



# Agency of Natural Resources

1 National Life Drive, Davis 2  
Montpelier, VT 05620-3901  
802-828-1295

## Endangered & Threatened Species Takings Permit

Statutory Authority: 10 V.S.A. Section 5408

### 1. Permittee:

US Fish and Wildlife Service  
Lake Champlain Fish and Wildlife Resource Offices  
11 Lincoln St.  
Essex Junction, VT 05452  
802.872.0629 x12  
[dave\\_tilton@fws.gov](mailto:dave_tilton@fws.gov)

### 2. Permit Period

Effective Date: 9/10/2013  
Expiration Date: 9/9/2014  
Authorization #EH-2013-14  
Amendment # 0

### 3. Principal Officer: Dave Tilton

### 4 .Subpermittee(s):

Lake Champlain Fish and Wildlife Management Cooperative Interagency sea lamprey control team (Staff from VT Fish and Wildlife Dept., NY State DEC, and the US Fish and Wildlife Service). Contact: Michael Calloway, 802.872.0629 x18 or 662.361.8656, [michael\\_calloway@fws.gov](mailto:michael_calloway@fws.gov)

### 5. Authorized Species:

<u>Common Name</u>	<u>Scientific Name</u>
pocketbook	<i>Lampsilis ovata</i>
pink heelsplitter	<i>Potamilus alatus</i>
fluted shell	<i>Lasmigona costata</i>
fragile papershell	<i>Leptodea fragilis</i>
cylindrical papershell	<i>Anodontooides ferrusacianus</i>
giant floater	<i>Pyganodon grandis</i>
Eastern sand darter	<i>Ammocrypta pellucida</i>
lake sturgeon	<i>Acipenser fulvescens</i>

### 6. Authorized Activity:

Application of the lampricide TFM or combination of TFM and 1% niclosamide for the Lamoille River in Milton and Colchester, VT to control larval sea lamprey (*Petromyzon marinus*).

### 7. Location Where Authorized Activity May Be Conducted:

Lamoille River in the Towns of Milton and Colchester downstream of the Peterson Dam.

### 8. Findings

#### General

- A. The Permittee is seeking an Endangered and Threatened Species Taking Permit under 10 V.S.A. § 5408 to authorize aquatic pesticide application to the Lamoille

River to control larval sea lamprey (*Petromyzon marinus*). The Lamoille River was first treated with lampricide previously in 2009.

- B. The sea lamprey is a fish that parasitizes other fish, scarring or killing its host. A substantial body of information collected by the Permittee and others indicates that the sea lamprey is depressing coldwater and some warm water fisheries in Lake Champlain. The negative impacts of sea lamprey parasitism have been documented in the Great Lakes where sea lamprey control programs have been in effect for more than 50 years.
- C. The proposed lampricide treatment is part a long-term sea lamprey control program for Lake Champlain initiated by the Permittee, along with the Lake Champlain Fish and Wildlife Management Cooperative, the New York State Department of Environmental Conservation, and the U.S. Fish and Wildlife Service in 2002. This program was developed in response to an eight-year experimental sea lamprey control program conducted on Lake Champlain between 1990 and 1997. The experimental program demonstrated the efficacy of the lampricide TFM in effectively reducing numbers of sea lamprey to levels resulting in significant improvement in salmonid survival and fishing quality in Lake Champlain. A primary goal of the long-term sea lamprey control program is to prevent the economic harm from sea lamprey parasitism as well as to enhance the propagation of salmonid and other fisheries in Lake Champlain.
- D. The Lamoille river system is one of 23 Lake Champlain tributaries in Vermont, New York and Quebec that are a source of sea lamprey production. Using quantitative assessment sampling (QAS) protocols, the U.S. Fish and Wildlife Service estimated a larval sea lamprey population of 3,280 in 2012, including 0 transformers (See permit application Attachment 1). The QAS methodology identifies populations of consequence and provides fishery managers with data that can be judged in the context of other rivers in the basin. Experience from the Great Lakes sea lamprey control program has shown the importance of comprehensively controlling all sources of lamprey production in attaining the goal of reduced lamprey impacts on host fish species (See permit application Attachment 1).

