11. CPA PROJECT APPLICATION FORM

[CPC Use Only: Date Received 2/17/2021 By: SAMMIE KUL
Assigned CPC #2022- 07]

If possible, use word processor to fill out form. Please answer all questions, use "N/A" if not applicable.

1. a.) Applicant Name and Organization: Last Anderson First Robert
Organization(s) (if appropriate) co-applicant: Great Pond Advisory Committee. support: Groton Lakes Assoc.

b.) Regional Project: Yes ☐ or No ☒ If Yes, Town/Organization: _____

2. Submission Date: 2/17/2021

3. Applicant Address: St. 270 Whiley Road
City/ State: Groton/MA ZIP: 01450

4. Ph. # 978-273-4051 Email: bobandersongroton@me.com

5. CPA Purpose. Check all that apply:
Community Housing ☐ (Affordable Housing: ☐ Historic Preservation*: ☐ Open Space: ☒
Recreation ☒

** As per MA General Law Chapter 44B, proposed historic projects that are not on the structures listed on the state's registry of historic places require a determination by the Groton Historic Commission that the proposed project is of historic significance.*

6. Town Committee or boards participating: Great Pond Advisory Committee as co-applicant/sponsor.

7. Project Location/Address: Duck Pond, Groton (between Whiley Road and Duck Pond Drive)

8. Project Name: Duck Pond Restoration & Preservation, Phase 2

9. Additional Responsible Parties (If applicable):

Role (specify)	Name	Address	Ph. (w) (cell)	Email
Property/Site Owner	Town of Groton (land easement & pond responsibility)	173 Main Street	978-448-1111	townmanager@grotonma.gov
Project Manager	Robert Anderson	270 Whiley Road	978-273-4051	bobandersongroton@me.com
Lead Architect				
Project Contractor	Kara Sliwoski, District Manager Solitude Lake Management	590 Lake Street, Shrewsbury, MA 01545	508-865-1000	ksliwoski@solitudelake.com
Project Consultants				
Other:				
Other				

10. As appropriate, indicate if proposal requires P&S agreement N Deed N
Option agreement N Other-describe: _____

11. a.) Assessor info. (map/ block/ lot id.(s)): 131/72/0 (lot w/easement) b.) Tax classification type: R/A

12. Permits required: Zoning: _____ Historic Preservation: _____ Other : Conservation Commission approval is still current.

13. Historic Commission Approval signoff (when required): N/A Date: _____

14. Funding: a.)Project Cost: $24,000. Estimate: $ Professional Quote: based on Phase1 GELD/Solitude actuals
b.) Requested from CPC: $ 19,800. c.) Committed from other sources: $4,200 neighbor donations
d.) Annual anticipated total income :$ N/A e.) Annual anticipated total expense: $ N/A
f.) Anticipated net income (loss): $ N/A g.) Estimator name/company:

15. CCP Objectives - use codes from **Section 5** to indicate all that apply: 5.3, OSRP 2.3

16. Project Timelines: Proposed Start Date: May, 2021 Projected Complete Date: June 2024

17. Estimated Delivery Date of Completion Report to CPC: July 2024

11. CPA PROJECT APPLICATION FORM

[CPC Use Only: Date Received _____ By: _____
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Recreation X X

** As per MA General Law Chapter 44B, proposed historic projects that are not on the structures listed on the state's registry of historic places require a determination by the Groton Historic Commission that the proposed project is of historic significance.*

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Project Consultants				
Other:				
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15. CCP Objectives - use codes from **Section 5** to indicate all that apply: 5.3, OSRP 2.3

16. Project Timelines: Proposed Start Date: May, 2021 Projected Complete Date: June 2024

17. Estimated Delivery Date of Completion Report to CPC: July 2024

18. Project description and explanation (attach additional sheets as needed):

Duck Pond Restoration & Preservation Project, Phase 2 is a three-year continuation of the restoration and preservation work in Phase 1 (CPC 2019-08). See page 3 for description and explanation.

