Notice of Intent Application
Richmond Pond
Aquatic Vegetation Management Program

Richmond, MA

November 2024

Prepared for:
Town of Richmond
c/o Danielle Fillio,Town Administrator
1751 State Road
Richmond, MA 01254

Prepared by:
Richmond Pond Association
P.O Box 447
Lenox, MA 01240

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WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Richmond
City/Town

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

Richmond Pond	Richmond	01254
a. Street Address	b. City/Town	c. Zip Code

Latitude and Longitude:

42.41571	-73.33172
d. Latitude	e. Longitude

0	0
f. Assessors Map/Plat Number	g. Parcel /Lot Number

2. Applicant:

Danielle	Fillio
a. First Name	b. Last Name

Town of Richmond
c. Organization

1751 State Road
d. Street Address

Richmond	MA	01254
e. City/Town	f. State	g. Zip Code

413-553-7793		townadmin@richmondma.org
h. Phone Number	i. Fax Number	j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

Commonwealth of Massachusetts	
a. First Name	b. Last Name

c. Organization

d. Street Address

e. City/Town	f. State	g. Zip Code

h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

Bruce	Wintman
a. First Name	b. Last Name

Richmond Pond Association
c. Company

P.O. Box 447
d. Street Address

Lenox	MA	01240
e. City/Town	f. State	g. Zip Code

413-519-0874		richmondpondwebsite@gmail.com
h. Phone Number	i. Fax Number	j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

$0 (exemption)	-	-
a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid

A. General Information (continued)

6. General Project Description:

   The applicant is seeking an Order of Conditions for an Aquatic Management Program at Richmond Pond to control non-native and proliferative weed growth utilizing Annual 2 foot Lake Level Drawdown, treatment with USEPA/MA State registered Aquatic Herbicides, and Targeted Weed Harvesting (see Attachment B - Project Description).

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ☒ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☒ Yes ☐ No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

310 CMR 10.53(4)(e)(5) Improving the natural capacity of a Resource Area through removal and control of aquatic non-native and proliferative weeds.

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

a. County ______ b. Certificate # (if registered land) ______

c. Book ______ d. Page Number ______

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

   Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area		Size of Proposed Alteration	Proposed Replacement (if any)
a. ☒	Bank	9957 feet 1. linear feet	9957 feet 2. linear feet
b. ☐	Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☒	Land Under Waterbodies and Waterways	6,912,972 square feet 1. square feet	6,912,972 square feet 2. square feet
		3. cubic yards dredged	

Resource Area		Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐	Bordering Land Subject to Flooding	1. square feet	2. square feet
		3. cubic feet of flood storage lost	4. cubic feet replaced
e. ☐	Isolated Land Subject to Flooding	1. square feet	
		2. cubic feet of flood storage lost	3. cubic feet replaced

f. ☐ Riverfront Area ______ 1. Name of Waterway (if available) - **specify coastal or inland**

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: ______ square feet

4. Proposed alteration of the Riverfront Area:

______ a. total square feet ______ b. square feet within 100 ft. ______ c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI? ☐ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☐ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement
If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW ______ b. square feet of Salt Marsh ______

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings ______ b. number of replacement stream crossings ______

C. Other Applicable Standards and Requirements

☒ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

a. ☐ Yes ☐ No

If yes, include proof of mailing or hand delivery of NOI to:

Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

b. Date of map

If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

c. Submit Supplemental Information for Endangered Species Review*

1. ☐ Percentage/acreage of property to be altered:

(a) within wetland Resource Area ______ percentage/acreage

(b) outside Resource Area ______ percentage/acreage

2. ☐ Assessor's Map or right-of-way plan of site

2. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

(a) ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

(b) ☐ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # ________ b. Date submitted to NHESP ________

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☐ Not applicable – project is in inland resource area only   b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Bourne to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Plymouth to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project?   d. ☐ Yes ☐ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

   a. ☐ Yes ☐ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

   a. ☐ Yes ☐ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

   a. ☐ Yes ☐ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

   a. ☐ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

      1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

      2. ☐ A portion of the site constitutes redevelopment

      3. ☐ Proprietary BMPs are included in the Stormwater Management System.

   b. ☐ No. Check why the project is exempt:

      1. ☐ Single-family house

      2. ☐ Emergency road repair

      3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☒ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☐ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☐ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

D. Additional Information (cont'd)

3. ☐ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☐ List the titles and dates for all plans and other materials submitted with this NOI.

a. Plan Title

b. Prepared By | c. Signed and Stamped by

d. Final Revision Date | e. Scale

f. Additional Plan or Document Title | g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☐ Attach NOI Wetland Fee Transmittal Form

9. ☐ Attach Stormwater Report, if needed.

E. Fees

1. ☒ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number | 3. Check date

4. State Check Number | 5. Check date

6. Payor name on check: First Name | 7. Payor name on check: Last Name

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

Danielle Fillio — 10/30/24

1. Signature of Applicant — 2. Date

3. Signature of Property Owner (if different) — 4. Date

5. Signature of Representative (if any) — 6. Date

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

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Eligibility Checklist

This Ecological Restoration Limited Project Eligibility Checklist guides the applicant in determining if their project is eligible to file as an Inland or Coastal Ecological Restoration Limited Project (310 CMR 10.53(4) or 310 CMR 10.24(8) respectively). These criteria must be met when submitting the Ecological Restoration Limited Project Notice of Intent to ensure that the restoration and improvement of the natural capacity of a Resource Area(s) to protect and sustain the interests identified in the WPA is **necessary** to achieve the project's ecological restoration goals.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Regulatory Features of All Coastal and Inland Ecological Restoration Limited Projects

(a) May result in the temporary or permanent loss of/or conversion of Resource Area: An Ecological Restoration Limited Project that meets the requirements of 310 CMR 10.24(8) may result in the temporary or permanent loss of Resource Areas and/or the conversion of one Resource Area to another when such loss is necessary to the achievement of the project's ecological restoration goals.

(b) Exemption from wildlife habitat evaluation: A NOI for an Ecological Restoration Limited Project that meets the minimum requirements for Ecological Restoration Projects and for a MassDEP Combined Application outlined in 310 CMR 10.12(1) and (2) is exempt from providing a wildlife habitat evaluation (310 CMR 10.60).

Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

(c) The following are considerations for applicants filing an Ecological Restoration Limited Project NOI and for the issuing authority approving a project as an Ecological Restoration Limited Project:

- ☒ The condition of existing and historic Resource Areas proposed for restoration.
- ☒ Evidence of the extent and severity of the impairment(s) that reduce the capacity of the Resource Areas to protect and sustain the interests identified in M.G.L. c. 131, § 40.
- ☒ The magnitude and significance of the benefits of the Ecological Restoration Project in improving the capacity of the affected Resource Areas to protect and sustain the other interests identified in M.G.L. c. 131, § 40.
- ☒ The magnitude and significance of the impacts of the Ecological Restoration Project on existing Resource Areas that may be modified, converted and/or lost and the interests for which said Resource Areas are presumed significant in 310 CMR 10.00, and the extent to which the project will:
  - a. avoid adverse impacts to Resource Areas and the interests identified in M.G.L. c. 131, § 40, that can be avoided without impeding the achievement of the project's ecological restoration goals.
  - b. minimize adverse impacts to Resource Areas and the interests identified in M.G.L. c. 131, § 40, that are necessary to the achievement of the project's ecological restoration goals.
  - c. utilize best management practices such as erosion and siltation controls and proper construction sequencing to avoid and minimize adverse construction impacts to resource areas and the interests identified in M.G.L. c. 131, § 40.

Eligibility Criteria - Coastal Ecological Restoration Limited Projects (310 CMR 10.24(8))

Complete this Eligibility Criteria Checklist ***before*** filling out a Notice of Intent Application to determine if your project qualifies as a Coastal Ecological Restoration Limited Project. (310 CMR 10.24(8)) Sign the Eligibility Certification at the end of Appendix A, and attach the checklist with supporting documentation and the Eligibility Certification to your Notice of Intent Application.

General Eligibility Criteria for All Coastal Ecological Restoration Limited Projects

Notwithstanding the requirements of 310 CMR 10.25 through 10.35, 310 CMR 10.54 through 10.58, and the Wildlife Habitat evaluations in 310 CMR 10.60, the Issuing Authority may issue an Order of Conditions permitting an Ecological Restoration Project listed in 310 CMR 10.24(8)(e) as an Ecological Restoration Limited Project and impose such conditions as will contribute to the interests identified in the WPA M.G.L. provided that the project meets all the requirements in 310 CMR 10.24 (8).

☐ The project is an Ecological Restoration Project as defined in 310 CMR 10.04 and is a project type listed below [310 CMR 10.24(8)(e)].

☐ Tidal Restoration.

☐ Shellfish Habitat Restoration.

☐ Other Ecological Restoration Limited Project Type.

☐ The project will further at least one of the WPA (M.G.L. c. 131, § 40) interests identified below.

- ☐ Protection of public or private water supply.
- ☐ Protection of ground water supply.
- ☐ Flood control.
- ☐ Storm damage prevention.
- ☐ Prevention of pollution.
- ☐ Protection of land containing shellfish.
- ☐ Protection of fisheries.
- ☐ Protection of wildlife habitat.

☐ If the project will impact an area located within estimated habitat which is indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands, a NHESP preliminary written determination is attached to the NOI submittal that the project will not have any adverse long-term and short-term effects on specified habitat sites of Rare Species or the project will be carried out in accordance with an approved NHESP habitat management plan.

Eligibility Criteria - Coastal Ecological Restoration Limited Projects (310 CMR 10.24(8)) (Cont.)

General Eligibility Criteria for All Coastal Ecological Restoration Limited Projects (cont.)

☐ If the project is located in a Coastal Dune or Barrier Beach, the project avoids and minimizes armoring of the Coastal Dune or Barrier Beach to the maximum extent practicable.

☐ The project complies with all applicable provisions of 310 CMR 10.24(1) through (6) and 310 CMR 10.24(9) and (10).

Additional Eligibility Criteria for Specific Coastal Ecological Restoration Limited Project Types

These additional criteria must be met to qualify as an Ecological Restoration Limited Project to ensure that the restoration and improvement of the natural capacity of a Resource Area to protect and sustain the interests identified in the WPA is **necessary** to achieve the project's ecological restoration goals.

☐ This Ecological Restoration Limited Project application meets the eligibility criteria for Ecological Restoration Limited Project [310 CMR 10.24(8)(a) through (d) and as proposed, furthers at least one of the WPA interests is for the project type identified below.

- ☐ **Tidal Restoration Projects**
  - ☐ A project to restore tidal flow that will not significantly increase flooding or storm damage impacts to the built environment, including without limitation, buildings, wells, septic systems, roads or other man-made structures or infrastructure.
- ☐ **Shellfish Habitat Restoration Projects**
  - ☐ The project has received a Special Projects Permit from the Division of Marine Fisheries or, if a municipality, has received a shellfish propagation permit.
  - ☐ The project is made of cultch (e.g., shellfish shells from oyster, surf or ocean clam) or is a structure manufactured specifically for shellfish enhancement (e.g., reef blocks, reef balls, racks, floats, rafts, suspended gear).
- ☐ **Other Ecological Restoration Projects** that meet the criteria set forth in 310 CMR 10.24(8)(a) through (d).
  - ☐ Restoration, enhancement, or management of Rare Species habitat.
  - ☐ Restoration of hydrologic and habitat connectivity.
  - ☐ Removal of aquatic nuisance vegetation to impede eutrophication.
  - ☐ Thinning or planting of vegetation to improve habitat value.
  - ☐ Fill removal and re-grading.
  - ☐ Riparian corridor re-naturalization.
  - ☐ River floodplain re-connection.

Eligibility Criteria - Coastal Ecological Restoration Limited Projects (310 CMR 10.24(8)) (Cont.)

Additional Eligibility Criteria for Specific Coastal Ecological Restoration Limited Project Types

- ☐ In-stream habitat enhancement.
- ☐ Remediation of historic tidal wetland ditching.
- ☐ Eelgrass restoration.
- ☐ Invasive species management.
- ☐ Installation of fish passage structures.
- ☐ Other. Describe: ______________________________

☐ This project involves the construction, repair, replacement or expansion of public or private infrastructure (310 CMR 10.24(9).

- ☐ The NOI attachment labeled _____ is an operation and maintenance plan to ensure that the infrastructure will continue to function as designed.
- ☐ The operation and maintenance plan will be implemented as a continuing condition in the Order of Conditions and the Certificate of Compliance.
- ☐ This project proposes to replace an existing stream crossing (310 CMR 10.24(10). The crossing complies with the Massachusetts Stream Crossing Standards to the maximum extent practicable with details provided in the NOI. The crossing type:
  - ☐ Replaces an existing non-tidal crossing that is part of an Anadromous/Catadromous Fish Run (310 CMR 10.35)
  - ☐ Replaces an existing tidal crossing that restricts tidal flow. The tidal restriction will be eliminated to the maximum extent practicable.
- ☐ At a minimum, in evaluating the potential to comply with the standards to the maximum extent practicable the following criteria have been consider site constraints in meeting the standard, undesirable effects or risk in meeting the standard, and the environmental benefit of meeting the standard compared to the cost, by evaluating the following:
  - ☐ The potential for downstream flooding;
  - ☐ Upstream and downstream habitat (in-stream habitat, wetlands);
  - ☐ Potential for erosion and head-cutting;
  - ☐ Stream stability;
  - ☐ Habitat fragmentation caused by the crossing;
  - ☐ The amount of stream mileage made accessible by the improvements;
  - ☐ Storm flow conveyance;

Eligibility Criteria - Coastal Ecological Restoration Limited Projects (310 CMR 10.24(8)) (Cont.)

Additional Eligibility Criteria for Specific Coastal Ecological Restoration Limited Project Types

- ☐ Engineering design constraints specific to the crossing;
- ☐ Hydrologic constraints specific to the crossing;
- ☐ Impacts to wetlands that would occur by improving the crossing;
- ☐ Potential to affect property and infrastructure; and
- ☐ Cost of replacement.

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4))

Complete this Eligibility Criteria Checklist ***before*** filling out a Notice of Intent Application to determine if your project qualifies as an Inland Ecological Restoration Limited Project. (310 CMR 10.53(4)) Sign the Eligibility Certification at the end of Appendix A, and attach the checklist with supporting documentation and the Eligibility Certification to your Notice of Intent Application.

General Eligibility Criteria for All Inland Ecological Restoration Limited Projects

Notwithstanding the requirements of any other provision of 310 CMR 10.25 through 10.35, 310 CMR 10.54 through 10.58, and 310 CMR 10.60, the Issuing Authority may issue an Order of Conditions permitting an Ecological Restoration Project listed in 310 CMR 10.53(4)(e) as an Ecological Restoration Limited Project and impose such conditions as will contribute to the interests identified in M.G.L. c. 131, § 40, provided that:

☒ The project is an Ecological Restoration Project as defined in 310 CMR 10.04 and is a project type listed below [310 CMR 10.53(4)(e)].

- ☐ Dam Removal
- ☐ Freshwater Stream Crossing Repair and Replacement
- ☐ Stream Daylighting
- ☐ Tidal Restoration
- ☐ Rare Species Habitat Restoration
- ☐ Restoring Fish Passageways
- ☒ Other (describe project type): Aquatic Invasive Weed Managment

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4)) (cont.)

General Eligibility Criteria for All Inland Ecological Restoration Limited Projects

☒ The project will further at least one of the WPA (M.G.L. c. 131, § 40) interests identified below.

- ☐ Protection of public or private water supply
- ☐ Protection of ground water supply
- ☐ Flood control
- ☐ Storm damage prevention
- ☐ Prevention of pollution
- ☐ Protection of land containing shellfish
- ☒ Protection of fisheries
- ☒ Protection of wildlife habitat

☒ If the project will impact an area located within estimated habitat which is indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands, a NHESP preliminary written determination is attached to the NOI submittal that the project will have no adverse long-term and short-term effects on specified habitat sites of Rare Species or the project will be carried out in accordance with an approved NHESP habitat management plan.

☐ The project will be carried out in accordance with any time of year restrictions or other conditions recommended by the Division of Marine Fisheries for coastal waters and the Division of Fisheries and Wildlife in accordance with 310 CMR 10.11(3).

☐ If the project involves the dredging of 100 cubic yards of sediment or more or dredging of any amount in an Outstanding Resource Water, a Water Quality Certification has been applied for or obtained.

☒ The project complies with all applicable provisions of 310 CMR 10.53(1), (2), (7), and (8).

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4)) (cont.)

Additional Eligibility Criteria for Specific Inland Ecological Restoration Limited Project Types

These additional criteria must be met to qualify as an Ecological Restoration Limited Project to ensure that the restoration and improvement of the natural capacity of a Resource Area to protect and sustain the interests identified in the WPA is **necessary** to achieve the project's ecological restoration goals.

☒ This project application meets the eligibility criteria for Ecological Restoration Limited Project in accordance with [310 CMR 10.53(4)(a) through (d) and as proposed, furthers at least one of the WPA interests is for the project type identified below:

- ☐ **Dam Removal**
  - ☐ Project is consistent with MassDEP's 2007 Dam Removal Guidance.
- ☐ **Freshwater Stream Crossing Repair and Replacement**. The project as proposed and the NOI describes how:
  - ☐ Meeting the eligibility criteria set forth in 310 CMR 10.13 would result in significant stream instability or flooding hazard that cannot otherwise be mitigated, and site constraints make it impossible to meet said criteria.
  - ☐ The project design ensures that the stability of the bank is NOT impaired.
  - ☐ To the maximum extent practicable, the project provides for the restoration of the stream upstream and downstream of the structure as needed to restore stream continuity and eliminate barriers to aquatic organism movement.
  - ☐ The project complies with the requirements of 310 CMR 10.53(7) and (8).
- ☐ **Stream Daylighting Projects**
  - ☐ The project meets the eligibility criteria for Ecological Restoration Limited Project [310 CMR 10.53(4)(a) through (d)] and as proposed the NOI describes how the proposed project meets to the maximum extent practicable, consistent with the project's ecological restoration goals, all the performance standards for Bank and Land Under Water Bodies and Waterways.
  - ☐ The project meets the requirements of 310 CMR 10.12(1) and (2) and a wildlife habitat evaluation is not included in the NOI.
- ☐ **Tidal Restoration Project**
  - ☐ Restores tidal flow.
  - ☐ the project, including any proposed flood mitigation measures, will not significantly increase flooding or storm damage to the built environment, including without limitation, buildings, wells, septic systems, roads or other man-made structures or infrastructure.

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4)) (cont.)

☒ **Other Ecological Restoration Projects** that meet the criteria set forth in 310 CMR 10.53 (4) (a) through (d).

- ☐ Restoration, enhancement, or management of Rare Species habitat.
- ☐ Restoration of hydrologic and habitat connectivity.
- ☒ Removal of aquatic nuisance vegetation to impede eutrophication.
- ☒ Thinning or planting of vegetation to improve habitat value.
- ☐ Riparian corridor re-naturalization.
- ☐ River floodplain re-connection.
- ☐ In-stream habitat enhancement.
- ☐ Fill removal and re-grading.
- ☐ Flow restoration.
- ☐ Installation of fish passage structures.
- ☒ Invasive species management.
- ☐ Other. Describe: ______________________________

☐ This project involves the construction, repair, replacement or expansion of public or private infrastructure. (310 CMR 10.53(7))

- ☐ The NOI attachment labeled _____ is an operation and maintenance plan to ensure that the infrastructure will continue to function as designed.
- ☐ The operation and maintenance plan will be implemented as a continuing condition in the Order of Conditions and the Certificate of Compliance.

☐ This project replaces an existing stream crossing (310 CMR 10.53(8)). The crossing type:

- ☐ Replaces an existing non-tidal crossing designed to comply with the Massachusetts Stream Crossing Standards to the maximum extent practicable with details provided in the NOI.
- ☐ Replaces an existing tidal crossing that restricts tidal flow. The tidal restriction will be eliminated to the maximum extent practicable.

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4)) (cont.)

- ☐ At a minimum, in evaluating the potential to comply with the standards to the maximum extent practicable the following criteria have been consider site constraints in meeting the standard, undesirable effects or risk in meeting the standard, and the environmental benefit of meeting the standard compared to the cost, by evaluating the following:
  - ☐ The potential for downstream flooding;
  - ☐ Upstream and downstream habitat (in-stream habitat, wetlands);
  - ☐ Potential for erosion and head-cutting;
  - ☐ Stream stability;
  - ☐ Habitat fragmentation caused by the crossing;
  - ☐ The amount of stream mileage made accessible by the improvements;
  - ☐ Storm flow conveyance;
  - ☐ Engineering design constraints specific to the crossing;
  - ☐ Hydrologic constraints specific to the crossing;
  - ☐ Impacts to wetlands that would occur by improving the crossing;
  - ☐ Potential to affect property and infrastructure; and
  - ☐ Cost of replacement.

Required Actions (310 CMR 10.11)

Complete the Required Actions before submitting a Notice of Intent Application for an Ecological Restoration Project and submit a completed copy of this Checklist with the Notice of Intent.

☒ **Massachusetts Environmental Policy Act (MEPA) / Environmental Monitor**
https://www.mass.gov/service-details/the-environmental-monitor

For Ecological Restoration Limited Projects, there are no changes to MEPA requirements.

☒ Submit written notification at least 14 days prior to the filing of a Notice of Intent (NOI) to the Environmental Monitor for publication. A copy of the written notification is attached and provides at minimum:

- ☒ A brief description of the proposed project.
- ☒ The anticipated NOI submission date to the conservation commission.
- ☒ The name and address of the conservation commission that will review the NOI.
- ☒ Specific details as to where copies of the NOI may be examined or acquired and where to obtain the date, time, and location of the public hearing.

☒ **Massachusetts Endangered Species Act (MESA) /Wetlands Protection Act Review**

☒ Preliminary Massachusetts Endangered Species Act Review from the Natural Heritage and Endangered Species Program (NHESP) has been met and the written determination is attached.

☒ Supplemental Information for Endangered Species Review has been submitted.

1. ☒ Percentage/acreage of property to be altered:

   a. Within Wetland Resource Area: 9931680
   Percentage/acreage

   b. Outside Wetland Resource Area: ____________
   Percentage/acreage

2. ☐ Assessor's Map or right-of-way plan of site

3. ☒ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work.

4. ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

5. ☐ Photographs representative of the site

6. ☒ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review)

Required Actions (310 CMR 10.11) (cont.)

Make check payable to "Commonwealth of Massachusetts - NHESP" and mail to NHESP:

Natural Heritage & Endangered Species Program
MA Division of Fisheries & Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

7. Projects altering 10 or more acres of land, also submit:

   a. ☒ Vegetation cover type map of site

   b. ☒ Project plans showing Priority & Estimated Habitat boundaries

OR Check One of the Following:

1. ☐ Project is exempt from MESA review.

Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/ma-endangered-species-act-mesa-overview; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59 – see C4 below)

2. ☐ Separate MESA review ongoing.

   ______________________ a. NHESP Tracking #

   ______________________ b. Date submitted to NHESP

3. ☐ Separate MESA review completed. Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

☒ **Estimated Habitat Map of State-Listed Rare Wetlands Wildlife**

If a portion of the proposed project is located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP), complete the portion below. To view habitat maps, see the **Massachusetts Natural Heritage Atlas** or view the maps electronically at: https://www.mass.gov/guides/masswildlife-publications#-massachusetts-natural-heritage-atlas-

☒ A preliminary written determination from Natural Heritage and Endangered Species Program (NHESP) must be obtained indicating that:

☒ Project will NOT have long- or short-term adverse effect on the actual Resource Area located within estimated habitat indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands Wildlife published by NHESP.

☐ Project will have long- or short-term adverse effect on the actual Resource Area located within estimated habitat indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands Wildlife published by NHESP. A copy of NHESP's written preliminary determination in accordance with 310 CMR 10.11(2) is attached. This specifies:

☐ Date of the map: ______________________

Required Actions (310 CMR 10.11) (cont.)

- ☐ If the Rare Species identified is/are likely to continue to be located on or near the project, and if so, whether the Resource Area to be altered is in fact part of the habitat of the Rare Species.
- ☐ That if the project alters Resource Area(s) within the habitat of a Rare Species:
- ☐ The Rare Species is identified;
- ☐ NHESP's recommended changes or conditions necessary to ensure that the project will have no short or long term adverse effect on the habitat of the local population of the Rare Species is provided; or
- ☐ An approved NHESP habitat management plan is attached with this Notice of Intent.

Send the request for a preliminary determination to:
Natural Heritage & Endangered Species Program
MA Division of Fisheries & Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

☐ **Division of Marine Fisheries**

☐ If the project will occur within a coastal waterbody with a restricted Time of Year, [see Appendix B of the Division of Marine Fisheries (DMF) Technical Report TR 47 "Marine Fisheries Time of Year Restrictions (TOYs) for Coastal Alteration Projects" dated April 2011 https://www.nae.usace.army.mil/Portals/74/docs/regulatory/StateGeneralPermits/MA/TR-47.pdf].

☐ Obtain a DMF written determination stating:

- ☐ The proposed work does NOT require a TOY restriction.
- ☐ The proposed work requires a TOY restriction. Specific recommended TOY restriction and recommended conditions on the proposed work is attached.

☐ If the project may affect a diadromous fish run [re: Division of Marine Fisheries (DMF) Technical Reports TR 15 through 18, dated 2004: https://www.mass.gov/service-details/marine-fisheries-technical-reports]

- ☐ Obtain a DMF written determination stating:
  - ☐ The design specifications and operational plan for the project are compatible with the passage requirements of the fish run.
  - ☐ The design specifications and operational plan for the project are not compatible with the passage requirements of the fish run.

Required Actions (310 CMR 10.11) (cont.)

Send the request for a written or electronic determination to:

South Shore – Bourne to Rhode Island border, and the Cape & Islands:
Division of Marine Fisheries –
South Coast Field Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: DMF.EnvReview-South@state.ma.us

North Shore – Plymouth to New Hampshire border:
Division of Marine Fisheries –
North Shore Field Station
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: DMF.EnvReview-North@state.ma.us

☐ **Division of Fisheries and Wildlife –** https://www.mass.gov/orgs/division-of-fisheries-and-wildlife

- ☐ Projects that involve silt-generating, in-water work that will impact a non-tidal perennial river or stream and the in-water work will not occur between May 1 and August 30.
  - ☐ Obtain a written determination from the Division of Fisheries and Wildlife (DFW) as to whether the proposed work requires a TOY restriction.
    - ☐ The proposed work does NOT require a TOY restriction.
    - ☐ The proposed work requires a TOY restriction. The DFW determination with TOY restriction and other conditions is attached.

☐ **MassDEP Water Quality Certification**

- ☐ Project involves dredging of 100 cubic yards or more in a Resource Area or dredging of any amount in an Outstanding Resource Water (ORW). A copy and proof of the MassDEP Water Quality Certification pursuant to 314 CMR 9.00 is attached to the NOI.
- ☐ This project is a Combined Permit Application for 401 Dredging and Restoration (BRP WW 26).

☐ **MassDEP Wetlands Restriction Order**

Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

☐ Yes ☐ No

☐ **Department of Conservation and Recreation**

Office of Dam Safety

- ☐ For Dam Removal Projects, obtain a written determination from the Department of Conservation and Recreation Office of Dam Safety that the dam is not subject to the jurisdiction of the Office under 302 CMR 10.00, a written determination that the dam removal does not require a permit under 302 CMR 10.00 or a permit authorizing the dam removal in accordance with 302 CMR 10.00 has been issued.

Required Actions (310 CMR 10.11) (cont.)

Areas of Critical Environmental Concern (ACECs)

Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

☐ Yes ☐ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations).

Name of ACEC

Minimum Required Documents (310 CMR 10.12)

Complete the Required Documents Checklist below and provide supporting materials before submitting a Notice of Intent Application for an Ecological Restoration Project.

☒ This Notice of Intent meets all applicable requirements outlined in for Ecological Restoration Projects in 310 CMR 10.12. Use the checklist below to ensure that all documentation is included with the NOI.

At a minimum, a Notice of Intent for an Ecological Restoration Project shall include the following:

☒ Description of the project's ecological restoration goals;

☒ The location of the Ecological Restoration Project;

☐ Description of the construction sequence for completing the project;

☐ A map of the Areas Subject to Protection Under M.G.L. c. 131, § 40, that will be temporarily or permanently altered by the project or include habitat for Rare Species, Habitat of Potential Regional and Statewide Importance, eel grass beds, or Shellfish Suitability Areas.

☐ The method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.) is attached with documentation methodology.

☒ List the titles and dates for all plans and other materials submitted with this NOI.

Attachment B - Project Description, Attachment C - Figures, Attachment D - MESA Review and 2023 Annual Report, Att. E - Herbicide Information, Att. F - 2024 Revised Draft Response.

Richmond Pond Association
b. Prepared by

c. Signed and Stamped by

d. Final Revision Date

e. Scale

f. Additional Plan or Document Title

g. Date

☐ If there is more than one property owner, attach a list of these property owners not listed on this form.

☒ Attach NOI Wetland Fee Transmittal Form.

Minimum Required Documents (310 CMR 10.12)

- ☐ An evaluation of any flood impacts that may affect the built environment, including without limitation, buildings, wells, septic systems, roads or other man-made structures or infrastructure as well as any proposed flood impact mitigation measures;
- ☒ A plan for invasive species prevention and control;
- ☐ The Natural Heritage and Endangered Species Program written determination in accordance with 310 CMR 10.11(2), if needed;
- ☐ Any Time of Year restrictions and/or other conditions recommended by the Division of Marine Fisheries or the Division of Fisheries and Wildlife in accordance with 310 CMR 10.11(3), (4), (5), if needed;
- ☒ Proof that notice was published in the Environmental Monitor as required by 310 CMR 10.11(1;
- ☒ A certification by the applicant under the penalties of perjury that the project meets the eligibility criteria set forth in 310 CMR 10.13;
- ☐ If the Ecological Restoration Project involves the construction, repair, replacement or expansion of infrastructure, an operation and maintenance plan to ensure that the infrastructure will continue to function as designed;
- ☐ If the project involves dredging of 100 cubic yards or more or dredging of any amount in an Outstanding Resource Water, a Water Quality Certification issued by the Department pursuant to 314 CMR 9.00;
- ☐ If the Ecological Restoration Project involves work on a stream crossing, information sufficient to make the showing required by 310 CMR 10.24(10) for work in a coastal resource area and 310 CMR 10.53(8) for work in an inland resource area; and
- ☐ If the Ecological Restoration Project involves work on a stream crossing, baseline photo-points that capture longitudinal views of the crossing inlet, the crossing outlet and the upstream and downstream channel beds during low flow conditions. The latitude and longitude coordinates of the photo-points shall be included in the baseline data.
- ☐ This project is subject to provisions of the MassDEP Stormwater Management Standards. A copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) is attached.
- ☒ Provide information as the whether the project has the potential to impact private water supply wells including agricultural or aquacultural wells or surface water withdrawal points.

Certification that the Ecological Restoration Project Meets the Eligibility Criteria

I hereby certify under penalties of perjury that the Ecological Restoration Project Notice of Intent application does not meet the Eligibility criteria for an Ecological Restoration Order of Conditions set forth in 310 CMR 10.13, but does meet the Eligibility Criteria for a Ecological Restoration Limited Project set forth in 10.24(8) or 10.53(4) whichever is applicable. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

Danielle Fillio
Signature of Applicant or Authorized Agent

Danielle Fillio
Printed Name of Applicant or Authorized Agent

10/30/24
Date

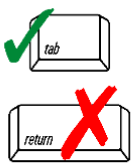
The certification must be signed by the applicant; however, it may be signed by a duly authorized agent (named in Item 2) if this form is accompanied by a statement by the applicant designating the agent and agreeing to furnish upon request, supplemental information in support of the application.

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Applicant Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



1. Location of Project:

Richmond Pond
a. Street Address

Richmond
b. City/Town

c. Check number

d. Fee amount

2. Applicant Mailing Address:

Danielle
a. First Name

Fillio
b. Last Name

Town of Richmond
c. Organization

1751 State Road
d. Mailing Address

Richmond
e. City/Town

MA
f. State

01254
g. Zip Code

413-553-7793
h. Phone Number

i. Fax Number

townadmin@richmondma.org
j. Email Address

3. Property Owner (if different):

Commonwealth of Massachusetts
a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Cat. 2e: Inland Limited Project			
- Fee Exempt (municipality)	1	$0	$0
		Step 5/Total Project Fee:	$0

Step 6/Fee Payments:

Total Project Fee:	$0 a. Total Fee from Step 5
State share of filing Fee:	$0 b. 1/2 Total Fee **less $**12.50
City/Town share of filling Fee:	$0 c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

ATTACHMENT A

Abutter Notification

To: The Environmental Monitor

From: The Town of Richmond, Massachusetts

Date: October 09, 2024

Re: Notification of filing an NOI for Richmond Pond

Anticipated date of submission: November 01, 2024

This project is seeking approval under an ecological restoration limited project provision to initiate an Aquatic Management Program at Richmond Pond in Richmond, MA. Annual 2 foot level lake drawdown will be applied to manage non-native and invasive plant species to protect the interests of the Wetlands Protection Act by improving habitat value and insuring critical dam longevity.

Reviewing Conservation Commission(s):

Richmond Conservation Commission
1751 State Road
Richmond, MA 01254

Pittsfield Conservation Commission
70 Allen Street
Pittsfield, MA 01201

Copies of the NOI may be examined or acquired from the Conservation Commissions.

See Conservation Commission website for the meeting schedule for exact dates and agendas.

To: The Environmental Monitor

From: The Town of Richmond, Massachusetts

Date: October 09, 2024

Re: Notification of filing an NOI for Richmond Pond

Anticipated date of submission: November 01, 2024

This project is seeking approval under an ecological restoration limited project provision to initiate an Aquatic Management Program at Richmond Pond in Richmond, MA. USEPA/State registered herbicides will be applied to manage non-native and invasive plant species to protect the interests of the Wetlands Protection Act by improving habitat value.

Reviewing Conservation Commission(s):

Richmond Conservation Commission
1751 State Road
Richmond, MA 01254

Pittsfield Conservation Commission
70 Allen Street
Pittsfield, MA 01201

Copies of the NOI may be examined or acquired from the Conservation Commissions.

See Conservation Commission website for the meeting schedule for exact dates and agendas.

To: The Environmental Monitor

From: The Town of Richmond, Massachusetts

Date: October 09, 2024

Re: Notification of filing an NOI for Richmond Pond

Anticipated date of submission: November 01, 2024

This project is seeking approval under an ecological restoration limited project provision to initiate an Aquatic Management Program at Richmond Pond in Richmond, MA. Targeted weed harvesting with mechanical harvester will be applied to manage non-native and invasive plant species to protect the interests of the Wetlands Protection Act by improving habitat value.

Reviewing Conservation Commission(s):

Richmond Conservation Commission
1751 State Road
Richmond, MA 01254

Pittsfield Conservation Commission
70 Allen Street
Pittsfield, MA 01201

Copies of the NOI may be examined or acquired from the Conservation Commissions.

See Conservation Commission website for the meeting schedule for exact dates and agendas.

AFFIDAVIT OF SERVICE

Under the Massachusetts Wetlands Protection Act

I, Danielle Fillio, hereby certify under the pains and penalties of perjury that on

10/31/24 ________ I gave notification to abutters in compliance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, in connection with the following matter:

A Notice of Intent filed under the

Massachusetts Wetlands Protection Act

by the Town of Richmond, MA

with the Richmond Conservation Commission

on ____________________ (date)

for the property located at Richmond Pond.

The form of the notification, and a list of the abutters to whom it was given and their addresses are attached to this Affidavit of Service.

Danielle Fillio
Name

10/31/24
Date

NOTIFICATION TO ABUTTERS UNDER THE MASS. WETLANDS PROTECTION ACT

In accordance with the second paragraph of the Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following:

A. The name of the applicant is __**Town of Richmond, MA**_______.

B. The applicant has filed a Notice of Intent with the Conservation Commission for the Town of Richmond seeking permission to remove, fill, dredge or alter an Area Subject to Protection Under the Wetlands Protection Act (General Laws Chapter 131, Section 40).

C. The address of the lot where the activity is proposed is _**Richmond Pond**___. The work proposed is **annual 2 foot lake level drawdown.**

D. Copies of the Notice of Intent may be examined at the Town of Richmond Conservation Commission, (413-553-7793) – Richmond Town Hall – 1751 State Road, Richmond, MA 01254, between the hours of:
8:00 AM - 4:00 PM – Monday -Thursday

E. Copies of the Notice of Intent may be obtained from either (check one):

__X___ the applicant _____ the applicant's representative
and/or
by calling the Richmond Conservation Commission Office at (413) 553-7793 in between the hours of
8:00 - 4:00 – Monday through Thursday

NOTE: Copies requested from the Richmond Conservation Commission Office will be charged at a time and materials rate. Please be advised that some copying requested through this office may need to be sent out to a copy service and pick-up and delivery charges will be passed onto the requestor, along with the actual cost of copying – (i.e. large sheet design plans).

F. Information regarding the date, time and place of the public hearing may be obtained from: Richmond Town Hall by calling this telephone number (413) 553-7793 between the hours of M-Th 8:00 to 4:00.

NOTE: Notice of the public hearing, including its date, time, and place will be published at least five (5) business days in advance in the **Berkshire Eagle** as a public legal notice.

NOTE: Notice of the public hearing, including its date, time, and place will be posted in Town Hall not less than forty-eight (48) hours in advance (do not count Saturdays, Sundays and holidays.)

NOTE: You may also contact your local Conservation Commission or the nearest Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protection Act. DEP administrative jurisdiction over Richmond, MA is the Western Region: (WERO) 436 Dwight Street, Springfield, MA 01103. (413-784-1100).

NOTIFICATION TO ABUTTERS UNDER THE MASS. WETLANDS PROTECTION ACT

In accordance with the second paragraph of the Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following:

A. The name of the applicant is __**Town of Richmond, MA**______.

B. The applicant has filed a Notice of Intent with the Conservation Commission for the Town of Richmond seeking permission to remove, fill, dredge or alter an Area Subject to Protection Under the Wetlands Protection Act (General Laws Chapter 131, Section 40).

C. The address of the lot where the activity is proposed is **Richmond Pond**___. The work proposed is **aquatic herbicide application.**

D. Copies of the Notice of Intent may be examined at the Town of Richmond Conservation Commission, (413-553-7793) – Richmond Town Hall – 1751 State Road, Richmond, MA 01254, between the hours of:
8:00 AM - 4:00 PM – Monday -Thursday

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NOTE: You may also contact your local Conservation Commission or the nearest Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protection Act. DEP administrative jurisdiction over Richmond, MA is the Western Region: (WERO) 436 Dwight Street, Springfield, MA 01103. (413-784-1100).

NOTIFICATION TO ABUTTERS UNDER THE MASS. WETLANDS PROTECTION ACT

In accordance with the second paragraph of the Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following:

A. The name of the applicant is **Town of Richmond, MA**.

B. The applicant has filed a Notice of Intent with the Conservation Commission for the Town of Richmond seeking permission to remove, fill, dredge or alter an Area Subject to Protection Under the Wetlands Protection Act (General Laws Chapter 131, Section 40).

C. The address of the lot where the activity is proposed is **Richmond Pond**. The work proposed is **weed harvesting of aquatic vegetation.**

D. Copies of the Notice of Intent may be examined at the Town of Richmond Conservation Commission, (413-553-7793) – Richmond Town Hall – 1751 State Road, Richmond, MA 01254, between the hours of:
8:00 AM - 4:00 PM – Monday -Thursday

E. Copies of the Notice of Intent may be obtained from either (check one):

__X__ the applicant _____ the applicant's representative
and/or
by calling the Richmond Conservation Commission Office at (413) 553-7793 in between the hours of
8:00 - 4:00 – Monday through Thursday

NOTE: Copies requested from the Richmond Conservation Commission Office will be charged at a time and materials rate. Please be advised that some copying requested through this office may need to be sent out to a copy service and pick-up and delivery charges will be passed onto the requestor, along with the actual cost of copying – (i.e. large sheet design plans).

F. Information regarding the date, time and place of the public hearing may be obtained from: Richmond Town Hall by calling this telephone number (413) 553-7793 between the hours of M-Th 8:00 to 4:00.

NOTE: Notice of the public hearing, including its date, time, and place will be published at least five (5) business days in advance in the **Berkshire Eagle** as a public legal notice.

NOTE: Notice of the public hearing, including its date, time, and place will be posted in Town Hall not less than forty-eight (48) hours in advance (do not count Saturdays, Sundays and holidays.)

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ABUTTERS LIST	RICHMOND SHORES				
Parcel ID	Owner	Address	TOWN/CITY	State	Zip Code
249/101.0-0100-0000.0	COMMONWEALTH OF MASSACHUSETTS	100 NASHUA ST	BOSTON	MA	02114-
249/101.0-0135-0000.0	VIOLA, MICHAEL J & CHRISTINE	75 LANDERS ROAD	LEE	MA	01238-
249/101.0-0138-0000.0	GARFINKEL, DANIELLE BETH TRUSTEE	27 NATHANIEL BLVD	DELMAR	NY	12054-
249/101.0-0141-0000.0	RICHMOND, TOWN OF	1529 STATE ROAD	RICHMOND	MA	01254-
249/101.0-0156-0000.0	MURTHA, THOMAS E. & JANETTE L	26 MARTY LANE	SOUTH WINDSOR	CT	06074-
249/104.0-0013-0000.0	BOY'S CLUB OF PITTSFIELD	16 MELVILLE ST.	PITTSFIELD	MA	01201-
249/104.0-0036-0000.0	KAISER, DONALD L. (TC)	76 QUEVIC DRIVE	SARATOGA SPRINGS	NY	12866-8957
249/101.0-0133-0000.0	KELLOGG, JEFFEREY J & LEWIS-KELLOGG, ELIZABETH	26 STORMVIEW ROAD	LANESBORO	MA	01237-
249/101.0-0134-0000.0	KELLOGG, JEFFREY J & LEWIS-KELLOGG, ELIZABETH	26 STORMVIEW ROAD	LANESBOROUGH	MA	01237-
249/101.0-0140-0000.0	BENSCOTER, CAROLYN A	250 WORTHINGTON ROAD	WINDSOR	MA	01270-
249/101.0-0144-0000.0	SABINO, JENNIFER	PO BOX 880	STOCKBRIDGE	MA	01262-
249/101.0-0147-0000.0	RICHTER BETH ROSENBERG & ROSENBERG, JOAN	18 BUTTERNUT LANE	NORTHAMPTON	MA	01060-
249/101.0-0152-0000.0	RICHMOND SHORES LLC	P.O. BOX 3292	PITTSFIELD	MA	01202-
249/101.0-0159-0000.0	GORDNIER CRAIG & KIM	210 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0160-0000.0	ROBERTS SHERRY L TRUSTEE	208 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0172-0000.0	PATTERSON, STEVAN F & PAULA M	PO BOX 111	RICHMOND	MA	01254-
249/101.0-0184-0000.0	RIDGE MAUREEN	129 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0128-0000.0	FRIEDER, HELEN M	7910 34TH AVE APT 6N	JACKSON HEIGHTS	NY	11372-2426
249/101.0-0131-0000.0	KRUSHNIC RICHARD & MARKOWITZ SUSAN	20 OAK STREET	CAMBRIDGE	MA	02139-
249/101.0-0132-0000.0	GREBELDINGER BRIAN & FRIEDERIKE	240 SHORE ROAD	PITTSIFLED	MA	01201-
249/101.0-0136-0000.0	MARCEAU STEPHEN & AROOTH MARCIA	51 CHURCHILL CREST	PITTSFIELD	MA	01201-
249/101.0-0151-0000.0	RICHMOND SHORES CIVIC ASSOCIATION	240 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0161-0000.0	SELIGMAN, RICHARD & MARK, CO-TRUSTEES	10605 BRUNSWICK AVE	KENSINGTON	MD	20895-
249/101.0-0163-0000.0	RICHMOND SHORES CIVIC ASSOCIATION	240 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0173-0000.0	KEEN, RYAN, RENEE & KELLIE	345 KERRWOOD DRIVE	WAYNE	PA	19087-
249/101.0-0174-0000.0	GARSON, KATHRYN E. SHOGRY-HAYER,	20 EAST STREET	LEE	MA	01238-9067

249/101.0-0178-0000.0	BLAUER, JOANNE & WEINTRAUB, ABIGAIL	215 WEST 91ST ST APT 72	NEW YORK	NY	10024-
249/104.0-0035-0000.0	KAISER, RONALD P. SR & DONALD L. (TC)	11 CLOVE COURT	CLIFTON PARK	NY	12065-
249/101.0-0068-0000.0	RENZI MATTHEW	70 HEMLOCK ROAD	PITTSFIELD	MA	01201-
249/101.0-0143-0000.0	MILLER, PETER G. & JOSEPHINE	676 MAIN STREET	SOUTH WINDSOR	CT	06074-
249/101.0-0149-0000.0	NEUMANN PAUL & LYNDA	421 COOLIDGE DRIVE	CENTERPORT	NY	11721-
249/101.0-0158-0000.0	MULCAHY, DONNA	135 VALLEY VIEW DRIVE	SOUTH WINDSOR	CT	06074-
249/101.0-0170-0000.0	GURWITZ, A & ABRAMOWITZ S	144 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0177-0000.0	KAISER, DONALD L. (TC)	76 QUEVIC DRIVE	SARATOGA SPRINGS	NY	12966-8957
249/104.0-0033-0000.0	KITTERMAN, RONALD	75 GEORGES STREET	LEE	MA	01238-
249/101.0-0139-0000.0	ROSENBLUM, ALEX S & SABINA (TE)	3333 HENRY HUDSON PKWY A	BRONX	NY	10463-
249/101.0-0150-0000.0	WECHTER, KRIS E & MARY LOU	274 SHORE ROAD	PITTSFIELD	MA	01201-
249/104.0-0032-0000.0	LAZAR, MARK H. & JAMIE A	1 BRANDYWINE DRIVE	EAST BRUNSWICK	NJ	08816-
249/104.0-0034-0000.0	TRIGOBOFF, JOSEPH & KIMBERLEE	67-123 DARTMOUTH STREET	FOREST HILLS	NY	11375-
249/101.0-0148-0000.0	SMITH MARVIN	295 AVENUE OF KINGS	NOKOMIS	FL	34275-
249/101.0-0153-0000.0	KELLOGG, BARRY N. TRUSTEE	1300 N RIVER RD. #E98	VENICE	FL	34293-
249/101.0-0154-0000.0	GREBELDINGER BRIAN & FRIEDERIK	240 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0175-0000.0	LEHMANN, DANIEL L	850 MATADERO AVE	PALO ALTO	CA	94306-
249/101.0-0183-0000.0	VIOLA ANTHONY	115 RICHMOND SHORE ROAD	PITTSFIELD	MA	01201-
249/104.0-0012-0000.0	BOY'S CLUB OF PITTSFIELD	16 MELVILLE ST.	PITTSFIELD	MA	01201-
249/101.0-0130-0000.0	MCNULTY, SHARON LEE	15 GREYSTONE DRIVE	VOORHEESVILLE	NY	12186-
249/101.0-0142-0000.0	RICHMOND, TOWN OF	1529 STATE ROAD	RICHMOND	MA	01254-
249/101.0-0146-0000.0	SCORPA, JOHN M. & CAROL A. (TE)	PO BOX 415	LANESBOROUGH	MA	01237-
249/101.0-0162-0000.0	GRUNOW, BRUCE H. & SHIRLEY, TRUSTEES	914 EAST NEW LENOX ROAD	PITTSFIELD	MA	01201-
249/101.0-0171-0000.0	BREWSTER, GEORGE O. W. & PAMELA J	15 MEAD STREET	PITTSFIELD	MA	01201-
249/101.0-0176-0000.0	VIOLA ANTHONY	115 RICHMOND SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0185-0000.0	DiSPAGNA, VINCENT J. JR	536 WHITE AVE.	NORTHVALE	NJ	07647-
249/101.0-0019-0000.0	BOY'S CLUB OF PITTSFIELD	16 MELVILLE ST	PITTSFIELD	MA	01201-
249/101.0-0137-0000.0	AURSWALD, LINDA LEE	279 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0145-0000.0	RENA H KIEVAL REVOCABLE TRUST	138 DARROCH ROAD	DELMAR	NY	12054-
249/101.0-0155-0000.0	GORDNIER, GRAIG A. & KIM M	16 ANTHONY ROAD	PITTSFIELD	MA	01201-
249/104.0-0020-0000.0	MCKINNIE, DOUGLAS & MONICA	3561 CR 14	MADRID	NY	13660-
249/104.0-0018-0000.0	JERVAS, CAROLEE & TAMMY	29 ELM ROAD	PITTSFIELD	MA	01201-
249/104.0-0014-2000.0	JERVAS, CAROLEE & TAMMY	29 ELM ROAD	PITTSFIELD	MA	01201-