#### **Enhancement of the Propagation of Species**

- E. The Permittee states that the proposed lampricide treatment is necessary to enhance the propagation and restoration of native lake trout and landlocked Atlantic salmon populations in Lake Champlain and will also benefit other Lake Champlain fish species, including walleye, northern pike and the endangered lake sturgeon.
- F. From the conclusion of the experimental sea lamprey control program in 1997 to the initiation of the long term program in 2002, the parasitic-phase sea lamprey population rebounded and lamprey wounding approached and exceeded pre-control levels. Wounding rates on Lake Champlain landlocked Atlantic salmon (*Salmo salar*) and lake trout continued to increase through the first five years of long-term control; however, substantial declines in wounding have been documented since 2007 (see Table 1 of permit application Attachment 1).

- G. Program wounding rate objectives are 15 wounds per 100 salmon and 25 wounds per 100 lake trout (USFWS et al. 2001). The 2012 wounding rate for salmon in the Main Lake was 21 wounds per 100 fish. Salmon wounding rates in the inland sea and Mallets Bay declined slightly to 14 wounds per 100 fish. The 2012 wounding rate for lake trout in the Main Lake was 40 wounds per 100 fish. Walleye (*Sander vitreum*) 2012 wounding rates also continue to remain higher than the objective of 2 wounds per 100 fish at a rate of 3.9 per 100 fish (Table 2, Attachment 1).
- H. There is evidence indicating that comprehensive lampricide applications result in drops in wounding rates, and lower wounding rates correlate to healthier fish populations (see pages 4 and 6 of permit application Attachment 1).

### **Economic Impact**

- I. The Permittee also states that the sea lamprey control program, of which the proposed lampricide treatment is a part, provides substantial economic and recreational benefits to the Lake Champlain region. According to the documentation provided by Permittee, realization of the full benefits of sea lamprey control is estimated to have an annual economic impact of up to \$42 million in fishing-related expenditures and \$59 million including all water-based recreation expenditures. Thus, ineffective control or no control of sea lamprey will result in substantial economic losses, particularly in businesses significantly dependent on water-based recreation in the Lake Champlain region.

### **Non-Chemical Alternatives**

- J. Currently, the only non-chemical control alternatives proven effective in certain situations are construction of barriers to spawning-phase sea lamprey migration and spawning-phase sea lamprey trapping. However, the screening process to determine appropriate long-term control strategies for the Lamoille River identified lampricide application as the only technically feasible control method. The Permittee states it will reassess the need for continued periodic lampricide treatments as future improvements in non-chemical control technologies are made.

### **Proposed Lampricide Treatment**

- K. The Permittee is proposing an aquatic pesticide treatment in the Lamoille River to control larval sea lamprey. The primary application point (AP) on the Lamoille River is at the Peterson Dam (river mile 6.0). The treatment is proposed to occur in late September through November.
- L. 3-Trifluoromethyl-4-nitrophenol (TFM) or a combination of TFM and 1% Niclosamide Sea Lamprey Larvicide is being proposed for potential use in the Lamoille River. The choice to use one or two lampricide(s) will be determined based on hydrology and water chemistry at the time of treatment. The proposed TFM product, TFM-HP (EPA Reg. No. 6704-45), is a liquid formulation. The concentration of active ingredient in TFM-HP is equivalent to 33% TFM, and isopropanol, which is used as the solubilizer, is the primary inert ingredient. The Niclosamide is labeled Baylusicide 20% Emulsifiable Concentrate and is composed of 20% Niclosamide ethanalamine salt, 64-68% N-methyl-2-pyrrolidone, and 13-15% non-ionic alkanolamide surfactant consisting of coconut oil diethanolamide

and diethanolamine. Both products are aquatic pesticides that are registered by the U.S. Environmental Protection Agency to control sea lamprey larvae in tributaries to the Great Lakes, the Finger Lakes, and Lake Champlain.