Approval is requested from CPC to commit funds prior to FY2022 in order to issue purchase orders after Town Meeting approval, so July work can be scheduled in advance and occur promptly after FY2022 begins. Invoices won't be received until FY2022.

19. Feasibility: Feasibility of the oxygenation process has been proven over the past three years and in many other studies. However, two summers were insufficient to prove the benefit of adding aerobic bacteria, so that process has been excluded from Phase 2.

20. List of attachments: Pg. 3: Project Description; Pg. 4: Budget; Pg. 5: Ownership Approval; Pg. 6: Management Plan, Risk Analysis; Pg. 7: Maintenance vs. Preservation; CPC Feedback comments; Pg. 8,9: CPC Scoring Criteria Applied; Pg. 10-19: Support Letters; Pg. 20: Appendix Contents; Pg. A1: Photos; Pgs. A2-A16: Solitude 2020 Duck Pond Report;

21. Additional Information: CPC approved this project as "appropriate" at the 11/9/2020 meeting, pending subsequent approval of full proposal by CPC and at Town Meeting. As there was discussion about whether the monthly GELD invoices constituted "maintenance" or "preservation", the CPC requested that the proposal address that subject. See page 7.

22. Management Plan: See Page 6.

23. Applicant Signature: Robert E. Anderson Date: 2/15/2021

Co Applicant Signature: J. W. Luening, GPAC Date: 2/15/2021

Co Applicant Signature: Date:

Duck Pond Restoration & Preservation Project, Phase 2
Project Description and explanation

The Duck Pond Environmental Restoration Project addressed environment degradation in Duck Pond, a 26-acre Great Pond in Groton used for fishing, canoeing, kayaking, Stand-Up Paddle-boarding (SUP), & hiking on the abutting trails on Conservation Commission and Groton Conservation Trust land that includes about 2/3 of the total pond shoreline. Decades of decaying algae, leaves, and weeds created a thick layer of sediment ("muck") that provides a nutrient-rich environment that leads to more weed growth each year. The quicksand-like muck and the thick weeds also are a safety hazard to anyone falling off or out of an SUP, canoe, or kayak. Decreasing water quality and the accumulating biomass also impact fish and other wildlife.

The three-year Project (CPC 2019-08) installed a Compressor and ten Diffusers located throughout the pond (see map). Air is pumped through the hoses to the Diffusers where bubbles rise to the surface and spread out. The resulting circular water pattern brings oxygen-rich surface water to the bottom (benthic) layer to keep aerobic bacteria alive to digest organic matter, and to prevent formation of anaerobic bacteria that can cause odors and toxic cyanobacteria blooms. The project also included the application of aerobic bacteria to increase the impact on the rate of muck growth (only years 2 and 3).

The project is working well as measured by the water quality testing and the sufficient level of Dissolved Oxygen (DO) throughout the water column. Fishermen have returned (photos) and there has been more open water for recreation because the water circulation pushes floating weeds toward the shore. Two summers have not been sufficient time to reliably measure whether the muck depth is decreasing (see Solitude's "2020 Duck Pond Report" in the appendix) so that process has been eliminated from Phase 2.

Phase 2 of the project proposed here provides three years of funds for electricity to operate the Compressor (8 months/year), three water quality tests per year, periodic muck-depth measurements ("tolling"), and a written final report. Additional tolling points will be used as well as techniques to improve accuracy at each point, in order to obtain better data about the muck-depth impact. See Budget Page 4.