249/104.0-0025-0000.0	MCKINNIE, DOUGLAS & MONICA	3561 CR 14	MADRID	NY	13660-
249/104.0-0014-1000.0	JERVAS TAMMY J	29 ELM ROAD	PITTSFIELD	MA	01201-
249/104.0-0017-0000.0	JERVAS, TAMMY	29 ELM ROAD	PITTSFIELD	MA	01201-
249/104.0-0021-0000.0	GRIZEY, THOMAS G	1 WILLOW ROAD	PITTSFIELD	MA	01201-
249/104.0-0031-0000.0	DEMPSEY KENNETH & KATHLEEN	67 BUNCE ROAD	ASHLEY FALLS	MA	01222-
249/104.0-0020-0000.0	MCKINNIE, DOUGLAS & MONICA	3561 CR 14	MADRID	NY	13660-
249/104.0-0040-0000.0	GREEN, PAMELA R. TRUSTEE	20 EAST BEACH ROAD	PITTSFIELD	MA	01201-
249/101.0-0002-0000.0	COMMONWEALTH OF MASSACHUSETTS	251 CAUSEWAY STREET SUITE 400	BOSTON	MA	02114-
249/102.0-0053-0000.0	LEVY RICHARD & PATRICIA	PO BOX 42	RICHMOND	MA	01254-
249/102.0-0053-1000.0	CHAMPLIN, DONALD	105 LAKE ROAD	PITTSFIELD	MA	01201-
249/102.0-0054-0000.0	LEVY RICHARD & PATRICIA	PO BOX 42	RICHMOND	MA	01254-
249/101.0-0197-0000.0	BERNOW MATTHEW & OLIVIA	51 RIPLEY STREET	NEWTON CENTER	MA	02459-
249/104.0-0005-0000.0	PLANTIER, THOMAS & DORENE A	11 OAK ROAD	PITTSFIELD	MA	01201-
249/104.0-0007-0000.0	GRIZEY, THOMAS G	1 WILLOW ROAD	PITTSFIELD	MA	01201-
249/104.0-0008-0000.0	GRIZEY, THOMAS G	1 WILLOW ROAD	PITTSFIELD	MA	01201-
249/104.0-0009-0000.0	GRIZEY, THOMAS G	1 WILLOW ROAD	PITTSFIELD	MA	01201-
249/101.0-0001-0000.0	BOY'S CLUB OF PITTSFIELD	16 MELVILLE ST	PITTSFIELD	MA	01201-
249/101.0-0006-0000.0	BOY'S CLUB OF PITTSFIELD	16 MELVILLE ST.	PITTSFIELD	MA	01201-
249/104.0-0001-0000.0	BOY'S CLUB OF PITTSFIELD	16 MELVILLE ST.	PITTSFIELD	MA	01201-
249/104.0-0011-0000.0	HAIDAR ELIAS A. TRUSTEE	17 CHESTNUT STREET	CHARLESTOWN	MA	02129-3812
249/104.0-0012-0000.0	BOY'S CLUB OF PITTSFIELD	16 MELVILLE ST.	PITTSFIELD	MA	01201-
249/101.0-0164-0000.0	PORITZKY, SANDY	15 HIDDEN GLEN ROAD	SCARSDALE	NY	10583-
249/101.0-0165-0000.0	DREWNIANY, BONNIE L	77 N.LAKE POINTE DRIVE	COLUMBIA	SC	29229-4336
249/101.0-0169-0000.0	WOLFE EMILIA EMMA	110 STEUBEN ST. #5B	BROOKLYN	NY	11205-
249/101.0-0172-0000.0	PATTERSON, STEVAN F & PAULA M	PO BOX 111	RICHMOND	MA	01254-
249/101.0-0190-0000.0	BOHLMAN, ROBERT S	159 WILLOW ROAD	PITTSFIELD	MA	01201-
249/101.0-0192-0000.0	GREEN, MICHAEL D	7 BRIDGE STREET	PITTSFIELD	MA	01201-
249/102.0-0002-2000.0	KILLEEN P & M. TRUSTEES	3 BALSAM DRIVE	WILBRAHAM	MA	01095-
249/102.0-0002-6000.0	FOOTE, CARL B & A L TRUSTEES	54 GALWAY COURT	LENOX	MA	01240-2609
249/101.0-0142-0000.0	RICHMOND, TOWN OF	1751 STATE ROAD	RICHMOND	MA	01254-
249/101.0-0166-0000.0	RICHMOND SHORES CIVIC ASSOCIATION	50 SPRUCE ROAD	PITTSFIELD	MA	01201-
249/102.0-0002-1000.0	BUTTENWIESER, PAUL A. & CATHERINE F	200 MARSH STREET	BELMONT	MA	02478-
249/102.0-0002-7000.0	ANDREWS, BRUCE A	95 JACOBY AVE.	PITTSFIELD	MA	01201-

249/102.0-0036-0000.0	KELLY PROPERTIES NOMINEE TRUST	10 HANCOCK WAY	WESTBOROUGH	MA	01581-
249/101.0-0143-0000.0	MILLER, PETER G. & JOSEPHINE	676 MAIN STREET	SOUTH WINDSOR	CT	06074-
249/101.0-0147-0000.0	RICHTER BETH ROSENBERG	1542 NORTH STREET	PITTSFIELD	MA	01201-
249/101.0-0149-0000.0	NEUMANN PAUL & LYNDA	421 COOLIDGE DRIVE	CENTERPORT	NY	11721-
249/101.0-0158-0000.0	MULCAHY, DONNA	135 VALLEY VIEW DRIVE	SOUTH WINDSOR	CT	06074-
249/101.0-0163-0000.0	RICHMOND SHORES CIVIC ASSOCIATION	50 SPRUCE ROAD	PITTSFIELD	MA	01201-
249/101.0-0170-0000.0	GURWITZ, A & ABRAMOWITZ S	144 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0177-0000.0	KAISER, DONALD L. (TC)	76 QUEVIC DRIVE	SARATOGA SPRINGS	NY	12866-957
249/101.0-0150-0000.0	WECHTER, KRIS E	274 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0167-0000.0	MILLER, MICHAEL & MARY DOCKRAY-MILLE	160 NORFOLK ST. #1	CAMBRIDGE	MA	02139-
249/101.0-0198-0000.0	36 EAST BEACH ROAD LLC	109 3RD DILIDO TERRACE	MIAMI BEACH	FL	33139-
249/102.0-0002-3000.0	STOVER, RICHARD K. III	495 SWAMP ROAD	PITTSFIELD	MA	01201-
249/102.0-0002-9000.0	KING CHRISTOPHER & BRIDGET	48 SIMMONS BROOK DR	WESTFIELD	MA	01085-7258
249/102.0-0039-0000.0	SCHNEIT, ALAN W. & FRANCINE	35 GRANITE RIDGE ROAD	CUMBERLAND FORESID	ME	04110-
249/102.0-0047-2000.0	DEW-CHAMPLIN, PENNY	105 LAKE ROAD	PITTSFIELD	MA	01201-
249/101.0-0148-0000.0	SMITH MARVIN	295 AVENUE OF KINGS	NOKOMIS	FL	34275-
249/101.0-0153-0000.0	KELLOGG, BARRY N. TRUSTEE	1300 N RIVER RD. #E98	VENICE	FL	34293-
249/101.0-0154-0000.0	GREBELDINGER BRIAN & FRIEDERIK	240 SHORE ROAD	PITTSFIELD	MA	01201-
249/101.0-0161-0000.0	SELIGMAN, M.;LEE,M.;SELIGMAN,R.B. TR	10605 BRUNSWICK AVE	KENSINGTON	MD	20895-
249/101.0-0168-0000.0	MILLER, MICHAEL & DOCKRAY-MILLER, MAR	160 NORFOLK ST. #1	CAMBRIDGE	MA	02139-
249/101.0-0175-0000.0	LEHMANN, DANIEL L	850 MATADERO AVE	PALO ALTO	CA	94306-
249/101.0-0191-0000.0	NOTARNICOLA, TOM M	9 CHERRY ROAD	PITTSFIELD	MA	01201-
249/102.0-0002-1100.0	JOHNSON CHRISTOPHER	135 TAYLOR AVENUE	DEDHAM	MA	02026-
249/102.0-0002-4000.0	O'BRIEN, DAVID J	965 MAIN ST. UNIT 10	HOLDEN	MA	01520-
249/101.0-0141-0000.0	RICHMOND, TOWN OF	1751 STATE ROAD	RICHMOND	MA	01254-
249/101.0-0146-0000.0	SCORPA, JOHN M. & CAROL A. (TE)	PO BOX 415	LANESBOROUGH	MA	01237-
249/101.0-0162-0000.0	GRUNOW, BRUCE H. & SHIRLEY, TRUSTEES	914 EAST NEW LENOX ROAD	PITTSFIELD	MA	01201-
249/101.0-0171-0000.0	BREWSTER, GEORGE O. W. & PAMELA J	15 MEAD STREET	PITTSFIELD	MA	01201-
249/101.0-0176-0000.0	VIOLA ANTHONY	115 RICHMOND SHORE ROAD	PITTSFIELD	MA	01201-
249/102.0-0002-8000.0	BOURGEOIS, SANDRA L	PO BOX 113	RICHMOND	MA	01254-
249/102.0-0047-1000.0	WINTMAN BRUCE	42 LAKE ROAD EXT	PITTSFIELD	MA	01201-
249/101.0-0002-0000.0	COMMONWEALTH OF MASSACHUSETTS	251 CAUSEWAY STREET SUITE	BOSTON	MA	02114-
249/101.0-0145-0000.0	RENA H KIEVAL REVOCABLE TRUST	138 DARROCH ROAD	DELMAR	NY	12054-
249/101.0-0155-0000.0	GORDNIER, GRAIG A. & KIM M	16 ANTHONY ROAD	PITTSFIELD	MA	01201-

249/101.0-0179-0000.0	BELODOFF, HAL R. TR	144 FULLER STREET	WEST NEWTON	MA	02465-
249/101.0-0181-0000.0	ADELMAN, JON & NANCY	119 EDGEWOOD ROAD	OSSINING	NY	10562-
249/101.0-0182-0000.0	RICHMOND SHORES CIVIC ASSOCIATION	50 SPRUCE ROAD	PITTSFIELD	MA	01201-
249/102.0-0002-5000.0	FAYE M. LESSNER TRUST	3 RODNEY TERRACE	NORTHBOROUGH	MA	01532-
249/102.0-0037-0000.0	NARDACCI, ALEXANDER & JUDITH	29 STRINGER AVENUE	LEE	MA	01238-9569
249/102.0-0038-0000.0	LEVITAN, KATHRINE D	PO BOX 846	NEW LEBANON	NY	12125-

Jeffrey Daigle, Member

Ray Supranowicz, Member

Mary K. Stodden, Administrative Assessor

This document reflects the data for a certified abutters list for Richmond Pond, Richmond, MA
as prepared by the Richmond Board of Assessors.

Mary K. Stodden Date October 29, 2024

Mary K. Stodden, Administrative Assessor

AFFIDAVIT OF SERVICE

Under the Massachusetts Wetlands Protection Act

I, James McGrath, hereby certify under the pains and penalties of perjury that on

10/23/24 I gave notification to abutters in compliance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, in connection with the following matter:

A Notice of Intent filed under the

Massachusetts Wetlands Protection Act

by Town of Richmond, MA

with the Pittsfield Conservation Commission

on ____________________ (date)

for the property located at Richmond Pond.

The form of the notification, and a list of the abutters to whom it was given and their addresses are attached to this Affidavit of Service.

[signature] ____________________
Name

10/24/24 ____________________
Date

NOTIFICATION TO ABUTTERS UNDER THE MASS. WETLANDS PROTECTION ACT

In accordance with the second paragraph of the Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following:

A. The name of the applicant is **Town of Richmond MA**.

B. The applicant has filed a Notice of Intent with the Conservation Commission for the City of Pittsfield seeking permission to remove, fill, dredge or alter an Area Subject to Protection Under the Wetlands Protection Act (General Laws Chapter 131, Section 40).

C. The address of the lot where the activity is proposed is **Richmond Pond**. The work proposed is **water level drawdown.**

D. Copies of the Notice of Intent may be examined at the City of Pittsfield Conservation Commission, (413-499-9359) – Pittsfield City Hall – Room 202, 70 Allen Street, between the hours of:
8:30 AM - 4:00 PM – Monday - Friday

E. Copies of the Notice of Intent may be obtained from either (check one):

✓ the applicant _____ the applicant's representative
and/or
by calling the Pittsfield Conservation Commission Office at (413) 499-9359 in between the hours of
8:30 - 4:00 – Monday through Friday

NOTE: Copies requested from the Pittsfield Conservation Commission Office will be charged at a time and materials rate. Please be advised that some copying requested through this office may need to be sent out to a copy service and pick-up and delivery charges will be passed onto the requestor, along with the actual cost of copying – (i.e. large sheet design plans).

F. Information regarding the date, time and place of the public hearing may be obtained from: ✓ by calling this telephone number (413) 499-9359 between the hours of M-F 830 to 4 pm.

NOTE: Notice of the public hearing, including its date, time, and place will be published at least five (5) business days in advance in the **Berkshire Eagle** as a public legal notice.

NOTE: Notice of the public hearing, including its date, time, and place will be posted in City Hall not less than forty-eight (48) hours in advance (do not count Saturdays, Sundays and holidays.) To view the agenda, please visit https://www.cityofpittsfield.org/document_center/conservation_commission_agendas_minutes.php

NOTE: You may also contact your local Conservation Commission or the nearest Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protection Act. DEP administrative jurisdiction over Pittsfield is the Western Region: (WERO) 436 Dwight Street, Springfield, MA 01103. (413-784-1100).

NOTIFICATION TO ABUTTERS UNDER THE MASS. WETLANDS PROTECTION ACT

In accordance with the second paragraph of the Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following:

A. The name of the applicant is __**Town of Richmond MA**______.

B. The applicant has filed a Notice of Intent with the Conservation Commission for the City of Pittsfield seeking permission to remove, fill, dredge or alter an Area Subject to Protection Under the Wetlands Protection Act (General Laws Chapter 131, Section 40).

C. The address of the lot where the activity is proposed is _**Richmond Pond**___. The work proposed is **aquatic herbicide application.**

D. Copies of the Notice of Intent may be examined at the City of Pittsfield Conservation Commission, (413-499-9359) – Pittsfield City Hall – Room 202, 70 Allen Street, between the hours of:
8:30 AM - 4:00 PM – Monday - Friday

E. Copies of the Notice of Intent may be obtained from either (check one):

✔ the applicant _____ the applicant's representative
and/or
by calling the Pittsfield Conservation Commission Office at (413) 499-9359 in between the hours of
8:30 - 4:00 – Monday through Friday

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NOTE: Notice of the public hearing, including its date, time, and place will be published at least five (5) business days in advance in the **Berkshire Eagle** as a public legal notice.

NOTE: Notice of the public hearing, including its date, time, and place will be posted in City Hall not less than forty-eight (48) hours in advance (do not count Saturdays, Sundays and holidays.) To view the agenda, please visit https://www.cityofpittsfield.org/document_center/conservation_commission_agendas_minutes.php

NOTE: You may also contact your local Conservation Commission or the nearest Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protection Act. DEP administrative jurisdiction over Pittsfield is the Western Region: (WERO) 436 Dwight Street, Springfield, MA 01103. (413-784-1100).

NOTIFICATION TO ABUTTERS UNDER THE MASS. WETLANDS PROTECTION ACT

In accordance with the second paragraph of the Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following:

A. The name of the applicant is __**Town of Richmond MA**______.

B. The applicant has filed a Notice of Intent with the Conservation Commission for the City of Pittsfield seeking permission to remove, fill, dredge or alter an Area Subject to Protection Under the Wetlands Protection Act (General Laws Chapter 131, Section 40).

C. The address of the lot where the activity is proposed is _**Richmond Pond**___. The work proposed is **weed harvesting of aquatic plants.**

D. Copies of the Notice of Intent may be examined at the City of Pittsfield Conservation Commission, (413-499-9359) – Pittsfield City Hall – Room 202, 70 Allen Street, between the hours of:
8:30 AM - 4:00 PM – Monday - Friday

E. Copies of the Notice of Intent may be obtained from either (check one):

✓ the applicant _____ the applicant's representative
and/or
by calling the Pittsfield Conservation Commission Office at (413) 499-9359 in between the hours of
8:30 - 4:00 – Monday through Friday

NOTE: Copies requested from the Pittsfield Conservation Commission Office will be charged at a time and materials rate. Please be advised that some copying requested through this office may need to be sent out to a copy service and pick-up and delivery charges will be passed onto the requestor, along with the actual cost of copying – (i.e. large sheet design plans).

F. Information regarding the date, time and place of the public hearing may be obtained from: ✓ by calling this telephone number (413) 499-9359 between the hours of M-F 830 to 4 pm.

NOTE: Notice of the public hearing, including its date, time, and place will be published at least five (5) business days in advance in the **Berkshire Eagle** as a public legal notice.

NOTE: Notice of the public hearing, including its date, time, and place will be posted in City Hall not less than forty-eight (48) hours in advance (do not count Saturdays, Sundays and holidays.) To view the agenda, please visit https://www.cityofpittsfield.org/document_center/conservation_commission_agendas_minutes.php

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Abutters to Richmond Pond

Pittsfield MA 01201

C020001001
Cloverdale Properties LLC
100 West St, #210
Pittsfield, MA 01201

B010003001
Town of Richmond, MA
1529 State Rd.
Richmond, MA 01254

C010099000
South Pond Farm Nominee Trust
1136 Barker Rd address
Pittsfield, MA 01201

ATTACHMENT B

Project Description

1.0 Introduction

The "Applicant", the Town of Richmond, in conjunction with the Richmond Pond Association, are seeking approval to continue the Aquatic Management Program at Richmond Pond. The continued objective of the management program is to control growth of nuisance and non-native aquatic plant species, curly-leaf pondweed (*Potamogeton crispus*), Eurasian watermilfoil (*Myriophyllum spicatum*), and spiny naiad (*Najas minor*), to improve and maintain open water habitat, maintain water quality, promote growth of less pervasive native plant species, and provide safe recreational access to the pond. Based on the type, distribution, and density of vegetation within Richmond Pond, it has been concluded the restoration goals of the Applicant can best be achieved through regular monitoring, annual drawdowns, the prudent use of USEPA/MA DAR registered herbicides , and possible targeted weed harvesting.

The proposed project has been filed as an Ecological Restoration Limited Project under 310 CMR 10.53(4) and will protect the interest of the Wetland Protection Act by controlling nuisance species, improving fish habitat, and improving water quality.[1] In addition, 310 CMR 10.53(3)(L) provides for the maintenance of water dependent uses, including safe recreational access to canals, beaches, and shorelines, minimizing any adverse effects.

2.0 Problem Statement:

Richmond Pond is a 228-acre, enhanced Great Pond located within the Housatonic River watershed (Attachment C – Figure 1). A significant portion of the water would be considered littoral area, where sunlight penetrates through the water to the sediment and can support dense aquatic macrophyte growth. Management has been undertaken at the waterbody since 1987, drawdowns, and annual herbicide treatments since 2005. Through the integrated management program, invasive species distribution and density has been significantly reduced since the 2013 filing of the Notice of Intent. In 2018, two herbicide treatments were conducted in May and August to manage the invasive species growth. If management is discontinued, unmanaged, dense growth of vegetation can degrade water quality, fish/wildlife habitat, and reduce recreational access to the pond. Based on the goals of the Applicant, a management program focusing on bacterial augmentation and chemical treatment with USEPA/MA DAR approved herbicides and algaecides is proposed to control the non-native and nuisance plant and algae species to maintain open water conditions and maintain desirable water quality. No weed management other than annual drawdown has been performed since 2021.

The proposed management program has been modified from a previously approved Order of Conditions (DEP File #271-0177) and will continue the objectives of reducing invasive vegetation growth, while seeking to improve the biologic function of the waterbody. It will continue to incorporate new information regarding effectiveness and safety of various management methods as it becomes available. Each method including annual drawdown, weed harvesting, and prudent use of herbicides will be discussed in this document as combined strategy.

3.0 Site Description:

Richmond Pond[2]	
Surface Area (acres)	228
Est. Mean Depth (feet)	12.7
Maximum Reported Depth (feet)	54
Estimated Volume	3,107 ac-ft. (1,012 million gal.)
Dominant Plant Species	Curly-leaf pondweed Waterweed Tapegrass Large-leaf pondweed

Richmond Pond is a 228-acre waterbody located in both Pittsfield and Richmond (Attachment C – Figure 2). The pond's watershed is large with an approximately 7.8 square mile drainage basin located to the west and south of the waterbody (Attachment C – Figure 3). Major tributaries include Mount Lebanon Brook which enters from the northwest and Royes Brook which enters from the southwest. Water exits the pond through a controllable outlet structure at the northern end of the pond before exiting to the Southwest Branch

[1] Department of Environmental Protection. Guidance for Aquatic Plant Management in Lake and Ponds as it Relates to the Wetlands Protection Act: April 2004, 1p.

[2] Estimates based on observed and reported conditions

Housatonic River. The shoreline of Richmond Pond supports moderate development of residential houses and a summer camp and is used for boating, fishing, and passive wildlife viewing.

4.0 Existing Conditions:

Regular surveys of the pond and the current conditions were performed throughout the management program in 2017 by SŌLitude Biologists to document existing target vegetation growth, in addition to an assessment of habitat features and vegetative composition (Attachment D). During the pre-treatment survey conducted 5/9/17 , curly-leaf pondweed growth was the most abundant species observed, with moderate to dense growth encompassing approximately 140-acres. Eurasian watermilfoil was only found in the southern inlet channel and with sparse to moderate growth to the north and south of the Shore Road bridge (Attachment C – Figure 4). Native vegetation at this time included: coontail (*Ceratophyllum demersum*), large-leaf pondweed (*Potamogeton amplifolius*), and macroalgae (*Chara sp.*).

Previous weed management treatments had been effective at controlling invasive weed species in the past. In 2021, Diquat and Copper treatments were discontinued. There has not been any further weed management at Richmond Pond except for the annual 2 foot drawdown.

The most recent weed survey for Richmond Pond was performed in July of 2023. This revealed the presence of invasive weed species as well as many native species as catalogued in the most recent Annual Report (See Addendum D). Trace amounts of Eurasian Watermilfoil were observed in a large portion of the littoral zone as well as lesser amounts of Spiny Naiad (see Figure 4A). During this 2023 survey, there was no Curly-leaf Pondweed (Potamogeton crispus), but this was likely due to the timing of the survey. Previous survey work at the lake showed that a substantial amount of Curly-leaf pondweed is present earlier in the season (See Figure 4B). The amount of Eurasian Milfoil and Curly-leaf Pondweed have increased substantially and have been definitively identified by Richmond Pond area residents in 2024. As weed management treatment has been on hold for the last several years due to changes in treatment options and application renewal delays; weed map surveys have been limited during this period.

Richmond Pond has benefitted from previous weed management of the invasive and proliferative weed species in past years. The towns of Richmond and Pittsfield look forward to further stewardship of Richmond Pond using a variety of safe and effective weed management efforts, including targeted herbicide treatment, weed harvesting, and annual 2 foot drawdown. These three integrated strategies are being applied for in this combined notice of intent.

5.0 In-Lake Management Recommendations:

5.1 Program Overview:

Five-year approval is requested for the continuation of the successful Aquatic Management Program at Richmond Pond. The continued goal of the management program is to control growth of invasive aquatic vegetation to improve and maintain open water habitat, promote the growth of less pervasive plant species, and provide safe recreational access to the pond through an integrated management program. This management program has been developed to be compatible with the goals of Applicant keeping in mind the regulatory responsibilities of the Pittsfield and Richmond Conservation Commissions, the Natural Heritage and Endangered Species Program, and MA DEP.

Our aims of improving water quality and manitaining open water habitat can be achieved through regular monitoring supplemented by various weed managments techniques including annual 2 foot lake level drawdowns performed in the late autumn. Lake drawdowns will further limit the pressure build up on the dam insuring greater dam longevity and hopefully avoiding dam failure which would likely be devastating to the indigenous wildlife and natural habitat in and around Richmond Pond. Two foot level lake drawdown when conducted in the prescribed manner below will have neglibile effects on the non-targeted species and wildlife associated with Richmond Pond.

In addition, the aquatic vegetation management strategy will include targeted weed harvesting, and use of USEPA/ MA DAR registered and NHESP approved aquatic herbicides: Sonar, ProcellaCOR, and Clearcast, use of which will be determined by annual and periodic weed mapping surveys. All three weed management techniques will be applied for with this combined notice of intent. The proposed herbicides listed below and detailed within this NOI target invasive and proliferative weeds in Richmond Pond. The proposed herbicides detailed below specifically afftect the invasive aquatic species to be controlled, and have a negligible effect on the

Non-targeted species and wildlife when applied in accordance with the label directions. All chemicals are applied at or below suggested doses accordin the product label. All doses are based on plant type and densities, so that a minimum amount of the chemicals is introduced into the waterbody.

No significant alteration to the wetland resource areas will occur as a result of the proposed pond management program; instead, the resource areas will be enhanced by controlling non-native, invasive and proliferative native weed species, while also improving water quality.

5.2 Proposed Products and Management Techniques

5.2A Annual 2 Foot Lake Level Drawdown

Overall, drawdowns in combination with targeted herbicide treatment have shown their combined success as an invasive and proliferative weed management strategy. In addition, the drawdown will preserve the vital longevity of the dam, which is critical to all the wildlife in and around the pond.

The principle mechanism through which water level drawdown controls aquatic plants is exposure to unfavorable climates for an extended period. This is accomplished by lowering the water level of the waterbody and exposing the target plants to the open air, essentially killing the plants and certain reproductive structures, due to the combined effects of sustained freezing and/or drying. Not every year is a "good" drawdown year as frequent rainfall, fluctuating water levels, early insulating snowfall, groundwater seepage and other factors can limit freezing and drying. Bottom substrates can also affect how well the drawdown works, as mucky and peaty soils (as are often seen in cove areas) are more resistant to drying.

Water level drawdown can be performed during the summer or winter months, but due to several factors, including environmental impacts, recreational usage, ability to refill and the added benefit of freezing temperatures, drawdowns are usually performed throughout the winter months in northern waterbodies. The following table presents the effect of drawdown on 19 common aquatic plants, including variable milfoil and bladderwort.

Effects of Drawdown on 19 Common Aquatic Plants*

Species that usually increase	alligator weed (*Alternanthera philoxerides*)
	hydrilla (*Hydrilla verticillata*)
	cutgrass (*Leersia oryzoides*)
	bushy pondweed (*Najas flexilis*)
	smartweed (*Polygonum coccineum*)
	leafy pondweed (*Potamogeton epihydrus*)
	softstem bullrush (*Scirpus validus*)
Species that usually decrease	watershield (*Brasenia schreberi*)
	fanwort (*Cabomba caroliniana*)
	coontail (*Ceratophyllum demersum*)
	Brazilian elodea (*Elodea densa*)
	milfoil (*Myriophyllum spp.*)
	southern naiad (*Najas guadalupensis*)
	yellow water lily (*Nuphar spp.*)
	water lily (*Nymphaea odorata*)
	Robbins's pondweed (*Potamogeton robbinsii*)
Species that do not change or have variable response	water hyacinth (*Eichhornia crassipes*)
	elodea (*Elodea canadensis*)
	cattail (*Typha latifolia*)
	bladderwort (*Utricularia sp.*)

*Based on Table from "Restoration and Management of Lakes and Reservoirs" by Cooke et.al.

Impacts Specific to the Wetlands Protection Act using Drawdown

- Protection of public and private water supply – Potential detriment (if adequate water for supply is not maintained), but can be neutral with proper management
- Protection of groundwater supply – Potential detriment (if lowered lake level lowers groundwater), but can be neutral (if groundwater level is maintained, or there is no significant interaction)
- Flood control – Benefit (flood storage potential increased)
- Storm damage prevention – Benefit (flood storage potential increased), but possible detriment (exposed areas may be subject to potentially damaging storm impacts)
- Prevention of pollution – May provide benefit (water quality enhancement) or detriment (water quality deterioration), but impacts generally limited
- Protection of land containing shellfish – Detriment (shellfish potentially exposed), but impacts may be neutral in some cases, and shellfish habitat may be improved overall
- Protection of fisheries - Possible benefit (habitat improvement) and possible detriment (temporary habitat loss) to different species in the same lake from same drawdown.
- Protection of wildlife habitat – Possible benefit (habitat improvement) and possible detriment (temporary habitat loss) to different species in the same lake from same drawdown.

Specifics of Annual Drawdown

2 Foot Annual Winter Drawdown. The drawdown shall comply with GEIR's Drawdown Performance Standards (Section 4.2.6.3, pdf page 332, summarized below)[1]:

a. Commence drawdown after the beginning of November.
b. Achieve the target drawdown depth by the beginning of December.
c. Achieve full lake refill level by the beginning of April.
d. Keep outflow during drawdown below a discharge equivalent to 4 cfs per square mile of watershed. Once the target water level is achieved, match outflow to inflow to the greatest extent possible, maintaining a stable water level.
e. Keep outflow during refill above a discharge equivalent to 0.5 cfs per square mile of watershed.
f. As per previous discussions with NHESP, the impacts and wetlands elevations around Richmond Pond as a result of the drawdown will be monitored by the Town, including impacts on any Bordering Vegetative Wetlands (BVW), specifically south of Town Beach Road (Richmond). Any adverse effects identified will be reported.

Dam Ownership and Operation

The dam which regulates outflow from Richmond Pond (see Figure 7) is owned and operated by Cloverdale Properties, LLC. They have been responsible for the annual drawdown in the past and will continue to take responsibility for this effort, following all proposed guideline specifics and carefully monitoring water levels. The owner of the dam assents to and authorizes this NOI, which includes the annual 2 foot lake level draw down (See the signed letter at the end of this subsection).

Authorization

With a Division-approved annual treatment plan (Condition B.1) submitted and approved, the 2-foot drawdown, may occur in 2025, 2026, 2027, 2028, and 2029. Thereafter, the Applicant will refile with the Division pursuant to the MESA prior to any further lake management activities.

Wetland Protection Act Filings Notice

When filing for any renewal, extension, or amendment of the WPA Orders of Conditions, the Applicant shall contact the Division for written response regarding impacts to Resource Area habitat of state-listed wildlife (310 CMR 10.59). A renewal, extension or amendment of Order of Conditions does not renew, extend, or amend this MESA authorization. The Applicant must refile with the Division pursuant to the MESA as specified herein.

1. Mattson, M.D., P.J. Godfrey, R.A. Barletta and A. Aiello. 2004. Eutrophication and Aquatic Plant Management in Massachusetts. Final Generic Environmental Impact Report. Edited by Kenneth J. Wagner. Department of Environmental Protection and Department of Conservation and Recreation, Executive Office of Environmental Affairs, Commonwealth of Massachusetts. (the "GEIR"); https:// www.mass.gov/files/documents/2016/08/sd/eutrophication-and-aquatic-plant- management-in-massachusetts-final-generic-environmental-impact-report-mattson.pdf

CLOVERDALE PROPERTIES, LLC
195 Cloverdale Street
Pittsfield, Massachusetts 01201

November 14, 2024

Re:	Dam Name:	Richmond Pond Dam
	Location of Dam:	195 Cloverdale Street, Pittsfield, MA
	National ID No:	MMA00017
	Record Owner:	Cloverdale Properties, LLC

To Whom it May Concern:

We are aware that there are Notices of Intents for Richmond Pond Weed Management being prepared on our behalf, which include the annual two-foot lake level drawdown, of which we approve.

This correspondence confirms that Cloverdale Properties, LLC is the record owner of the above-noted dam and that we are responsible for its safe operation and management as well as the implementation and monitoring of the drawdown.

Please contact me if you have further questions or need additional information. My email is tim@milltowncapital.com and my cell phone is (413) 841-9369.

Sincerely,

CLOVERDALE PROPERTIES, LLC

Signed by:

EA8E4072E0B841A

Timothy P. Burke, CEO
Mill Town Capital LLC, Its Manager

TPB/kmr

5.2B Annual Herbicide Treatment

• An Annual Herbicide Treatment Plan will be submitted. Annually, the Applicant will submit a treatment plan to the Division for review and written approval at least sixty (60) days prior to each year's proposed treatments. The treatment plan shall include, at a minimum, a detailed map of the proposed treatment area and methods, calculated treatment acres by method, proposed date(s) of treatment(s), proposed herbicide product names and formulations, active ingredients, active ingredient target concentrations and calculated treatment concentrations.

• Given our concerns for the safety of all the wildlife in and around Richmond Pond, including the Bridle Shiner and Bald Eagle species, Diquat and Chelated Copper herbicides will no longer be used as they had been the past, here and here elsewhere.

The new plan to address weed species in the pond in the most cost effective way would include a mix of tactics:

- Imazamox (Clearcast) to address Curly-leaf Pondweed in the spring
- Florpyrauxifen-benzyl (ProcellaCOR) for Eurasian Milfoil
- Fluridone (Sonar) or Weed Harvesting are considerations for Curly-leaf Pondweed and Eurasian Milfoil.

The above herbicides have been reviewed and approved by Natural Heritage. The concentrations specified for each application and for each product are noted below and will be followed. Impact statements for proposed herbicides are submitted.

Proposed Herbicides

Imazamox (Clearcast) – EPA # 241-437-67690, Imox – EPA # 20180108 or equivalent)
USEPA/MA registered herbicide Imazamox will be applied to only dense patches of curly leaf pondweed at or below the permissible label dose. This product may also be used to selectively maintain a healthy beneficial buffer by controlling encroaching emergent species. Imazamox will be applied at the application rate of approximately 3 qts/ac. Temporary water use restrictions for Imazamox are: 1) No drinking or cooking until residue testing results are below 50 ppb, 2) No irrigation until concentrations are below 50 ppb. There are no restrictions on swimming, boating, fishing, watering of livestock, or domestic use, but prudent herbicide management suggest that we close the area on the day of treatment. The shoreline will be posted with signs warning of these temporary water use restrictions prior to treatment. Imazamox is a systemic herbicide and is approved for injection treatments in aquatic environments.

Impacts Specific to the Wetlands Protection Act using Imazamox *

- Protection of public and private water supply – Generally neutral, but may have detriment at high doses (setback of treatment required, with distance based on dose and area treated)
- Protection of groundwater supply – Neutral (no interaction)
- Flood control - Neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction), but could be a detriment if plant die-off causes low oxygen at the bottom of the lake
- Protection of land containing shellfish - Generally neutral (no significant interaction)
- Protection of fisheries - Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)
- Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)

*Commonwealth of Massachusetts Executive Office of Environmental Affairs. Practical Guide to Lake Management: 2004. 133

Procellacor EC (Florpyrauxifen-benzyl) EPA Reg #67690-80: Procellacor will be applied via sub-surface injection for the control of Eurasian watermilfoil. We anticipate treatment of only small areas based on existing survey data (<10 acres total). Maximum applied concentration will be 7.72 ppb (4 PDU/acre foot).

Sonar (fluridone) EPA Reg #67690-21: Sonar Q (granular) will be applied via a calibrated spreader for the control of only nuisance areas of tapegrass. We anticipate treatment of <20-acres
total. The goal of the Sonar program is to maintain approximately 15 ppb fluridone within the treated areas from May through July, with applications starting in late April and spaced approximately 3-4 weeks apart. To achieve this concentration, three applications of Sonar will occur. The applications will be 40ppb, 50ppb, 60ppb.
Please see attached documents that describe Sonar impacts to fish, relevant sections below:
Acute – LC50 values for the fish tested ranged from 10 to 14 ppm, more than 500 times higher than the max of 20 ppb we'd seek to achieve in the water to for the listed target plants.
Chronic – no long-term impacts to fish when Sonar concentration is below 0.48 ppm, more than 24 times higher than the max of 20 ppb we'd seek to achieve in the water to for the listed target plants.

MASSACHUSETTS GEIR (See Attachment E):

Aquatic Organisms:

A number of studies have been conducted with fluridone to determine the LD50 or LC50 values for a variety of organisms. The LD50 (or LC50) is the dose (or concentration) to which a particular species is exposed, which results in the death of 50% of the test population. The EPA has cited the results of a number of these studies. EPA considers these studies to demonstrate moderate toxicity. These studies are listed in the Table III 5-2. In addition, a Maximum acceptable theoretica concentration (MATC) value for fathead minnow (second generation fry) was calculated to be between 0.48 mg/l and 0.96mg/l, meaning no treatment related effects were noted at or below 0.48 mg/l. Total length of 3-day old fry was reduced at 2 mg/l fluridone (USEPA, 1986).

Appendix III - Fluridone
No adverse effects were noted on crayfish, bass, bluegill, catfish, long-neck soft-shelled turtles, frogs, water snakes and waterfowl from the use of 0.1 to 1.0 ppm fluridone during field experiments (Arnold, 1979, McCowen et al., 1979 as cited in WSDOE, 1992). Application of 1.0 ppm fluridone to zooplankton caused a reduction in population, but the population quickly recovered. Application of 0.3 ppm did not cause a change in the total number of benthic organisms whereas application of 1.0 ppm did cause a change (Parka et al., 1978 as cited in WSDOE, 1992). An aqueous solution of fluridone caused a reduction in population of the amphipod Hyalella azteca when applied at a rate of 1.0 ppm but not when applied at a rate of 0.3 ppm (Arnold, 1979 as cited in McLaren/ Hart, 1995). Fish abundance and community structure remained unchanged in ponds exposed to a fluridone concentration level of 0.125ppm (Struve et al. 1991 as cited in McLaren/Hart, 1995). LC50 values for a variety of microscopic crustaceans including Diaptomus, sp., Eucyclops sp, Alonella sp., and Cypria sp., ranged from 8.0 - 13.0 ppm (Naqvi and Hawkins, 1989 as cited in McLaren/Hart, 1995).

Table III.5-2. Acute Toxicity Tests
SPECIES TEST TYPE VALUE
Daphnia magna 48-hr LC50 6.3 mg/l, Bluegill 96-hr LC50 12 mg/l, Rainbow trout 96-hr LC50 11.7 mg/l, Sheepshead minnow 96-hr LC50 10.91 mg/l, Oyster embryo larvae 48-hr LC50 16.51 mg/l (USEPA, 1986).
One group of investigators conducted extensive acute toxicity tests on a variety of aquatic invertebrates including amphipods, midges, daphnids, crayfish, blue crabs, eastern oysters and pink shrimp. The average 48-hour or 96-hour LC50 or EC50 (concentration at which 50% of the organisms exhibit an effect) was calculated as 4.3 + 3.7 ppm (Hamelink et al., 1986 as cited in McLaren/Hart, 1995). The same investigators also conducted studies with a variety of fish including rainbow trout, fathead minnows, channel catfish, bluegills and sheepshead minnows. A 96-hour LC50 value of 10.4+3.9 was calculated (Hamelink et al., 1986 as cited in McLaren/Hart, 1995). Daphnids, amphipods and midge larvae exposed chronically to fluridone concentrations of 0.2, 0.6 and 0.6 ppm as well as catfish fry exposed to fluridone concentrations of 0.5 ppm showed no treatment related significant effects. Exposure to concentrations of 1 ppm produced a decreased growth rate of catfish fry and concentrations of 0.95 and 1.9 ppm produced a decreased survival rate of fathead minnows within 30 days after hatching (Hamelink et al., 1986 as cited in McLaren/Hart, 1995).

NEW YORK GEIR (See Attachment E):
USEPA (1986a) summarizes the data developed from exposure of aquatic organisms in standard static water LC50 toxicity tests. Following exposure of Daphnia magna for 48 hours, the concentration of fluridone calculated to product an acute response in 50% of the test population was 6.3 ppm. Following exposure of rainbow trout (Salmo gairdneri) and bluegill (Lepomis macrochrius) for 96 hours, the concentration of fluridone calculated to produce a lethal response in 50% of the test population was 11.7 ppm and 12 ppm, respectively.

USEPA (1986a) also lists a Maximum Acceptable Toxicant Concentration (MATC) of greater than 0.48 ppm, but less than 0.96 ppm, for exposure of fathead minnow fry (Pimephales promelas) to fluridone, indicating that no treatment related effects on fathead minnow reproductive measures were observed at or below 0.48 ppm. Struve et al. (1991) observed that fish abundance and community structure remained unchanged in ponds exposed to a fluridone concentration level of 0.125 ppm.

Parka et al. (1978) reported that at the exaggerated rate of 1.0 ppm of fluridone in water, the total numbers of benthic organisms were significantly reduced when compared to a control population. They also noted that 0.3 ppm of fluridone in water did not significantly reduce total numbers of benthic organisms. Fluridone as an aqueous solution, when applied at the rate of 1.0 ppm resulted in the reduction of populations of the amphipod Hyalella azeteca while an application rate of 0.3 ppm did not result in the reduction of amphipod populations (Arnold, 1979). Naqvi and Hawkins (1989) reported Sonar LC50 values of 12.0 ppm, 8.0 ppm, 13.0 ppm and 13.0 ppm for the microcrustaceans Diaptomus sp., Eucyclops sp., Alonella sp., and Cypria sp., respectively.

Hamelink et al. (1986) conducted extensive acute and chronic toxicity tests on numerous fish and invertebrate organisms. For invertebrates, they noted an average 48-hour or 96-hour LC50 or EC50 (depending on the organisms) fluridone concentration of 4.3 ± 3.7 ppm. The representative invertebrates used in the study included amphipods (Gammarus pseudolimnaeus), midges (Chironomus pulmosus), daphnids (Daphnia magna), crayfish (Orconectes immunis), blue crabs (Callinectes sapidus), eastern oysters (Crassostrea virginica), and pink shrimp (Penaeus duroarum). For fish, they noted an average 96- hour LC50 fluridone concentration of 10.4 ± 3.9 ppm. The representative fish used in their study included rainbow trout (Salmo gairdneri), fathead minnows (Pimephales promelas) channel catfish (Ictalurus punctatus), bluegills (Lepomis macrochirus) and sheepshead minnows (Cyprinodon variegatus).

In the chronic toxicity tests conducted by Hamelink et al. (1986), no effects were observed in daphnids, amphipods, and midge larvae at fluridone concentrations of 0.2, 0.6, and 0.6 ppm, respectively. They reported that channel cattish fry exposed to fluridone concentrations of 0.5 ppm were not significantly affected. Catfish fry growth was reported as reduced at fluridone concentrations of 1.0 ppm. They also reported that chronic exposure of fathead minnows to mean concentrations of 0.48 ppm did not produce adverse effects. Results from Hamelink et al. (1986) indicated that fluridone concentrations of 0.95 and 1.9 ppm resulted in reduced survival of fathead minnow within 30 days after hatching. WISCONSIN DNR FACT SHEET (ATTACHED): Fluridone does not appear to have any apparent short-term or long-term effects on fish at legal application rates. Fish exposed to water treated with fluridone absorb fluridone into their tissues. Residues of fluridone in fish decrease as the herbicide disappears from the water. The EPA has established a tolerance for fluridone residues in fish of 0.5 parts per million (ppm).

Proposed 2025 Richmond Pond Herbicide Treatment

Aquatic vegetation treatment at Richmond Pond will focus on the control of non-native curlyleaf pondweed (Potamogeton crispus) and Eurasian watermilfoil (Myriophyllum spicatum). The herbicide of choice for Eurasian milfoil control is ProcellaCOR (florpyrauxifen-benzyl) and the best option for control of curlyleaf pondweed, considering NHESP concerns, is Clearcast (imazamox). Another option that is allowable by NHESP, that will control both species, is Sonar (fluridone) herbicide. Treatment with fluridone may also provide growth regulation of other problematic native species such as tapegrass (Vallisneria americana). Mechanical harvesting is a viable option for the management of overabundant native species and is being requested as well.

Proposed Activities

- Prior to any herbicide treatments, an annual License to Apply Chemicals will be obtained from MassDEP.

- A spring vegetation survey will be conducted to identify areas of target curlyleaf pondweed and Eurasian watermilfoil growth. The survey should be conducted in early May to observe curlyleaf pondweed which emerges earlier than most aquatic plants. Some Eurasian milfoil may also be present at that time, but a follow-up survey may be necessary later in the Spring.

- Depending on survey results and plant emergence, one treatment in mid-late May can be performed to control areas of both plants. A second application may be needed to control milfoil that emerges after the survey. Alternatively an initial treatment can be done for curlyleaf pondweed followed by a second treatment about a month later for milfoil.

- Clearcast would be applied at a rate of 100-150 ppb for curlyleaf control. ProcellaCOR would be applied at a rate of 2-4 PDU/acre-foot.

- Post-treatment surveys should be conducted to assess treatment success and monitor for any additional target plant growth.

- Fluridone Alternative - Rather than spot-treating individual areas of growth, the entire pond can be treated with a low-dose of fluridone. Fluridone concentrations will need to be maintained for 60+ days, requiring an initial and 1-2 follow-up applications. Fluridone will control both curlyleaf and Eurasian milfoil and may help to regulate the growth of native species including tapgrass.

Following the initial year of treatment, the incidence of both curlyleaf pondweed and Eurasian milfoil should be reduced. Some level of regrowth should be expected, especially for curlyleaf pondweed which doesn't exhibit a systemic response to the same extent as milfoil. If annual growth regulation of native species is desired, fluridone treatment will need to be done each year.

5.2C Targeted Weed Harvesting

1) Target of Harvesting. The proposed mechanical harvesting will target areas with dominant Myriophyllum spicatum L. (Eurasian, whorled, or spiked watermilfoil) and or Potamogeton crispus (Curly-leaf Pondweed), which are considered non-native and invasive in Massachusetts. In addition, high levels of Vallisneria americana (Tape Grass), may be targeted in select recreational areas for safety, including canal, dock corridors, shorelines, and beaches to insure safety for boating and swimming.

2) Maximum Extent and Area of Harvesting. The total footprint for all harvesting activities will be determined yearly based on annual survey of invasive weed species as noted above. The proposed amounts and locations for harvesting will vary from year to year. All weed harvesting shall be implemented as outlined in the proposed plan.

3) M. spicatum and P. crispus Pre-Harvesting Data Collection. A Submerged Aquatic Vegetation Survey to document the submerged aquatic vegetation (SAV) in Richmond Pond will be done as further described below.
a. The SAV community will be surveyed via boat using GPS and meter plots to assess general coverage and community composition.
b. The track of the boat is random within the boundaries of the "Potential Weed Harvesting Area" will be determined by the extent and area of the SAV communities encountered. During surveys, a floating meter square will be used to determine community composition, using both visual estimates of surface coverage, stem counts, and photo documents of the meter square. The number of samples will be a minimum of three for each community encountered.

c. In general, the survey will document stands of SAV greater than ~10 square meters and note presence of other plants in lesser abundance. Areas with sparse intermittent SAV will be documented and substrate type noted when possible. All SAV stands of single or mixed species will be geo-located as polygons and the edge of the beds recorded with GIS data points. This data can then be used to determine exact extent of the various SAV communities.
d. All plants will be identified in the field, including distinguishing species of Myriophyllum sp. and P. crispus with the use of a hand lens by a qualified botanist. If identification is in doubt, a voucher specimen will be collected with associated field notes and returned to the lab at the Berkshire Environmental Research Center for further analysis.
e. Maps showing the distribution and density of SAV will be created and harvesting will only occur in areas where M. spicatum and P. crispus are individually or collectively greater than 50% of the plant community in that area. Additionally, V. americana will only be targeted in areas where safety for boating and swimming are of great concern (See Attachment C, Figure 6).
f. Maps shall be sent to the Division, MassDEP and the Conservation Commissions as part of the post harvest reporting.