- M. TFM/1% Niclosamide are restricted use pesticides. Persons applying these pesticides are required to follow the "Standard Operating Procedures for Application of Lampricides in the Great Lakes Fishery Commission's Integrated Management of Sea Lamprey Control Program" (hereinafter "SOP"). Specific application instructions and formulas for application rates are included in the SOP. The toxicity of lampricides varies depending on stream water pH and total alkalinity. Thus, the amount of lampricide applied and application rate is based on stream conditions at the time of treatment, including discharge and water chemistry.
- N. In tributaries of Lake Champlain, TFM or TFM/1% Niclosamide are applied at concentrations between 1.0 x minimum lethal concentration (MLC) for sea lamprey and 1.5 MLC for a period of 12 hours. The application time may be extended to 14 hours to ensure dilution, attenuation and unforeseen circumstances do not result in failing to achieve the 9-hour minimum lethal level in downstream areas.
- O. Toxicity tests are conducted with non-target species of concern, especially threatened or endangered species to determine effective TFM or TFM/1% Niclosamide concentrations that will minimize adverse impacts on them. Reduced concentrations of TFM or TFM/1% Niclosamide may be used to reduce the risk to these species.
- P. TFM/1% Niclosamide treatment has shown in laboratory tests to increase the toxicity differential between sea lamprey and lake sturgeon, thereby providing a greater level of protection to sturgeon than TFM-only treatment.
- Q. The Permittee is proposing an application of TFM or TFM/1% Niclosamide combination (with Niclosamide concentration equivalent to 1% of the TFM concentration) be applied for 12 consecutive hours to achieve a target in-stream concentration of no greater than 1.3 x MLC. MLC will be determined by the results of an onsite toxicity and diurnal stream pH and alkalinity analysis in the days prior to treatment. The MLC may be adjusted during shift to compensate for changes in water chemistry.

### **Treatment Monitoring**

- R. The Permittee is proposing to use four water sampling stations on the Lamoille River as shown in Figure 2.
- S. During lampricide application, water samples will be collected and analyzed every ½ hour at the most upstream sampling station (Station 1) to allow for adjustments to lampricide application rate. Lampricide concentrations will be monitored at least once every 2 hours at all downstream sampling stations, by hand or by deployment of automatic water samplers to assess concentrations and duration of the lampricide block passing each point.

T. Water chemistry samples will be collected at least once every 2 hours at each station during the periods that the lampricide block passes through each point (Figure 2). Adjustments will be made to the application rate and target concentration to compensate for unexpected variation in pH and/or total alkalinity at Station 1 during the treatment. Water chemistry will be monitored at stations with automatic water samplers using pH/temperature data recorders; samples will be analyzed for total alkalinity at least at the times of deployment and retrieval of the samplers and data recorders.

### **Post-Treatment Monitoring**

U. To assess non-target mortality post-treatment, the Permittee is proposing that a crew systematically walk pre-defined sections of each treated stream within approximately 36 hours after the lampricide block passage. All visible river bottom areas of each section will be inspected and observations of non-target organism mortalities, except lamprey species, will be recorded. Non target assessment sections are about 20% of treated reaches and are defined based on the locations of U.S. Fish and Wildlife Service (USFWS) sea lamprey QAS transects (figure 3.)

V. Results of non-target mortality surveys will be submitted to the VT ANR by May 1 of the year following the treatment.

W. The Permittee is proposing to assess treatment effects on the Lamoille River lamprey populations by means of a QAS survey during the year following the year of treatment. Post-treatment QAS survey results will be submitted by December 31 of the year following the year of treatment.