Duck Pond Restoration Preservation Project, Phase 2 Budget

Spring 2021 costs have been reserved in Phase 1 but some Phase 2 funds may be needed

Item	2021	2022	2023	2024	Total
1. GELD Electricity (8 mos/yr.)	$ 1,300 July-Nov	$ 2,100 Apr-Nov	$ 2,100 Apr-Nov	$ 800 Apr-Jun	$ 6,300
2. Tests, Analyses* (2-4 sites, 3x/year) Dissolved Oxygen, Temp, pH, & Conductivity at multiple depths; Secchi Depth, Phosphorus-Total, Phosphorus-Ortho, Nitrogen (Ammonia, Nitrite, Nitrate, TKN); Bacteria sampling/analysis	$ 2,000 July/Oct	$ 3,000 Apr/July/Oc	$ 3,000 Apr/July/Oct	$ 1,000 April	$ 9,000
3. Sediment depth measurements* Original test points and new ones from 20-point tolling set in Phase 1	$ 1,000	$ 1,000	$ 1,000	$ 500	$ 3,500
4. System tasks (startup, hoses)	$ 700	$ 700	$ 700	$ 700	$ 2,800
5. Final Report			$ 1,000		$ 1,000
4. Contingency					$ 1,400
				Total:	$ 24,000
				less 17.5% donations from neighbors to Town of Groton:	$ 4,200
				CPA funding requested:	$ 19,800

From: David Doneski <DDoneski@k-plaw.com>
Date: March 12, 2018 at 6:36:30 PM EDT
To: 'Mark Haddad' <mhaddad@townofgroton.org>
Subject: RE: Owner approval of Duck Pond Restoration

Mark,

Per our telephone conversation of March 8, I am writing in regard to how the matter of ownership of Duck Pond in the Town of Groton may be treated for purposes of an application to the Community Preservation Committee (CPC) for Community Preservation Act funding to perform weed control/restoration activities in the pond. The issue was identified in your e-mail to me of February 6, 2018, copied below. That message included Robert Anderson's February 5 e-mail to you, describing that although Duck Pond appears to exceed the size requirement for a Great Pond, it has not been so classified by the Department of Environmental Protection (DEP) pursuant to a 'Great Pond List' project undertaken in 1996. You previously informed me that you had signed the owner authorization portion of the funding application, on behalf of the Town. In my view, this is the better approach at present.

Although it may be possible to have the DEP list amended to include Duck Pond, I would expect that the exercise could be a time consuming process and would not likely be completed in sufficient time to allow for the restoration work at Duck Pond to take place this year. I would take the view that having the Town act as the owner (or "for" the owner, presuming that Duck Pond does legally constitute a Great Pond under the ownership of the Commonwealth) is consistent with the protections afforded Great Ponds and the authority of the Town as a municipality and political subdivision of the Commonwealth.

The term Great Pond is defined in Chapter 131 of the General Laws (dealing with inland fisheries, game and natural resources) as "a natural pond the area of which is twenty acres or more." G.L. c.131, §1. Chapter 91 of the General Laws, dealing with "waterways," and the implementing regulations of the DEP at 310 CMR 9.00 define Great Ponds as ponds containing more than ten acres of land in their natural state. See G.L. c. 91, §35. Section 35 also states that such great ponds "shall be subject to any rights in such ponds which have been granted by the commonwealth." Id. "With limited exceptions, the waters of a great pond and the land that comprises the bed of the pond to the natural low water mark belong to the Commonwealth, and the ponds are held in trust for certain public uses." Opinion of the Justices to the Senate, 474 Mass. 1201, 1203 (2016).

Since colonial times, the courts have recognized the authority of both the Commonwealth and the municipalities in which Great Ponds lie to regulate the public use of Great Ponds without reference to the fee ownership of the ponds. See West Roxbury v. Stoddard, 89 Mass. 158, 7 Allen 158, 170-171 (1863). Ownership rights of any abutters would extend only to the natural low water mark. See e.g., ***Potter*** v. ***Howe***, 141 Mass. 357, 359 (1886), cited in Opinion of the Justices, supra, 474 Mass. at 1207. See also G.L. c. 131, §45, which provides that "any city or town in which the whole or any portion of any great pond not exceeding five hundred acres in extent is situated may, as to so much thereof, as is located within its boundaries, make and enforce rules and regulations relative to hunting, fishing and boating thereon." Where the purpose of the proposed work at Duck Pond is to preserve it from weed activity which can reduce oxygen within the pond and lead to eutrophication, it is my view that the Town acting as and/or for the Commonwealth in authorizing the application to the CPC is consistent with the long acknowledged public purpose of preserving Great Ponds to the use and good of the public.

