible risk to public health.

9. Long-range Management Plan – 10 V.S.A. 1455(d)(4). Sea lamprey have spread throughout Lake Champlain, are well-established, and eradication is a highly unlikely outcome from control efforts. Sea lamprey will continue to be a part of the aquatic environment of Lake Champlain for the foreseeable future. As a result, a targeted use of chemical and non-chemical control methods as a part of an integrated pest management plan to control nuisance levels of sea lamprey has been developed in accordance with the FSEIS.

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The Secretary has determined that a long-range management plan has been developed that incorporates a schedule of pesticide minimization by utilizing an integrated pest management plan.

10. Public Benefit – 10 V.S.A. 1455(d)(5). The Secretary considered the following criteria in determining whether there is a public benefit to be achieved from the application of the pesticide:

- 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.
 - Assessment: Tangible benefits to public good uses are likely to be associated with an increased opportunity for fishing, which in turn may increase other public good uses related to fishing, such as boat-related recreation. Tangible benefits to public good uses have been determined to 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.
 - Assessment: Additional cumulative impacts were considered that relate to the water resource and how the public may utilize that resource. The Secretary has determined that the cumulative impacts from carrying out the control activity are not anticipated to affect the water resource and the public that utilizes that resource.
 - The drinking water health advisory for TFM is 100 ppb and swimming should not occur in treated waters until the TFM concentrations are below 3.9 ppm. It is not anticipated that TFM concentrations will reach or exceed these concentrations for a long period of time. Any impacts on how the public utilizes the water resource is anticipated to be minor and temporary. Shoreline property owners within the water use advisory zones will be notified of the treatment and that potable water will be supplied by the permittee upon request to those who depend upon the treated waters within the water use advisory zones for domestic use to prepare food or drink. Water use advisory zones and the concentration monitoring protocol can be found within the *Water Use Advisory Zone Monitoring Plan for Lampricide Treatments of the Poultney/Hubbardton River, Lewis Creek, LaPlatte River, Winooski River, Lamoille River, Stone Bridge Brook, and the Missisquoi River* as identified in the Approved Application Appendix.
 - The Lamoille River is adjacent to the North Harbor Groundwater Source Protection Area, but it is not within a Groundwater Source Protection Area or a Surface Water Source Protection Area.
- Whether measures to reduce impacts on the water resource have been taken.
 - Assessment: The control activity proposed to control sea lamprey only. The target in-stream TFM concentration will be no greater than 1.3 times the minimum lethal concentration to sea lamprey where the treatment period will not exceed 14 hours. To ensure compliance with this permit and to assess any unforeseen or unanticipated adverse impacts on the resource or public good that may have resulted from a treatment, the permittee will submit an annual report to the Secretary. The permittee has developed a *Contingency Plan for Accidental Spillage of Lampricides During Lake Champlain Sea Lamprey Control Operations* that can be found in the Approved Application Appendix.
- Whether the control activity is excessive for the stated purpose.

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- Assessment: The use of lampricide as a part of an ongoing integrated pest management plan to manage an established population of sea lamprey is not considered excessive for the stated purpose.

Based upon review of the public good criteria, the Secretary has determined that the tangible benefits to the public good outweigh the potential negative impacts. The Secretary finds that there is a public benefit to be achieved from the application of a pesticide.

11. 10 V.S.A. § 1455(h) – Public Notification. Upon receipt of the application, the Secretary proceeded in accordance with the permit process as identified under 10 V.S.A. Chapter 170.

d. Authorization

By delegation from the Secretary, the Vermont Department of Environmental Conservation has made a determination that the above activity qualifies for an individual aquatic nuisance control permit. The Permittees are authorized per 10 V.S.A. § 1455(i) subject to the conditions herein specified.

This permit shall be effective on the day of signing and expire five years thereafter.

Peter Walke, Commissioner
Department of Environmental Conservation

By: _____
Oliver Pierson, Program Manager
Lakes & Ponds Management and Protection Program
Watershed Management Division