### **Risks to Listed Endangered or Threatened Species and Mitigation Measures**

X. Nine state-listed endangered or threatened mussel and fish species are known to inhabit the reach of the Lamoille River proposed for lampricide application (see Section 5 above).

Y. TFM toxicity tests conducted on the pocketbook, fluted shell, pink heelsplitter, fragile papershell, cylindrical papershell, and the giant floater mussels indicate that the TFM no observed effect concentration (NOEC) for these species is at concentrations of 1.5 to 1.9x MLC . TFM/1% Niclosamide toxicity tests on the fluted shell, pocketbook, fragile papershell, giant floater and pink heelsplitter mussels indicate that the TFM/1% Niclosamide NOEC levels are 1.2 to 1.5 x MLC.

Z. Two in-situ cage studies were conducted on mussels in 2002 and 2004. In 2002, nine species of mussels, including pocketbook, fluted shell and fragile papershell, were held in cages during the TFM treatment in Lewis Creek (1.3 x MLC). All individuals survived the treatment in three stream locations, which were exposed to maximum TFM concentrations of 1.3, 1.6 and nearly 1.9 x MLC. During the 2004 Winooski River TFM treatment (1.0 x MLC), pocketbook and eastern lampmussels were caged at two locations in the treated reach and monitored for five days post treatment, with no mortality or signs of stress.

- AA. Other data demonstrate similar resistance to lampricides. Two dead eastern lampmussels (*Lampsilis radiata*), a common species, were observed following the 2009 Lamoille River treatment. There were no mussel mortalities observed during post-TFM treatment mortality assessments following the 2004 and 2008 Winooski River treatments, the 2006 and 2010 Lewis Creek treatments, the 2007 Poultney River treatment (1.3 x MLC), and the 2008 Missisquoi River treatment.
- BB. Given these studies, the proposed Lamoille River treatment (no greater than 1.3 x MLC) is expected to minimize potential risks to resident listed mussel species. Little information is known about the sub lethal effects of lampricides on mussels, such as the potential impairment of reproduction following treatment and the long term ability of the mussels to tolerate the stress of TFM treatment. However, in the light of toxicity test data showing low observed effect concentration (LOEC) of >1.8 x MLC for TFM-only treatment or >1.5 x MLC for TFM/1% Niclosamide treatment for all the listed species, there is no expectation of mortality.
- CC. While existing toxicity data is based on 12 hour toxicity tests, no dead or stressed mussels were observed following 14-hour treatments of Lewis Creek in 1994 or the Missisquoi River in 2008.
- DD. Early life stages of lake sturgeon appear to be among the most sensitive of non-lamprey fishes to TFM and TFM/1% Niclosamide (Table 5). Boogaard et al. (2003) conducted a series of flow-through TFM and TFM/1% Niclosamide toxicity tests on nine early life stages of lake sturgeon, from sac fry, through age 1+. Young-of-year lake sturgeon up to about 80 mm total length were found to be nearly as sensitive to TFM and TFM/1% Niclosamide as sea lamprey, with NOECs ranging from 0.4 to 0.8 x MLC and 0.5 to 0.8 x MLC respectively, depending on size class.
- EE. Lake sturgeon's tolerance to TFM and TFM/1% Niclosamide increases with size. Average NOECs for TFM of three young-of-year size classes averaging 107, 157, 217 mm TL were equivalent to 1.0, 1.0, 1.2 x MLC, respectively; average NOEC for an age 1+ group averaging 261mm TL was equivalent to 1.5 x MLC. Average NOECs for TFM/1% Niclosamide of three young-of-year size classes averaging 107, 157, 217 mm TL were equivalent to 1.2, 1.0, 1.2 x MLC, respectively; average NOEC for an age 1+ group averaging 261mm TL was equivalent to 1.2 x MLC (Table 5, Attachment 1).
- FF. Additional analyses were conducted to better define a maximum acceptable toxicant concentration among size classes. The results suggest that significant mortality (greater than 10%) among lake sturgeon in the 107 mm and 157 mm size classes may occur at 1.3 x MLC, while the 217 mm size class (expected size range of young-of-year in fall) may range from 0-20%.
- GG. Based on these toxicity test results, the Great Lakes Fisheries Commission (GLFC) adopted the Technical Operating Procedure: *TOP:011.8A Protocol for Application of Lampricides to Streams with Populations of Young-of-Year Lake Sturgeon (Acipenser fulvescens)*, for inclusion in the SOP. The sturgeon protocol limits the maximum TFM concentration in a treatment to 1.0 x MLC, and requires that such streams be