Please contact me if you have any further questions on this matter.

David J. Doneski, Esq.

KP | LAW
101 Arch Street, 12th Floor
Boston, MA 02110
O: (617) 556 0007

Duck Pond Restoration & Preservation Project, Phase 2
Management Plan, Risk Analysis

Management Plan:

The tasks required and timing of those tasks are listed on the Budget.

Bob Anderson will manage the project, as he did in Phase 1. For Phase 1, he researched and designed the details of the Project, raised over $13K of non-CPA funding, drafted the narrative for the Conservation Commission Notice of Intent and presented at Conservation Commission meetings, resolved the Duck Pond ownership issue with an opinion from Town Counsel, and obtained quotes from multiple potential vendors.

After approval of the CPA application, he scheduled and supervised the site preparation by a Contractor, Electrician, and GELD, evaluated and recommended selection of the Lake Management Company vendor, supervised installation, approved invoices, and scheduled and supervised water quality treatments and periodic tests/analyses. He provided periodic reports to the CPC and the Conservation Commission. Mr. Anderson has extensive management experience as a former entrepreneur, a former CEO of a public technology company, and an Advisor to Technology Company CEOs for over 20 years.

Phase 2 represents a continuation of the same quotation, purchase order, invoice approval and vendor oversight processes used in Phase 1.

Vendor Risk Analysis:

Phase 2 uses the same vendors of electricity (GELD) and pond testing (Solitude) as Phase 1. There are no new measurements or other actions required so the risk is much smaller than it was in Phase 1. The Town of Groton also has extensive experience with the proposed lake management company at other Great Ponds.

Duck Pond Restoration & Preservation Project, Phase 2

"Maintenance" vs. "Preservation"

"Maintenance" means actions to keep a manually created product functioning as intended when created. Examples include repairing and updating a computer, replacing a house roof, and tending cultivated land by mowing a lawn and weeding a garden.

"Preservation" means actions to slow or stop the natural decay of a product or resource. Examples include freezing food, temperature/light control for ancient documents, and **slowing eutrophication of ponds**.

The Duck Pond Restoration and Preservation Project, Phase 1 and 2, are preservation projects for one of Groton's Great Ponds.

Response to CPC Feedback:

- Please remember that CPA funding is limited and competition for these funds is high; the CPC request that you do everything possible to be as efficient in choosing the funding amount as you possibly can.
  The aerobic bacteria application was eliminated from Phase 2 to cut cost in half.

- Please provide any other funding sources (including volunteer labor and donated professional services).
  Neighbor donations over $4000 were committed to reduce funding needs. Volunteer time and personal expenses over $1000 have been incurred during Phase 1 but are not included in the percentage calculation nor will they be reimbursed.

- Please include any additional project details in the final proposal.
  The project was expanded to include more sediment depth measurements as they are important to track more accurately.

- Please include Letters of Support in the final draft.
  Support Letters from the Select Board, Conservation Commission, Water Dept., Groton Conservation Trust, Great Ponds Advisory Committee, Groton Lakes Association are included, as well as email messages of support (some committing to donations) from neighbors on pages 10-19.

- The CPC prefers that applications be submitted in PDF format; however, it is not required.
  A Compressed PDF is being submitted.

CPC Scoring Criteria

12.1.2 CPA Project Application Criteria (applicant's view)

1. Submitted on Form: Yes
2. By deadline: Yes
3. Fits criteria: Yes
4. Historic Preservation: N/A
5. Site control: Yes. Continuation of Phase 1. See Ownership Pg. 5.
6. Management Plan: Yes. Continuation of proven Phase 1 management.
7. Professional Quote: Yes. Continuation of existing Phase 1 quotations.
8. Non-CPA Funds: Yes. Neighborhood donation commitments of $4,200 (17.5%). Combination of Phases 1 & 2: donations of $17,200 (20% of $86,000 total).