4) GPS Guided Harvesting. Harvesting will be conducted with a GPS guided system on the harvesting equipment to ensure work remains in designated areas using methods described. Tracks of the harvester shall be recorded and represented in the post-harvesting report.

5) Post-Harvesting Report. The Towns shall submit a written report documenting compliance with the conditions herein. The report shall be provided in writing to the Division, MassDEP and the Conservation Commission.

6) Notice: Request to Renew, Extend or Amend an Order of Conditions Pursuant to 310 CMR 10.00. Upon filing for any renewal, extension, or amendment of the Orders of Conditions, the Applicant shall similarly file with the Division pursuant to the MESA.

Special Considerations

• Members of the Conservation Commissions of Richmond and Pittsfield shall have the right to enter and inspect the area at reasonable hours to evaluate compliance, and may require the submittal of any data deemed necessary by the Conservation Commissions for that evaluation.

• Changes to the plans included in the Notice of Intent, or any changes in explanations and representations made to the Conservation Commissions by the applicant shall require the applicant to inquire of the Commissions in writing whether the change is significant enough to require the filing of a new Notice of Intent or amending any existing Order of Conditions. The Conservation Commissions are not obligated to grant changes, and will only grant changes by affirmative written communication to that effect.

• Any refueling of machinery shall take place outside of the buffer zone.

• Disposal of all vegetative refuse will be handled in a responsible manner with care being taken to avoid infringement, harm, and disruption of shoreline and surrounding wetlands.

• In order to achieve the most effective weed control and least disruptive activity to the pond wildlife mechanical harvesting will be performed on a limited basis, likely two times per growing season rather than on a continuous basis. Proposed targeting will include Richmond Shores Beach, South Pond Farm Beach, Richmond Public Beach, Public Boat Launch, Dock Corridor from Whitewood Association to Camp Russell Swimming Area, Camp Arrow Wood Beach, and the Richmond Shores Canal Inlet to the bridge. The use of the mechanical weed harvester will be limited to 150 yards from the shoreline. The total estimated area involved will be approximately 45 acres (See Attachment C, Figure 6)

• The mechanical weed harvester to be used has the ability to adjust blade depth from 0.5 to 6 feet. The mechanism of action of the mechanical weed harvester is to cut the weeds at the stem level below the seedhead so as to not disrupt the underlying sediment. Generally, as the work is taking place, fish and other wildlife will avoid the machine which creates surface disruption and moves at slow speed, far below that of other motorized boats on the lake. No hydroraking, dredging, or weed pulling will be performed, and these techniques are not being requested in this NOI application.

• Order of Conditions shall apply to any successor in interest or successor in control of the property and to any contractor or other person performing work conditioned by any Order of Conditions granted.

5.3 Annual Management Plan:

May	Early Season Survey	Identify targeted species and areas for treatment: Invasive species including milfoil and curley leaf pondweed.
June	Herbicide Treatment	Treat targeted areas.
July	Mid-Season Survey	Document initial treatment impact and plan for a second treatment.
	Targeted Weed Harvesting	Treat targeted areas.
August	Herbicide Treatment	Treat targeted areas.
	Targeted Weed Harvesting	Treat targeted areas.
September	Late Season Survey	Document impact of second treatment and prepare for the annual report.
November	Begin Annual 2 Foot Level Lake Drawdown	

See Section 5.5 for Previous Weed Management Treatment and Monitoring Schedules.

5.4 Monitoring:

Regular inspections will be conducted in order assess the growth phase of the target plant species and overall pond conditions. Post-management inspections will be conducted in order to assess the efficacy of the management efforts and any impacts on non-target species so future applications can be properly adjusted to minimize non-target impacts. Additionally, the vegetation and habitat features at the ten established survey points will be documented during the Pre-treatment, Mid-Season, and Post-Treatment surveys. Year-End Reports documenting our annual management efforts, observed conditions, management efficacy, and future recommendations will be provided to the Commission.

See Section 5.5 for Previous Weed Management Treatment and Monitoring Schedules.

5.5 Previous Weed Management Treatment and Monitoring Schedules

2018		
5/31/2018	Received MA DEP License to Apply Chemicals	
5/25/2018	Early Season Survey	Eurasian watermilfoil, curlyleaf pondweed about 140 acres
6/5/2018	Curlyleaf pondweed treatment	Diquat applied to band of 140 acres
7/30/2018	Interim Inspection	Spiny niaid observed
8/23/2018	Spiny naiad treatment	35 acres treated
10/1/2018	Late season survey	Few invasives were noted
11/20/2018	Annual report	Recommended similar treatment for 2019
2019		
6/7/2019	Received MA DEP License to Apply Chemicals	
5/25/2019	Early Season Survey	Administration delays cancelled the initial survey
6/5/2019	Initial treatment	and the initial treatment
7/15/2019	Mid Season Survey	Admin delays, scattered milfoil, tapegrass, spiny naiad
7/19/2019	Spiny naiad treatment	58 acres band along eastern and western shores, channel treated also
8/22/2019	Late season survey	Isolated spiny naiad outside of treatment areas
1/3/2020	Annual report	
2020		
4/2/2020	Received MA DEP License to Apply Chemicals	
5/21/2020	Early Season Survey	Curly leaf pondweed in band along shoreline spannning 24 acres
6/11/2020	Initial Herbicide treatment	Curly leaf pondweed and milfoil 24 acres with diquat including the channel
7/15/2020	Mid Season Survey	common waterweeds, tapegrass obswerved
8/24/2020	Spiny naiad treatment	10 acres treated with diquat including the channel
9/10/2020	Late season survey	Overall composition was native species traces of spiny naiad
1/15/2021	Annual report	Recommended similar treatment. Discussed tapegrass treatment options
2021		
5/13/2021	Received MA DEP License to Apply Chemicals	
5/25/2021	Early Season Survey	Curly leaf pondweed, no Eurasian milfoil
6/8/2021	herbicide treatment	44.4 acres treated with diquat including the channel were treated
7/15/2021	Mid Season Survey	No curlyleaf pondweed or milfoil found, common water weed and tapegrass
12/7/2021	Annual report	Recommended similar treatment. Harpoon (copper) granular herbicide not applied to a tapegrass test area per Natural Heritage requirement

No further weed management treatment other than Annual 2 Foot Lake Drawdown was performed since 2021. 2 Foot Annual Lake Level Drawdown has been performed safely and responsibly throughout this time period.

6.0 Alternatives Analysis:

Alternatives to the proposed Aquatic Plant Management Plan were considered. SŌLitude evaluated all available strategies for management of Southfield Court Pond. Findings and recommendations are based on direct experience and discussions found in the *Eutrophication and Aquatic Plant Management in Massachusetts Final Generic Environmental Impact Review* (FGEIR, EOEA 2004).

Bottom Weed Barriers: Not Recommended

Physical controls, such as the use of bottom weed barriers (i.e. Aquatic Weed Net or Palco) can be effective for small dense patches of nuisance vegetation, but are not cost effective or feasible for large areas. Weed barriers are expensive to install and maintain at ~$1.75/ft^2 (material & installation). Semi-annual maintenance to retrieve, clean and re-deploy the barriers would be expensive and time consuming. Additionally, covering expansive areas of the pond bottom may also have detrimental impacts on invertebrates or other types of wildlife.

Biological: Not Recommended

There are no proven biological controls available or approved by the State for the control of the invasive aquatic plant species present at Richmond Pond.

Sediment Excavation/Dredging: Not Recommended

Dredging nutrient rich bottom sediment is sometimes used as a strategy to control excessive weed growth. Conventional (dry) or hydraulic dredging would require the expenditure of hundreds of thousands of dollars in design and permitting fees alone. Dredging may also have severe impacts to aquatic organisms (i.e. fish and macroinvertebrates) in the ponds with no guarantees of elimination of invasive vegetation.

Do Nothing: Not Recommended

If the invasive and nuisance plant and algae growth is allowed to continue unabated, eutrophication and filling-in at the pond will continue to occur at an accelerated rate due to the annual decomposition of excessive plant material. Anoxic conditions would degrade water quality and potentially impact fish and other aquatic organisms. Stagnant conditions will also increase water temperatures promoting both algae and bacterial growth as well as providing extensive mosquito breeding habitat. The pond's recreational and aesthetic value would be significantly degraded.

7.0 Compliance

Massachusetts Wetlands Protection Act:
The objective of this project is to continue controlling an invasive species. Managing densities of native species will typically not adversely affect wildlife habitat and will not negatively impact other interests of the Massachusetts Wetlands Protection Act. No significant alteration to wetland resources areas will occur as a result of the proposed management program; instead the resource areas will be enhanced by controlling the nuisance aquatic weed growth. The proposed management activities are consistent with the guidelines in the following documents:

- Final Generic Environmental Impact Report: Eutrophication and Aquatic Plant Management in Massachusetts (June 2004)
- Guidance for Aquatic Plant Management in Lakes and Ponds: As it Relates to the Wetlands Protection Act (April 2004 – DEP Policy/SOP/Guideline # BRP/DWM/WW/G04-1)
- The Practical Guide to Lake Management in Massachusetts (2004)

Massachusetts Environmental Policy Act:

The strategies proposed in this NOI are options approved under the Massachusetts Environmental Protection Act (MEPA) process that was approved in 2004 with the issuance of the FGEIR and the *Practical Guide to Lake and Pond Management in Massachusetts*. These approaches do not require individual MEPA review.

Massachusetts Endangered Species Act:

According to the most recent Natural Heritage maps provided by MA GIS (Attachment C - Figure 5), Richmond Pond is located within area designated as Priority Habitats of Rare Species as determined by the Massachusetts Natural Heritage & Endangered Species Program (NHESP). A formal review by NHESP is required.

8.0 Impacts of the Proposed Management Plan Specific to the Wetlands Protection Act:

Protection of public and private water supply – Richmond Pond is not used directly as a drinking water supply. The proposed weed management techniques will not have any adverse impacts on the public or private water supply, when performed correctly.

Protection of groundwater supply – According to available studies, there is no reason to believe that the groundwater supply will be adversely impacted by the proposed management strategies, specifically with annual 2 foot lake level drawdown, NHESP approved herbicides, and targeted mechanical weed harvesting.

Flood control and storm damage prevention – No construction, dredging or alterations of the existing floodplain and storm damage prevention characteristics of the pond are proposed. However, in some instances, abundant and excessive aquatic plant growth can contribute to high water and flooding. Most commonly this occurs in the vicinity of waterbody outlets or water conveyance channels and structures. The unmanaged, annual growth and decomposition of abundant plant growth is also known to increase sediment deposition at an accelerated rate. Therefore, the proposed management approaches may increase the capacity of the resource area over the long-term to provide flood protection.

Prevention of pollution – No degradation of water quality or increased pollution is expected by the proposed management approaches.

Removal of the excessive growth of aquatic vegetation will contribute to improved water circulation and a reduction in the potential for anoxic conditions. The post-treatment decrease in plant biomass will help to decrease the rate of eutrophication currently caused by the decomposing of excessive plant material.

Protection of fisheries and shellfisheries – Contiguous, dense beds of aquatic vegetation provide poor habitat for most species of fish. Dense plant cover frequently results in significant diurnal fluctuations in dissolved oxygen as well as oxygen depletion during certain times of the year.

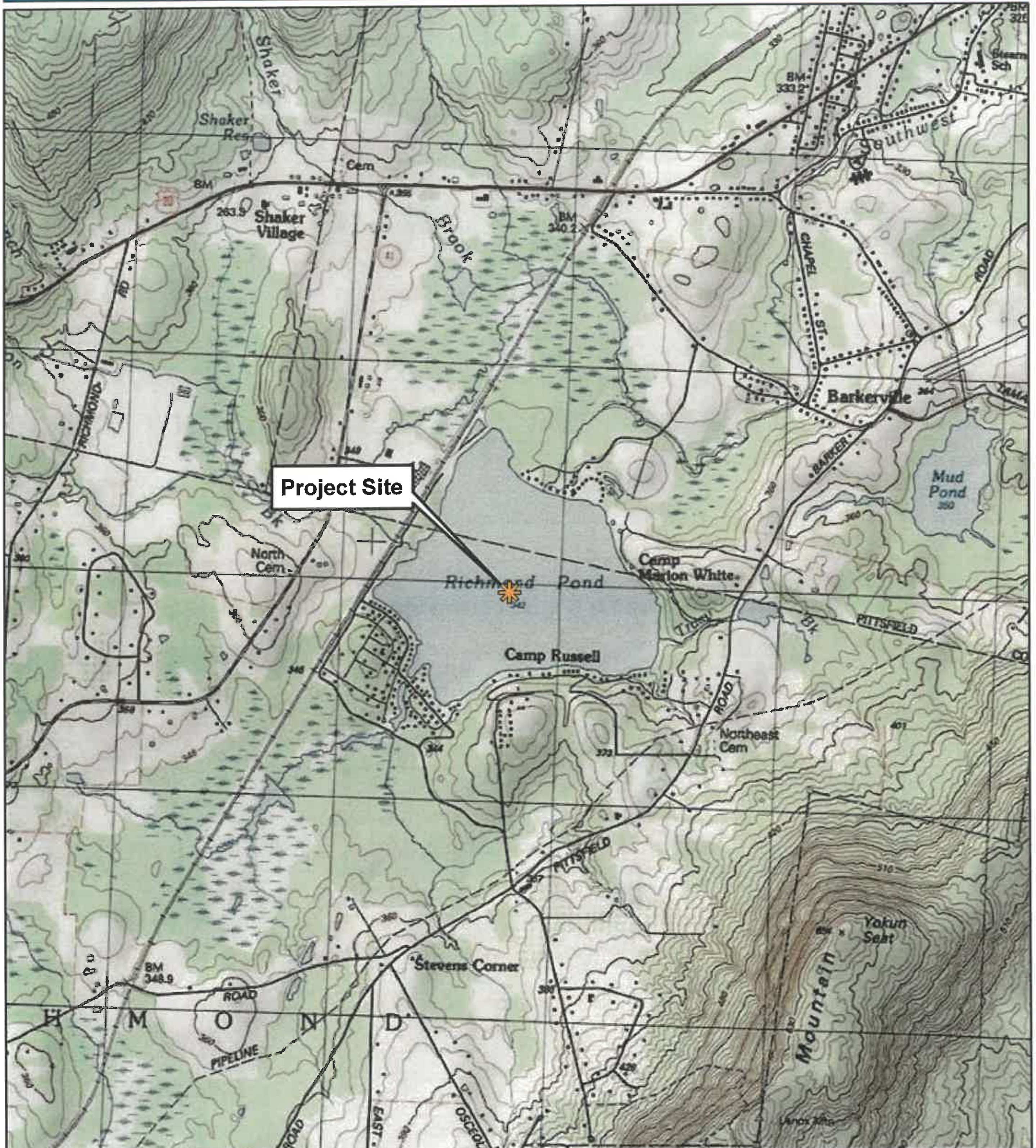
Protection of wildlife and wildlife habitat – In general, excessive and abundant plant growth, especially non-native plants, provides poor wildlife habitat for fish and other wildlife. The proposed management plan is expected to help prevent further degradation of the waterbody through excessive weed growth and improve the wildlife habitat value of the pond in the long-term. Maintaining a balance of open water and vegetated areas is intended.

ATTACHMENT C

Figures

FIGURE 1: Site Locus

SŌLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



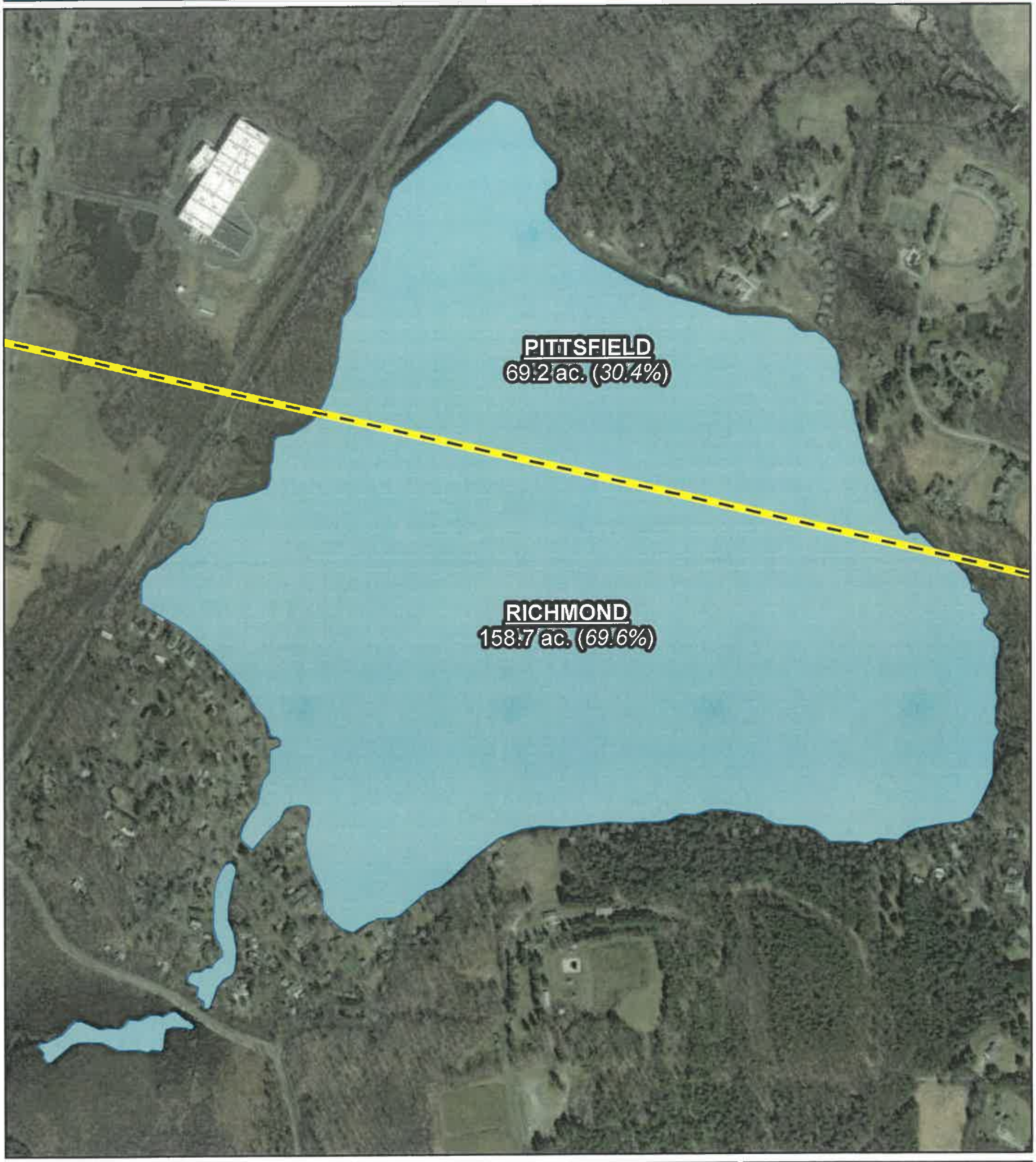
Richmond Pond
Pittsfield/Richmond, MA
Berkshire County
42.41535°, -73.32530°

Richmond Pond
0 1,000 2,000 3,000 Feet
1:24,000
N

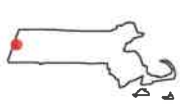
Map Date: 04/12/18
Prepared by: MS
Office: SHREWSBURY, MA

FIGURE 2: Waterbody Area by Town

SOLITUDE
LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Richmond Pond
Pittsfield/Richmond, MA
Berkshire County
42.41535°, -73.32530°



Richmond Pond

0 250 500 750 1,000 Feet

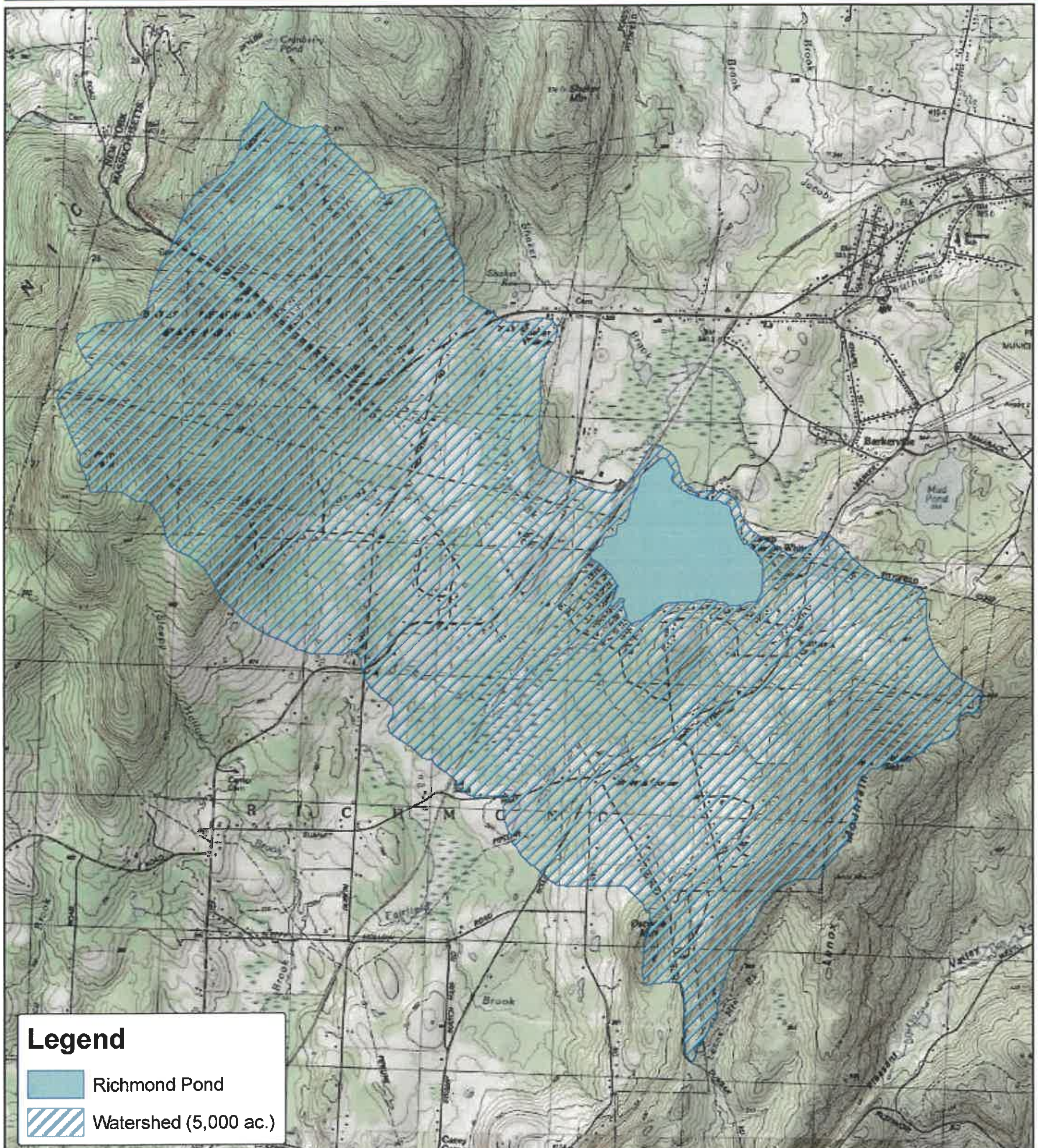
1:8,000

N

Map Date: 04/12/18
Prepared by: MS
Office: SHREWSBURY, MA

FIGURE 3: Watershed (USGS Streamstats)

SŌLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



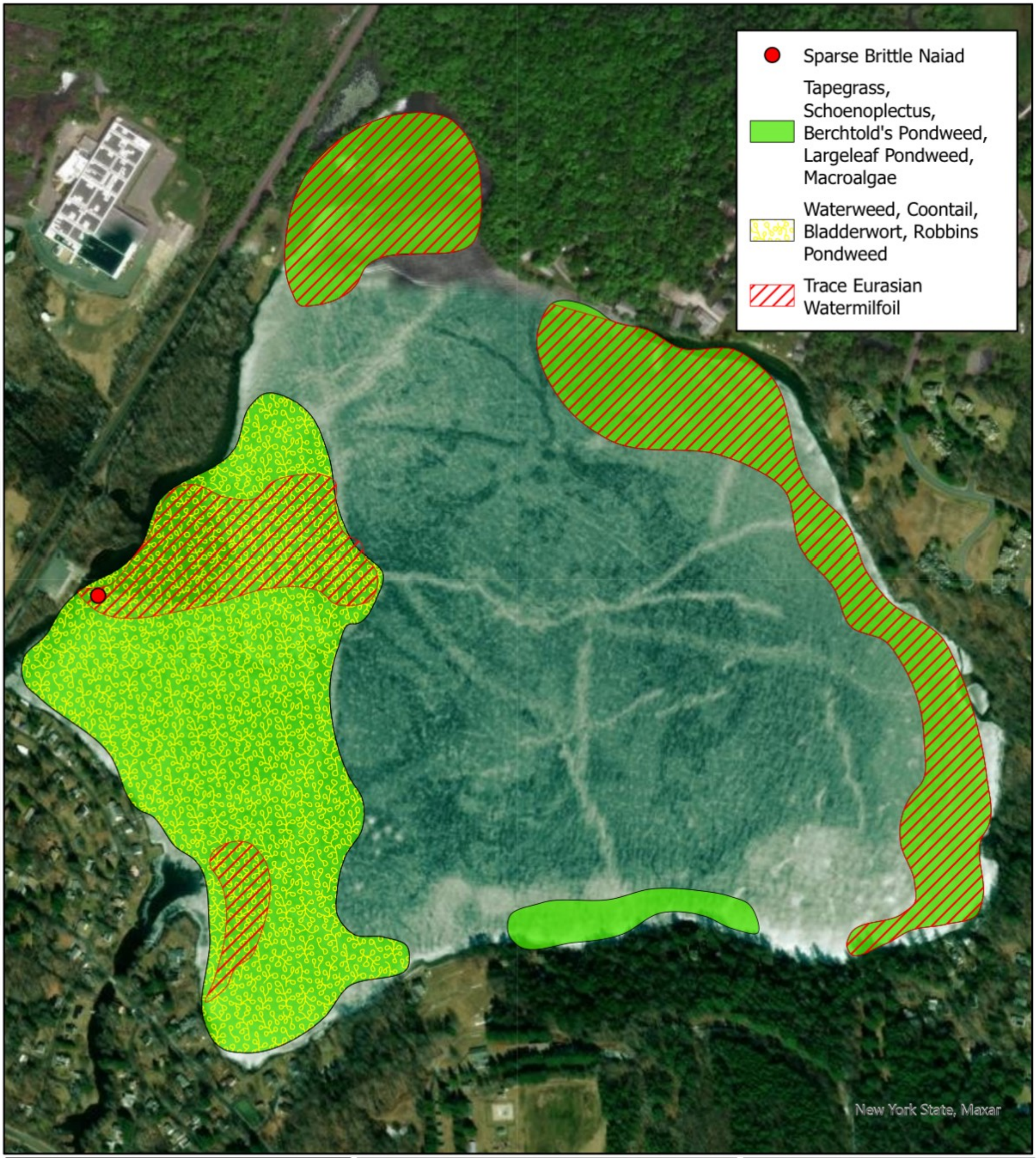
Richmond Pond
Pittsfield/Richmond, MA
Berkshire County
42.41535°, -73.32530°

Richmond Pond
0 2,500 5,000 Feet
1:40,000
N

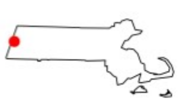
Map Date: 04/12/18
Prepared by: MS
Office: SHREWSBURY, MA

2023 Richmond Pond Vegetation Survey
Figure 4A

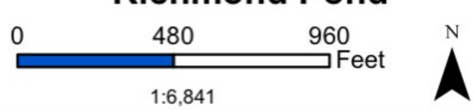
SŌLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Richmond Pond
Pittsfield, MA



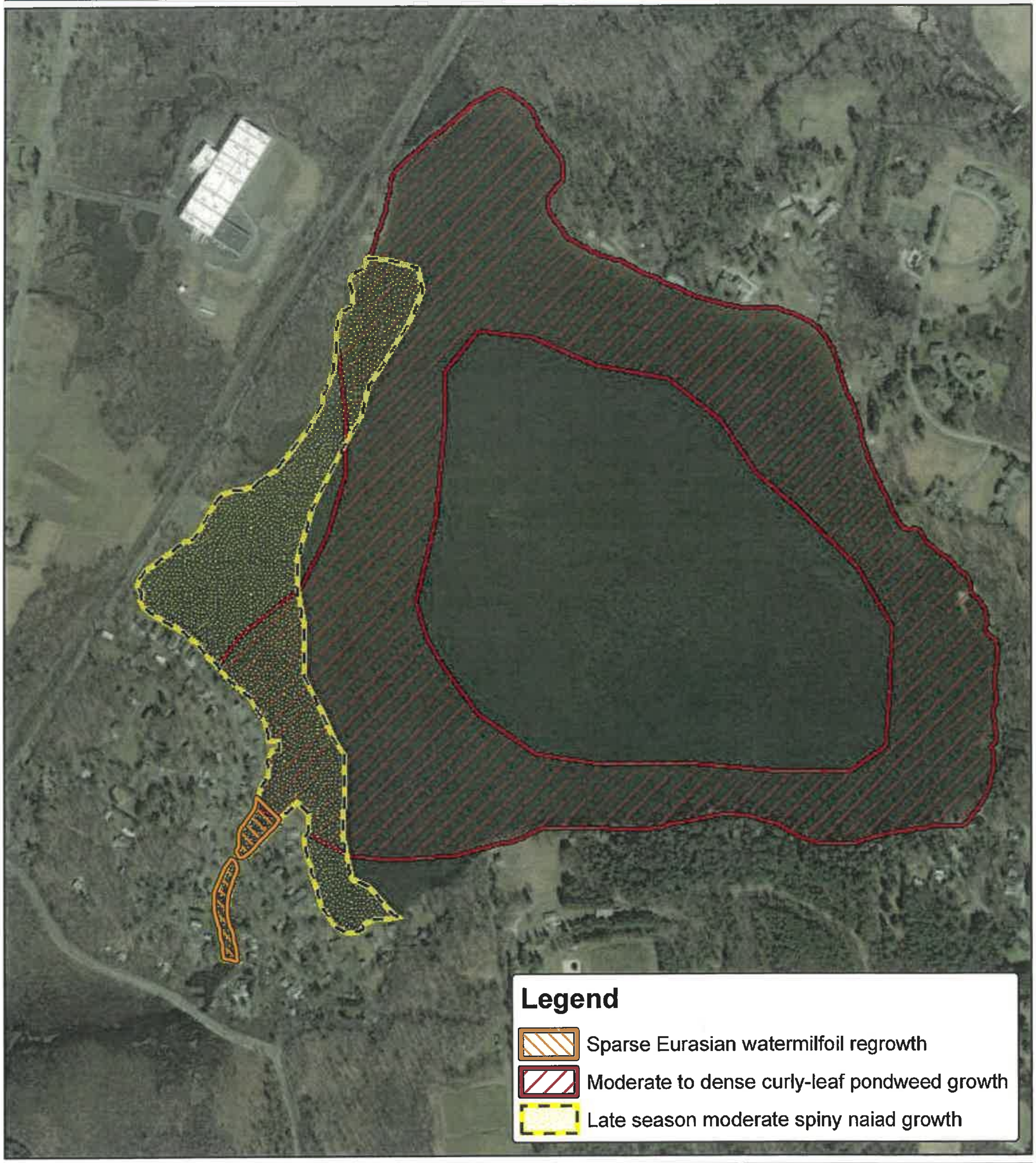
Richmond Pond



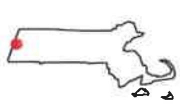
Survey Date: 07/25/2023
Prepared by: SB
Office: SHREWSBURY, MA

FIGURE 4B Invasive Vegetation Assemblage

SŌLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Richmond Pond
Pittsfield/Richmond, MA
Berkshire County
42.41535°, -73.32530°

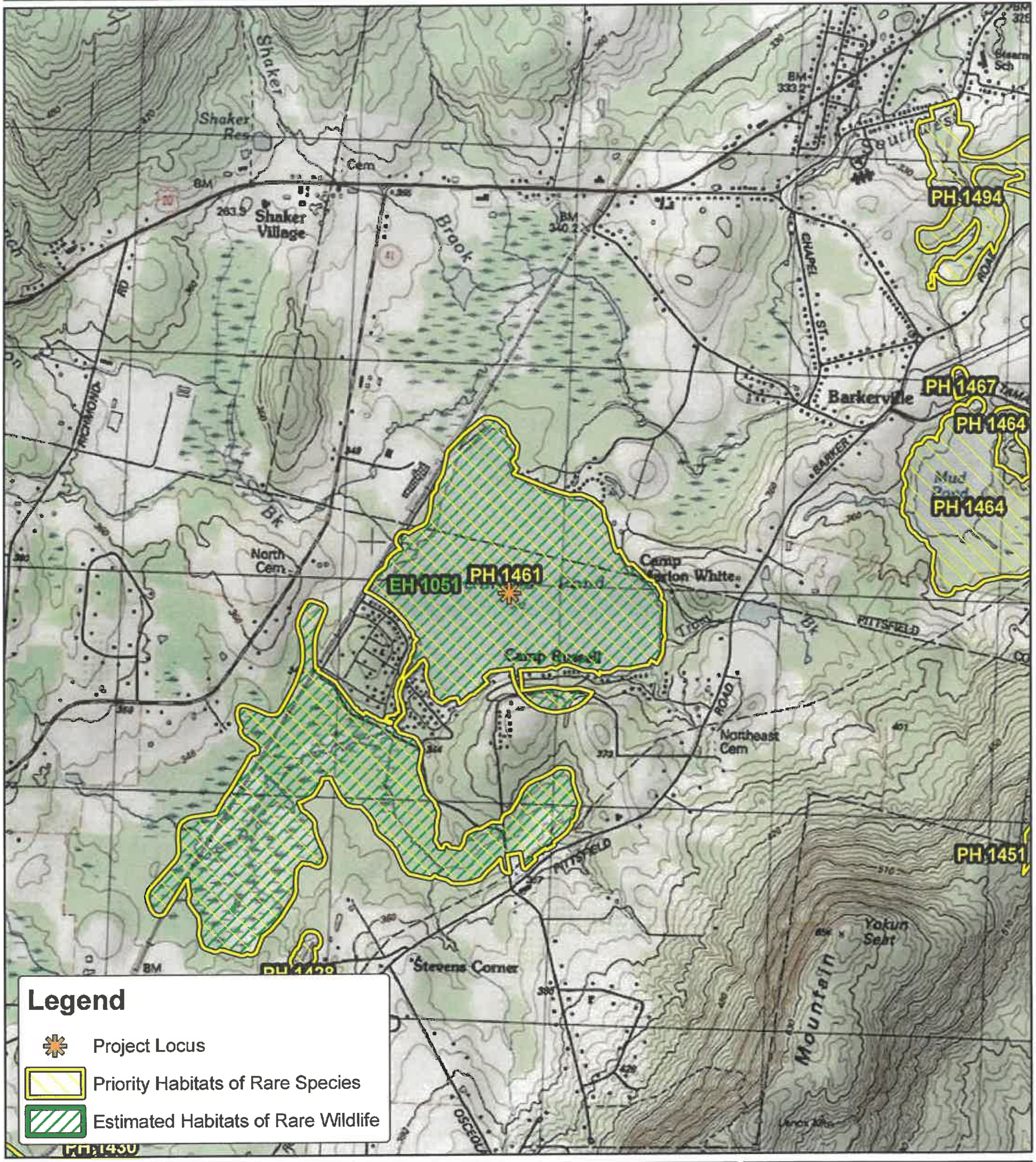


Richmond Pond

Map Date: 04/12/18
Prepared by: MS
Office: SHREWSBURY, MA

FIGURE 5: Natural Heritage & Endangered Species Program Habitat

SŌLITUDE
LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Richmond Pond
Pittsfield/Richmond, MA
Berkshire County
42.41535°, -73.32530°

Richmond Pond

0 1,000 2,000 3,000 Feet

1:24,000

N

Map Date: 04/12/18
Prepared by: MS
Office: SHREWSBURY, MA

Figure 6: Richmond Pond Potential Harvesting Areas (45 acres)

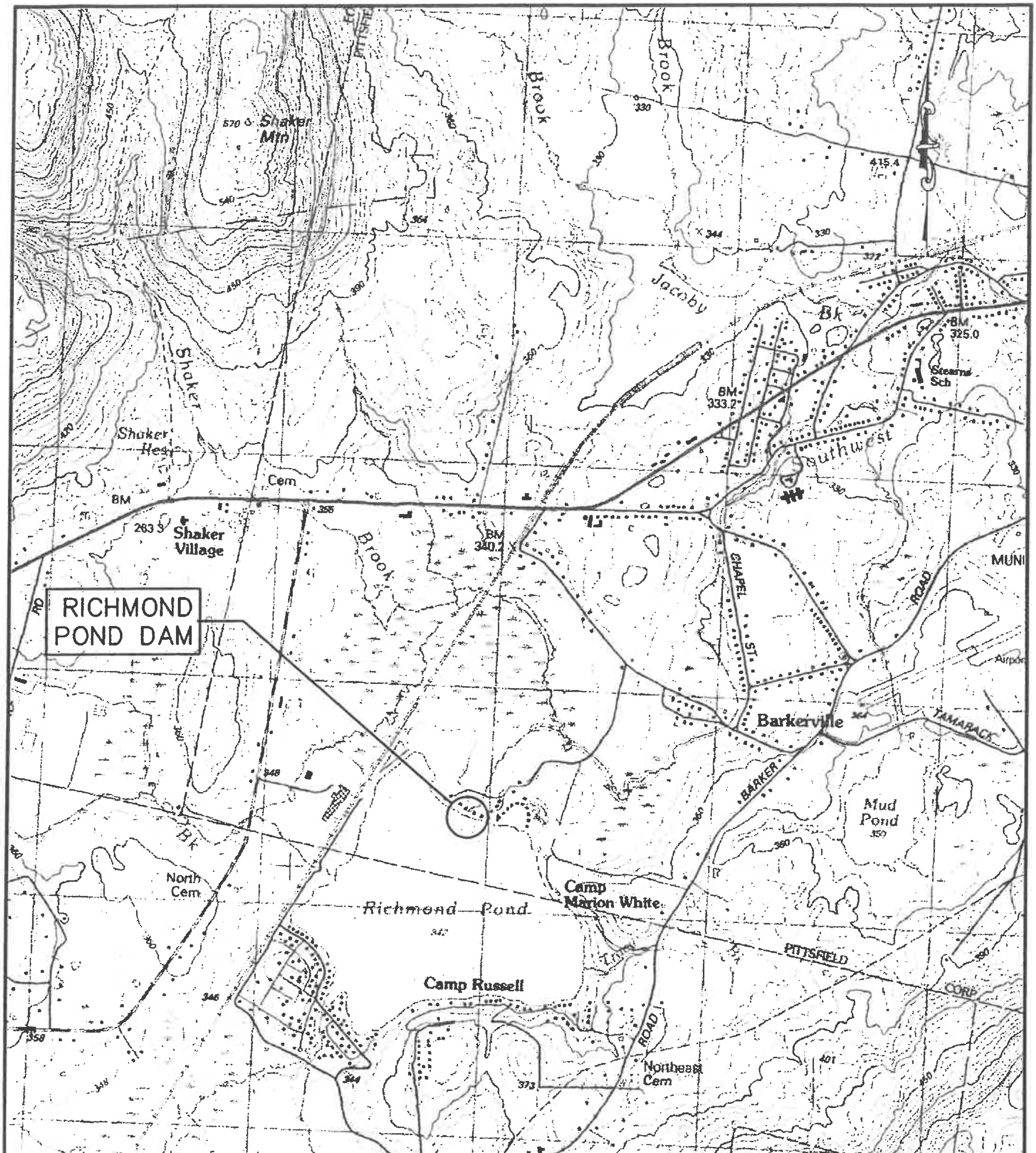
SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

Richmond Pond
Richmond/Pittsfield, MA
BERKSHIRE COUNTY

N
0 850 1,700 Feet
1:8,858

Map Date: 10/23/2024
Prepared by: DM
Office: SHREWSBURY, MA

Figure 7: Richmond Pond Dam Location



Source:
USGS TOPOGRAPHIC MAP
PITTSFIELD WEST, MA
QUADRANGLE

Lenard Engineering, Inc.
Auburn, MA

FIGURE 1 - SITE LOCATION

State ID# 1-2-236-10 NID# MA00017

RICHMOND POND DAM

PITTSFIELD, MA

Scale 1"=2000'

ATTACHMENT D

MESA Project Review & 2023 Aquatic Management Program Annual Report

MESA Review
Richmond Pond
Aquatic Vegetation Management Program

Richmond, MA

2024

Prepared for:
Natural Heritage & Endangered Species Program
MA Division of Fish and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

Annual Report Prepared by:
SŌLitude Lake Management
590 Lake Street
Shrewsbury, MA 01545

MASSWILDLIFE

MASSACHUSETTS
PROJECT REVIEW CHECKLIST

Massachusetts Endangered Species Act M.G.L. c.131A and Regulations (321 CMR 10.00)

Project Details

***Project or Site Name:** Richmond Pond

***Street Address/Location:** Richmond, MA 01254

***Town(s):** Richmond, MA 01254

***Total Site Acreage:** 158.7 acres (Richmond)   ***Acreage of Disturbance**[1]**:** 158.7 acres (Richmond)

Parcel/lot number: ____   **Assessors map/plat number:** 101

Project Description (If necessary, a project/site description can also be provided as an attachment)**:**

See Attachment B: Project Description

Registry of deeds information[2]

Registry: ____   **Certificate #** (if registered land)**:** ____

Book: ____   **Page Number:** ____

Do you have a previous NHESP Tracking number? (Yes / No) If yes, please provide: ____

Will this project require a filing with the Conservation Commission and/or DEP pursuant to the Wetlands Protection Act (WPA)? (Yes / No)

Map

***Required:** Enclose a map with the site location clearly marked and centered on the page.

Landowner Info

***Are you the Record Owner**[3] **of the property? (Yes / No)**

***If No, are you a representative of the Record Owner or do you have permission from the Record Owner to submit this request or filing?**[4] **(Yes / No)**

Commonwealth of Massachusetts

***Landowner Name**	**Organization (if applicable)**		
***Street Address/Location**	***City/Town**	***State**	***Zip Code**
Email	**Telephone**		

Comments/Purpose of request[5]**:**

[1] Please disclose the full acreage of disturbance associated with the project, including areas outside of Priority Habitat.
[2] If your project contains more than one registered property, please attach a document listing the Registry information for each.
[3] Record Owner means any person or entity holding a legal or equitable interest, right or title to real property, as reflected in a written instrument or recorded deed, or any person authorized in writing by such person.
[4] If you are not the record owner, a statement or proof that you are authorized by the record owner must be attached.
[5] Provide the authorization you have to submit this request if you are not the record owner and not a representative of the record owner.

Applicant Info

Danielle Fillio			
Applicant Name (if different from Landowner)		**Organization (if applicable)**	
1751 State Street	Richmond	MA	01254
Street Address/Location	**City/Town**	**State**	**Zip Code**
townadmin@richmondma.org		413-553-7793	
Email (if available)		**Telephone**	

Representative Info

Bruce Wintman for Richmond Pond Association			
Representative Name (if different from Landowner)		**Organization (if applicable)**	
P.O. Box 447	Lenox	MA	01240
Street Address/Location	**City/Town**	**State**	**Zip Code**
richmondpondwebsite@gmail.com		413-519-0874	
Email (if available)		**Telephone**	

**Required Documents*

- [x] USGS map (1:24,000 or 1:25,000) with property boundary clearly outlined
- [x] Project plans for entire site (including wetland Resource Areas, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work)
- [x] Assessor's map or right-of-way plan of site
- [x] Statement/proof that applicant is the Record Owner or that applicant is a person authorized in writing by the record owner to submit this filing
- [x] Photographs representative of the site

Projects altering 10 or more acres, must also submit:

- [x] A vegetation cover type map of the site
- [x] Project plans showing Priority Habitat boundaries

The Division will notify you within 30 days if the materials submitted do not satisfy the filing requirements under 321 CMR 10.20. The Division may request additional information, such as, but not limited to, species and habitat surveys. A request for additional information would come within 30 days of receiving a complete filing.

**Filing Fee*

Fee schedule is available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review

***Total MESA Fee Enclosed:** $300 Payable via check to **Comm. of MA - NHESP**

**Required Signatures*

I hereby certify under the pains and penalties of perjury that the information contained is true and complete to the best of my knowledge.

Signature of Property Owner/Record Owner of Property — Date

Danielle Fillio — 10/30/24

Signature of Applicant (if different from Owner) — Date

Please mail this completed form, with the required document and fee to:
NHESP Regulatory Review | MassWildlife Field Headquarters | 1 Rabbit Hill Road | Westborough, MA 01581

Natural Heritage & Endangered Species Program (NHESP) Provisional Approval

From: Marold, Misty-Anne (FWE) misty-anne.marold@mass.gov
Subject: RE: Alternate Herbicides for Richmond Pond - NHESP#01-9658
Date: April 26, 2024 at 11:36 AM
To: McGrath, James jmcgrath@cityofpittsfield.org
Cc: Van Der Kar, Robert rvanderkar@cityofpittsfield.org, Cheeseman, Melany (FWE) Melany.Cheeseman@mass.gov, Carmignani, Jason (FWE) Jason.Carmignani@mass.gov, Jonna Gaberman jgaberman@comcast.net

MM

RE: 23-8752 (legacy 01-9896), Richmond Pond, 2024 Work Plan

Hi Jim,

Thank you for sending the revised 2024 Work Plan dated February 16, 2024. The 2024 proposes the following:

- No use of chelated copper
- Diquat and ProcellaCOR applications
- 2-foot drawdown (fall/winter 2024/2025)

The 2024 workplan is approved provided all work complies with the relevant conditions in our April 12, 2022 determination letter (attached) and any additional conditions imposed by the Conservation Commission's OOCs.

I note, however, that I don't have record of receiving a request to extend the 2' drawdown from Richmond (271-0200). I only have a request and our response to Pittsfield (263-1131; MESA Covid Extension to 2025). You should be in contact with the Richmond Commission to determine if any additional approvals are needed from the NHESP on 271-0200.

Best, Misty-Anne

{HHUB\project}

Misty-Anne R. Marold
Senior Endangered Species Review Biologist

Massachusetts Division of Fisheries & Wildlife
Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6356 | f: (508) 389-7890
mass.gov/nhesp | facebook.com/masswildlife

From: McGrath, James <jmcgrath@cityofpittsfield.org>
Sent: Tuesday, April 2, 2024 11:39 AM
To: Marold, Misty-Anne (FWE) <misty-anne.marold@mass.gov>
Cc: Van Der Kar, Robert <rvanderkar@cityofpittsfield.org>; Cheeseman, Melany (FWE) <Melany.Cheeseman@mass.gov>; Carmignani, Jason (FWE) <Jason.Carmignani@mass.gov>; Jonna Gaberman <jgaberman@comcast.net>
Subject: RE: Alternate Herbicides for Richmond Pond - NHESP#01-9658

See Attachment F for cited Revised 2024 Work Plan

Annual Report
2023 Aquatic Management Program
Richmond Pond
Richmond & Pittsfield, MA

Prepared by: SŌLitude Lake Management
590 Lake Street
Shrewsbury, MA 01545

Prepared for: City of Pittsfield
c/o Jim McGrath
70 Allen Street
Pittsfield, MA 01201
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In accordance with the existing aquatic plant management contract between SŌLitude Lake Management and the City of Pittsfield for Richmond Pond, the following document serves to provide this year's survey results.