treated after August 1st in a given year, to assure that juvenile lake sturgeon are larger than 100 mm. The Lamoille River will be treated between late September and late November to allow young-of-year sturgeon to add two more months of growth and develop greater resistance to TFM or TFM/1% Niclosamide.

- HH. In 2005, the GLFC made a decision to suspend use of lampricide concentration limits specified in the sturgeon protocol (higher than 1.0 x MLC) in locations where the wounding rate objectives had not been achieved, due to the direct mortality of sturgeon from sea lamprey wounds. The Lamoille will be treated at 1.3 x MLC. The 1.0 x MLC concentration limit will be reinstated when sea lamprey targets are reached.
- II. Toxicity tests conducted on eastern sand darters showed an NOEC of approximately 1.4 x MLC for TFM and 1.6 x MLC for TFM/1% niclosamide.
- JJ. No mortalities were observed during recent TFM treatments over eastern sand darter populations including the Poultney River in 2007 treated at 1.2-1.3 x MLC or 2011 when treated at 1.0-1.5 x MLC. No mortalities for either darter species were observed during treatments in the Missisquoi in 2009 and 2012, the Winooski in 2008 or 2012, or the Lamoille River in 2009.
- KK. The spiny soft-shell turtle (*Apalone spinifera*) is known to inhabit the Lamoille River. The Permittee is not seeking coverage for this species because available information suggests turtles are not sensitive to TFM at the proposed concentrations. TFM toxicity studies show no mortalities when exposed to concentrations up to 3.3 times the 24-hr sea lamprey minimum lethal concentration. There have not been any reported observations of turtle mortality during lampricide treatments of the Great Lakes, Finger Lakes or Lake Champlain.

#### **Advice of Endangered Species Committee**

- LL. On June 7, 2013, representatives from the Endangered Species Committee (ESC), Vermont Fish & Wildlife (VFW), and the Applicant (USFWS) met to discuss the 2013 application to treat the Lamoille River with TFM or TFM/1% Niclosamide, as well as to continue previous conversations regarding long term implications stemming from the use of lampricide.
- MM. ESC representatives requested USFWS update their non-target mortality tables with data from the last two treatments and that each year in the future they update and forward to the ESC copies of those updated tables after May 1.
- NN. The ESC remains concerned about the high mortality of mudpuppies. Since data after the last treatment of the Lamoille River showed a significant decline in the number of female mudpuppies, ESC representatives asked that any dead mudpuppies be collected in such a way that they could be sexed and age classed. USFWS agreed to work with Professor Bill Kilpatrick and Jim Andrews to update the collection and storage protocol. Since the meeting the protocol has been updated and circulated to all involved parties.