12.2 Scoring (applicant's view)

12.2.1 Function

1. Goals/Objectives in latest Open Space & Recreation Plan [Score: 5]

OSRP pages 45, 69, 104:

Lakes and Ponds

Groton has or shares several Great Ponds, totaling 417 acres of surface water. [22] The largest of these is Lost Lake (the town's only lake), whose 205 acres include adjoining Knops Pond. Two more of the Great Ponds are located near the Lake: Whitney or Cow Pond (37 acres) and Duck Pond (26 acres). The other Great Ponds located entirely within Groton, Baddacook Pond (80 acres) and Martins Pond (22 acres), are located east of Town Center. Groton shares 42 acres of pond area with neighboring communities, including Massapoag Pond (111 acres total shared with Dunstable and Tyngsborough) and Long Pond (46 acres total shared with Ayer). An additional 37 acres of smaller natural and artificial ponds located throughout town range in size from less than one acre to approximately 10 acres.

For recreational purposes, public access is provided via protected open space to all Great Ponds located entirely in Groton except Martins Pond. There is limited or no public access to Long and Massapoag Ponds,

7) Ground and Surface Water Pollution

The water quality management program proposed for Lost Lake and Knops Pond consists of monitoring, resident education, development of new BMPs, such as localized rain gardens and other improvements to existing drainage and stormwater infrastructure. Aeration is being used to slow down eutrophication at Duck Pond.

2.3 Evaluate and implement strategies for water resource surface water quality and invasive plant control.	• Encourage development of comprehensive lake management plans for Great Ponds, particularly Lost Lake/ Knops and Baddacook Ponds.	Select Board, Great Ponds Advisory Committee, Conservation, NRWA
Funding sources: • Volunteer and	• Monitor where nutrients are coming from that contribute to aquatic plant overgrowth.	Great Ponds Advisory Committee, Health, Conservation

2. Multiple funding sources: [Score: 2.5. Donations of $4,200 (17.5% of $24,000).

12.2.2 Value:

1. Application quality: [Score 5]
2. Degree of urgency: [Score 4; so progress to date isn't lost]
3. Community support: [Score 5; Select Board, Conservation Commission, Water Department, Groton Conservation Trust, Great Ponds Advisory Committee, Groton Lakes Association, and neighbor emails. See pages 10-19.
4. Ease of execution: [Score 5; simple continuation of past three years work]
5. Level of risk: [Score 5; demonstrated results for three years]
6. Active applicant: [Score 5; three years of responsiveness demonstrated].

Total Score = Function + Value = 36.5

TOWN OF GROTON
173 Main Street
Groton, Massachusetts 01450-1237
Tel: (978) 448-1111
Fax: (978) 448-1115

Town Manager
Mark W. Haddad

Select Board
Alison S. Manugian, *Chair*
Joshua A. Degen, *Vice Chair*
Rebecca H. Pine, *Clerk*
John R. Giger, *Member*
John F. Reilly, *Member*

Groton Community Preservation Committee
Groton Town Hall
173 Main Street
Groton, MA 01450

RE: CPC# 2022-07
Duck Pond Restoration & Preservation, Phase 2

Dear Members of the Community Preservation Committee

On behalf of the Groton Select Board, I am writing to you to express the support of the Select Board for the project *CPC# 2022-07, Duck Pond Restoration & Preservation, Phase 2*. The Board voted unanimously to recommend this project be brought to the Spring Town meeting by the Community Preservation Committee. The project has been well managed over the past three years, with good communications with both Town officials (Town Manager, CPC Assistant, CPC Committee, Board of Health, and Treasurer) and vendors.

Initial data from the first three-year phase is encouraging that continued aeration of Duck Pond will slow eutrophication, improve recreational opportunities, and improve the health of the pond for wildlife. It also is important to continue to gather data about water quality, weeds, and sediment to understand the effectiveness of this relatively low-cost method of preservation for this pond and the potential application to other ponds.