Vegetation Survey

In order to assess the relative abundance and distribution of submersed vegetation within Richmond Pond, a survey was conducted by a SOLitude biologist on July 25th. A gas-powered boat was used to zig-zag along the littoral zone of the pond, and visual observations of plant species and densities were recorded. A throw-rake was used intermittently to drag up vegetation from the bottom of the pond to be identified and recorded.

Trace amounts of Eurasian watermilfoil were observed in a large portion of the littoral zone (see attached map **- Figure 1)**. During this survey, there was no curly-leaf pondweed (*Potamogeton crispus*), but this might be due to the timing of the survey. Previous survey work at the lake showed that a substantial amount of curlyleaf pondweed is present earlier in the season.

Native vegetation observed during this survey included: large-leaf pondweed (*Potamogeton amplifolius*), coontail (*Ceratophyllum demersum*), Robbins' pondweed (*Potamogeton* robbinsii), Berchtold's pondweed (*Potamogeton berchtoldii*), tape grass (*Vallisneria americana*), bulrush (*schoenoplectus sp.*), common waterweed (*Elodea canadensis*), bladderwort (*Utricularia spp.*), and muskgrass (*Chara sp.*) (**Table 1**). These species were observed in varying densities, mainly in shallow areas of 5 feet or less, but observations were also made at depths of 6 to 15 feet (**Figure 2** and **3**). The overall vegetation abundance was sparse to dense.

Table 1. List of Species found in Richmond Pond

COMMON NAME	SCIENTIFIC NAME	ABUNDANCE
Eurasian Watermilfoil	*Myriophyllum spicatum*	Trace
Brittle naiad	*Najas minor*	Sparse
Common Waterweed	*Elodea canadensis*	Sparse
Coontail	*Ceratophyllum demersum*	Sparse
Bladderwort species	*Utricularia spp.*	Trace
Robbin's Pondweed	*Potamogeton robbinsii*	Sparse
Berchtold's Pondweed	*Potamogeton berchtoldii*	Sparse
Large-leaf Pondweed	*Potamogeton amplifolius*	Moderate
Bulrush	*Schoenoplectus sp.*	Sparse
Tape Grass	*Vallisneria americana*	Sparse
Stonewort	*Nitella sp.*	Moderate

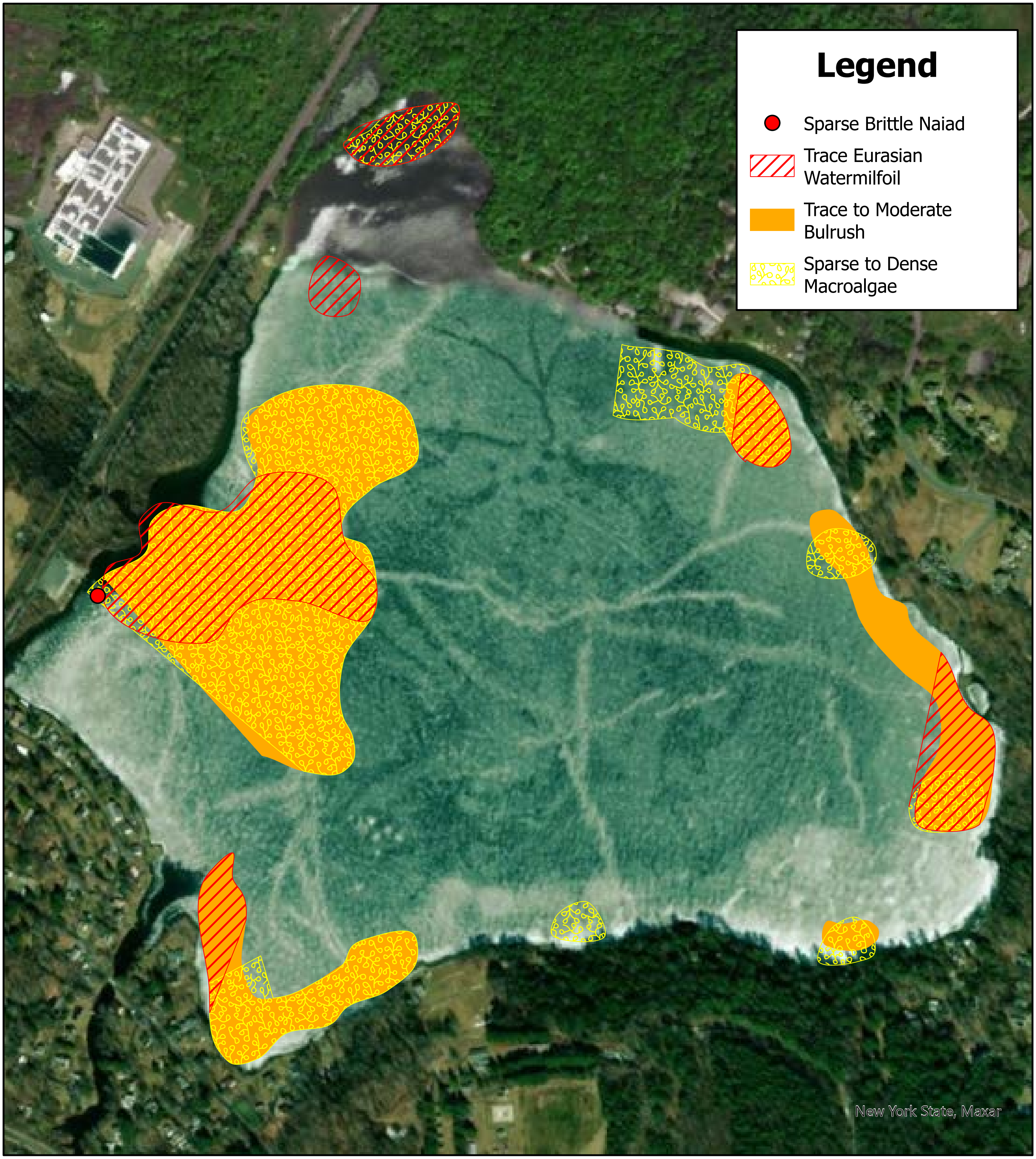
Red indicates invasive species

Summary

Two invasive species, Eurasian watermilfoil and brittle naiad, were identified in Richmond Pond this year. Trace Eurasian watermilfoil was found in the littoral zone of Richmond Pond. A sparse patch of brittle naiad was found near the boat launch. While these invasives were not at problematic densities, they can quickly spread and outcompete natives. The lake has a healthy assemblage of native species providing good habitat with some potential nuisance densities of native vegetation in some shallow areas, which can help limit the growth of the invasive plants but also limit recreational activity. SOLitude is assisting the City of Pittsfield, the Town of Richmond and other consultants to develop a revised management plan that will comply with NHESP's conditions in regards to the rare Bridle Shiner.

2023 Richmond Pond Vegetation Survey
Species Distribution (1 of 3)

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Richmond Pond
Pittsfield, MA

Richmond Pond

0 480 960 Feet

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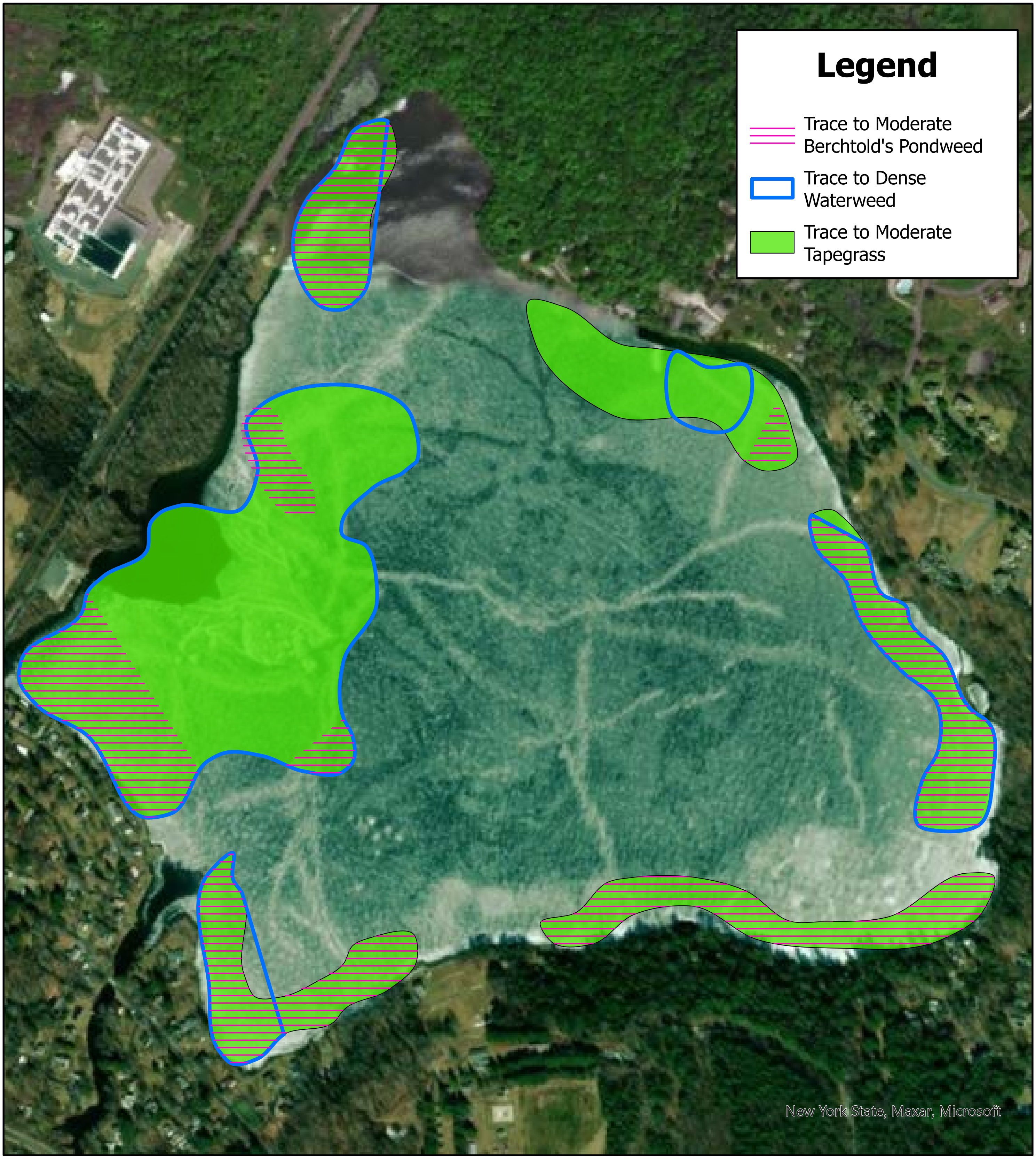
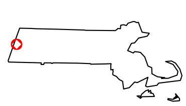
Survey Date: 07/25/2023
Prepared by: SB
Office: SHREWSBURY, MA

2023 Richmond Pond Vegetation Survey
Species Distribution (2 of 3)

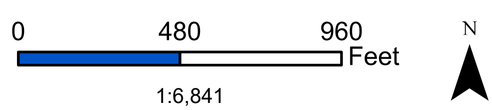
SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Richmond Pond
Pittsfield, MA



Richmond Pond



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Survey Date: 07/25/2023
Prepared by: SB
Office: SHREWSBURY, MA

2023 Richmond Pond Vegetation Survey
Species Distribution (3 of 3)

SOLITUDE LAKE MANAGEMENT
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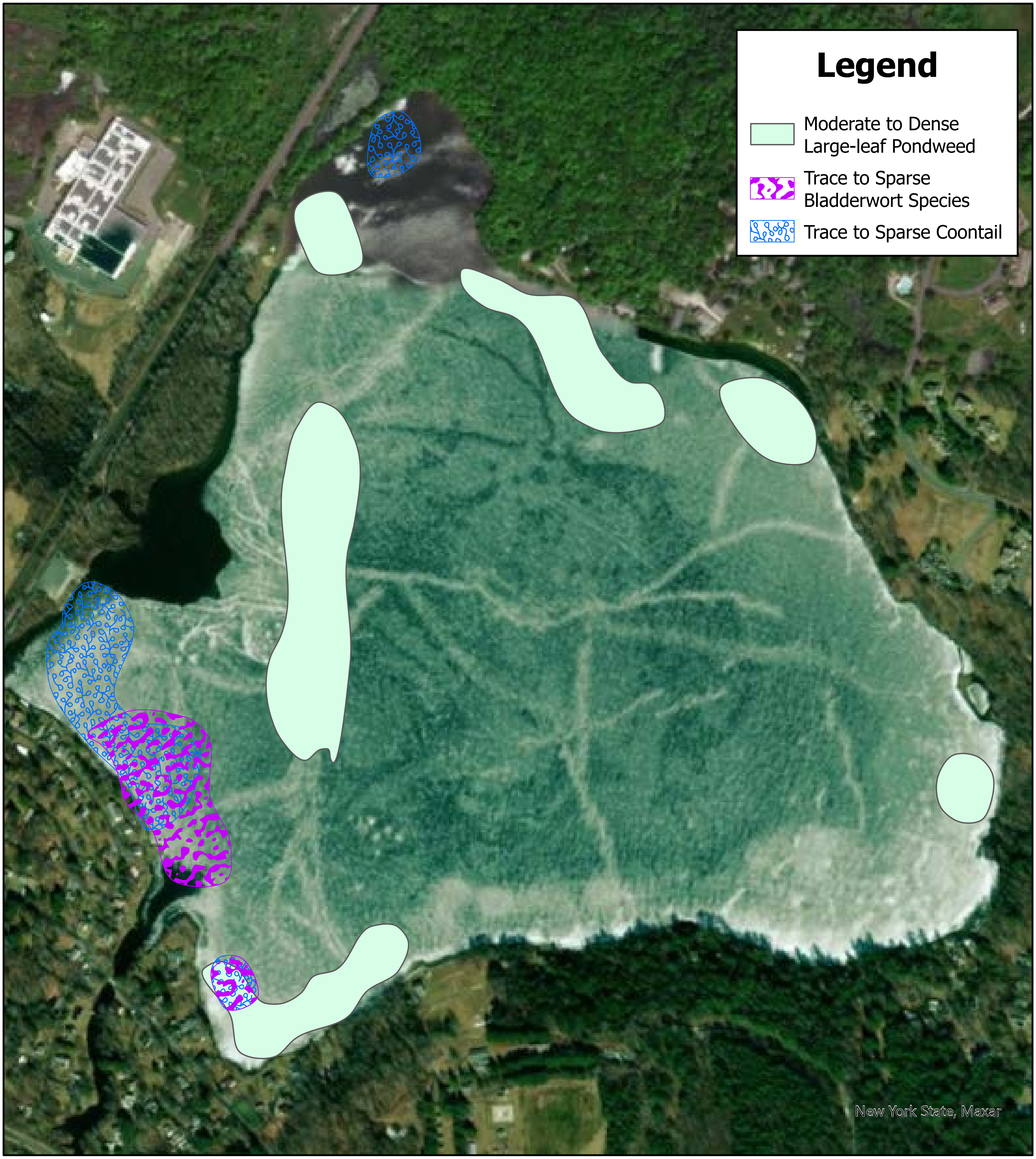
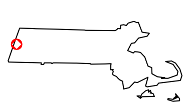
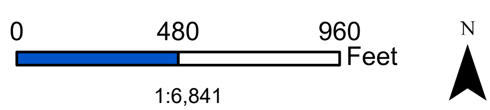


Richmond Pond
Pittsfield, MA



Richmond Pond



Survey Date: 07/25/2023
Prepared by: SB
Office: SHREWSBURY, MA

ATTACHMENT E

Herbicide Information

Detailed information regarding proposed herbicides in this NOI for Richmond Pond can be found in this attachment along with relevant citations.

Further information for herbicides proposed in this NOI can be found at the **Massachusetts Department of Conservation and Recreation, Lakes and Ponds Program website.**

https://www.mass.gov/lakes-and-ponds-program

Additional information on these herbicides can be found at the **Massachusetts Department of Agricultural Resources website**

https://www.mass.gov/herbicides-for-aquatic-vegetation-management

Wisconsin Department of Natural Resources

January 2012

Imazamox Chemical Fact Sheet

Formulations

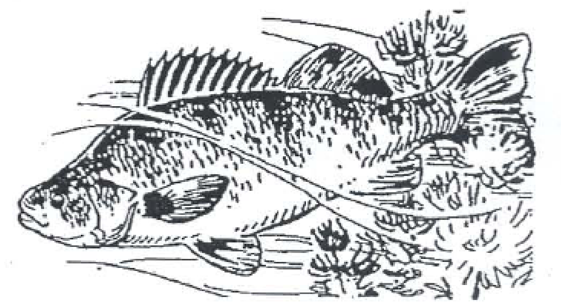
Imazamox is the common name of the active ingredient ammonium salt of imazamox (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-(methoxymethl)-3-pyridinecarboxylic acid. It was registered with EPA in 2008, and is currently marketed for aquatic use as Clearcast™. It is a liquid formulation that is applied to submerged vegetation by broadcast spray or underwater hose application and to emergent or floating leaf vegetation by broadcast spray or foliar application. There is also a granular version (Clearcast 2.7G™).

Aquatic Use and Considerations

Imazamox is a systemic herbicide that moves throughout the plant tissue and prevents plants from producing a necessary enzyme, acetolactate synthase (ALS), which is not found in animals. Susceptible plants will stop growing soon after treatment, but plant death and decomposition will occur over several weeks.

In Wisconsin, imazamox is used for treating emergent vegetation such as common reed (*Phragmites australis*) and flowering rush (*Butomus umbellatus*). Imazamox may also be used to treat the invasive curly-leaf pondweed (*Potamogeton crispus*). Imazamox is a relatively new herbicide that has not been extensively field tested, so there is some uncertainty regarding the sensitivity of non-target species. Desirable native species that may be affected could include other pondweeds (*P. nodosus, P. zosteriformis, P. foliosus, P. illinoensis, P. pusillus, P. gramineus, P. diversifolius, P. perfoliatus, P. amplifolius*), water shield (*Brasenia schreberi*) and some bladderworts (*Utricularia* spp.). Higher rates of imazamox will control Eurasian watermilfoil (*Myriophyllum spicatum*), but would also have a greater impact on native plants.

If used as a post-emergence herbicide, imazamox should be applied to plants that are



actively growing. It can also be used during a drawdown to prevent plant regrowth and on the emergent vegetation.

Repeated use of herbicides with the same mode of action can lead to herbicide-resistant plants. Herbicide resistance has now been found in at least one aquatic nuisance plant species. In particular, ALS inhibitor-resistant weeds have appeared at a higher rate than other herbicide types in terrestrial uses. In order to prevent herbicide resistance, avoid using the same type of herbicides year after year, and when possible, use non-herbicide methods of control instead.

Post-Treatment Water Use Restrictions

Treated water may be used immediately following application for fishing, swimming, cooking, bathing, and watering livestock. If water is to be used as potable water or for irrigation, the tolerance is 50 parts per billion (ppb), and a 24-hour irrigation restriction may apply depending on the water body.

Herbicide Degradation, Persistence and Trace Contaminants

Dissipation studies in lakes indicate a half-life ranging from 4 to 49 days with an average of 17 days. Herbicide breakdown doesn't occur in deep, poorly-oxygenated water where there is no light. In this part of a lake, imazamox will tend to bind to sediment rather than breaking down, with a half-life of approximately 2 years.

Once in soil, leaching to groundwater is believed to be very limited.

The breakdown products of imazamox are nicotinic acid and di- and tricarboxylic acids. None of the breakdown products are herbicidal nor suggest concerns for aquatic organisms or human health.

Impacts on Fish and Other Aquatic Organisms

Laboratory tests using rainbow trout, bluegill, and water fleas (*Daphnia magna*) indicate that imazamox is not toxic to these species at label application rates. Imazamox is rated practically non-toxic to fish and aquatic invertebrates. Imazamox does not bioaccumulate in fish.

Additional studies on birds indicate toxicity only at dosages that exceed approved application rates. However, honeybees are affected at application rates so drift during application should be minimized.

Human Health

Most concerns about adverse effects on human health involve applicator exposure. Concentrated imazamox can cause eye and skin irritation and is harmful if inhaled. Applicators should minimize exposure by wearing long-sleeved shirt and pants, rubber gloves, and shoes and socks.

In chronic tests, imazamox was not shown to cause tumors, birth defects or reproductive toxicity in test animals. Most studies show no evidence of mutagenicity. Imazamox is not metabolized and was excreted by mammals tested. Based on its low acute toxicity to mammals, and its rapid disappearance from the water column due to light and microbial degradation and binding to soil, imazamox is not considered to pose a risk to recreational water users.

For Additional Information

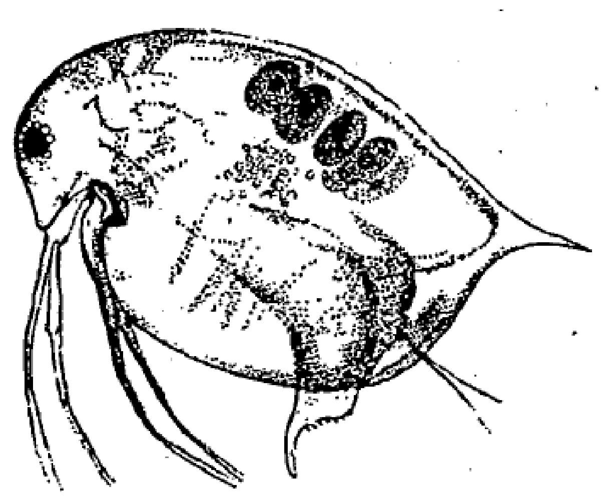
Environmental Protection Agency
Office of Pesticide Programs
www.epa.gov/pesticides

Wisconsin Department of Agriculture, Trade, and Consumer Protection
http://datcp.wi.gov/Plants/Pesticides/

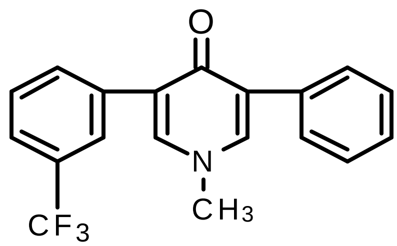
Wisconsin Department of Natural Resources
608-266-2621
http://dnr.wi.gov/lakes/plants/

Wisconsin Department of Health Services
http://www.dhs.wisconsin.gov/

National Pesticide Information Center
1-800-858-7378
http://npic.orst.edu/



III.5 FLURIDONE



FLURIDONE

SUMMARY

Fluridone (1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1H)-pyridinone) is a selective systemic aquatic herbicide used to control primarily broad-leaved, submerged aquatic macrophyte species including Eurasian watermilfoil, curly-leaf pondweed as well as native pondweeds (McLaren/Hart, 1995). It is used to treat ponds, lakes, reservoirs, canals and rivers. Fluridone is stable to oxidation and hydrolysis (McCowen *et al.*, 1979 as cited in Aquatic Plant Identification and Herbicide Use Guide, 1988). Volatilization of fluridone is insignificant (Muir and Grift, 1982 as cited in Aquatic Plant Identification Guide, 1988). Breakdown of fluridone in the aquatic environment occurs mostly through photolysis. Other fate processes include plant uptake and adsorption to soil and suspended colloids (Joyce and Ramey, 1986). Some microbial degradation of fluridone has also been reported (Muir and Grift, 1982 as cited in McLaren/Hart, 1995). Fluridone is taken up in fish but studies demonstrate that fish tissue concentrations generally reflect water concentrations and that fish concentrations rapidly clear when fluridone residues are removed from the water (West *et al.*, 1983 and Muir and Grift, 1982 as cited in McLaren/Hart, 1995). There are no restrictions on the use of fluridone to treat water used for swimming or domestic purposes. Care should be taken when applying Fluridone within one-fourth mile of any potable water intake (WSDOE, 1992).

The U.S. Environmental Protection Agency (USEPA) approved the label for Sonar on March 31, 1986 (McLaren/Hart, 1995).

REGISTERED PRODUCTS IN MASSACHUSETTS

The current list of aquatic herbicides containing fluridone that are registered in Massachusetts can be accessed at http://www.state.ma.us/dfa/pesticides/water/Aquatic/Herbicides.htm on the Massachusetts Department of Agricultural Resources (DAR) Aquatic Pesticide Website. The DAR updates this list regularly with changes. In addition, the DAR can be contacted directly at (617) 626-1700 for more specific questions regarding these products.

FLURIDONE USES AND APPLICATION

Fluridone is used to manage aquatic vegetation in fresh water ponds, lakes, reservoirs, canals and rivers (Cockreham, pers. comm., 1996). It is absorbed from the water by the shoots of submerged plants and from the hydrosoil by the roots of aquatic vascular plants. The effectiveness of fluridone depends on the degree to which the herbicide maintains contact with plants. Rapid water movement or any dilution of this herbicide in water will reduce its effectiveness (Dow Elanco, 1992; Aquatic Plant Identification and Herbicide Use Guide, 1988; WSDOE, 1992).

Application of fluridone may be made in several ways depending on the formulation used. The liquid suspension may be applied as a spray to the water surface, subsurface or along the bottom of the water body using specialized equipment. The pellet can be spread on the water surface (WSSA, 1983). Water should be used as a carrier during application of the liquid fluridone suspension. No surfactant is specified for use during application.

When treating ponds, application should be made to the entire water body. When treating lakes and reservoirs, plots no smaller than ten surface acres should be treated. In addition, areas with a large linear aspect (such as boat lanes and narrow shorelines) should not be treated (Aquatic Plant Identification and Herbicide Use Guide, 1988).

Application of fluridone may be made prior to active growth of aquatic weeds or any time during the spring or summer when weeds are visible (WSSA, 1983; Aquatic Plant Identification and Herbicide Use Guide, 1988).

Caution should be used when applying fluridone within one-fourth mile of any functioning potable water intake.

The plant selectivity of fluridone is dependent upon dose, application timing and formulation used. For specific information on recommended application rates for a particular product, the product label should be consulted. The USEPA Office of Pesticide Programs (OPP) has a link to a database of product pesticide labels at http://www.epa.gov/pesticides/pestlabels/. A list of the weeds that these products control, which has been compiled from the Environmental Protection Agency (EPA) registration labels for these products, is contained in Table III.5-1.

MECHANISM OF ACTION

Fluridone produces its toxic effect in plants by inhibiting synthesis of carotenes (pigments that protect chlorophyll molecules from photodegradation). The absence of carotenes causes degradation or "bleaching" of chlorophyll by sunlight from plants. Plants become whitish-pink or chlorotic at growing points and die slowly. This slow dying-off of plants (i.e., 30-90 days) (Cockreham, pers. comm., 1996) reduces the instantaneous oxygen demand caused by plants dying off and decomposing all at once (Joyce and Ramey, 1986). The herbicidal effects of fluridone usually appear within 7-10 days. Species susceptibility to fluridone may vary depending on time of year, stage of growth and water movement (McLaren/Hart, 1995).

Table III.5-1. List of Aquatic Plants Controlled by Fluridone

Common Name	Scientific Name
American Lotus	*Nelumbo lutea*
Bladderwort	*Utricularia* spp.
Common Coontail	*Ceratophyllum demersum*
Common Duckweed	*Lemna minor*
Common Elodea	*Elodea canadensis*
Egeria, Brazilian Elodea	*Egeria densa*
Fanwort	*Cabomba caroliniana*
Hydrilla	*Hydrilla verticillata*
Naiad	*Najas* spp.
Pondweed (except Illinois)	*Potamogeton* spp.
Watermilfoil (including Eurasian Watermilfoil)	*Myriophyllum* spp. (including *M. spicatum)*
Spatterdock	*Nuphar* spp.
Waterlily	*Nymphaea* spp.
Waterprimrose (including Waterpurslane)	*Ludwigia* spp. (including *Ludwigia palustris*)
Watershield	*Brasenia schreberi*

(McLaren/Hart, 1995; SePRO, 1994)

ENVIRONMENTAL FATE/TRANSPORT

The major fate process affecting fluridone persistence in aqueous environments is photolysis. Thus any factors which affect sunlight intensity and/or penetration of light into the water column will affect the dissipation rate of fluridone (Joyce and Ramey, 1986). Other factors affecting dissipation include geographic location, date of application, water depth, turbidity, weather and weed cover (West *et al.*, 1983 as cited in McLaren/Hart, 1995). Microbial degradation is also reported to occur in laboratories, but photolysis generally occurs much more quickly (Muir and Grift, 1982 as cited in McLaren/Hart, 1995). Other secondary fate processes include adsorption to soil and suspended colloids and plant uptake (Joyce and Ramey, 1986).

Fluridone will adhere to sediment particles/organics in the sediment. Eventually, the fluridone will desorb and photodegrade into the water column from the hydrosoil (Elanco, 1981 as cited in McLaren/Hart, 1995). The pH of the water can affect this rate (with the lower the pH, the higher the adsorption rate (Malik and Drennan, 1990 as cited in McLaren/Hart, 1995).

Fluridone is taken up in fish tissue. Fluridone fish concentrations generally reflect the concentrations of fluridone in the water (McLaren/Hart, 1995). When fluridone residues are removed from the water column, the fluridone concentration from fish tissue clears (West *et al.*, 1983; Muir *et al.*, 1983 as cited in McLaren/Hart). Based on a low bioaccumulation rate in fish and high levels of fluridone necessary to produce toxic responses in mammals and birds, it is not expected that fish-eating animals would be affected by fluridone used at recommended (registered) application rates (McLaren/Hart, 1995).

The primary metabolite of fluridone degradation in fish was identified as 1-methyl-3-(4-hydroxyphenol)-5-[3-trifluoromethyl)phenyl]-4[1H]-pyridone (West *et al.*, 1983 as cited in McLaren/Hart, 1995). This compound was also identified as a minor metabolite in water and hydrosoil (Muir and Grift, 1982 as cited in McLaren/Hart, 1995). 1,4-dihydro-1-methyl-4-oxo-5-[3-(trifluoromethyl)phenyl]-3-pyridone was also identified as the major hydrosoil metabolite in hydrosoil studies conducted in the laboratory; however, this compound has not been identified in the hydrosoil of small ponds under natural conditions (West *et al.*, 1983 as cited in McLaren/Hart, 1995). A number of other metabolites including benzaldehyde, 3-(trifluoromethyl)-benzaldehyde, benzoic acid and 3-(trifluoromethyl)-benzoic acid were produced as photolytic breakdown products in one laboratory study (Saunders and Mosier, 1983, as cited in McLaren/Hart, 1995). N-methylformamide (NMF) was produced in another study. However, NMF has not been identified as a breakdown product under natural conditions (Saunders and Mosier, 1983 as cited in McLaren/Hart, 1995).

The half-life of fluridone in water of small, artificial ponds ranged from 1-7 days. In hydrosoils, the compound persisted for 8 weeks to one year (Joyce and Ramey, 1986; WSDOE, 1992). Fluridone has a water solubility of 12 mg/l and an octanol-water partition coefficient (K_{ow}) of 74.1 (Elanco Products Company, 1985 as cited in Aquatic Plant Identification and Herbicide Use Guide, 1988). Fluridone is stable to oxidation and hydrolysis (McCowen *et al.*, 1979). Volatilization of fluridone is not expected to be a significant process, (Muir and Grift, 1982 as cited in Aquatic Plant Identification and Herbicide Use Guide, 1988).

PHARMACOKINETICS

Metabolism and distribution studies have shown that fluridone is absorbed and excreted in the feces within 72 hours of oral administration to rats (McLaren/Hart, 1995). No bioaccumulation of fluridone was noted. 90% of the absorbed fluridone was cleared in 96 hours (USEPA, 1988).

HEALTH EFFECTS

Avian:

Fluridone has very low toxicity to birds. A number of acute toxicity studies were conducted in various bird species. An oral LD50 value of >2,000 mg/kg was obtained for bobwhite quail. The EPA considers this value to represent slight toxicity (USEPA, 1986). An LD50 of >2,000 was identified for mallard ducks (WSDOE, 1992). Oral LC50 values of > 5,000 ppm were identified for bobwhite quail and mallard duck (USEPA, 1986). No impairment on reproduction for the above species was noted up to a dietary exposure concentration of 1,000 ppm (USEPA, 1986). In other studies, an LC50 value of about 10,000 ppm was identified for bobwhite quail and an LC50 value of >20,000 ppm was identified for mallard duck (WSDOE, 1992).

Mammalian:

Acute:

Most of the available information on the toxic effects of fluridone comes from studies conducted by the industry on various formulations of the product. Generally, the acute toxicity of fluridone is low. The LD_{50} for both rats and mice exposed through ingestion to technical grade fluridone is greater than 10,000 mg/kg. The oral LD_{50}s for cats and dogs exposed to technical grade fluridone are 250 mg/kg and 500 mg/kg, respectively. The LD_{50} for rabbits exposed through the skin to technical grade fluridone is greater than 2,000 mg/kg (Elanco, 1981 as cited in McLaren/Hart, 1995).

Fluridone was found to produce eye irritation in rabbits with effects including redness, corneal dullness and conjunctivitis. Fluridone was found to be neither irritating nor a sensitizer to rabbit skin at 2,000 mg/kg (USEPA, 1988).

Subchronic/Chronic:

In a three-week study in which fluridone was applied to rabbit skin daily at doses ranging from 192-768 mg/kg/day, dose-dependent skin irritation was produced at all doses. No systemic effects were noted at any dose. An increase in organ weight was noted at 384 mg/kg/day (USEPA, 1988).

In a three-month subchronic feeding study with fluridone, no treatment-related effects were noted in rats administered doses of 62 mg/kg or in mice administered doses of 330 mg/kg (Elanco, 1981 as cited in McLaren/Hart, 1995). A dietary level of fluridone of 16.5 mg/kg/day administered to mice for three months resulted in a partial enlargement of livers. A dietary level of 166 mg/kg administered to rats for three months resulted in an increase in liver weights. A No Observed Effect Level (NOEL) of 30 mg/kg/day was identified in rats administered fluridone in the diet for three months (USEPA, 1988). A concentration of 0.033% of fluridone fed to mice for three months produced morphologic changes in the liver and an increase in absolute liver weights in male mice (USEPA, 1988). In a study conducted with dogs, daily dietary fluridone levels up to 200 mg/kg/day did not result in any treatment-related effects (Elanco, 1978 as cited in USEPA, 1990).

In a one-year chronic study in which dogs were administered fluridone by capsule in food, a number of effects including weight loss, an increase in liver weight and an increase in liver enzymes were noted at a dose level of 150 mg/kg/day. A NOEL of 75 mg/kg/day was identified (USEPA, 1988). In a two-year feeding study in which mice were administered fluridone concentrations in the diet of up to 330 ppm fluridone, there was an increase in liver enzymes in males exposed at 330 ppm. No other toxic effects or lesions were noted at any of the doses (USEPA, 1988). In another two-year study, rats were exposed to doses of 0, 8, 25 and 81 mg/kg/day. At 25 mg/kg/day, rats experienced inflammation in the kidney, atrophy of the testes, inflammation of the cornea, weight loss and decreased organ weights (USEPA, 1988; USEPA, 1990).

Developmental/Reproductive:

In a study in which rats were exposed to up to 200 mg/kg/day of fluridone, neither maternal nor fetotoxic effects were noted (USEPA, 1988). In a three-generation study conducted in rats exposed to fluridone at a dose of 100 mg/kg/day, no teratogenic or maternal effects were noted. However, a dose of 100 mg/kg/day was found to be toxic to rat pups (USEPA, 1988; USEPA 1990). In a teratology study in which rabbits were exposed to fluridone doses of up to 750 mg/kg/day, a level of 300 mg/kg resulted in maternal effects including a decrease in body weight gain and abortion. Fetal effects, also noted at this level, included resorptions (USEPA, 1988). No teratogenic effects were noted (USEPA, 1990). In a pilot study in which rabbits were exposed to fluridone at doses of 0, 250, 500, 750 and 1,000 ppm, a maternal NOEL of 500 mg/kg was identified. A level of 750 mg/kg produced a maternal loss in body weight. A NOEL of 250 mg/kg/day was identified for fetal effects. At 500 mg/kg/day, fetal resorptions occurred (USEPA 1988). In another study, rats were administered doses by oral gavage of 0, 100, 300 and 1,000 mg/kg/day. A maternal NOEL of 100 mg/kg/day was identified. At 300 mg/kg/day, there was a decrease in maternal body weight. The NOEL for developmental effects was identified as 300 mg/kg/day. At 1,000 mg/kg/day, fetal effects included a decrease in fetal weight and delayed ossification. The NOEL for teratogenic effects was greater than 1,000 mg/kg/day (USEPA 1988).

Mutagenicity:

Fluridone was not found to be mutagenic in several test assays. Fluridone produced negative results in the Ames assay and did not induce sister chromatid exchange in Chinese hamster bone marrow cells. In addition, fluridone did not promote unscheduled DNA synthesis in rat hepatocytes (USEPA, 1988).

Carcinogenicity:

Based on negative cancer findings in the two chronic toxicity studies discussed above, there is no evidence indicating that fluridone is carcinogenic. The EPA Health Effects Division has designated fluridone as a Group E carcinogen (i.e., having evidence of noncarcinogenicity for humans) by the old EPA classification system. Under the new cancer classification system (USEPA, 1995), an E classification would correspond to a weight-of-evidence descriptor of "not likely to be carcinogenic to humans"..

Available Toxicity Criteria:

The EPA Carcinogen Risk Assessment Verification Endeavor (CRAVE) (RfD/RfC) workgroup has developed an oral Reference Dose (RfD) of 0.08 mg/kg/day for fluridone based on one of the two-year rat feeding studies conducted by Elanco cited earlier (USEPA, 1990). The EPA Office of Pesticide Programs (OPP) has calculated the same RfD value based on the same study (USEPA, 1995). The RfD is an estimate, (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime (USEPA, 1990).

The EPA has designated an acceptable residue level for fluridone in potable water of 0.15 ppm. This level is based on the maximum application rate for fluridone as registered under FIFRA (Federal Insecticide, Fungicide and Rodenticide Act) (USEPA, 1986 as cited in McLaren/Hart, 1995). The EPA has also established a tolerance of 0.5 ppm for residues of fluridone and its primary metabolites in fish and crayfish. In addition, EPA has established tolerances for crops irrigated with water containing fluridone residue concentrations at 0.15 ppm as well as for a number of raw, agricultural commodities (USEPA, 1986 as cited in McLaren/Hart, 1995).

ECOLOGICAL TOXICITY

Aquatic Organisms :

A number of studies have been conducted with fluridone to determine the LD50 or LC50 values for a variety of organisms. The LD50 (or LC50) is the dose (or concentration) to which a particular species is exposed, which results in the death of 50% of the test population. The EPA has cited the results of a number of these studies. EPA considers these studies to demonstrate moderate toxicity. These studies are listed in the Table III 5-2.

In addition, a Maximum acceptable theoretical concentration (MATC) value for fathead minnow (second generation fry) was calculated to be between 0.48 mg/l and 0.96 mg/l, meaning no treatment-related effects were noted at or below 0.48 mg/l. Total length of 3-day old fry was reduced at 2 mg/l fluridone (USEPA, 1986).

No adverse effects were noted on crayfish, bass, bluegill, catfish, long-neck soft-shelled turtles, frogs, water snakes and waterfowl from the use of 0.1 to 1.0 ppm fluridone during field experiments (Arnold, 1979, McCowen et al., 1979 as cited in WSDOE, 1992). Application of 1.0 ppm fluridone to zooplankton caused a reduction in population, but the population quickly recovered. Application of 0.3 ppm did not cause a change in the total number of benthic organisms whereas application of 1.0 ppm did cause a change (Parka *et al.*, 1978 as cited in WSDOE, 1992). An aqueous solution of fluridone caused a reduction in population of the amphipod *Hyalella azteca* when applied at a rate of 1.0 ppm but not when applied at a rate of 0.3 ppm (Arnold, 1979 as cited in McLaren/Hart, 1995). Fish abundance and community structure remained unchanged in ponds exposed to a fluridone concentration level of 0.125 ppm (Struve *et al.* 1991 as cited in McLaren/Hart, 1995). LC50 values for a variety of microscopic crustaceans including *Diaptomus*, sp., *Eucyclops* sp, *Alonella* sp., and *Cypria* sp., ranged from 8.0 - 13.0 ppm (Naqvi and Hawkins, 1989 as cited in McLaren/Hart, 1995).

Table III.5-2. Acute Toxicity Tests

SPECIES	TEST TYPE	VALUE
Daphnia magna	48-hr LC50	6.3 mg/l
Bluegill	96-hr LC50	12 mg/l
Rainbow trout	96-hr LC50	11.7 mg/l
Sheepshead minnow	96-hr LC50	10.91 mg/l
Oyster embryo larvae	48-hr LC50	16.51 mg/l

(USEPA, 1986)

One group of investigators conducted extensive acute toxicity tests on a variety of aquatic invertebrates including amphipods, midges, daphnids, crayfish, blue crabs, eastern oysters and pink shrimp. The average 48-hour or 96-hour LC50 or EC50 (concentration at which 50% of the organisms exhibit an effect) was calculated as 4.3 ± 3.7 ppm (Hamelink *et al.*, 1986 as cited in McLaren/Hart, 1995). The same investigators also conducted studies with a variety of fish including rainbow trout, fathead minnows, channel catfish, bluegills and sheepshead minnows. A 96-hour LC50 value of 10.4 ± 3.9 was calculated (Hamelink *et al.*, 1986 as cited in McLaren/Hart, 1995).

Daphnids, amphipods and midge larvae exposed chronically to fluridone concentrations of 0.2, 0.6 and 0.6 ppm as well as catfish fry exposed to fluridone concentrations of 0.5 ppm showed no treatment-related significant effects. Exposure to concentrations of 1 ppm produced a decreased growth rate of catfish fry and concentrations of 0.95 and 1.9 ppm produced a decreased survival rate of fathead minnows within 30 days after hatching (Hamelink *et al.*, 1986 as cited in McLaren/Hart, 1995).

Plants:

Fluridone selectively controls a number of broad-leaved submerged and floating aquatic macrophyte species as specified by its EPA label. In addition, the literature contains reports of fluridone's variable efficacy in controlling other species. The efficacy of fluridone is very dependent on contact time with plants. Thus, fluridone should be applied during periods of minimum water movement. Factors related to fluridone's variable efficacy include temperature, pH and light levels (Wells *et al.* 1986 as cited in WSDOE, 1992). In addition, one investigator found that in *Hydrilla* exposed to fluridone at various concentrations for 1, 3 and 5 weeks, plant recovery was directly related to the concentration of active iron (Fe^{2+}) in the plant at the time of treatment (Spencer and Ksander, 1989 as cited in WSDOE, 1992).

Fluridone did not appear to adversely affect desirable phytoplankton but some reduction in population of the less desirable species given as *Anabaena* and *Anacystis* occurred upon application of fluridone at levels of 0.3 and 0.1 ppm (Parka et al, 1978 as cited in WSDOE, 1992). A drastic reduction in phytoplankton population in Greek ponds including the disappearance within two months of a population of Cyanophyceae (Cyanobacteria) occurred after fluridone application. Diatom populations, a more desirable species, increased significantly, especially epiphytic and benthic species (Kamarianos *et al.*, 1989 as cited in WSDOE, 1992). No sufficient reduction in phytoplankton densities was noted when they were consistently exposed to a fluridone concentration of 0.125 ppm (Struve *et al.*, 1991 as cited in McLaren/Hart, 1995).

An aqueous solution of fluridone applied at a concentration of 1.0 ppm produced a significant reduction in a zooplankton population whereas a concentration of 0.3 ppm had no effect. The 1.0 ppm population returned to pretreatment levels within 43 days (Arnold, 1979 as cited in McLaren/Hart, 1995).

Table III.5-3. Properties of Fluridone

CAS #:	59756-60-4
Synonyms:	1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl-4(1H)-pyridinone;
Molecular formula	$C_{19}H_{14}F_3NO$
Molecular weight	329.3
Physical properties	white, crystalline solid
Melting point	154-155^oC
Vapor pressure	< 1 x 10^{-7} mm Hg at 25^{o}C
Photolysis half-life	1-6 days
Hydrolysis half-life	stable
Biodegradation half-life	2-60 days (based on overall half-life)
K_{ow}	74.1 at 20^o C
K_{oc}	~350-2460 ml/g
BCF	0.9-15.5
Water solubility	12 mg/l at 25^o C and pH 7

(Reinert and Rodgers, 1987; WSSA, 1983; Aquatic Plant Identification and Herbicide UseGuide, 1988; WSSA, 1994)

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Wisconsin Department of Natural Resources

January 2012

Fluridone Chemical Fact Sheet

Formulations

Fluridone is an aquatic herbicide that was initially registered with the EPA in 1986. The active ingredient is 1-methyl-3-phenyl-5-3-(trifluoromethyl)phenyl|-41H|-pyridinone. Both liquid and slow-release granular formulations are available. Fluridone is sold under the brand names Avast!, Sonar, and Whitecap (product names are provided solely for your reference and should not be considered endorsements).

Aquatic Use and Considerations

Fluridone is an herbicide that stops the plant from making a protective pigment that keeps chlorophyll from breaking down in the sun. Treated plants will turn white or pink at the growing tips after a week and will die in one to two months after treatment as it is unable to make food for itself. It is only effective if plants are growing at the time of treatment.

Fluridone is used at very low concentrations, but a very long contact time is required (45-90 days). If the fluridone is removed before the plants die, they will once again be able to produce chlorophyll and grow.

Fluridone moves rapidly through water, so it is usually applied as a whole-lake treatment to an entire waterbody or basin. There are pellet slow-release formulations that may be used as spot treatments, but the efficacy of this is undetermined. Fluridone has been applied to rivers through a drip system to maintain the concentration for the required contact time.

Plants vary in their susceptibility to fluridone, so typically some species will not be affected even though the entire waterbody is treated.

Plants have been shown to develop resistance to repeated fluridone use, so it is recommended to rotate herbicides with different modes of action when using fluridone as a control.

Fluridone is effective at treating the invasive Eurasian watermilfoil (*Myriophyllum spicatum*). It also is commonly used for control of invasive hydrilla (*Hydrilla verticillata*) and water hyacinth (*Eichhornia crassipes*), neither of which are present in Wisconsin yet. Desirable native species that are usually affected at concentrations used to treat the invasives include native milfoils, coontail (*Ceratophyllum demersum*), naiads (*Najas* spp.), elodea (*Elodea canadensis*) and duckweeds (*Lemna* spp.). Lilies (*Nymphaea* spp. and *Nuphar* spp.) and bladderworts (Utricularia spp.) also can be affected.

Post-Treatment Water Use Restrictions

There are no restrictions on swimming, eating fish from treated water bodies, human drinking water or pet/livestock drinking water. Depending on the type of waterbody treated and the type of plant being watered, irrigation restrictions may apply for up to 30 days. Certain plants, such as tomatoes and peppers and newly seeded lawn, should not be watered with treated water until the concentration is less than 5 parts per billion (ppb).

Herbicide Degradation, Persistence and Trace Contaminants

The half-life of fluridone (the time it takes for half of the active ingredient to degrade) ranges from 4 to 97 days depending on water conditions. After treatment, the fluridone concentration in the water is reduced through dilution due to water movement, uptake by plants, adsorption to the sediments, and break down from light and microbial action.

There are two major degradation products from fluridone: n-methyl formamide (NMF) and 3-trifluoromethyl benzoic acid. NMF has not been detected in studies of field conditions, including those at the maximum label rate.

Fluridone residues in sediments reach a maximum in one to four weeks after treatment and decline in four months to a year depending on environmental conditions. Fluridone adsorbs to clay and soils with high organic matter, especially in pellet form, and can reduce the concentration of fluridone in the water. Adsorption to the sediments is reversible; fluridone gradually dissipates back into the water where it is subject to chemical breakdown.

Impacts on Fish and Other Aquatic Organisms

Fluridone does not appear to have any apparent short-term or long-term effects on fish at application rates.