- OO. On July 11, 2013, the ESC met to discuss final recommendations regarding the Lamoille River lampricide permit application. The ESC stated that they remain concerned that there continues to be a *"lack of information on long and short-term implications on nontarget Threatened and Endangered (E&T) species."* However, the ESC applauded the efforts of the USFWS and the state ANR to meet with the ESC to work out continuing issues concerning the long-term effects of lampricides in the Lake Champlain ecosystem.
- PP. The ESC strongly endorsed the recommendations outlined in the Fish Scientific Advisory Group (FSAG) 7-9-2013 report titled "Recommendations of the Scientific Advisory Group for Fishes on the E&T species taking permit submitted by the US Fish and Wildlife Service for the application of chemicals to control Sea Lamprey in the Lamoille River in 2013." These recommendations are:
- a. That the applicant submit to the ESC for approval, a project plan that provides for annual monitoring surveys for eastern sand and channel darters, stonecat and American Brook lamprey in tributaries where they exist that are currently and potentially included in the lampricide treatment rotation. The applicant should provide annual reports summarizing these monitoring efforts, including an analysis of the condition of each of these discrete threatened or endangered populations. This information will allow the FSAG to provide better-informed permit recommendations for future permit applications, and will also provide clear documentation of the condition of these protected populations over time. Prior to submission of the plan the applicant must provide the ESC with information on impacts of the bottom trawl in mussels and small fishes. The plan should be submitted for ESC review as an attachment to any application filed after 2013 and that failure to submit such a plan would provide a basis for denial of any future permits.
  - b. Post treatment non target fish mortality counts should be conducted over the entire treated reach in areas shallow enough for the river bottom to be visible from the surface.

## 9. Statutory Determination

- A. 10 V.S.A. § 5408(a) provides: "[A]fter obtaining the advice of the Endangered Species Committee, the Secretary may permit, under such terms and conditions as the Secretary may prescribe by rule any act otherwise prohibited by this chapter done for any of the following purposes: scientific purposes; to enhance the propagation or survival of a species; economic hardship; zoological exhibition, educational purposes; or special purposes consistent with the purposes of the federal Endangered Species Act."
- B. The Permittee has requested an Endangered and Threatened Species Taking Permit for the following purpose: Enhance the Propagation of a Species and Economic Hardship.



- C. The state of Vermont recognizes the value which plants, fish and wildlife in their natural environment have for public enjoyment, ecological balance, and scientific study.
- D. The state of Vermont recognizes the need for protection and preservation of these plants, fish and wildlife in their natural environment.
- E. The General Assembly of Vermont intends that the species of wildlife and wild plants normally occurring within this state which may be found to be threatened or endangered within the state should be accorded protection as necessary to maintain and enhance their numbers.
- F. The General Assembly of Vermont intends that the state should assist in the protection of species of wildlife and wild plants which are determined to be threatened or endangered elsewhere pursuant to the federal Endangered Species Act.
- G. The General Assembly of Vermont intends to allow for the orderly development of Vermont without undue hardship being caused by the protections provided by the Threatened and Endangered Species Act by providing for the issuance of permits.
- H. Pursuant to 10 V.S.A. § 5408(a), the ANR Secretary hereby determines, based upon the findings detailed above and after receiving advice from the Endangered Species Committee, that the proposed activity is consistent the purposes of the 10 V.S.A. Chapter 123. An Endangered and Threatened Species Takings Permit is authorized as conditioned below.

## 10. General Permit Conditions

- A. The general conditions set out in 10 V.S.A. Chapter 123 are hereby incorporated into this permit. All activities authorized by this permit shall be carried out in accordance with, and for the purposes described in, the application. The continued validity of this permit is subject to the complete and timely compliance with all applicable conditions and the filing of all required information.
- B. The validity of this permit is expressly conditioned upon compliance with all applicable federal, state and local laws, regulations, and permits.
- C. By acceptance of this permit, the Permittee and its heirs, successors and assigns agree to provide the Agency with unrestricted access, at reasonable times, to the property covered by this permit for the purposes of monitoring and managing the populations of state-listed species, and otherwise ensuring compliance with this permit and with the Endangered and Threatened Species Law.
- D. The permit is valid for use by the named Permittee and Subpermittee only. Transfer of the permit shall require prior written authorization of the Secretary.
- E. The Agency maintains continuing jurisdiction over this project and may at any time modify, suspend, revoke, or terminate this permit upon a finding of good cause, or order the Permittee to undertake remedial measures if necessary to ensure the

protection and conservation of endangered or threatened species at the location of the permitted activity.