The Select Board appreciates the opportunity to provide this recommendation and would request that the Community Preservation Committee bring this project to the Spring Town Meeting for approval.

Thank you for your attention and consideration.

Sincerely,

Mark W. Haddad
Town Manager

MWH/rjb
cc: Select Board
Robert Anderson

TOWN OF GROTON
Conservation Commission
173 Main Street
Groton, MA 01450
(978) 448-1106
Fax: 978-448-1113
ngualco@townofgroton.org

February 10, 2020

Bruce Easom, Chairman
Community Preservation Committee
173 Main Street
Groton, MA 01450

Dear Chairman Easom,

At its regular meeting on January 26, 2021 the Groton Conservation Commission discussed with CPA Applicant Bob Anderson the details of his FY22 CPA proposal as well as reviewed a final report on the status of the effort to restore Duck Pond (a FY20 CPA funded project). Overall, the Commission was impressed with the progress made in such a short time on Duck Pond – mainly that more open water was observed in 2020 than previous years. While it is still too early to tell if the restoration efforts are making a significant change it does appear that the dissolved oxygen levels and overall water quality have begun to improve. Mr. Anderson's modest request for FY22 CPA – to continue to run the air compressor unit – appears to be a good use of CPA funding.

Furthermore, as Project Manager for the Town's effort to restore Duck Pond, Mr. Anderson has been successful in completing all the wetland permitting requirements for this project. He succeeded in obtaining an Order of Conditions in 2018 for the installation of the air compressor and related aeration hoses. This Order is valid through March 27, 2021 after which an extension permit will need to be obtained for a term of up to three years. Mr. Anderson has also provided regular monitoring reports to the Commission and has consistently demonstrated his commitment to the restoration and preservation of Duck Pond.

Finally, at its regular meeting on February 9, 2021 the Conservation Commission voted by roll call vote to support CPA Application FY2022-07 for the continued efforts to restore Duck Pond.

Sincerely yours,

Nikolis Gualco
Conservation Administrator

Superintendent:
Thomas D. Orcutt

Business Manager:
Lauren E. Crory

Commissioners:
John J. McCaffrey Jr.
James L. Gmeiner
Greg R. Fishbone

TOWN OF GROTON
Water Department
173 Main Street. Town Hall
Groton, Massachusetts 01450

Office: 978-448-1122
Fax: 978-448-1123

MEMORANDUM

To: CPC Committee

From: Board of Water Commissioners

Subject: CPC Project #2019-08 - Duck Pond Restoration

Date: January 23, 2018

The Board of Water Commissioners in general supports the application by Mr. Robert Anderson for a non-chemical based approach to treating the weeds at Duck Pond.

If you have questions or concerns regarding our support, please do not hesitate to contact the Water Department.

February 1, 2021

GROTON CONSERVATION TRUST

P.O. Box 395
Groton, MA 01450

gctrust.org

Bruce Easom, Chair

Community Preservation Committee
Town of Groton
173 Main St
Groton, MA 01450

Dear Mr. Easom,

The Groton Conservation Trust (GCT) is a private land trust with a more than 50-year history that owns over 1,400 acres in Groton. The GCT is dedicated to protection, management, and provision of public access to natural lands in town. One of the GCT's parcels, Duck Pond Conservation Area, is located on the eastern side of Duck Pond, and we have trails that run along the pond.

We previously supported the 2018 application from residents of Duck Pond to seek CPA funding for an aeration project to help address the deterioration ("eutrophication") of Duck Pond. We gained a greater appreciation at the time of the safety hazards from recreational use due to the aquatic weed growth, as well as the issue of declining fish population and the unpleasant smell that are byproducts of the eutrophication. There is evidence that this aeration approach would reduce some of the more damaging effects over a short to mid-term period even as the longer term eutrophication process most likely, would continue. Some of the updated data also suggests progress with the approach and we are supportive of the project continuing with the funds requested.