Fish exposed to water treated with fluridone absorb fluridone into their tissues. Residues of fluridone in fish decrease as the herbicide disappears from the water. The EPA has established a tolerance for fluridone residues in fish of 0.5 parts per million (ppm).

Studies on Fluridone's effects on aquatic invertebrates (i.e. midge and water flea) have shown increased mortality at label application rates.

Studies on birds indicate that fluridone would not pose an acute or chronic risk to birds. No studies have been conducted on amphibians or reptiles.

Human Health

The risk of acute exposure to fluridone would be primarily to chemical applicators. The acute toxicity risk from oral and inhalation routes is minimal. Concentrated fluridone may cause some eye or skin irritation. No personal protective equipment is required on the label to mix or apply fluridone.

Fluridone does not show evidence of causing birth defects, reproductive toxicity, or genetic mutations in mammals tested. It is not considered to be carcinogenic nor does it impair immune or endocrine function.

There is some evidence that the degradation product NMF causes birth defects. However, since NMF has only been detected in the lab and not following actual fluridone treatments, the manufacturer and EPA have indicated that fluridone use should not result in NMF concentrations that would adversely affect the health of water users. In the re-registration assessment that is currently underway for fluridone, the EPA has requested additional studies on both NMF and 3-trifluoromethyl benzoic acid.

For Additional Information

Environmental Protection Agency
Office of Pesticide Programs
www.epa.gov/pesticides

Wisconsin Department of Agriculture, Trade, and Consumer Protection
http://datcp.wi.gov/Plants/Pesticides/

Wisconsin Department of Natural Resources
608-266-2621
http://dnr.wi.gov/lakes/plants/

Wisconsin Department of Health Services
http://www.dhs.wisconsin.gov/

National Pesticide Information Center
1-800-858-7378
http://npic.orst.edu/

Hamelink, J.L., D.R. Buckler, F.L. Mayer, D.U. Palawski, and H.O. Sanders. 1986. Toxicity of Fluridone to Aquatic Invertebrates and Fish. Environmental Toxicology and Chemistry 5:87-94.

Fluridone ecological risk assessment by the Bureau of Land Management, Reno Nevada:
http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/veis.Par.91082.File.tmp/Fluridone%20Ecological%20Risk%20Assessment.pdf

Project Title:

USE OF THE REGISTERED AQUATIC HERBICIDE FLURIDONE (SONAR”) IN THE STATE OF NEW YORK

GENERIC ENVIRONMENTAL IMPACT STATEMENT

Prepared for:

SePRO Corporation
11550 North Meridian Street
Carmel, Indiana 46032

Prepared by:

McLaren/Hart Environmental Engineering Corporation
25 Independence Boulevard
Warren, New Jersey 07059

April 19, 1995

Version 2.0

**** NOTE ****

This Generic Environmental Impact Statement is an extraction from the Final Generic Environmental Impact Statement, Use of the Registered Aquatic Herbicide Fluridone (Sonar®) and the Use of the Registered Aquatic Herbicide Glyphosate (Rodeo® and Accord®) in the State of New York, Version 5.0, dated January 10, 1995. The following document is intended for information purposes only, either in the State of New York, or elsewhere. It cannot be utilized in the development of a permit application for the use of Sonar® in the waters of the State of New York. Interested parties must reference the Final Generic Environmental Impact Statement, Use of the Registered Aquatic Herbicide Fluridone (Sonar®) an the Use of the Registered Aquatic Herbicide Glyphosate (Rodeo® and Accord®) in the State of New York, Version 5.0, dated January 10, 1995, as approved by the New York State Department of Environmental Conservation on January 25, 1995 for any permit applications for the use of Sonar® in waters of the State of New York.

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EXECUTIVE SUMMARY

This Generic Environmental Impact Statement was extracted from the Final Generic Environmental Impact Statement, Use of the Registered Aquatic Herbicide Fluridone (Sonar®) and the Use of the Registered Aquatic Herbicide Glyphosate (Rodeo® and Accord®) in the State of New York, Version 5.0, dated January 10, 1995. That Generic Environmental Impact Statement (GElS) was submitted to the New York State Department of Environmental Conservation (NYSDEC) on behalf of DowElanco and SePRO, in part, for the aquatic herbicide fluridone (Sonar®)[1]. It is the purpose of the GEIS to objectively evaluate the scientifically documented evidence regarding all aspects of the use of (Sonar®) for the control of nuisance aquatic weeds in waters of the State of New York. This document is intended to present a general description of the potential positive and negative impacts from the use of this product within waters of the State of New York.

The GEIS was prepared in accordance with 6 NYCRR Part 617, the New York State Environmental Quality Review Act (SEQR). The purpose of SEQR is to incorporate the consideration of environmental factors into the existing planning, review and decision-making processes of State, regional and local government agencies at the earliest possible time. An action is subject to review by NYSDEC under SEQR if any state or local agency has the authority to issue a permit or other type of approval over that action.

NYSDEC issued a Positive Declaration (as defined in § 617.10(b)) stating that any permits developed for the potential use of the Sonar® in the State of New York warrants a review under the SEQR process. As described in Section 1.2 of this GEIS, DowElanco and SePRO chose to prepared the Final Generic Environmental Impact Statement, Use of the Registered Aquatic Herbicide Fluridone (Sonar®) and the Use of the Registered Aquatic Herbicide Glyphosate (Rodeo® and Accord®) in the State of New York, Version 5.0, dated January 10, 1995, as described in § 617.15 to facilitate the development of individual permits for potential users of those products. Section 617. 15 (a)(4) allows for the development of a GEIS to assess the potential environmental effects of an entire program or plan having wide application.

The preparation of this GEIS is intended to provided potential users and interested parties with information specific for Sonar® and its positive and negative impacts on surface water resources of New York State.

The U.S. Environmental Protection Agency (USEPA) approved the label for Sonar® on March 31, 1986. The USEPA registration number for Sonar® A.S. is 62719-124. The USEPA registration number for Sonar® SRP is 62719-123. DowElanco received New York State registration approval for Sonar® SRP on February 9, 1993. DowElanco applied for, and was

[1]The rights of the trademarked product Sonar® were purchased by the SePRO Corporation of Carmel, Indiana from DowElanco of Indianapolis, Indiana. The Department of Environmental Conservation has approved the application to change just the name on the labels of Sonar® A.S. and Sonar® SRP. The revised labels are identical with DowElanco's name replaced by SePRO.

granted, a Special Local Needs (SLN) registration for Sonar A.S.® for the control of Eurasian watermilfoil (Myriophyllum spicatum L.), at application rates of *50* ppb or less in freshwater ponds, lakes, and reservoirs The SLN registration was received by DowElanco on February 9, 1993. The SLN registration number is SLN NY-930001.

The proposed action is the use of the aquatic herbicide Sonar® for the control of nuisance aquatic vegetation in waterbodies located in the State of New York. The use of the products can be an important component of a comprehensive management approach to limiting the production and spread of certain aquatic macrophytes. These macrophytes are often undesirable, opportunistic introduced species. These species can become a nuisance as a result of the production of excessive biomass or because of the growth habits or physical architecture of the plant. The production of these plant species can reduce the recreational use of a waterbody by interfering with swimming, boating, or fishing, They may also clog intake screens and turbines, impart an unpleasant taste to the water, reduce the presence of native aquatic species, and modify the aquatic habitat for indigenous organisms.

Because of its mat forming characteristics, excessive growth of Eurasian watermilfoil (a primary target species for Sonar®) may also present a safety hazard to the recreational use of a waterbody. The mats may conceal rocks, logs and other obstructions that could damage moving boats or injure skiers. Additionally, the mats may entangle swimmers, potentially resulting in drowning. Drowning as a result of entanglement in Eurasian watermilfoil mats have been documented in New York and Michigan.

Sonar is a systemic aquatic herbicide produced by SePRO. Sonar® works by interrupting the photosynthetic abilities of the target plants. Specifically, Sonar® inhibits the formation of the accessory pigment carotene within the target plants. In the absence of carotene, chlorophyll is rapidly degraded by sunlight, thereby preventing the formation of carbohydrates necessary to sustain the plant.

The active ingredient in Sonar® is fluridone (1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4[1H]-pyridinone). The U.S. Environmental Protection Agency (USEPA) Shaughuessy code for fluridone is 112900-6. Sonar® is packaged in two formulations: Sonar® SRP and Sonar® A.S. Sonar® SRP is a pelleted formulation containing 5 % fluridone. Sonar® SRP is generally applied via broadcast spreading. Sonar® A.S. is a liquid formulation that is mixed with water prior to application. Sonar® A.S. is generally applied via broadcast surface spraying or through the use of underwater hoses.

For both Sonar® formulations, the critical feature with regard to aquatic macrophyte control is obtaining an adequate concentration of the product in the treated area for a sufficient time period to produce the effect. Under optimum conditions the desired level of target aquatic macrophyte control is achieved 30-90 days after the use of Sonar®. Sonar® is absorbed from water by plant shoots and from the hydrosoil by the roots of aquatic vascular plants

The Milfoil Study Committee of the Vermont Department of Environmental Conservation (VDEC) reported that the VDEC has been attempting to control the spread of Eurasian watermilfoil through non-chemical means since 1978. The primary means have been mechanical harvesters and bottom barriers. Despite the attempts, the Committee has noted that Eurasian watermilfoil has continued to spread within infected lakes and to uninfested lakes. The Study Committee recommended to the VDEC in 1993 that they use aquatic herbicides on a site-specific basis for the control of introduced, exotic vascular aquatic plant species in Vermont. The Committee does not recommend the use of Diquat or Endothall because their use would not meet the statutory requirement of pesticide minimization in a long-range management plan and they do not recommend the use of 2,4-D because of the uncertainty about potential human health effects.

It is the aim of this document to evaluate the role of Sonar® in the management of aquatic nuisance vegetation and the potential for impacts from that use. This Generic Environmental Impact Statement evaluates Sonar® with respect to the following issues:

- Environmental Setting
- General Description of Sonar® and Its Active Ingredients
- Significant Environmental Impacts
- Potential Public Health Impacts
- Mitigation Measures
- Unavoidable Environmental Impacts
- Alternatives

This Final Generic Environmental Impact Statement (GEIS) consists of:

- The text of the FGEIS as amended from the Draft Generic Environmental Impact Statement (DGEIS), based on comments received by the Department;
- The Written Comments received on or before the close of the public comment period on June 6, 1994 and the responses to those comments are contained in Appendix G to this document;
- The Hearing Comments as received at the May 4, 1994 Hearing in Lake George; the May 5, 1994 Hearing in Poughkeepsie; and the May 11, 1994 Hearing in Rochester and the responses to those comments are contained in Appendix H to this document.

The DGEIS was accepted as complete on April 6, 1994 and available for public comment for 60 days until June 6, 1994. There were 3 public hearings held as fo1lows

- May 4, 1994 at 7:00 pm in the Lake George Town Center on Old Post Road in the Village of Lake George;

• May 5, 1994 at 7:00 pm in the Best Western Inn and Conference Center at 679 South Road (Route 9) in the City of Poughkeepsie; and

• May 11, 1994 at 7:00 pm in the Marriot Thruway at 5257 West Henrietta Road in the City of Rochester.

1.0 INTRODUCTION

1.1 PURPOSE OF THE GENERIC ENVIRONMENTAL IMPACT STATEMENT (GEIS)

This Generic Environmental Impact Statement was extracted from the Final Generic Environmental Impact Statement Use of the Registered Aquatic Herbicide Fluridone (Sonar®) and the Use of the Registered Aquatic Herbicide Glyphosate (Rodeo® and Accord®) in the State of New York Version 5.0, dated January 10, 1995. That Generic Environmental Impact Statement (GEIS) was submitted to the New York State Department of Environmental Conservation (NYSDEC) on behalf of DowElanco and SePRO, in part, for the aquatic herbicide fluridone (Sonar®)[1]. It is the purpose of the GEIS to objectively evaluate the scientifically documented evidence regarding all aspects of the use of (Sonar®) for the control of nuisance aquatic weeds in waters of the State of New York. This document is intended to present a general description of the potential positive and negative impacts from the use of this product within waters of the State of New York.

1.2 OBJECTIVE OF THE GEIS

The development of the Final Generic Environmental Impact Statement, Use of the Registered Aquatic Herbicide Fluridone (Sonar®) and the Use of the Registered Aquatic Herbicide Glyphosate (Rodeo® and Accord®) in the State of New York Version 5.0, dated January 10**,** 1995 provided potential users of those products with a general understanding of the various results that might be associated with the use of Sonar® in the waters of the State of New York. By developing the GEIS, SePRO has provided the information necessary for individual potential applicators to easily develop the necessary permit applications. However, the approach taken through the development of this GEIS is not intended to prevent any applicant from preparing a site specific supplement to the Final Programmatic Environmental. Impact Statement on Aquatic Vegetation Control (NYSDEC, l981a) in the development of a permit for the use of fluridone (Sonar®) in surface waters of New York State.

The preparation of this GEIS is intended to provided potential users and interested parties with information specific for Sonar® and its positive and negative impacts on surface water resources of New York State.

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[1]The rights of the trademarked product Sonar® were purchased by the SePRO Corporation of Carmel, Indiana from DowElanco of Indianapolis, Indiana. The Department of Environmental Conservation has approved the application to change just the name on the labels of Sonar® A.S. and Sonar® SRP. The revised labels are identical with DowElanco's name replaced by SePRO.

1.3 REGULATORY FRAMEWORK

The GEIS was prepared in accordance with 6 NYCRR Part 617, the New York State Environmental Quality Review Act (SEQR). The purpose of SEQR is to incorporate the consideration of environmental factors into the existing planning, review and decision-making processes of State, regional and local government agencies at the earliest possible time. An action is subject to review by the NYSDEC under SEQR if any state or local agency has the authority to issue a permit or other type of approval over that action.

NYSDEC issued a Positive Declaration (as defined in § 617.10(b)) stating that any permits developed for the potential use of the Sonar® in the State of New York warrant a review under the SEQR process. As described in Section 1.2 of this GEIS, DowElanco and SePRO chose to prepare the Final Generic Environmental Impact Statement, Use of the Registered Aquatic Herbicide Fluridone (Sonar®) and the Use of the Registered Aquatic Herbicide Glyphosate (Rodeo® and Accord®) in the State of New York, Version 5.0, dated January 10, 1995, as described in § 617.15 to facilitate the development of individual permits for potential users of the products. Section 617.15 (a)(4) allows for the development of a GEIS to assess the potential environmental effects of an entire program or plan having wide application.

The regulations concerning the use of pesticides in NYS are defined in 6 NYCRR Part 325 through 327. The regulations addressing the use of pesticides in wetlands are defined in 6 NYCRR Part 663 and within the Adirondack Park, 9 NYCRR Part 578.

The USEPA issued an Experimental Use Permit (No. 1471-EUP-67) for Sonar® in 1981. The USEPA approved the label for Sonar® on March 31, 1986. The USEPA registration number for Sonar® A.S. is 62719-124. The USEPA registration number for Sonar® SRP is 62719-123. DowElanco received New York State registration approval for Sonar® SRP on February 9, 1993. DowElanco applied for, and was granted, a Special Local Needs (SLN) registration for Sonar® A.S. for the control of Eurasian watermilfoil (Myriophyllum spicatum L.), at application rates of 50 ppb or less in freshwater ponds, lakes, and reservoirs. The SLN registration was received by DowElanco on February 9, 1993. The SLN registration number is SLN NY-930001. Pursuant to the registration conditions described in 6 NYCRR Part 326, fluridone may only be used as follows:

1. Application of aqueous suspension formulations are permitted in water of the State at application rates not to exceed 50 ppb of the active ingredient fluridone.

2. Application of pellet formulations are not permitted in waters less than two feet deep.

3. Swimming is not allowed in treated areas for a period of 24 hours following the application.

Sonar® is registered for use without restrictions in all states bordering New York State. Sonar® is not registered in Canada. The approved labels and Material Safety Data Sheets (MSDS) for Sonar® SRP and Sonar® A.S. are presented in Appendix A.

1.4 IDENTIFICATION AND JURISDICTION OF THE INVOLVED AGENCIES

The following agencies were identified as involved agencies for purposes of the development of this GEIS:

a. New York State Department of Environmental Conservation (NYSDEC) - Responsible for implementation of the laws and regulations pertaining to the management of environmental resources for the State of New York
b. New York State Department of Health (DOH) - Responsible for potential public health issues associated with the use of

the Products.
c. New York State Office of General Services (OGS) - Responsible for the management of property owned by the State of New York. As pertaining to this project, they are responsible for the management of the lakes and/or lake bottoms owned by the State of New York.
d. Adirondack Park Agency (APA) - responsible for implementation of the Adirondack park Land Use and Development Plan (as described by the Adirondack Park Agency Act).
e. New York State Department of State (DOS) - Responsible for the administration of the Coastal Zone Program.

By agreement of the involved agencies, NYSDEC designated as the lead agency for the GEIS.

2.0 DESCRIPTION OF THE PROPOSED ACTION - USE OF SONAR®

The proposed action is the use of the aquatic herbicide Sonar® for the control of nuisance aquatic vegetation in waterbodies located in the State of New York. The use of Sonar® can be an important component of a comprehensive management approach to limit the spread of certain aquatic macrophytes. These macrophytes can be undesirable in certain circumstances. They may be introduced species, which because of the lack of controlling ecological factors, reach a nuisance stage in terms of extreme numbers or biomass. Such exponential growth can reduce the recreational use of a waterbody by interfering with swimming, boating, or fishing. They may also clog intake screens and turbines, impart an unpleasant taste to the water, and reduce the presence of native aquatic species (Madsen et al., 1991a). Vermont Department of Environmental Conservation notes that nuisance vegetation may modify the aquatic habitat for indigenous organisms (VDEC, 1993).

Because of its mat forming characteristics, excessive growth of Eurasian watermilfoil (a primary target species for Sonar®) may also present a safety hazard to the recreational use of a waterbody. The mats may cover rocks, logs, and other obstructions that could damage moving boats or injure water skiers. Additionally, the mats may entangle swimmers, potentially resulting in drowning. Drowning as a result of entanglement in Eurasian watermilfoil mats have been documented in New York (Long et al., 1987) and Michigan (COLAM, 1992).

2.1 GENERAL DESCRIPTION OF THE AQUATIC HERBICIDE FLURIDONE (SONAR®)

Sonar® is a systemic aquatic herbicide produced by SePRO. Sonar® works by interrupting the photosynthetic abilities of the target plants. Specifically, Sonar® inhibits the formation of the accessory pigment carotene within the target plants. In the absence of carotene, chlorophyll is rapidly degraded by sunlight, thereby preventing the formation of carbohydrates necessary to sustain the plant.

The active ingredient in Sonar® is fluridone (1 -methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]- 4[1H]-pyridinone). The U.S. Environmental Protection Agency (USEPA) Shaughnessy code for fluridone is 112900-6. Fluridone was registered with the USEPA in 1986 and with the NYSDEC in 1993. Sonar® is packaged in two formulations: Sonar® SRP (Slow Release Pellets) and Sonar® A.S. (Aqueous Suspension). Sonar® SRP is a pelleted formulation containing 5% fluridone. Sonar® SRP is generally applied via broadcast spreading. Sonar® A.S. is a liquid formulation that is mixed with water prior to application. Sonar® A.S. is generally applied via broadcast surface spraying or through the use of underwater application equipment.

For both formulations, the critical feature with regards to aquatic macrophyte control is obtaining an adequate concentration of the product in the treated area for a sufficient time period to produce the effect. Under optimum conditions, as noted on the approved label, the desired level of target aquatic macrophyte control is achieved 30 - 90 days after the application of

Sonar®. Sonar® is absorbed from water by plant shoots and from the hydrosoil by the roots of aquatic vascular plants.

2.1.1 Purpose of the Product

As a systemic aquatic herbicide, Sonar® is designed to control broad-leaved submerged aquatic macrophyte species. This includes nuisance species such as Eurasian watermilfoil and curlyleaf pondweed, as well as native pondweeds. As opposed to a non-selective contact herbicide which will kill any plant material that it comes in contact with. Sonar® is intended for a select group of target species, which are listed on the registered labels. Several plant species that perform valuable functions in the aquatic environment, mainly floating and emergent species such as algae, bulrush, pickerel weed, cattails and waterlilies, are either not impacted, marginally impacted, or are impacted in a positive manner by the use of Sonar® at the labeled application rates. It is noted that the target species for Sonar® also perform valued functions, though the level of function can be dependent on the density of the target species.

The product's manufacturer, supported by various researchers, believes that the selectivity of Sonar® to the intended group of broad-leaved submergent aquatic macrophytes can be focused based on the application rates. Those species such as Eurasian watermilfoil and curlyleaf pondweed which are highly sensitive to fluridone, can be treated at sufficiently low rates that those species which are not quite as sensitive will only be moderately impacted. However, it is understood that the higher the application rate, the broader the impacts become within that category of macrophytes which are considered as potential targets or are sensitive to fluridone.

It is for these reasons, that the authors believe that the use of the term "selective" is appropriate for a discussion of Sonar®. The authors have attempted to objectively present all available information with regard to questions of selectivity and varying responses based on observed application rates, which again, is the purpose of this document. This includes information on the observed rapid reestablishment of native plant communities within a growing season of Sonar® application. Kenaga (1993) states in his document that often there are other factors related to impacts to native aquatic plant communities which are not associated with the use of Sonar®. Of particular note is that the intended opportunistic target species may so dominate the plant community that the remaining non-target community is reduced and very poor. This is where the rapid reestablishment of the non-target community that is documented in other studies (and is discussed in the GEIS) would be of importance.

2.1-2 Need for the Product

Sonar® is all aquatic herbicide which is intended for the selective control of nuisance aquatic macrophytes. Sonar® is especially effective in controlling or removing Eurasian watermilfoil and curlyleaf pondweed. Eurasian watermilfoil is an exotic, invasive aquatic macrophyte that can significantly affect the littoral characteristics of a freshwater pond or lake (Pullman, 1993 and VDEC, 1993). VDEC (1993) reports that in Vermont the number of confirmed lake infestations by Eurasian watermilfoil has grown exponentially, from fewer than 5 in 1962, to more than 35 lakes in 1992. Eighty-Five percent of that growth has occurred since 1982 and has occurred despite the efforts of non-chemical control methods. Coalition of Lakes Against Milfoil (COLAM, 1992) notes that 10 counties in the State of New York had reported occurrences of Eurasian watermilfoil in 1980. They report that by 1992, that number had grown to 35 counties. In its 1993 Annual Report on the Aquatic Plant Identification Program, the Rensselaer Fresh Water Institute notes that 38 counties had documented populations of Eurasian watermilfoil in 1993 (Eichler and Bombard, 1994). As a result of the documented expansion in the occurrences of Eurasian watermilfoil throughout the State of New York, the need for environmentally sound, effective methods for control of this nuisance species is evident Westerdahl and Hall (1987) note that Eurasian watermilfoil is extremely susceptible to fluridone, (the active ingredient in Sonar®).

Curlyleaf pondweed is also an exotic species that has spread throughout the United States (NYSDEC, 1990), Pullman (1992) notes that the curlyleaf pondweed will thrive in most plant productive lakes and that it can be a severe nuisance during the early part of the peak recreational use period in lakes in the northern United States. Pullman (1992) reports that Sonar® was used selectively for the control of curlyleaf pondweed in lakes in Michigan.

2.1.3 Benefits of the Product

The use of Sonar® will allow for a comprehensive approach to the control and management of target aquatic macrophyte species. It allows for the selective control of target macrophyte species and for the restoration of native plant communities. Through the use of Eurasian watermilfoil management techniques, which include an aquatic herbicide such as Sonar®, the negative attributes of the growth of this nuisance weed can be reversed. Pullman (1993) reports that the use of Sonar® in lakes in Michigan has resulted in the removal of Eurasian watermilfoil and allowed for the restoration of the native plant community. At concentrations above 8 ppb, Sonar® has never failed to control the growth of both Eurasian watermilfoil and curlyleaf pondweed.

Based on an economic study conducted in the Okanagan Valley region of British Columbia, the British Columbia Ministry of Environment, Lands and Parks (BCMELP, 1991) noted that the failure to control Eurasian watermilfoil results in economic impacts to the area surrounding the affected waterbody. Their study was conducted-in an area containing seven mainstream lakes and one upper elevation lake, of which 1000 hectares of shoreline were reported to be infested with Eurasian watermilfoil. They estimated losses in several economic areas; including transportation, the restaurant industry, the accommodation sector, and the shopping sector. BCMELP (1991) projected that a no-action alternative to managing for Eurasian watermilfoil would result in a revenue loss of $85 million dollars in 1990 to the region (or 26.5% of 1989 revenues). BCMELP (1991) also predicted a loss of 1700 employment positions in the tourist industry and a loss in real estate values of $360 million in the region. However, the British Columbia Ministry of Environment, Lands and Parks has not verified these projected economic losses. The use of Sonar® as a management approach would help alleviate those concerns.

The use of Sonar®, as per the NYS registered labels, would allow for the alleviation of safety concerns brought about by the infestation of a lake by Eurasian watermilfoil. Eurasian watermilfoil can reach a stage where thick mats will form at the waters surface. Under these conditions, rocks, logs, and other obstructions will be concealed. These objects would damage moving boats or injure skiers attempting to pass through the matted areas. Sonar® could be used to remove the Eurasian watermilfoil, and allow for the safe recreational use of the lake.

Sonar® can be a selective means of managing nuisance aquatic vegetation. The benefit of its use is the selective removal, of those exotic aquatic macrophytes considered to be a nuisance to the use, function and value of a lake, while allowing for the reestablishment of more valuable native plant species.

2.1.4 History of Product Use

The USEPA issued an Experimental Use Permit (No. 147l-EUP-67) for Sonar® in 1981. The USEPA approved the label for Sonar® on March 31, 1986. There were no use restrictions included for treated ponds (waterbodies 10 acres or less in size). For treated lakes and reservoirs, the only restriction was the prohibition on the use of Sonar® within 1/4 mile (1320 feet) of any potable water intake. There were no restrictions on uses of treated water, Sonar® and its active ingredient, fluridone, are registered only for aquatic uses. Specifically, it is registered for the management of aquatic vegetation in freshwater ponds, lakes, reservoirs, drainage canals and irrigation canals. The Sonar® SRP formulation is also registered for application to rivers. The USEPA registration number for Sonar® A.S. is 62719-124. The USEPA registration number for Sonar® SRP is 62719-123. DowElanco received New York State registration approval for Sonar® SRP on February 9, 1993. DowElanco applied for, and was granted, a Special Local Needs (SLN) registration for Sonar® A.S. for the control of Eurasian watermilfoil (Myriophyllum spicatum L.), at application rates of 50 ppb or less in freshwater ponds, lakes, and reservoirs. The SLN registration was received by DowElanco on February 9, 1993. The SLN registration number is SLN NY-930001.

Pursuant to the registration conditions described in 6 NYCRR Part 326, fluridone may only be used as follows:

1. Application of aqueous suspension formulations are permitted in water of the State at application rates not to exceed 50 ppb of the active ingredient fluridone.

2. Application of pellet formulations are not permitted in waters less than two feet deep.

3. Swimming is not allowed in treated areas for a period of 24 hours fol1owing the application.

Sonar® herbicides have been used primarily for the control of submersed nuisance aquatic plants, primarily hydrilla (Hydrilla verticillata) in the southern states, and Eurasian watermilfoil in the northern United States (U.S.). Curlyleaf pondweed (Potmogeton crispus) is also frequently a target species of aquatic plant management programs. Applications have provided successful management of target species, with control lasting from one to several seasons after treatment.

Lack of satisfactory control within treated areas is generally evident only where moderate to rapid rates of water exchange cause rapid dilution of fluridone treated water, resulting in too little contact time with target plants for adequate herbicide uptake. This situation may occur at water inlets into otherwise quiescent waterbodies.

Experience during the years since registration has shown that the use of Sonar® A.S. in treating water at concentrations that are lower than those listed on the Federal label can provide excellent control of Eurasian watermilfoil (Pullman, 1992). This is especially true in situations where treatments can be applied to whole water bodies and there is limited opportunity for dilution with untreated water. The low use rate experience made possible a 24(c) Special Local Need registration of Sonar® A. S. in NYS for control of Eurasian watermilfoil using reduced treatment rates.

Sonar® applications for control of Eurasian watermilfoil in northern, states have been made most frequently in Michigan. Applications have also been made in Indiana, Illinois, Minnesota, New Jersey and Washington. As indicated, these treatments have provided excellent control of target plants. Reduced Sonar rates, early season treatments, and uniform product applications over the area to be treated have removed nuisance growths of Eurasian watermilfoil, while minimizing the herbicide impacts on non-target species, including other aquatic plants listed on the Sonar® labels as species controlled.

2.1 4.1 Registration Status in States and Canadian Provinces That Are Neighboring New York State

Sonar® is registered, without any use restrictions, in Pennsylvania, New Jersey, Connecticut, Massachusetts, and Vermont. Furthermore, there are no restrictions on the use of Sonar® herbicides in any other state in which it is registered. Sonar® herbicides are not registered for use in Canada. No registration actions have been submitted to Canada.

2.2 GENERAL LOCATION OF THE PROPOSED ACTION

For the purposes of this portion of the GEIS, the general location for the proposed action is in the surface waters of the State of New York. The proposed action is the use of the aquatic herbicide Sonar® for the control of certain nuisance aquatic macrophytes. A specific description of the actual body of water in which Sonar® is intended for use would be included in the individual permit applications. Sonar® A.S. is registered in New York for use in freshwater lakes, ponds, and reservoirs. Sonar® SRP is registered for use in freshwater lakes, ponds, reservoirs, drainage canals, irrigation canals, and rivers. Under Article 24 of the Environmental Conservation Law, some ponded water may be described as wetlands.

NYSDEC (1987) reports that over 7500 lakes, ponds, and reservoirs can be found in the State of New York. While NYSDEC (1990) states that there are no scientific terms for the three types of waterbodies, it notes that ponds are generally small, shallow waterbodies with little or no wave action, that usually exhibit uniform temperature distributions. Lakes are generally large and deep water bodies that exhibit periodic thermal stratification and may have rocky, wave-impacted shorelines due to exposure to prevailing winds. Water in the lake is contributed from the surrounding land which is termed the water basin. Water can be contributed to the lake through streams, rivers, groundwater, or general surface runoff. Reservoirs are man-made lakes. For purposes of label interpretation, Sonar® labels define a pond as a body of water 10 acres or less in size. A lake or reservoir is defined as greater than 10 acres in size.

2.3 POTENTIAL AQUATIC MACROPHYTE TARGET SPECIES

This GEIS is a supplement to the NYS Environmental Impact Statement, dated May 1, 1981 (NYSDEC, l981a). Based on the registered label for Sonar® SRP, the aquatic macrophyte species listed in this section are considered to be potential target species for this product. However, not all of the aquatic macrophyte species described on the product labels are found in the State of New York. The detailed discussions of the target species are limited to those species indigenous to New York State. With respect to Sonar® A.S., it should be noted that this product is registered in NYS only for the treatment of Eurasian watermilfoil. However, at the registered application rate for Sonar® A.S., the plants in the following sections would be expected to be either affected, or not affected, depending on the species sensitivity to fluridone.

2.3.1 Eurasian Watermilfoil (Myriophyllum spicatum L.)

A primary target species for Sonar® in New York State is Eurasian watermilfoil (Myriophyllum spicatum L.) Eurasian watermilfoil is an aquatic plant found in the taxonomic family Haloragaceae. It is a rooted, vascular submergent macrophyte with long stems and feathery perennial leaves. Plants form no specialized overwintering vegetative structures such as turions. The leaves are generally attached along the entire stem in whorls of four and can be in excess of 35 mm in length. Each leaf is composed of 7 to18 pairs of leaflets (Pullman, 1993). The leaflets are mostly straight and of equal length. The inflorescence is terminal and extends above the water surface. Upper flowers are generally staminate. Lower flowers are generally pistillate (Britton and Brown, 1970b). Eurasian watermilfoil is an invasive, opportunistic exotic plant that is native to Europe, Asia, and North Africa (Pullman, 1993 and Long et al., 1987). Hotchkiss (1972) reports that Eurasian watermilfoil is distributed across the northern tier of the United States, from California to Vermont.

2.3.2 Other Potential Aquatic Macrophyte Target Species

The following species are listed on the federally registered labels for Sonar® A.S. and Sonar® SRP as potential species targeted for control. These species are consistent with those species listed on the New York registered label for Sonar® SRP. Sonar® A.S. is only registered in the State of New York for the management of Eurasian watermilfoil. The selection of A.S. versus SRP is further addressed in Section 4.2 and 4.5. Only those potential target species actually occurring in New York State are discussed in this section. Species listed in Table 2-1 are found on the New York registered Sonar® SRP label, but do not occur in New York State.

TABLE 2-1

AQUATIC MACROPHYTES LISTED ON THE REGISTERED LABELS FOR SONAR® BUT NOT FOUND IN THE STATE OF NEW YORK

Alligatorweed (Alternanthera philoxeroides)
Giant Cutgrass (Zizaniopsis miliacea)
Hydrilla (Hydrilla vertilillata)

The following potential target species are noted as being either controlled or partially controlled, consistent with the Sonar® SRP label. The controlled notation indicates that the plant species would be removed from the treatment area by the use of fluridone at the application rate labeled for Sonar® SRP in NYS. The partially controlled notation indicates that at the 50 ppb maximum application rate for Sonar® A.S. and at the maximum label application rate for Sonar® SRP in NYS, some herbicidal effects or growth suppression would be observed on the plant. The level of herbicidal effects, however, would not be such that the species would be removed from the waterbody and a claim for commercial control of the macrophyte could be maintained, Plant distributions in this section are based on Hotchkiss (1972), Mitchell (1986), Magee (1981), Tiner (1987) and ACOE (1977).

Submerged, Floating-leaved, and Floating Plants:

American Lotus (Nelumbo lutea) Partially controlled

The American lotus or yellow lotus is found in the taxonomic family Nymphaeaceae. This plant is listed as a rare native plant species in NYS. The lotus is characterized by grayish-green leaves which are as much as 2 feet across and float or stand above the water.

Bladderwort (Ultricularia spp.) Controlled

Bladderworts are found in the taxonomic family Lentibulariaceae. Magee (1981) reports that bladderworts are generally found in ponds, shallow lakes and sluggish streams, up to 1.2 meters in depth. Bladderworts are long, slender, free-floating plants with finely forked leaves, bearing small air bladders in the forks of the divisions. When treated at low Sonar® rates for control of Eurasian watermilfoil, bladderwort species will increase in area covered after the treatment (Pullman, 1993).

Common Coontail (Ceratophyllum demersum) Controlled

Coontail, or hornwort, is found in the taxonomic family Ceratophyllaceae. NYSDEC (1990) reports that coontail is a free-floating perennial which lacks roots. The stems are generally slender, and hollow and can grow up to 50 cm in length. Leaves are submersed and whorled in groups of 5 to 12 and are abundantly located near the stem tip. The primary method for coontail reproduction is through fragmentation. When treated at low Sonar® rates used for watermilfoil, coontail displays temporary herbicidal symptoms (Pullman, 1993).

Common Elodea (Elodea canadensis) Controlled

Common elodea, or ditch-moss, is found in the taxonomic family Hydrocharitaceae. NYSDEC (1990) notes that common eloclea s a submersed perennial, with thin, branched green stems. It often forms large masses near the bottom. Leaves are arranged in whorls of three or are opposite. Leaves are generally 10 to 13 mm long and 3 to 5 mm wide. Elodea is considered to be an aquatic nuisance species (Nichols and Shaw, 1986). Elodea grows on a wide variety of sediments, though it grows best on fine sediments where organic matter ranges from 10% to 25%. Elodea overwinters as an entire plant under the ice and grows quickly in the spring from the dormant stem apices. As with Eurasian watermilfoil, elodea spreads primarily through the disposal of stem fragments. Elodea is considered to be an important substrate for invertebrates. It is not considered to be important for invertebrates as a food source or as a place to lay eggs. Elodea has been noted to inhibit the growth of phytoplankton in a waterbody (Nichols arid Shaw, 1986).

Egeria, Brazilian Elodea (Egeria densa) Controlled

Egeria is found in the taxonomic family Hydrocharitaceae, This plant is an exotic species that is listed in NYS as a rare, escaped plant species,

Fanwort (Cabomba caroliniana) Controlled

Fanwort is an exotic introduced species introduced to NYS. It is found in the taxonomic family Nymphaeaceae. It is a submersed, floating perennial herb that is often rooted. The stems are slender and the leaves are opposite and whorled. Flowers appear above the upper leaves and are usually white or pink,

Naiad (Najas spp.) Controlled

Plants in this family, Najadaceae, are distributed from Newfoundland and Quebec to Minnesota, and south to Florida, They are generally found in shallow, quiet waters of ponds, lakes, pools, and sluggish streams. Magee (1981) notes that these plants arc slender, with many-branched stems up to 1 meter long. The leaves are opposite, slender and thread-like. Flowers are small and inconspicuous. Naiad (Najas quadalupensis var. olivacea) and holly-leaved naiad or maxine naiad (Najas marina), are listed as rare native plants in NYS.

Parrotfeather (Myriophyllum brasiliense) Partially Controlled

Hotchkis (1972) notes that parrotfeather is a common aquarium plant that is originally from South America. Parrotfeather is found in inland freshwater marshes and ponds.

Pondweed (Potamogeton spp.) Controlled

The pondweed family, Potamogetonaceae, is distributed from Newfoundland and Quebec to southern Alaska, south from Florida to Ca1ifonia. Pondweeds are generally found in still waters of ponds, lakes to moderately moving streams and rivers. Magee (1981) reports that pondwceds have slender, flexible, underwater stems bearing variable leaves in two vertical rows and opposite, elliptic floating leaves. Flowers are borne on spikes above the water surface. One species of pondweed (Ogdens's pondweed, Potamogeton ogdenii) is listed as an endangered native species in NYS. Hill's pondweed (P. hillii) is listed as a threatened native plant species in NYS. Pondweed (P. confervoides), northern pondweed (P. alpinus) and sheathed pondweed (P. filiformis var. occidentalis) are listed as rare native plant species in NYS.

Curlyleaf pondweed (Potamogeton crispus) is an exotic species that is considered to be a nuisance aquatic weed. Nichols and Shaw (1986) note that curlyleaf pondweed is native to Eurasia. It overwinters under the ice and its primary mode of spread is through the dispersal of dormant apices or turions. It prefers a water depth of one to three meters and a fine sediment texture with 10% to 25% organic content. It will survive in highly eutrophic conditions. Curlyleaf pondweed will form dense surface mats, which disrupt native plant communities, Spatterdock (Nuphar sp.) Partially Controlled

Spatterdock (Family Nymphaeaceae) is found in inland and coastal, fresh water marshes, ponds, lakes, pools, and the borders of slowly moving streams. Leaves vary greatly in size, but are generally large and lance-like in shape. In the form of the species indigenous to the northeastern United States, the leaves generally float on the surface of the water (Hotchkiss, 1972). Low Sonar® application rates used for treatment of Eurasian watermilfoil do not control spatterdock, but may produce temporary herbicidal effects.

Waterlily (Nymphaea spp.) Partially Controlled

Waterlilies (Family Nymphaeaceae) are aquatic herbs with thick cylindric, horizontal rootstocks. The leaves are generally large and cordate. Flowers are showy (Britton and Brown, 1970b). Waterlillies are found in slow, standing water in ponds, lakes or slowly moving treams. The three species of waterlily commonly found in New York State include Nymphaea odorata, N. tuberosa, and N. alba. Low Sonar® application rates used for treatment of Eurasian watermilfoil do not control waterlily, but may produce temporary herbicidal effects (Pullman, 1993).

Watermilfoil (Myriophyllum spp.) Controlled

Native species of Myriophyllum (Family Haloragaceae) are submersed, stout-stemmed perennials (Fairbrothers and Moul, 1965). There are generally 5 to 13 pairs of leaflets per leaf with each leaf approximately 4 cm long. Flowers are small and inconspicuous and occur in the axils of the upper leaves. Watermilfoil is found in ponds, lakes, sluggish streams, and shorelines. Eurasian watermilfoil (Myriophyllum spicatum L.) is considered to be an exotic nuisance weed (Nichols and Shaw, 1986).

Watermilfoil (Myriophyllum alterniflorum) is listed as a rate native plant species in NYS.

Waterprimrose (Ludwigia spp.) Partially Controlled

Waterprimroses are found in the evening-primrose family (Onagraceae). Plants in the genus Ludwigia are perennial or annual herbs, with alternate, usually entire leaves. They are generally found in freshwater marshes (Britton and Brown, 1970b). Ludwigia (Lugwigia sphaerocarpa) is listed as a rare plant species in NYS. Low Sonar® application rates used for treatment of Eurasian watermilfoil will only produce temporary herbicidal effects in waterprimrose

Waterpurslane (Lugwigia palustris) Partially Controlled

Waterpurslane, or false loosestrife (Family Onagraceae), is found along streams or springy areas. It can be found partly or wholly submerged in shallow water or sprawling over mud (Magee, 1981). It is a plant with a prostrate stem, with rooting occurring at the lower and middle nodes. Waterpurslane will often form mats. The leaves of the species are opposite and entire. The flowers of the species are small and found in the leaf axils. Low Sonar® application rates used for the treatment of Eurasian watermilfoil will only produce temporary herbicidal effects in waterpurslane.

Watershield (Brasenia schreberi) Partially Controlled

Watershield (Family Cabombaceae) is found in ponds, lakes, pools, and margins of slowly moving streams. It is found in water up to 1.2 meters in depth. The plant has floating leaves and flowers attached to flexible underwater petioles which are connected to thick rhizomes embedded horizontally in the mud. The leaves are large; growing up to 25 cm. The flowers are pinkish, with dark red centers. Low application rates used for the treatment of Eurasian watermilfoil will only produce temporary herbicidal effects in watershield.

Emergent and Marginal Plants:

Reed Canarygrass (Phalaris arundinaceae)
Reed canarygrass (Family Poaceae) is a grass that grows up to 2 meters in height. It is primarily found in marshes, wet meadows, and in ditches (Magee, 1981). Reed canarygrass normally grows in dense colonies. The leaf blades are long (up to 3.6 meters) and flowers are borne in a narrow, dense panicle. Reed carnarygrass is not controlled by Sonar at low Eurasian watermilfoil treatment rates.

Smartweed, Pennsylvania (Polygonum pensylvanicum)
The forms of species within this genus (Family Polygonaceae) are highly variable. Leaves are generally lance-like. The flowers are rose-pink or white. Pennsylvania smartweed is found in damp soil, roadsides, or fields (Peterson and McKenney, 1968).

Smartweed is not controlled by Sonar® at the low concentrations used to treat Eurasian watermilfoil.

Smartweed, swamp (Polygonum coccineum)

The forms of species within this genus are highly variable. This species has an erect form in the terrestrial environment and an aquatic form with floating leaves. Leaves are lance-like. Flowers are showy and pink.

Swamp smartweed is found in swamps and in shallow water, and along the borders of ditches (Peterson and McKenney, 1968). Smartweed is not controlled by Sonar® at the low concentrations used to treat Eurasian watermilfoil,

Spikerush (Eleocharis spp.)

Spikerushes (Family Cyperaceae) are annual or perennial sedges. Spikerushes are found in shallow water, marshes, and in wet soil, The culms of each plant are generally simple. The leaves are generally reduced to sheaths; very rarely the lowest leaf is bladebearing. Flowers are borne in spikes. There are approximately 120 species of spikerushes distributed in North America (Britton and Brown, 1970a). Some of the spikerush species indigenous to New York State include the creeping spikerush (Eleocharis fallax), blunt spikerush (Eleocharis obtusa), and dwarf spikerush (Eleocharis parvula). Engelmann spikerush (E. engelmannii) is listed as an endangered native plant species in NYS. Knotted spikerush (E. equisetoides), angled spikerush (E. quadrangulata) three-ribbed spikerush (E. tricostata), and long-tubercled spikerush (E. tuberculosa) are listed as threatened native plant species in NYS. Creeping spikerush, salt-marsh spikerush (E. halophila), and blunt spikerush are listed as rare native plant species in NYS. Spikerush is not controlled by Sonar® at the low concentrations used to treat Eurasisn watermilfoil.

3.0 ENVIRONMENTAL SETTING-SONAR

This section describes the environmental setting in which the proposed action, the use of the aquatic herbicide Sonar® is projected to occur. While this section presents the available data in as detailed an extent as is required, the information is generic for the State of New York.

3.1 GENERAL DESCRIPTION OF NEW YORK STATE AQUATIC ECOSYSTEMS

The aquatic ecosystems of New York State generally fall into four basic categories. These include standing freshwater systems (lakes, ponds, and reservoirs), flowing freshwater systems (rivers and streams), brackish systems (tidal estuaries), and saline coastal systems.

It is calculated that New York State has over 3.5 million acres covered by some type of surface water system (NYSDEC, 1967). That includes over 7500 lakes (NYSDEC, 1987), of which over 1500 are found in the Adirondack Mountains (NYSDEC, 1967). The Adirondack Mountains also contain over 16,700 miles of significant fishing streams. The state's largest lakes are Lake George, Lake Chautauqua, Oneida Lake, and the major Finger Lakes; Canadaigua, Keuka, Seneca, Cayuga, and Skaneateles (NYSDEC, 1967).

The specific characteristics of each aquatic system are partially determined by its physiographic setting within the state. Changes in the characteristics of each aquatic system will lead to changes in the endemic biota associated with that waterbody. Generally, waterbodies within New York State can be defined geographically by region and drainage basin location. Aquatic ecosystems in the eastern region, which includes the St. Lawrence/Lake Champlain/Black River basin, the Hudson-Mohawk basin, the Delaware basin, and Long Island are defined by either the Adirondack/Catskill mountain areas to the north or the New York Bight tidal estuarine area to the south. Aquatic ecosystems in the central region, which includes the Oswego-Ontario basin and the Susquehanna, are defined by areas of low relief with large areas of marshes to the north and broad, steeply sided valleys with limited natural storage capacity in the south. Aquatic ecosystems in the western region, which includes the Lake Ontario basin, the Erie-Niagara basin, the Genesee basin, and the Allegheny basin, are defined by the glaciated geology of that region (NYSDEC, 1967).

Waters in each of these basins are influenced by the composition of the geological formations found within the region. For example, waters in the Adirondack mountains and the Catskill mountains can be influenced by formations with little buffering capacity. In some lakes, this results in waters with pH values of less than 5 (NYSDEC, 1981b; ALSC, 1989). Surface water systems in the Erie-Niagara basin in western New York State are characterized by high levels of dissolved solids (140 to 240 ppm) and hard water (100 to 200 ppm, expressed as $CaCO_3$). Surface water in the Delaware River basin are characterized by low dissolved solid levels (averaging 37 ppm) and an average hardness of approximately 37 ppm. The dominant ions are silica, calcium, bicarbonate and sulfate (Archer and Shaughnessy, 1963). The dissolved solid concentrations in surface waters in the Champlain-Upper Hudson basin rarely exceed 500 ppm

(Giese and Hobba, 1970). In surface waters of the Western Oswego River basin, dissolved solid concentrations range from 50 to 300 ppm (Crain, 1975).

3.2 GENERAL CHARACTERIZATION OF AQUATIC PLANT COMMUNITIES IN NEW YORK STATE WATERBODIES

Aquatic plants are often the dominant biotic factors in pond settings and are important ecological features of larger waterbodies such as lakes and reservoirs.