## 11. Specific Permit Conditions

- A. The Permittee is authorized to use TFM-HP Sea Lamprey Larvicide (EPA Reg. No. 6704-45), alone or in combination with Bayluscide 20% Emulsifiable Concentrate (EPA Reg. No. 6704-92) in one concurrent treatment of the Lamoille River in the Towns of Colchester and Milton downstream of the Peterson Dam. The treatment shall only occur after Labor Day and prior to December 1 of 2013 or Labor Day and prior to December 1 of 2014 if the treatment is not performed in 2013.
- B. The specific products used, TFM-HP and Bayluscide 20% Emulsifiable Concentrate must be registered with the U.S. Environmental Protection Agency and the Vermont Agency of Agriculture, Food and Markets for use in Vermont at the time of the treatment, and shall be handled, applied, and disposed of in full conformance with all label requirements and state and federal regulations in effect at the time of the treatment.
- C. The Permittee is allowed to introduce TFM alone or TFM/ 1% Niclosamide at the Peterson Hydro Facility.
- D. No treatment shall occur in the Lamoille River unless the surface elevation of Lake Champlain on the day of treatment is at or below 98 feet NGVD as measured at the permanent U.S.G.S. gauging station located at Burlington, Vermont.
- E. Treatment shall only occur in the Lamoille River when the measured flow rate on the day of treatment does not exceed 1,700 cfs.
- F. The Permittee shall conduct the treatment at the concentration that will be expected to maintain a 9-hr lethal block (1.0 x MLC or greater) in all downstream areas and that will not exceed a target in-stream lampricide concentration (TFM alone or in combination with niclosamide) at the upstream-most sampling site below the proposed application point of 1.3 times the minimum lethal concentration to sea lamprey (1.3 x MLC), as determined by an on-site toxicity test conducted on or after September 1 of the year of the treatment.
- G. The Permittee shall introduce TFM-HP alone or in combination with Bayluscide 20% Emulsifiable Concentrate for the shortest duration that will be expected to maintain a 9-hr lethal block (1.0 x MLC) in all downstream areas and shall not introduce such lampricides for longer than 14 consecutive hours. The Permittee will also be allowed to introduce Bayluscide 20% Emulsifiable Concentrate 2 hours prior to addition of TFM in order to stabilize Niclosamide concentrations and ensure proper concentrations are applied. The early application of Bayluscide 20% Emulsifiable Concentrate will not count against the 14 hours of total treatment time allowed.
- H. The Permittee shall collect and analyze water samples from sampling stations in accordance with the sampling station locations, parameters, methods and sampling frequencies outlined in the In-stream TFM Monitoring section of Attachment 1 of the Endangered and Threatened Species Takings Permit Application.
- I. Except for samples collected for water use advisory purposes, the Permittee shall determine TFM concentrations with tests accurate to within 0.1 parts per million.