While the GCT sees the merit of the project, we feel continuing to collect data and analyzing the on-going results remains critical element of any funding on our ponds, so we can continue to assess the efficacy of various approaches to minimize the eutrophication that takes place in our local ponds. .

The GCT appreciates the work that the Community Preservation Committee does and its attention to this matter. If you have questions for us, please do not hesitate to contact me.

Sincerely,

Ted Lapres

To: Community Preservation Committee

From: Alexander Woodle

Subject: Duck Pond Restoration & Preservation

Dear Committee members,

I support the Duck Pond proponents to continue their project in order for a more complete picture of the process to be evaluated. There are some early indications of a successful treatment, but a longer time horizon is needed.

Last year's drought conditions negatively affected this demonstration program. The CPC made a judgement that this project had merit. It only seems reasonable and prudent to extend it to obtain longer term results that will ultimately determine whether to pursue this kind of a program into the future.

There are many small coves on Lost Lake that have similar conditions. Positive results from this project could have long-term benefits for treating these coves to improve water quality.

Sincerely,

Alex Woodle, Member

Great Ponds Advisory Committee &

The Groton Lakes Association

Neighbor Support Letters:

John Valentine January 30, 2021 at 12:29 PM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

To the CPC and Groton Residents:

Duck Pond is a significant resource to the Town of Groton for numerous reasons and is deserving of community resources to assure its preservation for the benefit of Groton residents--both human and wildlife. Since we have lived on the Pond we have seen an increasing number of people hike its trail, canoe, kayak, paddle board, fish and even swim in its waters. There are birds of all kinds, including Great Blue Herons, Ibis, Kingfishers, Canada Geese, Swans and, of course, many kinds of ducks which enjoy its waters as well as beavers, muskrats and many, many bull frogs. Fox hunt its borders and wild blueberries line its shores.

We have observed the Pond since the early spring of 2015 when we purchased the old cottage owned by Barney Soslovitch, who used to host a group of people who loved the Lost Lake area--that later became the Groton Lakes Association. We have lived here for the last 2+ years. In that time we have seen increased community use of this natural resource that has been consistent with retaining its value as a habitat for wildlife. We believe that the efforts to preserve the Pond are well worth it and appear to have thus far succeeded in maintaining and even somewhat improving its viability, as it has more and clearer open water than in the first few summer peaks we experienced--when we were extremely concerned that it was becoming a bog!

We wholly support the continuation of the preservation efforts set forth in the most recent CPC Application. We note the broader community support this project initially received and the increased enjoyment of Duck Pond by the community. Accordingly, we urge the CPC to vote to approve the pending application.

Sincerely,

John & Linda Valentine

Remi Kaleta January 31, 2021 at 12:33 AM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

Seven years ago I arrived to Groton and purchased a house near the Duck Pond.
It was the most beautiful pond. Large like a small lake but quiet. No motor boats and clear, transparent water. We used to paddle on it and meet neighbors late summer afternoons after work or during the weekends on the spacious surface of the Pond. We admired the water life and rare bryozoa (moss animal) colonies on the submersed branches.
Everything was idyllic until one hot summer that initiated a rapid degradation. The water began very cloudy and tightly covered by weeds. The vegetation changed and besides just water lilies we started seeing typical plants (like the Pickerel Plant, that may be indicating a conversion to a swamp). At this moment, with the great support from the Town, we were able to initiate the Pond aeration project. Two years after we already see some improvement. The water is clear and transparent again. There is still a lot of weeds on the surface but not the swamp-type. There is a lot of fish, bullfrogs and other animals attracting hunters like otters, minks or even eagles. The aeration concept was right and slowly shows effect in restoration of this uniquely beautiful, natural lake that is not changed it's shape since it was first drown on the oldest available map of Groton.
We would like to join the other residents of Groton to ask the Town for continues support of the Duck Pond restoration concept