The characteristics of plant communities in aquatic settings are determined by the type of waterbody in which the community is located. New York State, with its over 7500 lakes, contains an extensive array of freshwater systems. This diversity is further increased by the inclusion of streams, rivers, and other bodies of flowing water. Waterbodies vary in terms of color, pH, temperature, silt loading, bottom substrate, depth, rate of flow if it is a moving body, and watershed area. Each of these characteristics will affect, to some extent, the type and distribution of the plant communities in that waterbody. NYSDEC (1990) notes that the bottom morphology (shape) of a lake is a key factor is determining the type and extent of plant communities that are present. The chemical quality of the water is another factor that influences the distribution of plant species within a waterbody. Soft water lakes with a total alkalinity of up to 40 ppm and a pH of between 6.8 and 7.4 will often have sparse amounts of vegetation. Hard water lakes with a total alkalinity from 40 ppm to 200 ppm and a pH between 8.0 and 88 will have dense growths of emergent species that can extend into deeper water (Fairbrothers and Moul, 1965). Sculthorpe (1967) notes that the distribution of species within a waterbody is determined by the bottom substrate, light intensity (which is a function of depth and water clarity), and turbulence (currents or wave action).

Freshwater ecosystems include lentic ecosystems represented by standing waterbodies, such as lakes and ponds, and lotic ecosystems, which are represented by running water habitats. Lentic systems can be further subdivided in littoral, profundal, and benthic zones. The littoral zone is that portion of the waterbody in which the sunlight reaches to the bottom. This area is occupied by vascular, rooted plant communities. Beyond the littoral zone is the open water area, or limnetic zone, which extends to the depth of light penetration. This point of light penetration is called the compensation depth. This is the depth where approximately 1 % of the light incident on the water surface still remains. As a result of this decreased light, photosynthesis does not balance respiration in plants. Therefore, the light is not sufficient to support plant life. The strata below the compensation depth is called the profundal zone, The bottom of the waterbody, which is common to both the littoral zone and the profundal zone, is the benthic zone (Smith, 1980).

Lentic systems can be categorized based on ecological successional characteristics of the waterbody (Smith, 1980; NYSDEC, 1990; and Pullman, 1992). Succession is the ecological process by which one community is gradually replaced by a series of communities; tending to progress to a terminal community. In aquatic settings, the initial stage of succession is characterized by a lack of biota. Over a period of time, pioneering species colonize the waterbody, As the water and bottom substrates change as a result of movement of organic and inorganic sediments and nutrients into the waterbody, the organisms present change from those intolerant of higher organic material levels, to species that are more tolerant of the changes. Eventually, the waterbody can shift from a deep, sterile pool, to a shallow temporary pond, to an emergent marsh to eventually a terrestrial meadow. For additional information on lentic systems typical of NYS lakes, see Diet For a Small Lake (NYSDEC, 1990).

In lotic systems the distribution of plant communities is dictated by the velocity of the water flow and the nature of the bottom substrate. In fast moving waters, the system is usually divided into riffle and pool habitats. Riffles, which are areas of fast water, are centers of high biological productivity. However, the speed at which the water flows in these areas usually will not allow for rooted macrophytes to become established. Rooted vascular plant are more characteristic of pool habitats, which are interspersed with the riffle zones. In pools, the softer bottom substrate and the slower current velocities allow for the establishment of rooted plants. This is also the case for slower moving streams and rivers. In larger rivers, as with lakes, ponds, and reservoirs, depth becomes a determining factor for the distribution of plant communities (Smith, 1980).

Functionally, aquatic plants play important roles in the aquatic ecosystem. Aquatic macrophytes provide food and shelter for both vertebrate and invertebrate organisms and as spawning habitat for fish (Keast, 1984; (Gotceitas and Colgan, 1987; Schramm and Jirka, 1989; Hacker and Steneck, 1990: and Kershner and Lodge, 1990). The ability of the. nornrnunity to fill these functions, its value per se, is often a function of the species, density, and distribution of the members of that plant community. Daubenmire (1968) notes that plants in the genera Potamogeton and Scirpus are a favored food source for North American waterfowl, whereas muskrats (Ondatra zibethica) favor plants in the genera Carex, Sagittaria, and Typha. Brown et al. (1988) reported that vertically heterogeneous stands of aquatic macrophytes tended to contain more invertebrates than a community dominated by a single taxon. Therefore, opportunistic, rapid-growing species such as Eurasian watermilfoil, purple loosestrife, phragmites, and cattails, which develop dense monotypic stands in mature communities, would not he expected to offer the quality or diversity of habitat in such circumstances as more diverse communities would. Dionne and Felt (1991) note that high plant densities can interfere with the foraging ability and efficiency of piscivorous and insectivorous fish. Dense plant stands can directly or indirectly disrupt the utilization of macrophyte beds by fish and macroinvertebrates by affecting light penetration, temperature regimes, and water chemistry (Lillie and Budd, 1992).

Aquatic vegetation performs four basic functions in waterbodies (Fairbrothers and Moul, l965). These functions include: 1) modification of the dissolved gas content of the surrounding water; 2) provision of nutrient material suitable for food and the introduction of inorganic nutrients into the food cycle; 3) modification of the physical environment; and 4) the protection and provision of habitat for other organisms. In general, aquatic plants fulfill the preceding functions in the aquatic ecosystem. However, the extent to which those functions are fulfilled will depend on the location of the plant community (i.e. emergent community versus a deepwater community). The following sections more specifically address the type of plant community most likely to be involved in the use of Sonar® in New York State waterbodies. Furthermore, the roles that the individual species may play in that community are also described.

3.2.1 **Submerged, Deepwater and Floating Plant Communities**

Submerged plants are generally relegated to the littoral zone and include such genera as Potamogeton and Myriophyllum. Many of these macrophytes are rooted plants which complete the majority of their life cycle below the water surface, with only the reproductive structures extending above the water surface. Exceptions to this include plants in the genera Ceratophyllum and Utricularia. These plants do not have true roots, but are considered to be submerged plants found in the littoral zone (NYSDEC, 1990). Lemna and other free-floating species are generally found over the littoral zone and deeper water.

In ponded waters, generally a greater variety of plant genera is available to fulfill the necessary functions provided by the plant communities (Daubenmire, 1968). This occurs because of the small size of the ponds, which results in a reduction in the influence of wave action. Plant communities and large lakes can be influenced by wind driven waves which will restrict the distribution of plants in exposed areas. The functions described by Daubenmire include habitat for fish and invertebrates, food for waterfowl, and nesting or hiding areas for fish and other vertebrates, such as amphibians. Plants in the genera Ceratophyllum, Chara, Elodea, Naj as, and Potamogeton are the most common native species to fulfill these functions. These macrophyte species are generally the first macrophytes to advance over the bottom and will usually dominate the plant community which occupies that portion of the littoral zone at the pond margin to a depth of 7 meters.

In ponds, Daubenmire (1968) reports that floating plants, such as Lemna, are not affected by the depth of water with regards to distribution. The surface of a pond is a homogenous habitat for these plants, which will occur uniformly. Floating plants can be pushed by the wind from one area to another. Floating-leaved hydrophytes are common in shallow water habitats. These plants, such as the species Brasenia schreberi, Nuphar lutea and Nymphaea odorata, are limited to shallow water because they must produce a petiole of sufficient length to connect the root stock to the floating leaf,

Aquatic plant communities are commonly arranged by species along depth contours. These communities are comprised of either heterogeneous mixtures of species, or as is sometimes the case, they are comprised of monotypic stands of a single opportunistic macrophyte. The species diversity or richness of a plant community depends or sediment type, disturbance, and vegetation management efforts. The characteristics of the communities will, change with increasing depth as more shade tolerant species become dominant. Mosses, charophytes, several vascular species, and blue-green algae (Cyanobacteria) are the common constituents of the near-profundal zone. Open architecture species such as members of the genera Potamogeton are found in shallower, better lighted zones. Emergent species will typically dominate the shailowest water, but are usually accompanied by other vascular species.

Aquatic plants serve as food sources for a variety of organisms, including fish, waterfowl, turtles (snapping, Chelydra serpentina and painted, Chrysemys picta), and moose (Alces alces). Herbivores will consume fruits, tubers, leaves, winter buds and occasionally, the whole plant. Many species in the genera Potamogeton and Najas are considered to be valuable sources of food items. Plants in the genera Myriophyllum, Nymphaea, and Ceratophyllum are considered to be poor sources of food items (Fairbrothers and Moul, 1965). Nichols and Shaw (1986) note that Eurasian watermilfoil (Myriophyllum spicatum) is a poor source of food for waterfowl.

Submerged plants play an important role in supporting fish populations. Submerged plants provide food and shelter for rich and their young. Submerged plants serve as the substrate for the invertebrates that support fish populations. Smith et al. (1991) state that the production of forage fish and invertebrates generally increases in proportion to the submersed plant biomass. However, they conclude that populations of piscivorous fish tend to peak in water with intermediate levels of plant biomass, This is a function of the ability of the piscivorous fish, such as largemouth bass (Micropterus salmoides) to see their prey.

Submerged macrophyte stems and leaves may act as a substrate for a variety of microscopic organisms, called aufwuchs. Aufwuchs include bacteria, fungi, diatoms, protozoans, thread worms, rotifers and small invertebrates. The architecture of a particular plant species will also determine its suitability as a place for egg deposition for fish and amphibians. Additionally, the young of many fish species and some tadpoles will seek shelter in plant structures to evade predators.

Pullman (1992) notes that the architectural attributes of a particular plant species are a critical feature in the ability of that plant to function in support of fish populations. Those vertical plants with open architecture (some Potamogetons, Elodea, Cabomba, and a native species of Myriophyllum) provide more suitable habitat for fish than those plant species that form dense vertical mats or mats at the surface such as are formed by (Myriophyllum spicatum), and some Potamogetons (including Potamogetons crispus). Matted Eurasian watermilfoil plants have few leaves along their stems. The leaves are shaded and replaced by a dense leaf cover at the water’s surface. The collection of vertical stems has limited habitat value.

Madsen et al (1991) supports this by noting that most native species are recumbent or have short stems and do not approach the water surface and therefore tend to support greater fish populations than mat forming macrophyte species. Variable height and leaf architecture will yield more diverse habitats.

Pullman (1992) concludes that, in general, most native aquatic plant species do not reach nuisance levels. It is generally the exotic, introduced species that reach nuisance proportions based on numbers or biomass and are considered to be weeds.

3.3 DISTRIBUTION AND ECOLOGY OF PRIMARY POTENTIAL AQUATIC MACROPHYTE TARGET SPECIES

As mentioned in Section 2.0, the proposed action is the use of the aquatic herbicide Sonar® for the control of nuisance aquatic vegetation located in the State of New York. NYSDEC (1981) defines nuisance vegetation as overabundant vegetation that may be aesthetically unpleasing, may interfere with effective and proper harvest of fishery resources, and may interfere with other recreational activities. Pieterse (1990) defines nuisance aquatic vegetation as an aquatic weed or "an aquatic plant which, when growing in abundance, is not desired by the manager of it place of occurrence". In some circumstances, the aquatic species of concern is an exotic or introduced species. Such a species is not indigenous to the area and was introduced either accidentally or on purpose. This is not to say that exotic aquatic macrophytes do not, in some circumstances, fulfill all of the benefits and functions of native species. This is discussed more thoroughly in Section 9.0. A plant species, whether native or exotic, becomes a nuisance when the population reaches some level of overabundance such that a problem with the waterbody is evident. However, because an aquatic species is an exotic or introduced species, it generally has the potential for a more rapid population growth for the following reasons.

Suter (1993) maintains that many of the severe man-caused effects brought upon natural biotic systems are caused by the introduction of exotic species. Introduced species are generally opportunistic in nature and are usually able to out-compete native species. Thus, they have can significantly alter the character of native plant communities or the ecosystems. Exotic species are considered pioneer species. Pioneer species are those organisms that possess a reproductive strategy that emphasizes efficient dispersal of propagules, rapid spread and growth rate, and sometimes high rates of biomass production emphasized by high productivity and rapid growth. These plants are able to occupy a wide diversity of habitats (Smith, 1980).

Invasive, exotic species have successfully extended their distribution through both natural and anthropogenic means on a world-wide basis. Nichols and Shaw (1986) and Wade (1990) note that an invasive aquatic macrophyte has the potential to infest a waterbody, then spread to the maximum extent of the available habitat. Following the initial invasion period, the production of the invasive species can attain a degree of stability and habitat equilibrium. Subsequently, the population of the invasive will fluctuate in response to the temporal and spatial dynamics of the aquatic environment (Nichols and Shaw, 1986; Wade. 1990). Usually, the equilibrium condition for the production of species such as Eurasian watermilfoil and curlyleaf pondweed is considered to be deleterious for most recreational and utilitarian uses as well as a disruptive influence on the production of native plants and animals.

Some exotic species do serve as target species for Sonar®. This is particularly true of Eurasian watermilfoil, curlyleaf pondweed and cabomba (See Section 2.3). However, other exotic species which have substantial populations in NYS are not considered to be target species. That includes waterchestnut (Trapa natans). The following sections describe the general distribution and ecology of the primary target macrophyte for Sonar®".

3.3.1 Eurasian Watermilfoil (Myriophyllum spicatum L.)

Eurasian Watermilfoil is an introduced exotic that is thought to be native to Eurasia and North Africa (Couch and Nelson, 1985). It is currently believed to have been introduced into the Chesapeake Bay region in the mid-1940s. Since then, it has spread across the St. Lawrence system, the Great Lakes region, and into British Columbia and Washington State (Aiken et al., 1979). It is found throughout the Tennessee Valley system and from Florida to Texas (Giesy and Tessier, 1979). As

of 1992, COLAM (1992) reports that Eurasian watermilfoil had been identified in lakes in 35 of New York State's 62 counties. In its 1993 Annual Report on the Aquatic Plant Identification Program, the Rensselaer Fresh Water Institute notes that 38 counties
had documented populations of Eurasian watermilfoil in 1993 (Eichler and Bombard, 1994), VDEC (1993) reports that over 35 lakes in Vermont have been infested with Eurasian watermilfoil as of 1992. That is up from approximately 5 lakes in 1982. Pullman (1993) reports that Eurasian watermilfoil had been identified in lakes in all 83 counties in Michigan by 1978.

Eurasian watermilfoil is a tolerant species that has been shown to grow well in a variety of aquatic habitats. Couch and Nelson (1985) note that the plant will thrive in all types of nutrient conditions (oligotrophic to eutrophic), both hard and soft water and under both brackish and freshwater conditions. The plant appears to grow best in fine, nutrient-rich sediments that do not contain more than 20% organic matter and requires a minimum light intensity of 1% to 2% of the available light (Smith and Barko. 1990). Kimbel (1982) reports that the colonization success of Eurasian watermilfoil in terms of growth and mortality is best in late summer months in shallow water on rich organic sediments. Eurasian watermilfoil's maximum growth rate occurs at temperatures ranging from 30 to 35° C (Smith and Barko, 1990). The plant utilizes both sediments and the surrounding surface water as sources of nitrogen and phosphorus (Smith and Barko, 1990). Barko and Smart. (1980) indicate that uptake by the roots is the primary means of obtaining phosphorus.

Eurasian watermilfoil grows in waters at depths of 0 to 10 meters (typically between 1 to 5 meters in depth). Eurasian watermilfoil will commonly grow as an emergent in circumstances where the water level of the lake slowly recedes (Aiken et at., 1919). Smith and Barko (1990) suggest that light intensity determines much of the distribution and morphology of Eurasian watermilfoil. While it grows in waterbodies with wide ranges in water clarity, in turbid waters growth is generally concentrated in the shallow areas (Titus and Adams, 1979). In relatively clear waters, Eurasian watermilfoil grows at much deeper depths and may not reach the water surface.

Pearsall (1920) considers Eurasian watermilfoil to be a deep water plant species, which he defines as a plant growing at a depth where light intensity is less than 15% of full sunlight. The common growth pattern for Eurasian watermilfoil is for the plant to initially colonize deeper waters, where it will generate a large quantity of biomass which extends to the surface (Coffey and McNabb, 1974). As the Eurasian watermilfoil reaches toward the surface, the lower leaves of the plant will be shaded out and will slough off. This creates a dense organic bed beneath dense beds of Eurasian watermilfoil and is part of the process that recycles nutrients back into the water column. The leaves and stems of Eurasian watermilfoil will concentrate at the surface of the waterbody, forming a thick canopy or mat which extends into shallower waters when the plant reaches sufficient densities.

Madsen et al. (1991a), in work done in Lake George, New York, noted that growth characteristics are facilitated by a high photosynthetic rate and a high light compensation point. Because of its high photosynthetic rate and correspondingly increased metabolic activity and productivity, the plant is able to grow at a significantly higher rate than that exhibited by native species such as Potamogeton spp. and Elodea canadensis. Additionally, with its high light tolerance, Eurasian watermilfoil will tend to grow closer to the waters surface than the native species that occur in low to medium light intensity regions of the littoral zone. This pattern allows for successful replacement or disruption of native vegetative communities. Madsen et al. (1991b) reported that dense growth of Eurasian watermilfoil in a bay in Lake George had significantly reduced the number of native species present.

Eurasian watermilfoil will overwinter with much of its green biomass intact, Because of its adaption to grow at lower temperatures than many native aquatic species, Eurasian watermilfoil is capable of tremendous growth at the very beginning of the growing season. The early timing of growth, in conjunction with its great ability to produce large quantities of biomass, further gives Eurasian watermilfoil a competitive advantage over most native aquatic macrophytes (Pullman, 1992). Smith and Barko (1990) report that the characteristic annual pattern of growth is for the spring shoots to begin growing rapidly as soon as the water temperature approaches l5°C. Pullman (1993) notes that this growth generally occurs before most native aquatic macrophytes become active. However, Boylen and Sheldon (1976) state that some native aquatic macrophytes, including Potamogoton robbinsii and P. amplifolius, will remain metabolically active at temperatures as low as 2°C.

As the shoots grow, the lower leaves slough off as a result of shading. As the shoots approach the surface, they branch extensively and form the characteristic canopy (mat) discussed earlier in this section. Biomass peaks at flowering in early

July, and then declines. If the population flowers early, a second biomass peak and subsequent flowering may be attained. It is common for Eurasian watermilfoil to adopt a stoloniferous habit in the autumn, growing prostrate over the surface of the lake sediment. This may also assist Eurasian watermilfoil in the displacement of competing native species through the acquisition of space when most native species are dormant. Variations in this growth pattern can occur as a result of differences in climate, water clarity and rooting depth.

Dispersal of Eurasian watermilfoil is primarily through the spread of vegetative fragments. Seed production has been reported, but is considered a minor contributor to the plant spread (Hartleb et al., 1993). Pullman (1993) notes that there is much circumstantial evidence indicating that Eurasian watermilfoil does not form a viable seed bank in infested lakes. Eurasian watermilfoil has a tremendous capacity for the formation of vegetative fragments. A viable plant can regenerate from a single node carried on a fragment released in the water. Fragmentation can occur from boating or skiing impacts, as well as from mechanical harvesting operations. Additionally, Madsen et at. (1988a) reports that autofragmentation (self-fragmentation) is common after peak seasonal biomass is attained. Often fragments released through autofragmentation bear adventitious roots. Madsen et al. (l988a) also noted that fragments are very durable, and resistant to extensive environmental stress.

Pullman (1993) concluded that Eurasian watermilfoil is supportive of fish populations during its initial expansion stages in a waterbody. However, he goes on to note that once Eurasian watermilfoil begins to dominate the plant community and form its characteristic dense mats, the lack of plant species diversity and associated water quality impacts will reduce the quality of the habitat for fish. Nichols and Shaw (1986) reported that Eurasian watermilfoil provides beneficial cover for fish, unless the cover is so dense that stunting of fish growth from overcrowding results. Eurasian watermilfoil has been shown to provide a better habitat for fish (Kilgore et al., 1989) and invertebrates (Pardue and Webb, 1985) than open water. However, Dvorek and Best (1982) found that Eurasian watermilfoil had the poorest invertebrate fauna populations out of 8 aquatic macrophyte species that were examined. Keast (1984) noted that fish abundance was 3 to 4 times greater in mixed native plant communities than in a plant community dominated by Eurasian watermilfoil. Nichols and Shaw (1986) noted that Eurasian watermilfoil is poor food for muskrats and moose and fair food for ducks, which will eat its fruit.

Eurasian watermilfoil is an opportunistic species that is commonly found growing in areas that are not highly disturbed (Pullman, 1992). However, Pullman goes on to report that Eurasian watermilfoil appears to significantly increase in numbers and in biomass in areas of disturbance. This is reflective of the high productivity rate of the species and its resulting ability to outgrow native plant species. Eurasian watermilfoil is an aggressive colonizer and is able to displace native submergent plant species in as little as 2 to 3 years (Aiken et at, 1979). Nichols and Shaw (1986) summarized that Eurasian watermilfoil has various physiological adaptations that allow the plant to rapidly propagate by vegetative means, an opportunistic nature for absorbing nutrients, a life cycle that favors cool weather and mechanisms that enhance photosynthetic activity.

Once it has formed dense stands, Eurasian watermilfoil interferes with, or prevents, recreational activities in a lake. Pullman (1993) notes that mats may constitute a safety hazard because they are not penetrable by boats and may hide submerged objects that could be struck by moving boats. He also notes that people can be placed at risk if they swim in dense areas of Eurasian watermilfoil due to the potential for entanglement.

3.4 DISTRIBUTION AND ECOLOGY OF OTHER POTENTIAL AQUATIC MACROPHYTE TARGET SPECIES OF SONAR®

In addition to the primary potential aquatic macrophyte target species discussed in Section 3.3, Sonar® is intended for use to potentially control other aquatic macrophyte species. While the opportunistic ecological behavior of Eurasian watermilfoil will lead to extensive growth and large quantities of biomass, under certain conditions, the following species may also reach a nuisance level. They include both introduced and native species.

Table 3-1 discusses the submerged, floating-leaved and floating macrophyte species that are potential targets for control by Sonar®. The sources of information for Table 3-1 include NYSDEC (1990), Fairbrothers and Moul (1965), Magee (1981). Hotchkiss (1972), and Martin et al (1951). These species are found throughout New York State, though the actual presence and distribution in a waterbody are dependent on the physical characteristics of that waterbody.

TABLE 3-1

DISTRIBUTION AND ECOLOGY OF
POTENTIAL SUBMERGED, FLOATING-LEAVED AND FLOATING
TARGET MACROPHYTE SPECIES

American Lotus (Nelumbo letua)

Found in ponds and quiet streams; is at the northern edge of its geographic distribution in NYS

Bladderwort (Ultricularia spp.)

Found in ponds, lakes and sluggish streams throughout New York State (NYS); is considered of little food value to birds and mammals, but is a provider of cover for fish

Common Coontail (Ceratophyllum demersum)

Found in shallow ponds and slow streams throughout NYS; provides good shelter for young fish and supports insects that are eaten by fish; its fruits are eaten by waterfowl

Common Elodea (Elodea canadensis)

Found in ponds, lakes and sluggish streams throughout NYS; provides shelter for fish; used as food by waterfowl

Egeria, Brazilian Elodea (Egeria densa)

Found in ponds, lakes and sluggish streams; is a rare and exotic species in NYS; is considered to have escaped into the natural environment

Fanwort (Cabomba caroliniana)

Found in ponds and quiet streams in Southern regions of NYS; provides cover and food for fish; not an important food for waterfowl or mammals

Naiad (Najas spp.)

Grows in shallow ponds, lakes and sluggish streams throughout NYS; all parts of these plants are eaten by waterfowl

TABLE 3-1 (CONTINUED)
DISTRIBUTION AND ECOLOGY OF
POTENTIAL SUBMERGED, FLOATING-LEAVED AND FLOATING
TARGET MACROPHYTE SPECIES

Parrotfeather (Myriophvllum brasiliense)

Grows in shallow ponds, lakes and sluggish streams throughout most of NYS; poor food source; good shelter for invertebrates and fish

Pondweed (Potamogeton spp.)

Found in sluggish streams, lakes and ponds throughout NYS; all portions of the plant are eaten by birds and muskrats

Watermilfoil (Myriophyllum spp.)

Native watermilfoil species are found in ponds, lakes and sluggish streams throughout NYS; is considered a low-grade duck food; is considered to be good habitat and shelter for fish and macroinvertebrates

Spatterdock (Nuphar luteum)

Found in sluggish streams, ponds, small lakes and swamps throughout NYS; low wildlife food value

Waterhyacinth (Eichornia crassipps)

Rare and introduced in NYS; found in ponds, lakes and sluggish streams

Waterlily (Nymphaea spp.)

Found in shallow ponds, lakes and swamps throughout NYS; seed and rootstocks are eaten by ducks and marshbirds, beaver and moose eat the foliage, invertebrates utilize the undersides of leaves as shelter

Waterprimrose (Ludwigia spp., including waterpurslane (Ludwigia palustris)

Found in streams and springy areas throughout NYS; serves as a food source for birds and grazing mammals

TABLE 3-1 (CONTINUED)
DISTRIBUTION AND ECOLOGY OF
POTENTIAL SUBMERGED, FLOATNG-LEAVED AND FLOATING
TARGET MACROPHYTE SPECIES

Watershield (Brasenia schreberi)

Grows in ponds, lakes, and along margins of sluggish streams; plants provide shade and shelter for certain fish; fruits are eaten by various species of ducks

3.5 ROLE OF POTENTIAL AQUATIC MACROPHYTE TARGET SPECIES IN PLANT COMMUNITIES WITHIN NEW YORK STATE WATERBODIES

As discussed in Section 3.2, aquatic macrophytes fulfill valuable functions in the aquatic environment. They assist in oxygenation of the water, recycling of nutrients, and provide nesting and shelter areas for fish, amphibians, birds and mammals. Aquatic macrophytes serve in the stabilization of banks along watercourses and are a food source for a variety of organisms, including both invertebrates and vertebrates. The ability of a particular macrophyte to perform these functions and the quality of that function often depends on the characteristics of the entire aquatic community. Heterogeneous stands of plant species generally offer more of these functions than a monotypic stand (dominated by a single species). Heterogeneous stands have a greater vertical distribution of niches, which aquatic organisms that are dependent on the vegetation may fill. Additionally, the horizontal distribution of the aquatic plant communities will affect the functions and values that the individual species may offer. Patchy communities, with a variety of vegetative species spread over the available substrate, tend to offer a greater variety in habitats than a community dominated by a single species that completely covers the substrate. However, if that single species community is localized and is the only available habitat in a large aquatic setting, then at least some of the functions generally offered by aquatic vegetation would be offered. This circumstance may be evaluated in a lake management plan that would determine the goals and objectives of the vegetation management needs for that waterbody. Restoration of a mixed community of desirable plant species is likely to require initial removal of a monotypic plant stand.

3.5.1 Submerged, Floating-leaved, and Floating Plant Communities

Lilllie and Budd (1992) provide a definitive evaluation of the quality of habitat offered by Eurasian watermilfoil. In their study, conducted on a lake in Wisconsin, Lillie and Budd utilized an index of plant habitat quality and quantity to describe the following; 1) horizontal visibility within macrophyte beds; 2) the amount of shading afforded by the surface canopy; 3) the amount of available habitat for macroinvertebrate attachment: 4) the relative amount of protection afforded fish by the plants; and 5) the degree of crowding or compaction among plants. The results of their study indicated that the edges of Eurasian watermilfoil beds potentially provide more available habitat for macroinvertebrates and fish than interior portions. This conclusion was based on their observation that habitat space was more optimal at the edges, than in the center of the beds where stem crowding and self-defoliation resulted in a lack of vertical architecture due to the formation of surface mats. They noted that as Eurasian watermilfoil densities increase from sparse to dense, habitat value for prey species increased. However, as the vegetative density increased in Eurasian watermilfoil stands, a reduction in habitat for macroinvertebrates reduced the habitat quality for small fish. Habitat value for predator fish species initially increased as Eurasian milfoil first colonized areas, but, then decreased as plant crowding impacted the ability of the predators to access their prey.

The work by Lillie and Budd (1992) suggests that in relatively new or small Eurasian watermilfoil beds or in heterogenous communities where watermilfoil is a component, habitat functions and values of this plant are consistent with native plant species. However, it must be recognized that areas occupied by small, new or partial Eurasian watermilfoil stands may become dominated by this species within one or two seasons (Lillie and Budd, 1992).

In work conducted by Keast (1984) in a lake in Ontario, Canada, Eurasian watermilfoil significantly modified the habitat available to fish and macroinvertebrates. Keast noted that since the advent of Eurasian watermilfoil in his study area, significantly fewer bluegill (Lepomis macrochirus) were observed, but greater numbers of black crappie (Pomoxis nigromaculatus) and golden shiner (Notemigonus crysoleucus) were seen. He reported 3 to 4 times as many fish feeding in native plant beds as in the Eurasian watermilfoil beds.

The most critical impact Keast (1984) noted was to prey organisms. Keast reported that significantly fewer macroinvertebrates were seen in the watermilfoil beds than in a native plant community composed of Potamogeton and Vallisneria. He found 3 to 7 times greater abundance of 5 invertebrate taxa in the native plant communities and noted that foliage of the native plants supported twice as many invertebrates per square meter. Keast observed twice as many insect emergences in the native plant community as in the Eurasian watermilfoil beds.

Other recent studies have documented the impacts to the aquatic environment by the invasion of Eurasian watermilfoil. Madsen et al. (1991) noted a sharp decline in the number of native species per square meter in a bay in Lake George, New York. The decline was due to the suppression of native species by Eurasian watermilfoil. The decline was from 5.5 species per square meter to 2.2 species per square meter over a 2-year period.

Honnel et at. (1992) noted that in ponds containing Eurasian watermilfoil, dissolved oxygen levels were significantly lower than dissolved oxygen levels in ponds dominated by native plants. Additionally, they note that pH levels were higher in Eurasian watermilfoil than in native plant dominated ponds.

3.6 GENERAL CHARACTERIZATION OF AQUATIC VEGETATION MANAGEMENT OBJECTIVES FOR THE USE OF SONAR®

Aquatic vegetation management becomes necessary when the populations or biomass of aquatic macrophytes in a waterbody become so great that they impact some function or use of that waterbody. This is equally true for introduced exotic plant species, such as Eurasian watermilfoil, which displace native species that may possess greater ecological value. Those deleterious effects could include reduction in fish populations or quality of the fishery, angler success or waterfowl use, restrictions in boating or swimming, and clogging of intake pipes. Additionally, the scenic beauty on the lake and value of lakeside property will be significantly reduced as a result of the uncontrolled spread of an invasive species.

The primary management objective for the use of Sonar® is the control of overabundant submerged aquatic weeds, particularly Eurasian watermilfoil and curlyleaf pondweed. How Sonar® is to be used within the waterbody will depend on the aquatic plant management objectives for the individual waterbody. It is important that these objectives be identified by the lake association or organization governing the use of a waterbody. Factors which may need to be considered in developing the objectives include the size of the lake or waterbody and whether the waterbody is to be used for potable water, swimming, boating, and fish or waterfowl management. Improvement or maintenance of aesthetic, scenic, and property values may also require aquatic plant management. Additionally, information on the development of lake management objectives can be found in Chapter 5 of Diet For a Small Lake (NYSDSC, 1990).

4.0 GENERAL DESCRIPTION OF SONAR® AND ITS ACTIVE INGREDIENT FLURIDONE

4.1 GENERAL DESCRIPTION OF SONAR® A.S. AND SRP FORMULATIONS

Sonar® is a systemic aquatic herbicide used in the management of aquatic macrophytes in freshwater ponds, lakes, reservoirs, drainage canals, irrigation canals, and rivers. The active ingredient of Sonar® is fluridone. Two formulations of Sonar® are registered in New York State. Sonar® A.S. (Aqueous Suspension) is a liquid formulation containing 41.7% fluridone and 58.3% inert ingredients. Sonar® SRP (Slow Release Pellets) is a dry material containing 5.0% fluridone and 95.0% inert ingredients.

4.1.1 Active Ingredients

The active ingredient in Sonar® is fluridone (l-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl)- 4[1H]-pyridinone). Technical fluridone is an off-white to tan, odorless crystalline solid. It melts at between 151 to 154° C. The vapor pressure of fluridone is less than 1 x 10^{-7} mm Hg at 25°C. Fluridone is stable to hydrolysis at a pH of 3, 6 and 9. The partition coefficient (log K_{ow}) for fluridone in n-octanol/water is 1.87. Fluridone is not corrosive.

4.1.2 Inert Ingredients

The primary inert ingredient in Sonar® A.S. is water. Other inert ingredients are added to serve as wetters and dispersants in the formulation and to prevent freezing during storage. Sonar® A.S. and Sonar® SRP do not contain any inert ingredient listed on the USEPA List 1- Inerts of Potential Toxicological Concern or List 2 - Potentially Toxic Inerts/High Priority for Testing. The primary inert ingredient in Sonar® SRP is clay. Small amounts of a binder are added to maintain the integrity of the pelleted formulation.

4.1.3 Product Contaminants

There are no toxicological concerns associated with product impurities in Sonar® herbicides as formulated.

4.2 SELECTION OF SONAR® SRP VERSUS SONAR® A.S.

The selection of Sonar® SRP versus Sonar® A.S. should be based on the management objectives of the aquatic macrophyte control program for the particular waterbody. The permit restrictions for the products should also be considered, noting that Sonar® A.S. is only registered for the management of Eurasian watermilfoil. The selection of one formulation or the other is related to maintaining an appropriate concentration of fluridone for a sufficient amount of time to allow for uptake by the target macrophyte. Generally, Sonar® SRP is more appropriate for moving water because it releases fluridone over a longer period of time than the A.S. formulation. This will allow for a longer exposure time than the liquid formulation which would tend to be more rapidly diluted by untreated water.

Sonar SRP is most effective when applied while the target submerged plants are low growing in the water column and where bottom sediments are sands or other firm substrates. Sonar® A.S. is most effective where target submerged plants have grown to near the water surface. Sonar A.S. performs well when applied over soft muck or organic sediment.

4.3 DESCRIPTION OF USE

Sonar® is used as a systemic herbicide for the control of unwanted aquatic macrophytes in lakes, ponds, reservoirs, slow moving rivers, drainage canals, and irrigation canals. Sonar® A.S. can be applied through surface application, subsurface application, or by bottom application just above the hydrosoil. Sonar® SRP is applied through any type of broadcast applicator.

4.4 MODE OF ACTTON/EFFICACY

Sonar® is a systemic herbicide that is absorbed from the water column by plant shoots and from the hydrosoil by roots. The active ingredient in Sonar®, fluridone, inhibits the biosynthesis of carotenoid pigments within susceptible plants. Carotenoid pigments protects the photosynthetic pigment chlorophyll from photodegradation. Without the carotenoid pigments, chlorophyll is photodegraded and the plant is unable to carry on photosynthesis, Photosynthesis is required by the plant to produce carbohydrates necessary for metabolism (Elanco, 1981 and USEPA, 1986a). Specifically, the application of fluridone results in the accumulation of the colorless carotenes, phytoene and phytofluene, and lack of formation of the colored carotenoid, ß-carotene. In the absence of ß-carotene, chlorophyll is destroyed and the chloroplasts are disrupted in the sunlight causing cellular bleeding (Bartels and Watson, 1978 and Kowalczyk-Schröder and Sandmann, 1992).

Sonar®, and its active ingredient fluridone, have been shown to effectively control susceptible aquatic macrophytes. Eurasian watermilfoil and curlyleaf pondweed have been shown to be highly sensitive to fluridone. Pullman (1993) reported the removal of Eurasian watermilfoil and curlyleaf pondweed and the restoration of the native plant community following the treatment of a lake in Michigan with Sonar® at a rate of 13.6 ppb. Pullman (1993) cited more than two dozen other lake treatments in Michigan using application rates of between 8 ppb to 29 ppb to successfully control Eurasian watermilfoil and curlyleaf pondweed.

Sonar® is a slow-acting herbicide that requires an extended period of contact with the target macrophytes for the herbicidal effects to be induced. Netherland and Getsinger (1992) note that control of Eurasian watermilfoil with fluridone may take several weeks. DowElanco (1990) stated that it generally takes 30 to 90 days for Eurasian watermilfoil to drop out of the water column after treatment.

4.5 APPLICATION C0NSIDRATIONS THAT MAXIMIZE THE SELECTIVITY OF SONAR®

Application considerations should include those conditions described in 6 NYCRR Part 326. Under those considerations, fluridone may only be used as follows:

1. Application of aqueous suspension formulations are permitted in water of the State at application rates not to exceed 50 ppb of the active ingredient fluridone.

2. Application of pellet formulations are not permitted in waters less than two feet deep.

3. Swimming is not allowed in treated areas for a period of 24 hours following the application.

SONAR cannot be used with 1320 feet of any functioning potable water intake and users must comply with all other federal and state approved label requirements. Further, it must be noted that Sonar® A.S. is only permitted for the treatment of Eurasian watermilfoil. The following factors should be considered in the application of Sonar® to ensure maximum selectivity of the product.

4.5.1 Time of Application

It is recommended that Sonar® be applied as early in the growing season, as possible. Eurasian watermilfoil initiates productivity and metabolic activity at an earlier time than native plants (Smith and Barko, 1990). They report that the characteristic annual pattern of growth is for the spring shoots to begin growing rapidly as soon as the water temperature approaches 15° C. Pullman (1993) notes that this growth generally occurs before most native aquatic macrophytes become active. However, Boylen and Sheldon (1976) state that some native aquatic macrophytes, including Potamogeton robbinsii and P. amplifolius, will remain metabolically active at temperatures as low as 2° C. As a result of those growth characteristics, an early season application is recommended.

Utilizing an early growing season application would allow for the treatment of Eurasian watermilfoil while the remaining plant community is still dormant. Additionally, such applications would occur while the water is sufficiently cold to prevent recreational use (Pullman, 1994). Based on observations made in Michigan, Pullman (1993) noted that several broadleaf pondweeds may be moderately to highly susceptible to fluridone at application rates of 15 to 20 ppb, if the application occurs as these plants begin to grow. Though again, the spring growth of these species occurs after initiation of the growth of Eurasian watermilfoil.

4.5.2 Rate of Application

The registered application rates are described on the labels attached as Appendix A. Application rates for individual treatments may be varied to reflect the potential for water exchange in the treated area and for the susceptibility of target plants. Where treatments are being applied on a whole lake basis, with minimal opportunity for dilution by untreated water, application of Sonar® A.S. at low fluridone concentrations of 10 to 12 ppb has provided control oe Eurasian watermilfoil. Higher rates may be required where applications are made to portions of a water body and where water movement will cause dilution with untreated water. Such conditions would be based on the characteristics of an individual site.

It is the objective of this GEIS, under the SEQR process, to objectively present all pertinent facts associated with the potential use of these products as currently registered in the State of New York. The information that has been presented in the GEIS is a compilation of facts that have been shown in various studies. While it is true that lower applications rates may be efficacious, this is usually in entire waterbodies where the concentrations can be maintained for a sufficient period of time, In larger waterbodies where partial area control may be attempted, a higher concentration (but not exceeding the registered application concentration) would be required to compensate for dilution from untreated waters. It is for this reason that the NYS registered labels for Sonar® SEP and A.S. give the user a range of application rates such that a variety of site circumstances can be addressed.

4.5.3 Method of Application

The method of application should be chosen based on the formulation of Sonar® to he used, which is a function of the management objectives of the control program. Sonar® A.S. can be applied through surface application, subsurface application, or by bottom application just above the hydrosoil, if plant development permits. Sonar® SRP is applied through any type of broadcast applicator. Sonar® should be applied as evenly as possible over nuisance plant zones. However, certain lake basin morphometries may require that the material be applied uniformly over the entire lake. This should be done to enhance the selectivity of the Sonar® application.

4.5.4 Species Susceptibility

The potential target macrophytes discussed in Section 2.0 are susceptible to Sonar®. Susceptibility is related to the concentration of Sonar® applied to the system. Table 4-1 lists the species considered to be susceptible to Sonar®.

4.5.5 Dilution Effects

As previously noted, the important factor regarding the efficacy of Sonar® is the ability to keep a sufficient concentration of fluridone in contact with the plant for a sufficient time to allow for uptake by the target macrophyte. To prevent the dilution of the herbicide from reducing efficacy, several recommendations may be made. Ponds should be treated at one time. If lakes or reservoirs are being treated, it is recommended that treated areas be greater than 5 acres. To obtain effective plant control, spot treatments should not be applied to small (less than 5 acre) areas in large water bodies, such as when narrow boat lanes or dock areas are being treated. Application periods should be chosen when heavy rainfall is not expected. Where possible, the efficacy may be improved by restricting the flow of water. Whole lake applications provide the greatest opportunity for the long-term restoration of native plant communities.

TABLE 4-1.

SPECIES CONSIDERED SUSCEPTIBLE TO SONAR

American Lotus (Nelumbo lutea)
Bladderwort (Ultricularia spp.)
Common Coontail (Ceratophyllum demersum)
Common Elodea (Elodea canadensis)
Egeria, Brazilian Elodea (Egeria densa)
Fanwort (Cabomba caroliniana)
Naiad (Najas spp.)
Parrotfeather (Myriophyllum brasiliense)
Pondweed (Potamogeton spp.)
Watermilfoil (Myriophyllum spp., including Eurasian watermilfoil, M. spicatum)
Spatterdock (Nuphar luteum)
Waterhyacinth (Eichornia crassipes)
Waterlily (Nymphaea spp.)
Waterprimrose (Ludwigia spp., including waterpurslane (Ludwigia palustris)
Watershield (Brasenia schreberi)

Sources: Payne, 1992, Pullman, 1993 and
the **NYS** approvcd labels for Sonar 81W and Soner0 A-S.

4.6 FLURIDONE PRODUCT SOLTUBILITY

Fluridone is slightly soluble in organic solvents such as methanol, diethyl ether, ethylacetate, chloroform, and hexane. Fluridone has a water solubility or 12 ppm, which is considered to be medium solubility. The solubility of fluridone in water is greater than the 0.05 ppm use rate on the NYS SLN label for Sonar® A.S.

4.7 SURFACTANTS

Surfactants are not used with Sonar® products when used as labeled in New York.

4.8 FATE OF FLURUDONE AND ITS PRIMARY METABOLITE IN THE AQUATIC ENVIRONMENT

Various studies have indicated that photolysis is the primary degradation mechanism for fiuridone in aquatic ecosystems (Saunders and Mosier, 1983 and Muir and Grift, 1982). Microbial degradation of fluridone is documented to occur in laboratories (Mossler et al., 1991); however, photolysis generally occurs much more quickly (Muir and Grift, 1982), West and Parka (1981) also reported that the photolytic action occurs rapidly and is not influenced by the type of dispersal mechanism used to introduce Sonar®. Variables which may affect the rate of photolysis are those variables associated with sunlight penetration of the water column and sunlight intensity. They include geographic location, date of application, water depth, turbidity, weather, and weed cover (West et al., 1983).

West et al. (1983) identified 1-methyl-3-(4-hydroxyphenyl)-5-[3-(trifluoromethyl)phenyl]-4[1H]-pyridinone as the primary metabolite in fish. The same metabolite was identified as a minor metabolite in water and hydrosoil by Muir and Grift (1982). West et al. (1983) also identified 1 ,4-dihydro-1-methyl-4-oxo-5-[3-(trifluoromethyl)phenyl]-3-pyridinone as the major hydrosoil metabolite in hydrosoil studies conducted in laboratory settings. They note that the laboratory hydrosoil metabolite has not been identified in the hydrosoil of small ponds under natural conditions. Saunders and Mosier (1983) identified benzaldehyde, 3-(trifluoromethyl)-benzaldehyde, benzoic acid, and 3-(trifluoromethyl)-benzoic acid as photolytic breakdown products of fluridone added to a methanol/water solution in the laboratory.

Saunders and Mosier (1983) also identified N-methylformamide (NMF) as a photolytic breakdown product of fluridone which was added to a methanol/water solution in the laboratory. NMF has been shown to be teratogenic in rabbits at high doses and can penetrate human skin (Gaines, 1989). Early investigators were concerned with the possibility of NMF being produced by the breakdown of fluridone in the natural environment. However, NMF has never been identified under natural conditions (Gaines, 1989 and Osborne et al., 1989). Dechoretz (1991) did not identify NMF in water samples collected from ponds in California treated with aqueous suspension and pelleted formulations of Sonar®. West et al. (1990) did not identify NMF in water or hydrosoil samples collected from two ponds in Florida treated with Sonar® A.S. and Sonar® SRP at application rates of 0.15 ppm. In three ponds in Massachusetts, Smith et al. (1991) applied Sonar® A.S. and Sonar® SRP at a concentration rate of 0.15 ppm. Analysis of water samples collected from the ponds did not detect for NMF. Osborne et al., did not find NMF in water samples from ponds treated with up to 446 ppb fluridone.

4.8.1 Water (Aerobic and Anaerobic)

USEPA (1986a) reports that, under anaerobic conditions, fluridone has a half-life of 9 months and under aerobic conditions has an average half-life of 20 days. In field trials in ponds and lakes, using pelleted and aqueous Sonar® formulations, West et al. (1983) reported that the average maximum concentration for fluridone occurred 1 day after treatment in ponds (0.0871 ppm) and lakes (0.026 ppm). Observed concentrations are, of course, dependent on use rate.

Ponds, which were 1.2 hectares and smaller, were located throughout the U.S., including New York State. Treatment in this study was on a whole pond basis. Lakes were larger than 1.2 hectares and were located in Florida and Panama. Areas of 0.8 to 4.0 hectares were treated in lakes, West et al. (1983) reported the maximum average concentrations of fluridone in water after treatment using a pelleted formulation of Sonar® (Sonar® 5P), occurred 2 weeks after treatment in ponds (0.025 ppm) and 1 day after treatment in lakes (0.022 ppm). The delay in reaching the maximum concentration in the pelleted formulation is due to the time involved in the breakdown of the clay pellet and the subsequent release of fluridone. West et al. (1983) noted that the average fluridone concentrations in the water from the pelleted formulation were similar or less than the average fluridone concentrations in the water from the aqueous formulation. Additionally, their results indicated that, once the maximum fluridone concentrations were reached, the dissipation rates between the two formulations were similar.

Langeland and Warner (1986) supported the work conducted by West et al. (1983). In the study conducted by Langeland and Warner, two ponds In North Carolina were treated with 2.27 kg ai/ha and 1.14 kg ai/ha of Sonar® A.S. respectively. One additional pond in Virginia was treated with Sonar® 5P, a pelleted formulation, similar to Sonar® SRP. Their results indicated that between 64 and 69 days were required to reach no detectable levels of fluridone in the Sonar® A.S. treated ponds. In the Sonar® 5P treated lake, the maximum fluridone concentration (44.4 ppb) was reached 17 days after treatment, reflecting a time lag necessary for the fluridone to dissociate from the pellet formulation. Concentrations then decreased until 51 days after treatment, when a small increase in the fluridone concentration (from 20.9 to 28.9 ppb) in water was observed. Langeland and Warner speculated that this was the result of the release of fluridone back into the water from stressed vegetation.

West et al. (1983) reported that the half-life for fluridone in pond water treated with Sonar® A.S. ranged from *5* to 60 days. They were unable to calculate a half-life figure for the pelleted formulation of Sonar®. This was because fluridone was degrading at the same time it was being released from the pelleted formulation, resulting in a steady state concentration. Muir et al. (1980) reported a half-life for fluridone in water at a treatment level of 0.70 ppm of 4 days.

4.8.2 Sediment

Fluridone will adhere to sediment particles and organic material within the sediment. Elanco (1981) reported that fluridone will gradually desorb from the hydrosoil into the water column where it will photodegrade. Malik and Drennan (1990) noted that ph can be a controlling factor in adsorption, with the strength of adsorption increasing with lower pH levels. USEPA (1986a) notes that the half-life of fluridone in the hydrosoil is 90 days. West et al. (1979) reported a sediment maximum residue concentration equivalent to 16% of the fluridone theoretically applied to a pond in New York State. The application rate was 2.7 kg/ha of an aqueous fluridone formulation. That residue concentration decreased to 3% of the applied amount after 112 days. West et al. (1983) calculated a half-life of 3 months for fluridone in the hydrosoil of ponds. Additionally, they noted in 20 field trials that the laboratory hydrosoil metabolite does not form under natural conditions. West et al. (1983) also reported that studies on sediment-water systems indicated that fluridone tends to establish an equilibrium concentration between the water and sediment. Removal of fluridone from the water through photolysis results in the desorption of fluridone from the sediment into the water column to maintain the equilibrium.