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- J. The Permittee shall determine niclosamide concentrations (if used) to within 1 part per billion.
- K. During the first two scheduled sampling times, the Permittee shall take samples at the upstream-most sampling station from one-quarter, one-half and three-quarters of the distance across the treated section of each river. If sample analyses demonstrate that TFM and niclosamide (if used) concentrations are uniform across the river (the near shore measurements are within 0.1 parts per million TFM and 1 part per billion niclosamide of the midstream measurement), the Permittee may collect future samples from one location only. If TFM concentrations are not uniform, the Permittee shall take three samples across the river at future scheduled sampling times until the results indicate that the concentrations are uniform, at which time subsequent sampling may be conducted at one location only.
- L. If during the permitted treatment, the TFM concentration from a single river sample at the most upstream sampling station exceeds the authorized target TFM concentration (defined in condition F. above) by a factor of 0.1x MLC (i.e. 1.4 x MLC or greater) or more, the Permittee shall adjust the TFM feed rate downward until the in-stream TFM concentration no longer exceeds the authorized target concentration.
- M. The Permittee shall conduct the Lamoille River TFM treatment in compliance with all of the requirements established in the following documents: *Standard Operating Procedures for Application of Lampricides in the Great Lakes Fishery Commission Integrated Management of Sea Lamprey (Petromyzon marinus) Control Program* Sea Lamprey Control, Marquette, Michigan. Special Report 92-001.4. (Adair and Sullivan 2006); *Contingency Plan for Accidental Spillage of Lampricides During Lake Champlain Sea Lamprey Control Operations* (2011).
- N. If the authorized treatment in the Lamoille River is delayed until 2014, the Permittee shall submit any new research findings or other factual information not previously available pertaining to effects of lampricides on any of the species covered by this permit as soon as possible but no later than 30 days prior to treatment in 2014.
- O. The Permittee shall conduct a post-treatment survey in the treated reaches of the Lamoille River to estimate abundance of sea lamprey and other lamprey species using the standard Quantitative Assessment Sampling (QAS) methodology within one year after treatment. The results of the survey shall be submitted to the Agency within six months of completion of the survey.
- P. A post-treatment mortality assessment will be conducted in accordance with the SOP and as defined in the ANC 2010-C05 permit. Post-treatment mortality assessment crews will walk systematically pre-defined sections of each treated stream reach within 36 hours of the lampricide block passage. All visible river-bottom in each section will be inspected and observations of non-target organism mortalities except lamprey species will be recorded. Non-target assessment sections comprise about 20% of the treated reaches and are defined based on the locations of USFWS sea lamprey QAS transects as follows: One section will start immediately below each lampricide application point; equal in length to the distance between two transects. Four additional sections will be assessed on each stream reach between transects 3-4, 9-10, 15-16, and 21-22. Results of non-target mortality surveys will be submitted to the VT ANR by May 1 of the year following the treatment. The post-treatment QAS survey results will be submitted by December 31 of the year following the year of treatment.
- Q. USFWS will preserve any dead specimens of listed species that are collected according to the protocol worked out with the following scientists during 2012:

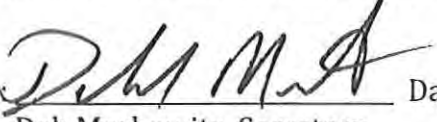
Sturgeon – Chet McKenzie

Eastern Sand Darters- Ken Cox

Mussels – Mark Ferguson (highly unlikely that dead mussels will be found)

Turtles – Steve Parren (highly unlikely for turtles to be affected)

- R. The Permittee shall submit a final lampricide treatment report to the Agency by May 1 of the year following treatment. The report shall include at a minimum: (1) batch numbers and quantity used of TFM-HP, Bayluscide 20% Emulsifiable Concentrate (if used); (2) the results from the on-site toxicity test and MLC determination; (3) the treatment duration; (4) all raw data from pre-, during and post-treatment water chemistry monitoring; (5) river discharge records; (6) non-target, non-lamprey post treatment mortality counts; and (7) a summary of the day-of-treatment activities. In the event that conditions warrant introduction of lampricide for a period of time exceeding 12 consecutive hours but not longer than 14 consecutive hours, the Permittee shall also include in the report documentation justifying the need for lampricide introduction in excess of 12 consecutive hours.

Issued by  Date: 9.9.13  
Deb Markowitz, Secretary  
Agency of Natural Resources

### Appeal

If you wish to appeal this determination, please contact the Vermont Environmental Court. Appeals to that Court must be filed within 30 days of the date of an appealable decision. The appellant must attach to the Notice of Appeal the entry fee of \$225.00, payable to the State of Vermont. 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 Court; and must be signed by the appellant or its 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 more information, see the Vermont Rules for Environmental Court Proceedings, available online at [www.vermontjudiciary.org](http://www.vermontjudiciary.org). The address for the Court is 2418 Airport Road, Suite 1, Barre, Vermont 05641 (Tel. 802-828-1660).