4.8.3 Plants

Muir et al. (1980), using exaggerated application rates, reported a maximum residue concentration of 63.71 ppb of fluridone in duckweed (Lemna minor) following exposure to 5.0 ppm of fluridone in water. West et al. (1979) reported a maximum fluridone residue concentration of 3.98 ppm in Elodea canadensis, 7 days after treatment with an aqueous solution of fluridone that resulted in a water column concentration of 0.30 ppm at the time of application.

There is no information available on studies of herbivorous animals that consume aquatic vegetation containing fluridone residues. However, based on the low bioaccumulation rates reported in plants and the high levels of fluridone necessary to produce a toxic response in mammals and birds, it is not expected that herbivorous animals would be impacted by the use of fluridone at the registered application rates.

4.8.4 Fish

Based on all available fluridone residue data, USEPA has established a tolerance level of 0.5 ppm as adequate to protect human health from consumption of fish and crayfish (40 CFR and 180.420). The tolerance expressions assume an application at the maximum rates listed on the Federal Sona® labels. West et al. (1983) reported that the maximum residue in the edible tissue of fish (the filet) occurred 1 day after treatment using Sonar® A.S. (reported 0.132 ppm), 14 days after treatment (reported 0.528 ppm) in inedible tissue (the viscera) and 14 days after treatment in whole fish (reported 0.399 ppm). They also reported a maximum residue level in the edible tissue of fish occurred 1 day after trearment using a pelleted formulation of Sonar® (reported 0.067 ppm), 28 days after treatment in inedible tissue (reported 0.268 ppm) and 28 days after treatment in whole fish (reported 0.185 ppm).

Muir et al. (1980) observed a maximum concentration of 0.17 ppb of fluridone in fathead minnows (Pinephales promelas) following exposure to 0.070 ppb of fluridone in water. Additionally, they noted that the maximum concentration was detected 9.6 days after treatment. In ponds treated at an application rate of 0.1 ppm, Arnold (1979) noted fluridone concentration residues of 0.054 ppm in green sunfish (Lepomis cyanellus) one day after application; concentration residues in pumpkinseed sunfish (Lepomis gibbosus) of 0.023 ppm and in largemouth bass (Micropterus salmoides) of 0.010 ppm 7 days after application; concentration residues in black bullhead (Ictalurus melas) of 0.010 ppm 14 days after application; and no detectable concentration residues in pumpkinseed sunfish and largemouth bass after 27 days after application.

The consensus of the scientific literature is that fluridone concentrations in fish generally reflect the concentrations in water. As the residues are removed from the water column, they clear from fish tissues. In their work, West et al. (1983) observed that concentrations of fluridone in fish were at non-detectable levels following dissipation of the material from the water column. This supported the observations made by Muir et a1. (1980).

There is no information available on studies of fish-eating mammals or birds that consume fish containing fluridone residues. However, based on low bioaccumulation rates reported in fish and the high levels of fluridone necessary to produce a toxic response in mammals and birds, it is not expected that piscivorous animals would be impacted by the use of fluridone at the registered application rates.

4.8.5 Mammals

Absorption/excretion studies in rats indicate that a single oral dose of fluridone is rapidly absorbed and extensively metabolized and primarily excreted in the feces. Arnold (1979) noted that the fluridone dose was excreted within 72 hours. More than 80% was excreted in the feces and a trace was excreted in the urine.

4.8.6 Bioaccumulation/Biomagnification

USEPA (1986a) states that fluridone has a low potential for accumulation in fish. West et al, (1983) identified a total average bioconcentration factors for total fluridone residues of 1.33 for edible tissue, 7.38 for inedible tissue, and 6.08 for whole body. These data were obtained from 175 fish samples collected from across the country, including New York State. Muir et al. (1980) reported bioconcentration factors of up to 85 in duckweed following exposure to 5-0 ppm of fluridone in water. West et al. (1979) reported bioconcentration factors ranging from 0 to 15.5 in vascular plants following exposure to 0.10 ppm of fluridone in water. These peak values of fluridone residues were followed by a decline in concentrations as fluridone dissipated from the water column. No circumstance was identified in the scientific literature where fluridone irreversibly accumulated in biological tissues and remained after the dissipation of fluridone from the water column.

4.9 FLURIDONE RESIDUE TOLERANCES

The following residue tolerances have been established in accordance with applicable federal regulations.

4.9.1 Water

The USEPA designated an acceptable residue level for fluridone in potable water of 0.15 ppm. This concentration is based on the maximum application rate for fluridone as registered under FIFRA (USEPA, 1986a). NYS DOH has established an acceptable level of 0.05 ppm for unspecified organic compounds in drinking water that applies to fluridone residues.

4.9.2 Fish/Shellfish

The USEPA has designated a tolerance of 0.5 ppm for residues of fluridone and its primary rnetabolite (metabolite II) in fish (USEPA, 1986) and crayfish (40 CFR §180.420).

4.9.3 Crops/Agricultural Products

USEPA (1986) and 40 CER § 180.420 have designated the following residue tolerances for crops irrigated with water containing fluridone residue concentrations of 0.15 ppm:

Commodities	Parts per Million
Avocados	0.10
Citrus	0.10
Cottonseed	0.10
Cucurbits	0.10
Forage grasses	0.15
Forage legumes	0.15
Fruiting vegetables	0.10
Grain crops	0.10
Hops	0.10
Leafy vegetables	0.10
Nuts	0.10
Pome fruit	0.10
Root crops, vegetables	0.10
Seed and pod vegetables	0.10

Small fruit	0.10
Stone fruit	0.10

Additionally, residue tolerances have been established for the following raw agricultural commodities by USEPA (1986a) and 40 CFR § 180.420:

Commodities	Parts per Million
Cattle, fat	0.05
Cattle, kidney	0.10
Cattle, liver	0.10
Cattle, meat (except liver and kidney)	0.05
Cattle, mbyp	0.05
Eggs	0.05
Goats, fat	0.05
Goats, kidney	0.10
Goats, liver	0.10
Goats, meat (except liver and kidney)	0.05
Goats, mbyp	0.05
Hogs, fat	0.05
Hogs, kidney	0.10
Hogs, liver	0.10
Hogs, meat (except liver and kidney)	0.05
Hogs, mbyp	0.05
Horses, fat	0.05
Horses, kidney	0.10
Horses, liver	0.10
Horses, meat (except liver and kidney)	0.05
Horses, mbyp	0.05
Milk	0.05
Poultry, fat	0.05
Poultry, kidney	0.10
Poultry, liver	0.10
Poultry, meat (except liver and kidney)	0.05
Poultry, mbyp	0.05
Sheep, fat	0.05
Sheep, kidney	0.10
Sheep, liver	0.10
Sheep, meat (except liver and kidney)	0.05
Sheep, mbyp	0.05

5.0 SIGNIFICANT ENVIRONMENTAL IMPACTS ASSOCIATED WITH SONAR®

As a manufactured chemical that is released into the environment, Sonar® has been extensively evaluated for non-desired impacts in aquatic ecosystems. Much of this testing and evaluation has been reviewed as a facet of the NYS registration process, which resulted in the registration of Sonar® SRP in NYS, limiting its application to waters greater than two feet in depth. The registration process also resulted in the issuance of a Special Local Need (SLN) registration limiting the use of Sonar® A.S. to reduced application rates (50 ppb or less) for the control of Eurasian watermilfoil (Myriophyllum spicatum L.). However, as supported by extensive toxicological tests conducted during the product development and

FIFRA registration process, no adverse impacts have been identified which are expected to result from the presence of fluridone at or below the NYS unspecified organic compound concentration level of 50 ppb.

The EPA has designated an acceptable residue level for fluridone in potable water at 0.15 ppm (150 ppb) (USEPA, l986a). Independent studies have reported that fluridone has a very low level of toxicity to zooplankton, benthic macroinvertebrates, fish, and wildlife (Parka et al., 1978; McCowen et al., 1979; Arnold, 1979, and Grant et al., 1979). Arnold (1979) reported that fluridone is a safe, slow-acting herbicide that provides control of selected aquatic macrophytes, without impacting phytoplankton, zooplankton, benthic organisms or fish. Hamelink et al. (1986) concluded that fluridone is not expected to have adverse effects on the assortment of fish and invertebrates utilized in their study or on similar nontarget aquatic organisms. Furthermore, the potential for impacts can be reduced through the application considerations to maximize target selectivity as discussed in Section 4.5 and consideration of mitigation measures as discussed in Section 7.0. The following section discusses the potential impacts from the use of Sonar® in the water of NYS.

5.1 DIRECT AND INDIRECT IMPACTS TO NON-TARGET SPECIES

Sonar® is formulated as a selective aquatic herbicide for use in the management of unwanted aquatic macrophytes. As a chemical introduced into the environment, Sonar® has been evaluated during the registration process to determine potential adverse effects to non-target species. Direct impacts evaluated include toxicity, chronic changes in behavior or physiology, genetic defects or changes in breeding success or breeding rates for many test organisms. Indirect effects resulting from aquatic plant management may include changes in population size, changes in community structure or changes in ecosystem function. Both direct and indirect impacts can be evaluated at all stages of the life cycle of the non-target organism; though generally, the most sensitive stage of the organism (the young) is the period during which the organism is at greatest risk.

It should be noted that indirect impacts are often positive. For example, by controlling an exotic weed with Sonar®, the lake manager can facilitate the restoration of the native plant community. These desired changes in the community structure could be construed as an “impact”. The connotation of negative must be examined in light of the management objectives for the use of the product in the waterbody. Additionally, the balance of potential impacts must he considered in relation to the potential impacts from the presence of an exotic nuisance weed in an aquatic environment. The prevention of long-term impacts caused by unwanted aquatic plants may offset a potential short-term impact of the management program. Again, this issue should be evaluated for the waterbody of concern.

The direct toxicity of fluridone-based herbicides has been assessed using laboratory toxicity tests. The results of tests referenced in this section will be characterized according to the risk phases established by Christenson (1976) as follows:

EC or LC_{50}	Classiflcation
< 1 mg/1	Highly Toxic
1 - 10 mg/1	Moderately Toxic
10 - 100 mg/1	Slightly Toxic
100 - 1,000 mg/l	Practically Non-toxic
> 1,000 mg/1	Insignificant Hazard

Note: EC = Effective Concentration
LC_{50} = Concentration Considered to be Lethal to 50% of the Test Population

The following results should be considered in comparison to the 0.05 ppm concentration of fluridone allowed under the NYS drinking water concentration limit for all chemical compounds not specifically identified in the standards in waterbodies of NYS.

5.1.1 Macrophytes and Aquatic Plant Communities

Impacts to non-target rnacrophytes will be dependent on the sensitivity of that rnacrophyte to Sonar® at the application rate utilized (less than 50 ppb or 0.05 ppm), time of year of application, and use rate. Table 5-1 and Section 4.5.4 discuss those aquatic plants considered to be sensitive to Sonar® and fluridone. The loss of non-target plants within the aquatic plant community could alter the quality of functions that the vegetative community serves in the aquatic ecosystem. Loss of certain species from the community could alter the available habitat for fish species. The thinning of the macrophyte community could reduce the amount of refuge available to prey species and enhance the success of predators such as smallmouth bass. Such changes could benefit the fishery by altering the size distribution of the fishery (Andrews, 1989).

Lillie and Budd (1992) and Pullman (1993) suggest that in plant communities where Eurasian watermilfoil is in its pioneer stage of invasion or in heterogenous communities where watermilfoil is a component, habitat functions and values of this plant are considered to be comparable with native plant species. Therefore, the control of Eurasian watermilfoil in such communities could positively or negatively impact the associated fish community by temporarily reducing needed cover, shelter and food sources. However, it should be recognized that, once established, Eurasian watermilfoil is opportunistic and aggressive and demonstrates an ability to grow faster than and displace native plants (Pullman, 1993; Madsen, 1991b). The value of the fishery will then be degraded by loss of plant diversity resulting from excessive Eurasian watermilfoil growth.

TABLE 5-1

SENSITIVITY OF SUBMERGED AND FLOATING MACROPHYTE SPECIES TO SONAR APPLIED TO MICHIGAN LAKES

The sensitivity of common rnacrophyte species to Sonar when applied as whole lake treatments at rates used for the selective control of Eurasian watermilfoil and curlyleaf pondweed during the year of application and the year following application.

Common Name	Scientific Name	Response During Year of Application[1]	Response Following Year of Application[1]
Watershield	*Brasenia schreberi*	4	2
Fanwort	*Cabomba caroliniana*	5	?
Coontail	*Ceratophyllum demersum*	4-5	2
Charoid Algae	*Chara* spp. & *Nitella* spp.	1	2
Elodea	*Elodea chanadensis*	5	5
Water Stargrass	*Heteranthera dubia*	1	1
Northern Watermilfoil	*Myriophyllum sibiricum*	5	3
Eurasian watermilfoil	*Myriophyllum spicatum*	5	0
Watermilfoil	*Myriophyllum derticillatum*	3	3

Naiad	*Najas* spp.	4	2
Spatterdock	*Nuphar* spp.	4	2
Waterlilly	*Nymphaea* spp.	4	2
Broad Leaf Pondweed	*Potamogeton amplifolium*	3-4	2
Curlyleaf Pondweed	*Potamogeton crispus*	5	1-5
Illinois Pondweed	*Potamogeton illinoenis*	3-4	2
Sago Pondweed	*Potamogeton pectinatus*	4	1
Robin's Pondweed	*Potamogeton robbinsii*	1	3
Bladderwort	*Utricularia* spp.	1	3
Wild Celery	*Balliseria americana*	2-5	3

• The range of responses is related to the timing of the Sonar application.

TABLE 5-1 (CONTINUTED)

Response During Year of Application:

1 = Production or Total Distribution Increased
2 = Production or Total Distribution Slightly Increased
3 = No Impact on Plant Production or Distribution
4 = Production or Total Distribution Slightly Decreased
5 = Production or Total Distribution Drastically Decreased

Response Following Year of Application:

0 = Production Virtually Eradicated by Previous Year Application
1 = Production or total Distribution Increased
2 = Production or Total Distribution Slightly Increased
3 = No Impact on Plant Production or Distribution
(Production and Distribution Presumed to be Similar to Time of Pre-Milfoil Invasion)
4 = Production or Total Distribution Slightly Decreased
5 = Production or Total Distribution Dramically Decreased

Source: D. Pullman, Personal Communication, 1993

to grow faster than and displace native plants (Pullman, 1993; Madsen et al., 1991b). The value of the fishery will then be degraded by loss of plant diversity resulting from excessive Eurasian watermilfoil growth.

Sonar® controls all species listed on the label at the federal label application rate of 150 ppb. The label also lists species that may be partially controlled or are not controlled at these rates. Andrews (1989) notes that at low concentrations, Sonar® is highly selective to Eurasian watermilfoil and curly leaf pondweed. In a series of lake treatments in Michigan in 1992 at Sonar® application rates ranging from 8 to 29 ppb, Eurasian watermilfoil and curlyleaf pondweed were completely removed from the aquatic plant communities (Pullman, 1993). Non-target impacts included temporary herbicidal symptoms in water lilies (Nymphea and Nuphar spp.) and coontail (Ceratophyllum demersum). Pullman (1993) did report that elodea (Elodea canadensis) is susceptible to Sonar® and was usually removed from the plant communities in the treated lakes. He did observe that some native broadleaf pondweeds (Potamogedon spp.) appeared to be moderately to highly susceptible to Sonar® at application rates of 15 to 20 ppb, if the application occurred in the latter part of April and the early part of May. However, Pullman noted that native flora reestablished itself within a year of application. The production of Chara increased dramatically in nearly all lakes during the season of application. Water stargrass (Heteranthera dubia) and bladderwort (Utricularia spp.) also increased in area cover during the season of application.

In another lake treatment in Michigan, Pullman (1990) reported that at a Sonar® application rate of 0.014 ppm, Eurasian watermilfoil and curly leaf pondweed were removed from the water column in 4 to 6 weeks. In that treatment, water lilies exhibited some Sonar® induced chlorosis. Coontail was heavily impacted by the treatment, but persisted until the end of the growing season. Illinois pondweed (Potamogedon illinoensis) and water stargrass (Heteranthera dubia) were not affected by the Sonar® application and succeeded in expanding their distribution into areas previously colonized by the exotic aquatic macrophytes.

In a review of 21 lake treatments in Michigan in 1992, Kenaga (1992) noted that Sonar® effectively removed Eurasian watermilfoil and curlyleaf pondweed at concentrations as low as 8 ppb, where water exchange was minimal. The lakes ranged in size from two to 600 surface acres. In many of these lakes, non-target species had been limited by almost monoculture populations of nuisance exotic macrophytes. Kenaga (1992) went on to report that Sonar® was moderately effective at controlling southern naiad (Najas guadalupensis) and coontail (Ceratophyllum demersum) at 20 ppb, but relatively ineffective at controlling fanwort (Cabomba spp.).

In his 1992 preliminary draft report, Kenaga also noted that Sonar® effectively removed non-target species from the treated lakes at concentrations above 12 ppb. Re reported that after twelve to sixteen weeks from 20 to 100% of tho native plant community had been removed in the 21 lakes. However, he also noted that the study had not been of sufficient duration to evaluate the longer term control effectiveness of Sonar®, and even stated that pondweed regrowth was observed in two lakes at the end of the study. He also stated that several factors contributing to the low amounts of remaining cover could vary from lake to lake and could include:

a. A lack of accurate knowledge of the lakes depth resulted in treatment with a higher concentration of Sonar® then planned.

b. Succeeding yearly treatments.

c. Poor initial non-target plant communities. Monotypic stands of Eurasian watermilfoil or curlyleaf pondweed will result in very low populations of native plants. Kenaga noted that in 11 lakes in which the submersed native plant community was reduced in cover by 90 to 100% after 14 to 16 weeks, the initial native plant community was sparse to very sparse in terms of species diversity and density prior to treatment.

As previously discussed, Pullman (1993) stated that regrowth of the native plant community nearly always returned within a year of application. This is further supported in Pullman (1994).

Kenaga (1992) also reported that the primary emergent vegetation effected by Sonar® were water lilies and cattails. Impacts to these species were primarily chlorosis and damage to plant foliage. However, even with damage or lost leaves, most water lilies were still observed to flower, indicating the continuing viability of the plant. Kenaga did note that emergent vegetation in lakes treated early in the season or in the 8 to 10 ppb range, experienced the least damage.

In an experimental lake treatment in Florida using both Sonar® A.S. and Sonar® SRP, hydrilla (Hydrilla verticillata) and Illinois pondweed (Potamogeton illinoensis) were the only two submerged aquatic macrophytes significantly impacted by the application. Coontail (Ceratophyllum demersum), southern naiad (Najas quadalupensis), bladderwort (Ultricularia spp.) and eelgrass (Vallisneria americana) were unaffected by the Sonar® application

Fluridone has the potential to impact terrestrial plants through the use of water containing fluridone for irrigation purposes. Recommended time frames for delaying use of treated water for irrigation are summarized on the Sonar labels.

5.1.2 Algal and Planktonic Species

Sonar® is not considered to be effective as an algicide (product label). Pullman (1993) reported that chara rapidly spreads in the littoral zone of Michigan lakes following Sonar® use for removal of Eurasian watermilfoil or curlyleaf pondweed. Filamentous algae and Nitella increased in Lake Sompson, Florida, following treatment with Sonar® (Hinkle 1985). Parka et al. (1978) noted that fluridone did not appear to adversely affect desirable phytoplankton at treatment concentrations of 0.3 and 0.1 ppm. They did report some temporary reductions in less desirable blue-green phytoplankton species such as Anabaena and Anacystis. Similarly, Kammarianos et al. (1989) reported the elimination of bloom causing blue-green algae (Cyanophyceae) following the treatment of a Greek pond with Sonar® A.S., which resulted in a water concentration of 0.042 ppm of fluridone. However, diatoms and other phytoplankton species (Diatomaceae, Chlorophyceae, Dinophyceae and Englenineae) increased after Sonar® use. The authors concluded that no detrimental effects were apparent. Struve et al. (1991) reported no sufficient reduction in phytoplankton densities when two ponds in Alabama were consistently exposed to a fluridone concentration of 0.125 ppm. Fluridone as an aqueous solution, when applied at the exaggerated rate of 1.0 ppm resulted in the reduction of zooplankton species, while an application rate of 0.3 ppm did not produce any effects in the zooplankton community (Arnold, 1979). In the 1.0 ppm treated pond zooplankton populations returned to pretreatment levels within 43 days. Arnold reported similar trends in the phytoplankton population.

Kenaga (1992) reported that Chara expanded almost exponentially following the removal of submersed macrophytes in most lakes that he surveyed in Michigan. He also noted a perceived improvement in water clarity. While not scientifically documented, Kenaga reported that the possible reason for the improvement in water clarity was the increased growth in Chara.

5.1.3 Fish, Shellfish and Aquatic Macroinvertebrates

USEPA (1986a) summarizes the data developed from exposure of aquatic organisms in standard static water LC_{50} toxicity tests. Following exposure of Daphnia magna for 48 hours, the concentration of fluridone calculated to product an acute response in 50% of the test population was 6.3 ppm. Following exposure of rainbow trout (Salmo gairdneri) and bluegill (Lepomis macrochrius) for 96 hours, the concentration of fluridone calculated to produce a lethal response in 50% of the test population was 11.7 ppm and 12 ppm, respectively.

USEPA (1986a) also lists a Maximum Acceptable Toxicant Concentration (MATC) of greater than 0.48 ppm, but less than 0.96 ppm, for exposure of fathead minnow fry (Pimephales promelas) to fluridone, indicating that no treatment related effects on fathead minnow reproductive measures were observed at or below 0.48 ppm. Struve et al. (1991) observed that fish abundance and community structure remained unchanged in ponds exposed to a fluridorie concentration level of 0.125 ppm.

Parka et al. (1978) reported that at the exaggerated rate of 1.0 ppm of fluridone in water, the total numbers of benthic organisms were significantly reduced when compared to a control population. They also noted that 0.3 ppm of fluridone in water did not significantly reduce total numbers of benthic organisms. Fluridone as an aqueous solution, when applied at the rate of 1.0 ppm resulted in the reduction of populations of the amphipod Hyalella azeteca while an application rate of 0.3 ppm did not result in the reduction of amphipod populations (Arnold, 1979). Naqvi and Hawkins (1989) reported Sonar LC_{50} values of 12.0 ppm, 8.0 ppm, 13.0 ppm and 13.0 ppm for the microcrustaceans Diaptomus sp., Eucyclops sp., Alonella sp., and Cypria sp., respectively.

Hamelink et al. (1986) conducted extensive acute and chronic toxicity tests on numerous fish and invertebrate organisms. For invertebrates, they noted an average 48-hour or 96-hour LC_{50} or EC_{50} (depending on the organisms) fluridone concentration of 4.3 ± 3.7 ppm. The representative invertebrates used in the study included amphipods (Gammarus pseudolimnaeus), midges (Chironomus pulmosus), daphnids (Daphnia magna), crayfish (Orconectes immunis), blue crabs (Callinectes sapidus), eastern oysters (Crassostrea virginica), and pink shrimp (Penaeus duroarum). For fish, they noted an average 96-hour LC_{50} fluridone concentration of 10.4 ± 3.9 ppm. The representative fish used in their study included rainbow trout (Salmo gairdneri), fathead minnows (Pimephales promelas) channel catfish (Ictalurus punctatus), bluegills (Lepomis macrochirus) and sheepshead minnows (Cyprinodon variegatus).

In the chronic toxicity tests conducted by Hamelink et al. (1986), no effects were observed in daphnids, amphipods, and midge larvae at fluridone concentrations of 0.2, 0.6, and 0.6 ppm, respectively. They reported that channel cattish fry exposed to fluridone concentrations of 0.5 ppm were not significantly affected. Catfish fry growth was reported as reduced at fluridone concentrations of 1.0 ppm. They also reported that chronic exposure of fathead minnows to mean concentrations of 0.48 ppm did not produce adverse effects. Results from Hamelink et al. (1986) indicated that fluridone concentrations of 0.95 and 1.9 ppm resulted in reduced survival of fathead minnow within 30 days after hatching.

5.1.4 Avian Species

USEPA (1986a) notes that acute toxic effects were not observed in bobwhite quail (Colinus virginianus) following the oral administration of a dose concentration of 2000 mg/kg of fluridone. USEPA considers this to be a slightly toxic response. Avian 8-day dietary studies for the bobwhile quail and the mallard ducks (Anas platyrhynchos) resulted in no mortality at 5000 ppm fluridone in the bird's food ration. (USEPA, 1986). USEPA further reported that no reproductive impairments in bobwhite quail or mallard ducks were observed following dietary. exposure of up to 1000 ppm.

5.1.5 Mammals

Metabolism and distribution tests have shown that fluridone is, absorbed and excreted in the feces within 72 hours of oral administration within rats. Acute toxicity studies have shown that the LD_{50} for a rat (Rattus norvegicus) exposed through the oral pathway to technical grade fluridone is greater than 10,000 ppm. Ingestion of Sonar® A.S. by rats resulted in no mortality when administered at 0.5 ml/kg. The LD_{50} for a mouse (Mus musculus) exposed through the oral pathway to technical grade fluridone is greater than 10,000 ppm. The LD_{50} for a cat (felis domesticus) exposed through the oral pathway to technical grade fluridone is greater than 250 ppm. The LD_{50} for a dog (Canis familiaris) exposed through the oral pathway to technical grade fluñdone is greater than 500 ppm (Elanco, 1981).

In 90-day subchronic feeding studies, no treatment-related effects were noted in rats at dietary doses of 330 ppm fluridone or in mice at dietary doses of 62 ppm fluridone. No toxic effects were observed in dogs at dietary doses of fluridone of 200 mg/kg/day. In one-year feeding studies, a dietary level of fluridone o 200 ppm did not produce toxic effects in rats and a 100 ppm dietary level did not produce toxic effects in mice. The administration of 150 mg/kg/day of fluridone to dogs for one year did not produce toxicological effects. Two-year feeding studies resulted in no evidence of carcinogenicity. In reproductive studies, fluridone was not teratogenic to rats at 200 mg/kg/day or rabbits at 750 mg/kg/day when administered during the organogenesis phase of gestation. Three successive generations of rats maintained on diets containing 2000 ppm of fluridone showed no impairment of fertility, liveborn litter size, gestation length or survival, progeny survival, or sex distribution (Elanco, 1981). Table 5-2 summarizes the NOEL's identified in toxicological tests conducted on fluridone. NOEL (No Observed Effect Level) is the highest dose tested which did not produce effect in the test group. For relative comparison of toxicity values, a listing of the toxicity of some common chemicals follows in Table 5-3.

5.1.6 Reptiles and Amphibians

Toxicity tests have not been conducted on any reptile or amphibian species, nor have they been required under the FIFRA process. Qualitative observations made by Arnold (1979) in field tests of fluridone in an aqueous solution at application rates of up to 1.0 ppm noted that frogs (Rana spp.), watersnakes (Nerodia spp.), and softshell turtles (Trionyx spp.), were not obviously impacted by the herbicidal application.

5.1.7 Federal and State Listed Rare, Threatened, and Endangered Species

Endangered species are those organisms faced with extinction in all or much of their distribution, Threatened species are those organisms chat seem likely to become endangered. Rare species are those organisms which have widely scattered populations or are few in number. These organisms are rare for a variety of reasons, including changes in habitat (both natural and man made), at the extent of its geographical range and predation pressure. Federal identified species are listed under the 50 CFR § 17.11 and § 17.12. State listed species are identified in NYCRR § 193.3.

Acute aquatic toxicity values and MATC's suggest that potential hazards to aquatic organisms would only be seen at concentrations higher than labeled application rates. This is particularly true in New York, where the maximum label rate for use of Sonar® A.S. is 0.05 ppm in treated. water. It should also be noted that Sonar® labeling states that "to avoid impact on threatened or endangered aquatic plant or animal species, users must consult their State & Game Agency or the U.S. Fish and Wildlife Service before making applications". Identification of any rare, threatened or endangered species should be made as part of a permit application. A complete listing of threatened and endangered plant species in NYS is presented in Appendix B.

5.1.8 Biodiversity Sites

Information on the known location of rare species and significant natural communities can by obtained from the NYS Natural Heritage Program, which maintains a database on those resources. A determination of whether the proposed location of a Sonar® application would occur in one of these areas may be made through the Natural HeritageProgram as part of the evaluation of a permit application.

TABLE 5-2

SUMMARY OF NOEL'S IDENTIFIED IN TOXICOLOGICAL RESEARCH CONDUCTED ON FLURIDONE

FLURIDONE STUDIES	NOEL RESULTS
90-day feeding study	53 mg/kg/day in the diet
90-day mouse feeding study	9.3 mg/kg/day in the diet
90-day dog feedng study	200 mg/kg/day administered orally
1-year rat feeding study	9.4 mg/kg/day in the diet
1-year mouse feeding study	11.4 mg/kg/day in me diet
1-year dog feeding study	150 mg/kg/day
2-year rat chronic feeding/oncogenicity studies	8.5 mg/kg/day in the diet No evidence of carcinogenicity at any feeding level
2-year mouse chronic feeding/oncogenicity studies	11.6 mg/kg/day in the diet No evidence of carcinogenicity at any feeding level
Modified Ames test	Negative at level of compound solubility
Unscheduled DNA repair synthesis assay	Negative in cultured rat hepatocytes at 1 micromole/ml
Sister chromatid exchange assay	Negative at an intraperitoneal dose of 500 mg/kg in Chinese hamster bone marrow
Dominant lethal test in male rats	Negative at an oral dose of 2,000 mg/kg
Rat teratology study	200 mg/kg/day
Rabbit teratology study	750 mg/kg/day
3-generation rat reproduction study	121 mg/kg/day in the diet

Notes: NOEL = No Observed Effect Level
mg/kg/day = milligram/kilogram/day
mg/kg = milligram/kilogram
micromole/ml = micromole/rnilliliter

Source: NYSDOH, 1986

TABLE 5-3

APPROXIMATE TOXICITY VALUES FOR OTHER COMMON CHEMICALS RELATIVE TO SONAR

COMPOUND	LD50
Technical Grade Fluridone	>10,000 mg/kg*
Table Salt	3,000 mg/kg
Vitamin A	2,000 mg/kg
Asprin	1,000 mg/kg
Caffeine	164 mg/kg
Nicotine	53 mg/kg

• For exposure to rats via the oral pathway

5.2 POTENTIAL FOR IMPACT FROM THE ACCUMULATION/DEGRADATION OF TREATED PLANT BIOMASS ON WATER QUALITY

The rapid defoliation of aquatic plants in the water column can negatively impact Dissolved Oxygen (DO) levels in the waterbody as a result of the biological degradation of the organic material. This can impact the fish populations in the surrounding area. It is not expected that this event would occur foflowing the use of Sonar®. Sonar® is a slow acting systemic herbicide which can take 30 to 60 days to produce its herbicidal effects in the target population. This results in a slow addition of organic material into the water column. Various researchers (Parka et al., 1978 and Struve et al., 1991) reported that Sonar® applications of up to 0.125 ppm have not resulted in significant decreases in DO content. In field tests conducted by Arnold (1979), fluridone in an aqueous solution at application rates of up to 1.0 ppm did not change water quality parameters as measured by DO, pH, Biological Oxygen Demand (BOD), color, dissolved solids, hardness, nitrate**,** specific conductance, total phosphates, and turbidity. Osborne et al. (1989) and West et al. (1990) also did not identify any changes in DO levels following application of Sonar®

As discussed in Section 4.8.1, several authors (West et al., 1979 and Langeland and Warner, 1986) reported that low concentrations of fluridone are released back into the water system as the plant material degrades. Langeland and Warner (1986) noted an increase from 20.9 ppb to 28.9 ppb at day 51 of their degradation trial at a pond in Virginia. However, this increase is not to a level considered to be detrimental to fish population and is taken into account with regards to the overall degradation profile of fluridone which is discussed in Section 4.0. As such, the rerelease of fluridone into the water column from decaying plant material is not considered to be a potential for ecological concern.

5.3 IMPACT OF RESIDENCE TIME OF SONAR® IN THE WATER COLUMN

As discussed in the previous sections, Sonar® is a slow acting systemic herbicide that degrades with an average half-life of approximately 20 days in the water column. The chemical is designed to remain in the water column long enough to produce its effects and the application concentrations of fluridone are below those considered to be toxic to most aquatic organisms. Therefore, it is not anticipated that the residence time in the water column would alter the projected impacts that have been discussed.

5.4 RECOLONIZATION OF NON-TARGET PLANTS AFTER CONTROL OF TARGET PLANTS IS ACHIEVED

It is expected that following the reduction of coverage of nuisance macroPHYTES such as Eurasian watermilfoil and curlyleaf pondweed which are sensitive to low-level application rates of Sonar®, that the more tolerant native aquatic macrophyte species would expand into the vacated niches. Pullman (1993) supports that assumption based on observations of Sonar® application in lakes in Michigan. Certain species such as water stargrass, Chara, Nitella, bladderwort, and Illinois pondweed may actually expand enough to become a nuisance the year after Sonar® application. Kenaga (1992) reported exponential growth in Chara in most of the 21 lakes he surveyed in Michigan that were treated with Sonar®. Dechoretz (1991) reported that regrowth by pondweeds, coontail and other native plants occurred generally within six to eight months following treatment of ponds in California with Sonar® A.S. and Sonar® SRP at the labeled application rates (0.15 ppm).

5.5 IMPACTS ON COASTSL RESOURCES

As noted in Section 5.1.3, the use of Sonar® herbicides at the recommended application rates is not likely to result in any adverse toxicological effects to marine species. The likelihood of any effects is also reduced by the probability of heavy dilution of any herbicide reaching the water column due to wave, current, and tidal activity.

If the use of Sonar® herbicides is proposed to be located within the NYS Coastal Zone and is determined to require federal licensing, permitting, or approval, or involves federal funding, then the action would be subject to the NYS Coastal Zone Management Program (19 NYCRR Section 600). This determination, would be required during the preparation of an individual permit application. It should be noted that the label for Sonar® SRP states that it should not be applied in tidewater/brackish water and the SLN label for Sonar® A.S. allows its use only in freshwater ponds, lakes, and reservoirs.

6.0 POTENTIAL PUBLIC HEALTH IMPACTS OF SONAR

6.1 BRIEF OVERVIEW OF FLURIDONE TOXICITY

USEPA (1986a) has reported that technical grade fluridone, as used in manufacturing, is in Category IV for acute oral effects in the rat and is moderately toxic through acute inhalation exposure. Eye irritation for technical fluridone potential has been demonstrated as moderate to severe (Category III and Category II). Both the aqueous suspension and pellet formulations are in Category III for oral, dermal, skin, and eye irritation effects. Consequently, Sonar® A.S. and Sonar® SRP labels bear a “Caution” signal word.

Metabolism and distribution tests have shown that fluridone is absorbed and excreted in the feces within 72 hours of oral administration to rats. Acute toxicity studies have shown that the LD_{50} for a rat (Rattus norvegicus) exposed through the oral pathway to technical grade fluridone is greater than 10,000 mg/kg. Administration of Sonar® 4 A.S. to rats at 0.5 ml/kg did not provoke a lethal response. The LD_{50} for mice (Mus musculus) exposed through the oral pathway to technical grade fluridone was greater than 10,000 mg/kg. The LD_{50} for cats (Felis domesticus) exposed through the oral pathway to technical grade fluridone was greater than 250 mg/kg. The LD_{50} for dogs (Canis familiaris) exposed through the oral pathway to technical grade fluridone was greater than 500 mg/kg (Elanco, 1981).

In 90-day subchronic feeding studies, no treatment-related effects were noted in rats at dietary doses of 330 mg/kg or in mice at dietary doses of fluridone of 62 mg/kg. No toxic effects were observed in dogs at dietary doses of fluridone of 200 mg/kg/day. In chronic toxicity studies, dietary levels of fluridone of 200 mg/kg did not produce toxicological or carcinogenic effects for either a one or two year test period. In reproductive studies, fluridone was not teratogenic to rats at 200 mg/kg/day or rabbits at 750 mg/kg/day when administered during the organogenesis phase of gestation. Three successive generations of rats maintained on diets containing 2000 mg/kg of fluridone showed no impairment of fertility, liveborn litter size, gestation length or survival, progeny survival, or sex distribution (Elanco, 1981).

6.2 NYS DRINKING WATER STANDARD

The drinking water standard established in New York State for any organic chemical contaminant not specifically identified in the standards is either 5 ppb or 50 ppb, depending on the chemical structure. Based on its chemical structure, the drinking water standard for fluridone is 50 ppb. Pursuant to the SLN, application of Sonar® A.S. is limited to application rates of 50 ppb. The release of fluridone from the pellet formulation (Sonar® SRP) will not result in fluridone concentrations exceeding 50 ppb at the labeled application rate. No adverse health effects have been identified at fluridone concentrations of 50 ppb or less. Kim (1992) states that at the 50 ppb application rate, no restrictions are necessary on the use of Sonar® A.S. in water bodies that serve as sources of potable water, beyond not allowing swimming for 24 hours and those restrictions on the federal label. Kim does recommend for Sonar® SRP that application should be prohibited in waters less than 2 feet deep. USEPA (1986a) has designated an acceptable residue level for fluridone in potable water at 0.15 ppm (150 ppb). Sonar® cannot be applied within one-fourth mile (1320 feet) from any functioning potable water intake.

7.0 MITIGATION MEASURES TO MINIMIZE ENVIRONMENTAL AND HEALTH IMPACTS FROM SONAR

Mitigation measures describe guidelines to mitigate or lessen the potential for impacts from the use of Sonar® in the waters of NYS. While no impacts to humans are expected from the use of Sonar® in the waters of NYS, there is the potential for some ecological effects. The mitigation measures described in this section will reduce, or mitigate that potential for ecological effects, without reducing the efficacy of the product.

7.1 USE CONTROLS

When the aquatic plant management objective is to control Eurasian watermilfoi1, while minimizing impacts to other aquatic macrophytes, Sonar® may be used early in the season. As was discussed in Section 3.5.1, Eurasian watermilfoil is essentially evergreen and begins to grow rapidly at the beginning of the growing season. This enables this plant to develop significant biomass before native macrophyte species begin growing (Smith and Barko, 1990). The use of Sonar® early in the growing season would target Eurasian watermilfoil, while minimizing the impact on other aquatic vegetation.

For removal of Eurasian watermilfoil with minimal impact on other species, it is suggested that Sonar® products be uniformly applied across the entire area to be treated. Applicators should follow an application pattern that minimizes concentration of the product in local areas. When making lake-wide treatments it is recommended that application rates, calculated as ppb of fluridone be based only on the water volume in which mixing is expected to occur. Calculations should be based on water volume in the epilimnion above any deep water areas below the metalimnion or thermocline.

7.2 LABEL INSTRUCTIONS

The USEPA approved label for Sonar® SRP and the NYSDEC Special Local Need supplemental label for Sonar® A.S. list several general use precautions for the two products. The sale of Sonar® A.S. solely under the USEPA approved label is not permitted in NYS. The use is only allowed in conjunction with the SLN label. The SLN label for Sonar® A.S. specifies the use of this product for Eurasian watermilfoil only. Label use precautions and directions include the following:

1) Before applying the product, notification of and approval of the NYS Department of Environmental Conservation is required, either by an aquatic permit issued pursuant to ECL Section 15.0313(4) or issue of purchase permits for such use

2) In lakes and reservoirs, do not apply Sonar® A.S. within one-fourth mile (1320 feet) of any functioning potable water intake. Existing potable water intakes which have been disconnected and are no longer in use, such as those replaced by connections to potable water wells or a municipal water system, are not considered to be functioning potable water intakes.

3) Irrigation with Sonar® treated water may result in injury to the irrigated vegetation.

4) Follow use directions carefully so as to minimize adverse effects on nontarget organisms. In order to avoid impact on threatened or endangered aquatic plant or animal species, users must consult their State Fish arid Game Agency or the U.S. Fish and Wildlife Service before making applications.

5) Do not apply in tidewater/brackish water.

6) Lowest rates should be used in shallow areas where the water depth is considerably less than the average depth of the entire treatment site, for example, shallow shoreline areas.

7.3 RELATIONSIP TO THE NYS DRINKING WATER STANDARD

The drinking water standard established in New York State for all chemical compounds not specifically identified in the standards is 50 ppb. No adverse health effects have been identified at fluridone concentrations of 50 ppb or less. Kim (1992) states that at the 50 ppb application rate, no restrictions are necessary on the use of Sonar® AS in water bodies that serve as sources of potable water. As discussed in Section 4.4, Sonar® is effective as a selective systemic herbicide at the application rate of 50 ppb or less.

7.4 RULEMAKING DECISIONS

As of April 7, 1993, all pesticides labeled for use in aquatic settings were classified as restricted use products by regulation of the New York State Department of Environmental Conservation. Under this regulation, 6 NYCRR Parts 325 and 326. The use of aquatic pesticides, including Sonar® A.S., and Sonar® SRP, is limited to persons privately certified, commercially certified in Category 5, or possessing a purchase permit for the specific application that is proposed. Additionally, only those persons who are certified applicators, commercial permit holders, or have a purchase permit may purchase aquatic use pesticides.

With respect to fluridone, the regulations place the following restrictions on its use:

1. Aqueous suspension formulations may be applied at application rates not to exceed 50 ppb.

2. Pellet formulations may be applied to water two feet or greater in depth.

3. Swimming is not allowed in treated waters for 24 hours following application.

The effect of these rules will be to reduce the potential for risks to public health and the environment.

Under Part 327, a site specific permit will be required for the use of Sonar® in the waters of NYS, unless the waterbody is a privately-owned, no-outlet pond. The permit is issued through the NYSDEC. Potential permit applicants are cautioned to utilize the most recent product label for the development of their permit application. The applicants for the permit are required to be a riparian owner, or a lessee of a ripairan owner, or association of such persons. The applicant is required to submit the permit on a form provided by the NYSDEC. The information required for the application includes;

1. A scale drawing or map, including depth soundings adequate to determine: the size and depth of the treatment area; the concentration of the chemical within the area and the conformity to the limitations set forth in the regulations; the location and type of submerged and emergent weed beds; the location of water users relative to the area and along the outlet; and any further information required by the permit-issuing official.

2. Applications that involve public water supply waters or their tributaries will be referred to the State DOH for approval before the permit is issued.

3. The applicant must certify: that the listed chemical will be employed in conformance with all conditions specified in the permit issued; that the applicant obtained agreements to the treatment from water users whose use may be restricted as set forth in the application; that the applicant agrees that the issuance of the permit is be based on the assumed accuracy of all statements presented by him; that the applicant is legally responsible for damages resulting from the application of the chemical, or from the inaccuracy of any computations or from improper application of the chemical; and that the applicant assumes full legal responsibility for the accuracy of all representations made in obtaining approvals or releases, and for any failure to obtain approval or releases from the persons likely to be adversely affected.

A full copy of the Part 327 regulation is contained in Appendix C to this GEIS.

The use of SONAR within any jurisdictional wetland in the Adirondack Park is a regulated activity requiring a wetland permit from the APA pursuant to 9 NYCRR Part 578. The Agency's permit application requests information similar to that required by the NYSDEC, however additional details on the identification of all plant species including rare or endangered and their relative density within the treatment area will be necessary.

7.5 SPILL CONTROL

Care should be taken to use Sonar® properly and in accordance with the approved labels. Any leaks or spills should be promptly addressed. Liquid spills on an impervious surface should be cleaned up using absorbent materials and disposed of as waste. Liquid spills on soil may be handled by removal of the affected soil, and disposal at an approved waste disposal facility. Leaking containnrs should be separated from non-leaking containers and either the container or its contents emptied into another container. Spills of granular material should be promptly picked up, placed in a container and used according to label directions or disposed of in a proper manner at an approved waste disposal facility.

7.6 OTHER MITIGATION CONSIDERATIONS

In addition to the above mentioned activities, the following measures may be considered to further reduce, or mitigate any potential for environmental effects, without reducing the efficacy of the product.

7.6.1 Timing of Application

The potential for non-target impacts may be mitigated by the selection of an optimum time for application. It is recommended that Sonar® be applied as early in the growing season as possible. Eurasian watermilfoil initiates productivity and metabolic activity at an earlier time than native plants (Smith and Barko, 1990). As a result of those growth characteristics, an early season application is recommended. This would allow for treatment of Eurasian watermilfoil while the remaining plant community is still dormant. Based on observations made in Michigan, Pullman (1993) noted that several broadleaf pondweeds may be moderately to highly susceptible to fluridone at application rates of 15 to 20 ppb. if the application occurs as these plants begin to grow.

Additionally, early season application would be conducted while the water is relatively cold. Dissolved Oxygen levels during that time of the year are generally high, thereby mitigating any possibility of impacts to fisheries. Also, recreational use of water during that time frame would be limited (Pullman, 1994).

7.6.2 Application Techniques

The choice of Sonar® SRP or Sonar® A.S. could serve as a means of mitigating the potential for impacts to non-target macrophytes. The selection of Sonar® SRP versus Sonar® A.S. should be based on the management objectives of the aquatic macrophyte control program for the particular waterbody. The selection of one formulation or the other is related to maintaining an appropriate concentration of fluridone for a sufficient amount of time to allow for uptake by the target macrophyte. Generally, Sonar® SRP is more appropriate for moving water because it releases fluridone over a longer period of time than the A.S. formulation. This will allow for a longer exposure time than the liquid formulation which would tend to be more rapidly diluted by untreated water.

Sonar SRP is recommended when applied while the target submerged plants are low growing in the water column and where bottom sediments are sands or other firm substrates

SONAR® A.S. is recommended where target submerged plants have grown to near the water surface. Sonar A.S. performs well when applied over soft muck or organic sediments.

8.0 UNAVOIDABLE ENVIRONMENTAL IMPACTS IF USE OE SONAR IS IMPLEMENTED

As detailed in Section 6.0, the use of Sonar® has been evaluated during federal and New York State registration process and in this GEIS for various impacts to non-target organisms in the aquatic setting. There are several unavoidable impacts that will occur when Sonar® is used in the waters of NYS to manage unwanted aquatic macrophytes such as Eurasian watermilfoil. It is important to note that the mitigation approaches described in Section 7.0 will lessen the magnitude and extent of those impacts. Those impacts are:

1. Impact to Habitat

   When Sonar® is introduced into a waterbody, it will result in the death of the target macrophytes. Once these target macrophytes have dropped out of the water column, there will be a period of time before the native non-target macrophytes reestablish themselves in the vacant niches. While the non-target species will reestablish themselves as detailed in Section 5.4, the process is not immediate. During that period of time, the aquatic macrophyte community will be reduced in size.

2. Impacts to Non-target Species

   A review of the literature indicates that there are native macrophytes which would be impacted to some extent by the use of fluridone in a waterbody. This has been detailed in Section 5.1.1. However, the literature indicates that a plant community composed of native plant species will become reestablished during the season following Sonar® use.

3. Possible Reinfestation

   In areas of significant water flow, such as lake inlets, Eurasian watermilfoil and other target plants may not be sufficiently controlled due to the dilution of applied Sonar® with untreated water. The reinfestation of Eurasian watermilfoil may occur via the dispersal means described in Section 3.3.1. This may necessitate the utilization of alternative means of controlling Eurasian watermilfoil in those areas of rapid water movement.

9.0 ALTERNATIVES TO SONAR®

This section details the various alternatives to the proposed action. The other alternatives include the no-action alternative to the use of Sonar® (which entails the lack of any aquatic macrophyte control measure, except as specified), chemical alternatives to Sonar®, mechanical alternatives to Sonar®, biological alternatives to Sonar®, and various other options. The no-action alternative does not preclude the ability of an applicant to apply for a permit for the use of those products described in the Final Programmatic Environmental Impact Statement on Aquatic Vegetation Control (NYSDEC, 1981a). Each of the possible alternatives will be evaluated from the standpoint of efficacy, positive and negative environmental impacts, and relative costs. The choice of a particular alternative over the proposed use of Sonar® should be based on the management objectives for the waterbody and the specific characteristics of the problem.

9.1 NO-ACTION ALTERNATIVE

In the no-action alternative, aquatic macrophyte control measures which could be utilized in the waterbodies of potential concern would be those chemical and mechanical means identified in the Final Programmatic Environmental Impact Statement on Aquatic Vegetation Control (NYSDEC, 1981a). Under the no-action alternative, the use of Sonar® is not considered for the control of the growth and spread of the target macrophytes in the waterbodies of concern. In this scenario, the only controlling measures, other than natural fluctuations in the plant populations, would be those activities presently permitted in NYS waterbodies. Without any controlling measures, the spread of invasive weeds such as Eurasian watermilfoil could result in significant modifications of the native aquatic habitat of a particular waterbody. Uncontrolled invasive macrophytes produce seeds and/or other reproductive parts that can be spread to other aquatic sites.

As discussed in Section 3.3.1, a large number of researchers have documented the negative impact of the introduction of Eurasian watermilfoil in a waterbody (Aiken et al., 1979; Lonsdale and Watkinson, 1983; Keast, 1984; Nichols and Shaw, 1986; and Smith and Barko, 1990). Madsen et al. (1991a) documented the decline of native macrophytes in a New York lake as a result of the invasion of Eurasian watermilfoil. Without any controlling measures, Eurasian watermilfoil can potentially modify the native plant community in a significant manner. Eurasian watermilfoil, once it has begun to form its characteristic canopy, will displace non-canopy forming native species. The result of the typical growth pattern of Eurasian watermilfoil is to form dense monotypic stands.

Pullman (1993) concluded that Eurasian watermilfoil is supportive of fish populations during its initial expansion stages in a waterbody. However, he goes on to note that once Eurasian watermilfoil begins to dominate the plant community and form its characteristic dense mats, the lack of plant species diversity and associated water quality impacts will reduce the quality of the habitat for fish. Nichols and Shaw (1986) reported that Eurasian watermilfoil provides beneficial cover for fish, unless the cover is so dense that stunting of fish growth from overcrowding results. Eurasian watermilfoil has been shown to provide a better habitat for fish (Kilgore et al, 1989) and invertebrates (Pardue and Webb, 1985) than open water. However, Dvorek and Best (1982) found that Eurasian watermilfoil had the poorest invertebrate fauna populations out of 8 aquatic macrophyte species that were examined. Keast (1984) noted that fish abundance was 3 to 4 times greater in mixed native plant communities than in a plant community dominated by Eurasian watermilfoil. Nichols and Shaw (1986) noted that Eurasian watermilfoil is poor food for muskrats and moose and fair food for ducks, which will eat its fruit.

Eurasian watermilfoil also impacts the recreational use a waterbody by interfering with swimming and boating, by reducing the quality of sport fisheries, and by reducing the aesthetic appeal of waterbodies (Newroth, 1985). Because of its mat forming characteristics, excessive growth of Eurasian watermilfoil (a primary target species for Sonar® may present a safety hazard to the recreational use of a waterbody. The mats may cover rocks, logs, and other obstructions that could damage moving boats or injure water skiers. Additionally, the mats may entangle swimmers, potentially resulting in drownings. Drownings as a result of entanglement in Eurasian watermilfoil mats have been documented in New York (Long et al., 1987). NYSDEC (1981) notes that the lack of vegetation control may result in economic loss to the state and may reduce water quality, hinder desired human usages, and present health hazards.

Keast (1984) noted that fish populations and their invertebrate prey species are reduced in dense mats of Eurasian watermilfoil. Excessive Eurasian watermilfoil growth will result in clogged industrial, potable and power generation intakes, lowered dissolved oxygen concentrations, and increased populations of permanent pool mosquitoes (Bates et al., 1985). Additionally, the failure to control an invasive species such as Eurasian watermilfoil can jeopardize uninfested lakes by increasing the likelihood of the spread of the plant (VDEC, 1993).

Under the no-action alternative, there is the potential for subsequent declines in Eurasian watermilfoil following the invasion of a particular waterbody by the plant. Smith and Barko (1990) note that the population growth patterns of Eurasian watermilfoil in many waterbodies often vary to a great extent over time and from location to location. A variety of hypotheses have been presented to explain these population declines. They include nutrient depletion, shading by phytoplankton, attack by parasites, climatic fluctuations, and long-term effects of aquatic weed control. (Carpenter, 1980). Smith and Barko (1990) note that declines have been documented in Wisconsin, British Columbia, and the Chesapeake Bay area. Painter and McCabe (1988) reported the decline and disappearance of Eurasian watermilfoil from several lakes in Ontario, Canada. No reason was confirmed for the disappearance, though circumstantial evidence indicated insect herbivory as the cause.

Carpenter (1980) reports that the period of peak abundance in these locations has ranged from approximately 5 to 10 years, with 10 years seen as the typical time frame. However, fluctuations in Eurasian watermilfoil populations are not generally predictive. In some areas, population fluctuations have been, limited to seasonal changes or have not been observed (Grace and Wetzel, 1978; Madsen et al., 1988a; Kimbel, 1982; Nichols and Shaw, 1986; and Madsen et al., 199lb). Pullman (1992) noted declines in several Michigan lakes; though the declines were generally short-lived and populations soon returned to pre-decline levels. FOLA (1994) noted that the decline of Eurasian watermilfoil populations in Cayuga Lake appeared to be associated with the spread of the European aquatic moth larva (Acentria nivea). As detailed in Section 3.3.1, the number of lakes throughout the northeastern United States in which Eurasian watermilfoil infestation has been observed is increasing.

Some research has shown that the failure to manage Eurasian watermilfoil in a waterbody can have financial impacts to the recreational use of the waterbody. In a socio-economic research study in an area of 8 lakes infested with Eurasian watermilfoil, BCMELP (1991) estimated a loss in several economic areas, including transportation, the restaurant industry, the accomodation sector, and the shopping sector. They projected that a no-action alternative to managing for Eurasian watermilfoil would result in a loss in revenues in 1990 of $85 million in the Okanagan Valley region of British Columbia, Canada (or 26.5% of 1989 revenues). They also predicted a loss of 1700 employment positions in the tourist industry and a loss in real estate values of $360 million in the region. However, these figures have not been verified by the British Columbia Ministry of Environment, Lands and Parks,

9.2 CHEMICAL ALTERNATIVES

NYSDEC (1981) presented an evaluation of various chemical alternatives to Sonar®. Generally, chemical herbicides are divided into two broad categories. Those categories include contact herbicides and systemic herbicides. Contact herbicides remove that part of the plant that they come in contact with. Plant regrowth typically occurs within a few weeks or months. Systemic herbicides are absorbed by the plant and translocated to the lower stem and root system, which results in longer term plant control. Because of the systemic nature of Sonar®, another submersible systemic herbicide would be its most logical chemical alternative.

NYSDEC (1990) notes that aquatic herbicides are chemicals used primanly to manage specificafly-targeted aquatic macrophyte species. Herbicides are applied in either a liquid or granular form. Herbicides can be successfully used in most lakes. In those lakes which serve as a potable water supply, however, certain use restrictions may be in place for the herbicides. NYSDEC (1990) lists endothall, diquat, and 2,4-D as the most commonly used aquatic herbicides in NYS. The average cost of most aquatic herbicides ranges between $200 -$400 per treated acre (NYSDEC, 1990). The cost per acre to apply Sonar varies greatly depending on the application rate and the depth of water. In general, the cost may range between $40 - $160 per treated acre

9.2.1 Endothall

Endothall was reviewed by the NYSDEC (1981). Endothall compounds are contact herbicides, which are primarily used for the control of most pondweeds and coontail. Endothall is not effective for floating or emergent species. The active ingredient in endothall is 7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid. The dipotassium salt of endothall is sold under the trade name Aquathol® K, as an aquatic herbicide. The mono(N,N-dimethylalkylamine) salt of endothall is sold under the trade name Hydrothol® 191, as an aquatic algicide and herbicide.

Pullman (1993) notes that the dipotassium salt of endothall will control Eurasian watermilfoil. However, he goes on to note that selective control is not possible because the application rates necessary to control Eurasian watermilfoil are lethal to many native plant species. WSDOE (1992) reports that endothall may have significant adverse impacts on non-target aquatic plants. A treatment concentration of 500 ppb for 72 hours was shown by Netherland et al. (1991) as being an optimum concentration to result in a complete removal of Eurasian watermilfoil in the water column and a shoot biomass reduction of greater than 98% when compared to reference locations.

NYSDEC (1981) notes that endothall is highly toxic to humans. WSDOE lists the acute toxicity of dipotassium or disodium endothall as ranging from 95 ppm for redfin shiners (Notropis umbratilis) to 710 ppm for striped bass (Morone saxatilis) fingerlings. Elf Atochem (1992) reports a tolerance level in water for fish of 60 to 100 ppm of dipotassium or disodium endothall. Toxicity values are significantly lower for the amine formulation of endothall. Endothall is rapidly taken up and produces quick results. This can lead to depleted oxygen levels in the water due to the sudden contribution of decaying plant biomass to the water column. Endothall is neither bloaccumulated nor persistent in the aquatic environment.

Vermont Department of Environmental Conscivation (VDEC, 1993) notes that the advantage of endothall is that it is a fast acting herbicide. They also report that the disadvantages include: 1) the potential need for water use restrictions; 2) the potential need for an alternate water supply for a period of time; 3) the fact that endothall does not kill the roots, only the leaves and stems it comes in contact with; 4) the fact that control is short-termed; and 5) the fact that endothall is not selective for Eurasian watermilfoil.

9.2.2 Diquat

Diquat was reviewed by NYSDEC (1981). Diquat dibromide (6,7-dihydrodipyrido (1,2-a:2’,1’-c)pyrazinediium dibromide) is a contact herbicide that can be selective for Eurasian watermilfoil. Diquat is sold under the tradename Reward®. It is used to control several submergent, floating, and emergent macrophytes at one to two gallons per acre. It is a broad spectrum contact herbicide with only 1ocal plant translocation. It is absorbed through the cuticle and works by interfering with photosynthetic activity within the plant. As a contact herbicide, it is taken up quickly and produces rapid results. This can result in decreased oxygen levels due to the sudden addition of decaying plant biomass to the water column. Pullman (1993) notes that at an application rate of 1 gallon per acre of treatment area, Eurasian watermilfoil will drop out of the water column in 10 days to two weeks, with little impact to aquatic plants native to Michigan. However, Eurasian watermilfoil will rapidly recover from a diquat application. NYSDEC (1981) considers diquat to have moderate toxicity to fish and invertebrates, moderate toxicity to test mammals, high oral toxicity to humans, and moderate to low toxicity to birds.

VDEC (1993) notes that the advantage of diquat is that it is a fast acting herbicide. They also report that the disadvantages include: 1) the potential need for water use restrictions; 2) the potential need for an alternate water supply for a period of time; 3) the fact that diquat does not kill the roots, only the leaves and stems it comes in contact with; 4) that fact that control is short-termed; and 5) the fact that diquat is not selective for Eurasian watermilfoil and water stargrass.

9.2.3 2.4-D

The aquatic herbicide 2,4-D was reviewed by NYSDEC (1981). The active ingredient is a granular formulation of 2,4-dichlorophenoxyacetic acid, butoxyethyl ester. 2,4-D is sold under the tradename Aqua-Kleen®. It is considered to be quite selective for Eurasian watermilfoil. It is a systemic herbicide which kills by inhibiting cellular division, though at low concentrations it may stimulate growth (VDEC, 1993). It is used to control several floating and submerged species, including Eurasian watermilfoil (NYSDEC, 1990). Pullman (1993) reports that when 2,4-D is applied at label-recommended rates, little or no impact to non-target species is observed. NYSDEC (1981) considers 2,4-D to have moderate toxicity to humans, low toxicity to test mammals, low toxicity to birds and varying toxicities to fish. VDEC (1993) reports that a concern has been raised by the USEPA's Office of Pesticide Programs concerning the potential carcinogenicity of 2,4-D, which is being evaluated by that office.

9.3 NON-CHEMICAL ALTERNATIVES

Non-chemical alternatives to Sonar® were evaluated with respect to their effectiveness, their advantages, and their disadvantages. These alternatives could he more suitable for small areas of milfoil or other target aquatic macrophytes (less than five acres for partial treatment) and areas having significant water movement. Generally, the non-chemical alternatives to Sonar® can be divided into mechanical alternatives, biological alternatives, and water level manipulation (drawdowns).

It is important to note that the Vermont Department of Environmental Conservation (VDEC) has been attempting to control the spread of Eurasian watermilfoil through non-chemical means since 1978. The primary mean have been mechanical harvesters and bottom barriers. Despite the attempts at controlling the spread of Eurasian watermilfoil, this aquatic macrophyte has continued to spread within infected lakes where controls have been attempted and to uninfested lakes which had not been targeted for milfoil control measures (VDEC, 1993). The Milfoil Study Committee of the VDEC recommended the use of aquatic herbicides on a site specific basis for the control of introduced, exotic vascular aquatic plant species (VDEC, 1993). The Committee does not recommend the use of Diquat or Endothall because their use would not meet the statutory requirement of pesticide minimization in a long-range management plan and they do not recommend the use of 2,4-D because of the uncertainty about potential human health effects.

9.3.1 Mechanical Alternatives

9.3. 1. 1 Aquatic Weed Harvesters

Harvesters are floating machinery that use a series of blades to cut the aquatic weeds at a point just above the hydrosoil of the water body, depending on depth. Harvesters are effective at removing aquatic vegetation. Madsen et al. (1988b) noted harvesting efficiencies of 79% of Potamogeton pectinatus. Engel (1990) noted that the effectiveness of harvesting is dependent on the time of year it is conducted. In his evaluation, a native macrophyte community harvested in June took a few weeks to reach pre-harvesting biomass. A native macrophyte community harvested in July took until the following spring to reach pre-harvest biomass. In his four year study, Painter (1988) reported that harvesting of a plot in Buckhorn Lake in Ontario in June and September resulted in reduction of Eurasian watermilfoil biomass, shoot weight, and plant density. However, plant height continued to reach the waters surface in the fourth year of the study. Perkins and Sytsma (1987) noted that a single harvest of Eurasian watermilfoil in July produced only a short reduction in the standing crop biomass. A twin harvest program provided an additional 36% reduction in the standing crop biomass. However, in their investigation, Perkins and Sytsma (1987) did not see a long-term reduction in the standing crop as a result of harvesting.

Harvesters have several advantages in that their use results in an immediate reduction in the plant material in the water column. Mechanical harvesters can be used in a limited, confined area and their use generally does not require any type of water use restriction. Another advantage is that they remove the plant biomass from the water. VDEC (1993) notes that the advantages to mechanical harvesting include; 1) mechanical harvesting may be used on a large scale; 2) the method immediately creates open water areas; 3) the fact that the lower part of the plant remains intact to provide some habitat; and, 4) the fact that there is no interference with water supplies or water use.

There are several disadvantages to mechanical harvesting, Because harvesting does not remove the plant roots, regrowth will occur. Generally, the maximum depth that the harvesters blades can reach is approximately six feet. For aquatic species such as Eurasian watermilfoil, growing in excess of six feet of water, a substantial amount of biomass will be uncut. For fast growing species such as Eurasian watermilfoil, regrowth may occur in as little as one month, thereby requiring several harvests during the growing season. Pullman (1993) noted that repeated harvesting during a single growing season has been shown to reduce Eurasian watermilfoil populations. However, because mechanical harvesting is a broad spectrum process, the native plant communities will be as significantly impacted as the target species. The loss of the native plant community can result in the loss of valuable fish and wildlife habitat. Engel (1990) noted that the major ecological impacts of harvesting were changes in the macrophyte community structure and impacts to fish and their invertebrate prey.

Another disadvantage is the production of plant fragments. While harvesters remove most of the cut vegetation from the water column, they are not completely successful. Some plant fragments will be dispersed through the actions of the harvester. For plants such as Eurasian watermilfoil, which spread primarily through the dispersion of plant fragments, this may result in increased aerial coverage of the aquatic weed. Mechanical harvesting will also directly impact fish populations in the treatment area. WSDOE (1992) notes that harvesting can kill up to 25% of small fish in a given treatment area.

Other disadvantages include: 1) the need to have the plants within close proximity of the water surface to facilitate the most efficacious removal; 2) the fact that operating depths are generally limited to five to six feet, with an inability to harvest in shallow water; 3) the need for a disposal site for the harvested plants; 4) the inability to harvest around boats or inside docks; 5) the need for a ramp to launch the harvester; 6) the need for good weather and light winds; and 7) costs that are generally greater than herbicidal control. Harvesters cost between $50,000 and $120,000 per machine and from $200 to $600 per acre to operate for each harvest pass (NYSDEC, 1990 and VDEC, 1993).

9.3.1.2 Benthic Barriers

Benthic barriers are any compound, fabric, or physical structure that can be placed between the sediment and the water column to block sunlight and prevent the photosynthetic activities of the targeted plants. Benthic barriers may drastically alter lake plant and fish communities if used on more than a spot basis. Perkins et al. (1980) have shown that benthic barriers are an effective means of treating Eurasian waterrnilfoil. Eichler et al. (1993) noted that following removal of the benthic barriers, the first species to recolonize the treated areas were native species that overwintered as seeds or turions. In their investigation, Eurasian watermilfoil recolonized 71% of all sites within two years of removal of the barriers, though it was not the dominant species in the community.

The advantages of benthic barriers include multi-year control after initial installation. WSDOE (1992) notes that the effectiveness may range from 1 to 2 years up to 10 years. Benthic barriers can be used in confined areas around docks or in swimming areas. They are generally easy to install and durable, though they can be difficult to install if the water is not shallow. VDEC (1993) notes that the advantages to bottom barriers include: 1) long-term control if properly installed; 2) the method provides immediate control throughout the entire water column; 3) the use in areas not accessible to other mechanical means; and 4) the fact that there is no interference with water supplies or water use if properly installed.

The disadvantages include the high cost of initial installation. NYSDEC (1990) noted that benthic barriers can cost between $2,000 and $8,000 per acre, depending on the choice of fabric. VDEC (1993) considers this technique as not feasible on a large scale because of cost. Benthic barriers often require maintenance on a yearly basis and will require a relatively smooth lake or pond basin substrate. Additionally, benthic barriers may interfere with fish spawning and may significantly impact the benthic invertebrate community (NYSDEC, 1990 and WSDOE, 1992). Bartodziej (1992) noted that the use of benthic barriers in a lake in Florida resulted in significant adverse impacts to the benthic community under the barriers. Further, benthic barriers are not selective within the treatment area.

9.3.1.3 Hand Cutting

Hand cutting or pulling consists of the use of battery operated, knife blade or rake-type implements to cut the target plants. These methods are adequate for control of aquatic weeds inside decks and around boats, along shoreline property and inside swimming areas. This weed management technique is labor intensive, but does not require substantial skill, equipment, or expense (WSDOE, 1992). Bove (1992) utilized this technique in a lake in Vermont and considered the method effective in areas of low Eurasian watermilfoil densities.

VDEC (1993) considers the advantages of this technique to include: I) the selective use in areas of greatest Eurasian watermilfoil density; 2) the potential for use by volunteers to keep costs down; 3) the method can be utilized in rocky and confined areas; 4) the fact that long-term control may be achieved if roots are removed, though fragments from other plants may movc back into the treated area if a whole lake treatment program is not taken; and 5) there is no interference with water supplies or water use. Bove (1992) suggests that volunteers become more difficult to obtain over the course of a long management program, thereby placing a potential labor restraint on this method.

The disadvantages of this alternative include the non-discriminate nature of the method, depending on the type of hand removal. This disadvantage is usually mitigated by the small area of impact. Additional disadvantages include: 1) the fact that plant fragments may be generated which act to spread the target species; 2) the method may result in a short-termed sediment disturbance which would reduce water quality; 3) the fact that a smooth bottom is generally needed; and 4) the fact that the method is too slow and labor intensive to use on a large scale.

9.3.1.4 Rototilling or Rotovating

Rototilling is the use of a hydraulically operated rotovator head from a floating platform that removes the plant roots from the hydrosoil. This method is an effective means of controlling aquatic vegetation (Pullman, 1993). The advantages of this method include the ability to work to a maximum depth of 17 feet. Rototilling allows for seasonal to multiseasonal control of aquatic vegetation, depending on species. Generally, there are no water use restrictions with this method of weed control. It can be performed in a limited area and rototilling can occur over rocks and stumps.

There are several disadvantages to this method. As with mechanical harvesting, this method is broad spectrum and can facilitate the spread of the weed through the generation of plant fragments. Also, because this method occurs in the hydrosoil, a significant sediment load can be generated in the water column which could smother fish eggs arid fry. Invertebrate habitat in the benthic area will be destroyed, which could impact the fish and wildlife species dependent on those organisms. This could result in changes in the aquatic ecosystem. Additionally, faster growing invasive species, such as Eurasian waterrnilfoil, may repopulate the area to the exclusion of slower growing native species (Smith and Barko, 1990; NYSDEC, 1990; and Pullman, 1993). NYSDEC (1990) and VDEC (1993) note that the capital costs for rototilling range from $50,000 to $120,000, with an operating cost of $100 to $1200 per acre.

9.3.1.5 Diver-operated Suction Dredging

This technique consists of the use of suction dredging equipment by scuba-equipped divers to strategically remove the target species. WSDOE (1992) noted that this technique is practical for clearing individual objects such as dock areas or pilings nd can result in up to 90% removal of the desired species. It can be a selective method for either an area or a species (NYSDEC, 1990 and WSDOE, 1992). Eichler eta'. (1991) reported that suction dredging did not eliminate mu foil populations in a single season of harvesting, but was an effective means of managing Eurasian watermilfoil. Bove (1992) noted that diver-operated suction harvesting was used in a lake in Vermont with only limited success, She noted that it was an effective technique in areas of moderate densities of growth. However, it was not effective in dense growth areas as the root systems were difficult to extract from the associated sediments 'arid ecessivc fragmentation of the milfoil was created. Bove also noted that effectiveness varies with bottom sediments type, with rockier sediments being more difficult to remove the plants from than silty sediments.

VIYEC (1993) noted that the advantages to this technique inclHde: 1) the removal of roots; 2) the fact that there is no limitation in water depth to operate; 3) the fact that this method can be selective for Eurasian watermilfoil: 4) the fact that this method can work in areas with underwater obstructions; 5) that control is possible for up to two years; and, 6) the fact that there is no interference with water supplies or water use.

The disadvantages to this method include an increase in turbidity and re-suspension of any contaminants bound in the sediment, decreased water clarity, and a possibility of algal blooms as a result of an increased nutrient load in the water column. Suction dredging will destroy benthic invertebrate habitat, though the effect is generally limited to a small ra2 hecause of the limited nature of the method, VDEC (1993) noted that the disadvantages to this method include:
1) the creation of plant fragments; 2) the necessity for plant disposal; 3) the need for constant machine maintenance; 4) the method is slow and labor intensive; 5) the method is generally applicable for small scale use only; 6) the method disturbs organisms in the benthic zone of a waterbody; 7) the method may result in short-term siltation which would smother fish eggs and fry; and, 8) this method is potentially hazardous to employees due to the necessity for scuba equipment NYSIJEC (1990) estimates that the capital cost of the dredge equipment is about $15,000 to $20,000, with an operating cost of approximately $1,000 to $25,000 per acre.

9.3.2 Biological. Alternatives

Biological methodologies consist of the use of introduced biota to control the targeted aquatic macrophytes. This alternative poses all of the potential problems of the invasive exotic aquatic macrophytes in that once they are released, the biota cannot be controlled. Of the three types of biological alternatives, the use of grass carp (Ctenopharynogodon idella) is not permitted in NYS and the use of insects and plant pathogens are still under study.

To underscore the problems inherent to biological controls, the following is quoted from NYSDEC (1990), Page 6-45:

> "Biological control methods, however, are not well understood. They are relatively new, have not been studied often in the field, and have not been applied to a wide variety of lake conditions. The most significant reason for the tack of understanding about biological controls, however, is in the nature of biological manipulation. Ecosystems are at once dynamic and extremely fragile; a change in one component in the ecosystem can have dramatic effects in other components within the ecosystem. Unlike physical control methods and to a lesser extent, chemical techniques, the results from biological manipulation studies either in theory or in the laboratory cannot be easily reproduced in the field, in actual lakes."

9.3.2.1 Grass Carp

Grass carp are an exotic herbivorous fish that can consume from 20 to 100% of their body weight in vegetation on a daily basis. Generally, only sterile carp are released into waters for vegetation control. NYSUEC (1990) considers that the disadvantages of grass carp use for vegetation control far outweigh their advantages. Unless adequately controlled, fish can escape from the stocked water and move into other waters, where they could impact plant communities in an unwanted fashion. NYSDEC (1990) noted that the most significant disadvantage to the use of grass carp is the potential to completely eradicate aquatic vegetation within a waterbody. This is further exacerbated by the fact that carp will not choose target plants such as Eurasian watermilfoil as their primary diet, instead choosing more native species, such as the pondweeds (NYSDEC, 1990, and Pine and Anderson, 1991). The total removal of the plant community can have extreme consequences to the aquatic ecosystem, significantly affecting native fish, wildlife, vertebrate and invertebrate populations (NYSDEC, 1990). Additionally, parasites have been identified as carried by grass carp. Costs for the use of grass carp range from approximately $50 to $100 per acre.

9.3.2.2 Insects

Various insects have been shown to be effective in controlling aquatic nuisance macrophytes. Generally, these organisms have certain life stages which feed on selected portions of the targeted plants. The larvae of a midge, Cricotopus myriophylli, has been shown to produce significant impacts to Eurasian watermilfoil (Kangasniemi, 1993). Macrae et al. (1990) noted that trials indicated that the larvae are very host-specific to Eurasian watermilfoil. However, more information is needed regarding the extent and specificity of the control. Macrae et al. (1990) noted that the midge only feeds on that portion of the plant extending above the surface of the water, leaving the underwater portion intact. As a controlling agent then, this alternative would not address the issue of Eurasian watermilfoil in a waterbody. NYSDEC (1990) noted that most of the successful applications of insects as a controlling agent have occurred in the southern United States. NYSDEC (1990) goes on to note that insects have been used effectively in conjunction with short-term control programs such as herbicidal or mechanical treatment, to produce long-term control. There is no indication as to the projected cost of this alternative

9.3.2.3 Pathogens

Pathogens are biological agents that produce disease and death in. the targeted organism. Pullman (1993) noted that a fungal, pathogen, Mycoleptodiscus terrestris, has been shown to be a possible biological agent for the control and management of Eurasian watermilfoil. Much of the research has been conducted through the U.S. Army Corps of Engineers Waterways Experiment station in Vicksburg, Mississippi. This technique is currently a research project and pathogens are not available for use on Eurasian watermilfoil or other submersed northern species. There is no indication of the potential cost for this alternative.

9.3.3 Water Manipulation - Drawdown

Drawdowns or water level control is an activity in which the level of the lake is lowered to expose aquatic vegetation in shallow nearshore areas to the elements with the aim to eradicate it. Drawdowns are usually limited to those lakes or ponds which have a dam structure or similar mechanism for controlling the level of water. NYSDEC (1990) noted that the only beneficial time for a drawdown is in winter. NYSDEC (1990) goes on to note that for a drawdown to have a significant effect, the water level must he lowered at least three feet, the plants must be exposed for at least four weeks, and the bottom sediments must be frozen to a depth of at least four inches. Article 15, Title 8 of the Environmental Conservation Law presents the regulations associated with the volume, timing, and rate of change of reservoir releases.

Jenkins (1989) noted that a drawdown conducted at Lake Bomoseen in Vermont resulted in a 60% reduction of cover by aquatic species and a 99% reduction in cover by floating aquatic species. Local diversity was reduced by 44%. However, the abundance of a legally protected species was reduced by 86% and a rare species proposed for legal protection was completely removed from the lake. Additionally, he reported that the drawdown damaged the lake bottom, producing nutrient releases. VDEC (1990) noted that Eurasian watermilfoil was reduced in exposed areas of Lake Bomoseen; however, because it was not impacted in the deeper sections of the lake, recolonization of the shallower sections was expected.

VDEC (1993) considers the advantage of this technique to be the low operational cost and the potential for longer-term control than with other methods, though this would only be the situation if the whole benthic zone was exposed. Impacts to aquatic macrophytes from drawdowns are mixed, depending on species. Drawdowns have been shown to affect fanwort, coontail, most species of milfoil, most species of yellow waterlilies, and bladderwort. Drawdowns have been shown to have little effect on Chara spp., elodea, cattails, and tapegrass (Vallisneria americana). Drawdowns have been shown to increase the populations of most species of pondweeds (NYSDEC, 1990).

Disadvantages include the possible depletion of oxygen in the remaining water, if the lake is shallow and there is a high oxygen demand in the sediments and stream inflow. This could possibly result in fish kills. A nutrient release could result upon restoring the original water levels, which can produce algal blooms. Other macrophyte species may emerge as a result of the drawdown. Increased turbidity and resuspension of sediments may occur (NYSDEC, 1990). VDEC (1993) lists the disadvantages of this technique as being: 1) the potential for significant impact to non-target plants, invertebrates, fish and wildlife; 2.) the potential for impacts to water intakes and shallow wells; and, 3) method effectiveness and lake refill depends on the weather.

9.4 INTEGRATED PEST MANAGEMENT

The optimal method of addressing aquatic macrophyte concerns is in a coordinated effort that brings the most effective and environmentally sound techniques to bear on the problem. An integrated approach would be based on the use of all techniques, depending on the characteristics of the specific problem in a waterbody. An integrated approach, however, would not only be based on a variety of techniques to address the immediate issue of excessive aquatic macrophyte growth, but also the inherent causes of the problem. Such an approach would include measurcs to reduce artificially stimulated lake eutrophication that exacerbates nuisance weed growth. Such activities would include measures such as management and control of nutrient loading, reduction of wastewater flow and reduction of sedimentation on a lake watershed basis. However, such techniques can be expensive and slow to implement. Integrated pest management is an ideal goal of lake management, but is not always a practical solution. A detailed discussion of Integrated Pest Management is presented in Diet For a Small Lake (NYSDEC, 1990).

9.5 ALTERNATIVES ANALYSIS

As discussed throughout Sections 2.0 and 3.0 of this GEIS, the uncontrolled growth of aquatic rnacrophytes in surface waterbodies can substantially impact the ecological characteristics of that waterbody. Desired water uses such as recreational uses may also be prevented or made hazardous by unwanted plant growth. This is particularly true for exotic species such as Eurasian watermilfoil and curlyleaf pondweed, which are capable of exponential growth. It is the responsibility of the lake manager or lake association to decide upon a course of action that not only effectively controls the macrophyte of concern, but also is ecologically sound. The use of the aquatic herbicide Sonar® is one of the alternatives that is available for the control of aquatic macrophytes. This section describes a general approach to deciding upon the use of Sonar® with respect to the other alternatives described in Section 9.

It is the responsibility of the lake manager or lake association to monitor their lakes or ponds with respect to its plant populations, including the growth and distribution of exotic and indigenous macrophytes. Through these monitoring efforts, the infestation of the waterbody by exotic macrophytes or the excessive growth of macrophytes would be noted. Any subsequent decisions regarding macrophyte management approaches must consider all permit requirements, including those specified in Part 327 as described in Section 7.4.

To document the infestation, particularly in advance of a Part 327 permit application, information on the nature and extent of the inestation would be required. That information would include the nature and areal coverage of the infestation, the areal size of the waterbody, the location of the infestatopm with respect to the watcrbody, the depth of the water column, the recreational uses of the waterbody, the location and distances of potable water intakes with respect to the potential treatment zone, other macrophyte species which may be present, and the presence and distribution of any rare species. Information on sediment types and water movements should also be gathered. Other important considerations would be the lake management objectives and any criteria under the NYS Freshwater Wetlands Act.

Much of this information is available directly off of maps and diagrams produced by the NYSDEC. The nature of the macrophytes in and surrounding the infestation area can be determined through either direct visual observation (non-harvesting methods) or by clipping samples of the littoral vegetation for identification (harvesting methods). Community characteristics such as horizontal and vertical zonation, plus frequency and dominance can be determined by the collection of a number of samples in relationship to the area of concern. The depth of the water column can either be determined through electronic means (Sonar) or through mechanical means (drop-lines and staff gauges).

As noted in Section 3.0, small quantities of Eurasian watermilfoil and curlyleaf pondweed in the early stages of infestation may offer many of the functions and values of native aquatic macrophytes In this instance, the no-action alternative may be an appropriate management strategy. The lake manager or Lake association would monitor the growth patterns of the areas of infestation under such a strategy. If the infestation is highly localized, the lake manager or lake association may chose a technique such as hand pulling, benthic barriers, or suction dredging as a control option. If the decision by the lake manager or lake association is that the quantity of macrophytes in the waterbody of concern is posing an ecological, recreational, or safety impact to the use of the waterbody, an appropriate management approach may be chosen using the following guidelines.

In ponds less than five acres in size where the entire waterhody is sbustantially dominated by macrophytes targeted for control, Sonar® would be an effective control method, particularly with respect to Eurasian watermilfoil and curlyleaf pondweed. In comparison to the other possible herbicides, neither Endothall nor Diquat are selective for Eurasian watermilfoil. 2,4-D is selective for Eurasian watermilfoil, but has greater water use restrictions than fluridone. Other herbicides may not be selective to control only targeted species. With respect to mechanical alternatives, Sonar® would produce longer lasting results with less environmental damage than mechanical harvesting, benthic barriers or dredging. Drawdown also is not a preferred option as it is not always a choice with a particular waterbody and the drawdown may not be able to effect the deeper parts of the pond. The potential ecological impacts from drawdowns include the possible depletion of oxygen in the remaining water, which could result in fish kills, and nutrient releases, which could produce algal blooms and increase the spread of other macrophyte species. Increased turbidity and resuspension of sediments may occur (NYSDEC, 1990). Other disadvantages are listed in Section 9.3.3.

Within a larger lakes, if the area to be treated is less than 5 acres in size, a contact herbicide such as Endothall or Diquat may be an appropriate control method. A systemic herbicide such as 2,4-D may also prove effective, if water use restriction can be met. The Sonar® label states that treating areas less than five acres in size may not produce satisfactory results due to dilution by untreated water. Mechanical alternatives such as benthic barriers or raking would also be possible treatment choices, and woutd be more cost effective than harvesting.

Where the area to be treated is greater than five acres, Sonar® would be an appropriate alternative. In comparison to the other possible herbicides, Endothall and Diquat are non-selective for Eurasian watermilfoil and do not provide long-term control of Eurasian watermilfoil. 2,4-D is selective for Eurasian watermilfoil, but has stricter water use restrictions than fluridone. With respect to mechanical alternatives, Sonar® would produce longer lasting results, with less environmental damage, than mechanical harvesting. VDEC (1993) notes that there are significant environmental impacts associated with the use of mechanical alternatives. Drawdown often is not a choice with a particular waterbody and the drawdown may not be able to effect the deeper parts of the lake. The potential ecological impacts from drawdowns include: possible depletion of oxygen in the remaining water that could result in fish kills; and nutrient releases which could produce algal blooms and increase the spread of other macrophyte species. Increased turbidity and resuspension of sediments may occur (NYSDEC, 1990). Other disadvantages are listed in Section 9.3.3.

As discussed in Section 9.3.2, biological alteatives in NYS are either not permitted or are still in the testing phase. At present, biological alternatives are not developed for use.

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Peer-reviewed journals are noted in **bold**

ATTACHMENT F

4/23/24 Revised Draft Response to NHESP

Subsequently revised from Draft Response to Original NHESP letter of 4/12/22 and initial response letter from 2/16/24 cited in email from Misty-Ann Marold on 4/26/24.

CITY OF PITTSFIELD

DEPARTMENT OF COMMUNITY DEVELOPMENT, CITY HALL, 70 ALLEN STREET, RM 205, PITTSFIELD, MA 01201

MEMORANDUM

To: Misty-Anne Marold, Senior Endangered Species Review Biologist NHESP
From: James McGrath, CPRP Park, Open Space, and Natural Resource Program Manager
Date: April 23, 2024
Subject: **NHESP Tracking No.: 01-9658**
CC: Danielle Fillio, Richmond Town Admin.

The Town of Richmond, working with the City of Pittsfield, offers the following response to the April 12, 2022 letter regarding lake management activities at Richmond Pond.

A. Chelated Copper Herbicide –

At this time, the use of any chelated copper product is not being considered at Richmond Pond.

B. Diquat, ProcellaCOR, 2-foot drawdown

1. *Submit an Annual Herbicide Treatment Plan.* See the attached for 2024.

2. *Reviewed and Approved Herbicides.* The concentrations specified in the correspondence for each application and for each product are noted and will be followed. In addition, for NHESP consideration, the Town proposes the use of Imazamox (Clearcast) for control of the curly leaf pondweed. For control of tapegrass, the Town proposes the use of Sonar (fluoridone). Impact statements for Sonar are attached. Additionally, the Town plans to file a new NOI in April 2024 for the possible use of mechanical harvesting for tapegrass control. Mechanical harvesting is the Town's preferred method for tapegrass control.

3. *2 Foot Annual Winter Drawdown.* The drawdown activity will comply with GEIR's Drawdown Performance Standards as summarized in the correspondence and fully contained within GEIR Section 4.2.6.3.

4. *Authorization*. It is understood that the Town must refile with the Division pursuant to the MESA prior to any further lake management activities (herbicide application and the 2-foot drawdown)

beyond 2028 only after a submitted and Division-approved annual treatment plan (Condition B.1).

5. *Wetland Protection Act Filings*, *Notice*. The Town understand that when filing for any renewal, extension, or amendment of the WPA Orders of Conditions, it shall contact the Division for written response regarding impacts to Resource Area habitat of state-listed wildlife (310 CMR 10.59) and that a renewal, extension or amendment of Order of Conditions does not renew, extend, or amend this MESA authorization.

The Town and the City look forward to working with NHESP on future lake management activities for the benefit of the lake.

<u>Richmond Pond Treatment Plan for 2024</u>

Imazamox (Clearcast – EPA # 241-437-67690, Imox – EPA # 20180108 or equivalent)

USEPA/MA registered herbicide Imazamox will be applied to only dense patches of curly leaf pondweed at or below the permissible label dose. This product may also be used to selectively maintain a healthy beneficial buffer by controlling encroaching emergent species. Imazamox will be applied at the application rate of approximately 3 qts/ac. Temporary water use restrictions for Imazamox are: 1) No drinking or cooking until residue testing results are below 50 ppb, 2) No irrigation until concentrations are below 50 ppb. There are no restrictions on swimming, boating, fishing, watering of livestock, or domestic use, but prudent herbicide management suggest that we close the area on the day of treatment. The shoreline will be posted with signs warning of these temporary water use restrictions prior to treatment. Imazamox is a systemic herbicide and is approved for injection treatments in aquatic environments.

Impacts Specific to the Wetlands Protection Act using Imazamox *

● Protection of public and private water supply – Generally neutral, but may have detriment at high doses

(setback of treatment required, with distance based on dose and area treated)

● Protection of groundwater supply – Neutral (no interaction)

● Flood control - Neutral (no significant interaction)

● Storm damage prevention – Neutral (no significant interaction)

● Prevention of pollution – Generally neutral (no significant interaction), but could be a detriment if plant

die-off causes low oxygen at the bottom of the lake

● Protection of land containing shellfish - Generally neutral (no significant interaction)

● Protection of fisheries - Possible benefit (habitat enhancement) and possible detriment (food source

alteration, loss of cover)

● Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food

source alteration, loss of cover)

**Commonwealth of Massachusetts Executive Office of Environmental Affairs. Practical Guide to Lake Management: 2004. 133*

Procellacor EC (Florpyrauxifen-benzyl) EPA Reg #67690-80: Procellacor will be applied via sub-surface injection for the control of Eurasian watermilfoil. We anticipate treatment of only small areas based on existing survey data (<10 acres total). Maximum applied concentration will be 7.72 ppb (4 PDU/acre foot).

- **Sonar Q** (fluridone) EPA Reg #67690-21: Sonar Q (granular) will be applied via a calibrated spreader for the control of only nuisance areas of tapegrass. We anticipate treatment of <20-acres total. The goal of the Sonar program is to maintain approximately 15 ppb fluridone within the treated areas from May through July, with applications starting in late April and spaced approximately 3-4 weeks apart. To achieve this concentration, three applications of Sonar will occur. The applications will be 40ppb, 50ppb, 60ppb.

Please see attached documents that describe Sonar impacts to fish, relevant sections below:

Acute – LC50 values for the fish tested ranged from 10 to 14 ppm, more than 500 times higher than the max of 20 ppb we'd seek to achieve in the water to for the listed target plants.

Chronic – no long-term impacts to fish when Sonar concentration is below 0.48 ppm, more than 24 times higher than the max of 20 ppb we'd seek to achieve in the water to for the listed target plants.

MASSACHUSETTS GEIR (ATTACHED):

Aquatic Organisms:

A number of studies have been conducted with fluridone to determine the LD50 or LC50 values for a variety of organisms. The LD50 (or LC50) is the dose (or concentration) to which a particular species is exposed, which results in the death of 50% of the test population. The EPA has cited the results of a number of these studies. EPA considers these studies to demonstrate moderate toxicity. These studies are listed in the Table III 5-2. In addition, a Maximum acceptable theoretical concentration (MATC) value for fathead minnow (second generation fry) was calculated to be between 0.48 mg/l and 0.96 mg/l, meaning no treatment related effects were noted at or below 0.48 mg/l. Total length of 3-day old fry was reduced at 2 mg/l fluridone (USEPA, 1986).

Appendix III - Fluridone 97

No adverse effects were noted on crayfish, bass, bluegill, catfish, long-neck soft-shelled turtles, frogs, water snakes and waterfowl from the use of 0.1 to 1.0 ppm fluridone during field experiments (Arnold, 1979, McCowen et al., 1979 as cited in WSDOE, 1992). Application of 1.0 ppm fluridone to zooplankton caused a reduction in population, but the population quickly recovered. Application of 0.3 ppm did not cause a change in the total number of benthic organisms whereas application of 1.0 ppm did cause a change (Parka et al., 1978 as cited in WSDOE, 1992). An aqueous solution of fluridone caused a reduction in population of the amphipod Hyalella azteca when applied at a rate of 1.0 ppm but not when applied at a rate of 0.3 ppm (Arnold, 1979 as cited in McLaren/Hart, 1995). Fish abundance and community structure remained unchanged in ponds exposed to a fluridone concentration level of 0.125ppm (Struve et al. 1991 as cited in McLaren/Hart, 1995). LC50 values for a variety of microscopic crustaceans including Diaptomus, sp., Eucyclops sp, Alonella sp., and Cypria sp., ranged from 8.0 - 13.0 ppm (Naqvi and Hawkins, 1989 as cited in McLaren/Hart, 1995).

Table III.5-2. Acute Toxicity Tests

SPECIES TEST TYPE VALUE

Daphnia magna 48-hr LC50 6.3 mg/l

Bluegill 96-hr LC50 12 mg/l

Rainbow trout 96-hr LC50 11.7 mg/l

Sheepshead minnow 96-hr LC50 10.91 mg/l

Oyster embryo larvae 48-hr LC50 16.51 mg/l

(USEPA, 1986)

One group of investigators conducted extensive acute toxicity tests on a variety of aquatic invertebrates including amphipods, midges, daphnids, crayfish, blue crabs, eastern oysters and pink shrimp. The average 48-hour or 96-hour LC50 or EC50 (concentration at which 50% of the organisms exhibit an effect) was calculated as 4.3 + 3.7 ppm (Hamelink et al., 1986 as cited in McLaren/Hart, 1995). The same investigators also conducted studies with a variety of fish including rainbow trout, fathead minnows, channel catfish, bluegills and sheepshead minnows. A 96-hour LC50 value of 10.4+3.9 was calculated (Hamelink et al., 1986 as cited in McLaren/Hart, 1995). Daphnids, amphipods and midge larvae exposed chronically to fluridone concentrations of 0.2, 0.6 and 0.6 ppm as well as catfish fry exposed to fluridone concentrations of 0.5 ppm showed no treatment related significant effects. Exposure to concentrations of 1 ppm produced a decreased growth rate of catfish fry and concentrations of 0.95 and 1.9 ppm produced a decreased survival rate of fathead minnows within 30 days after hatching (Hamelink et al., 1986 as cited in McLaren/Hart, 1995).

NEW YORK GEIR (ATTACHED):

USEPA (1986a) summarizes the data developed from exposure of aquatic organisms in standard static water LC50 toxicity tests. Following exposure of Daphnia magna for 48 hours, the concentration of fluridone calculated to product an acute response in 50% of the test population was 6.3 ppm. Following exposure of rainbow trout (Salmo gairdneri) and bluegill (Lepomis macrochrius) for 96 hours, the concentration of fluridone calculated to produce a lethal response in 50% of the test population was 11.7 ppm and 12 ppm, respectively.

USEPA (1986a) also lists a Maximum Acceptable Toxicant Concentration (MATC) of greater than 0.48 ppm, but less than 0.96 ppm, for exposure of fathead minnow fry (Pimephales promelas) to fluridone, indicating that no treatment related effects on fathead minnow reproductive measures were observed at or below 0.48 ppm. Struve et al. (1991) observed that fish abundance and community structure remained unchanged in ponds exposed to a fluridone concentration level of 0.125 ppm.

Parka et al. (1978) reported that at the exaggerated rate of 1.0 ppm of fluridone in water, the total numbers of benthic organisms were significantly reduced when compared to a control population. They also noted that 0.3 ppm of fluridone in water did not significantly reduce total numbers of benthic organisms. Fluridone as an aqueous solution, when applied at the rate of 1.0 ppm resulted in the reduction of populations of the amphipod Hyalella azeteca while an application rate of 0.3 ppm did not result in the reduction of amphipod populations (Arnold, 1979). Naqvi and Hawkins (1989) reported Sonar LC50 values of 12.0 ppm, 8.0 ppm, 13.0 ppm and 13.0 ppm for the microcrustaceans Diaptomus sp., Eucyclops sp., Alonella sp., and Cypria sp., respectively.

Hamelink et al. (1986) conducted extensive acute and chronic toxicity tests on numerous fish and invertebrate organisms. For invertebrates, they noted an average 48-hour or 96-hour LC50 or EC50 (depending on the organisms) fluridone concentration of 4.3 ± 3.7 ppm. The representative invertebrates used in the study included amphipods (Gammarus pseudolimnaeus), midges (Chironomus pulmosus), daphnids (Daphnia magna), crayfish (Orconectes immunis), blue crabs (Callinectes sapidus), eastern oysters (Crassostrea virginica), and pink shrimp (Penaeus duroarum). For fish, they noted an average 96-hour LC50 fluridone concentration of 10.4 ± 3.9 ppm. The representative fish used in their study included rainbow trout (Salmo gairdneri), fathead minnows (Pimephales promelas) channel catfish (Ictalurus punctatus), bluegills (Lepomis macrochirus) and sheepshead minnows (Cyprinodon variegatus).

In the chronic toxicity tests conducted by Hamelink et al. (1986), no effects were observed in daphnids, amphipods, and midge larvae at fluridone concentrations of 0.2, 0.6, and 0.6 ppm, respectively. They reported that channel cattish fry exposed to fluridone concentrations of 0.5 ppm were not significantly affected. Catfish fry growth was reported as reduced at fluridone concentrations of 1.0 ppm. They also reported that chronic exposure of fathead minnows to mean concentrations of 0.48 ppm did not produce adverse effects. Results from Hamelink et al. (1986) indicated that fluridone concentrations of 0.95 and 1.9 ppm resulted in reduced survival of fathead minnow within 30 days after hatching.

WISCONSIN DNR FACT SHEET (ATTACHED):

Fluridone does not appear to have any apparent short-term or long-term effects on fish at legal application rates. Fish exposed to water treated with fluridone absorb fluridone into their tissues. Residues of fluridone in fish decrease as the herbicide disappears from the water. The EPA has established a tolerance for fluridone residues in fish of 0.5 parts per million (ppm).