Sincerely,
Remi and Beata Kaleta

Neighbor Support Letters:

Jeffrey & Johanne Thompson January 26, 2021 at 8:42 AM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

Hi Bob
The Thompson's at 5 little hollow are happy to support this project and are happy to make a donation when needed.
Cheers
Johanne Thompson

Sent from my iPhone

Gene & Petronella Guttromson January 26, 2021 at 6:23 PM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

I am supportive and willing to make a donation to keep the project going and improve the health of our Pond.
Gene Guttromson
196 Duck Pond Drive

Kanti Mann January 27, 2021 at 11:13 PM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

Sorry, Bob, meant to type $500.
Kanti

On Wed, Jan 27, 2021 at 11:11 PM Kanti Mann <kantimann@gmail.com> wrote:
> Hi Bob,
> Thanks as always for sorting this out. John and I will Contribute $300 to the pond efforts.
>
> Kanti

Jim Gmeiner January 26, 2021 at 12:39 PM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

Bob:

Thanks for the update on the progress of the Duck Pond project. I am hopeful that the CPC will approve the new application to continue this project. As I think you know I am in favor of finding solutions to improve water quality which do not involve the use of pesticides/herbicides, which in the long run are costly fiscally and otherwise. Please feel free to share this email with the CPC.

Very truly yours,

Jim Gmeiner.

Neighbor Support Letters:

Paul Harter
Re: your email about Duck Pond
To: Bob Anderson, Cc: Gerri Harter
7:26 PM
Details

Hi Bob,

Sorry about the delayed response. We are happy to support the next phase as we did the last. I don't have our contribution handy, but you can count on us for the same level of support.

paul

from my phone. Please excuse typos, terseness.

Ira Blieden
RE: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

To the Town of Groton, MA, Bob Anderson, and all involved with the Restoration of Duck Pond:

By way of this email, Sue and I want to acknowledge the work being done to restore Duck Pond. Sue and I take walks around Duck Pond and we enjoy the area. We will be sending a donation in support.

You have our support!

Thanks,
Ira & Sue Blieden
Ira's Cell: 781-507-3764

Dorothy Mastandrea
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Remi Kaleta, Bob Anderson

Dear Bob and Remi:

We support Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07), continued efforts to restore and preserve the health of Groton's Duck Pond.

Our family discovered beautiful Duck Pond when we moved into a home on Duck Pond Drive last November. Since we moved in 3 months ago, we have enjoyed birdwatching and hiking on trails along the pond. Last weekend a hawk flew over us, checking us out, while we were ice skating on the pond.

We look forward to kayaking and stand-up paddleboarding on the pond next summer. It should be noted that we observe deep and extensive muck at the shoreline and in the water, which will likely make it challenging to launch a kayak or SUP. We also understand that the abundance of pond weed makes it difficult to navigate the pond with a kayak or SUP.

We feel fortunate to live in Groton, a town that values its open space and recreational opportunities. We thank the Community Preservation Committee and Town of Groton for their efforts, resources, and support to restore and preserve this beautiful great pond. We hope that continuing to oxygenate the water will slow eutrophication of the pond and over time reduce the muck and weeds so that outdoor enthusiasts can enjoy this beautiful resource for many years to come.

Best regards,

Dot and Andy Mastandrea
53 Duck Pond Dr
Groton, MA 01450

Neighbor Support Letters:

Lon & Katie Novak January 26, 2021 at 10:43 AM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

Hi Bob-

I am stating my support!

Katie Novak
195 Duck Pond Drive

Gleb Nechayev February 1, 2021 at 6:49 PM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

Dear Bob -

Thank you for your e-mail and sorry for the delay reply - I just saw this.
I certainly support proceeding with Phase 2 of the project!

Kind regards,

Gleb

Kevin & Jessica Charland January 26, 2021 at 8:21 AM
Re: Duck Pond Restoration & Preservation Project Phase 2 (CPA 2022-07)
To: Bob Anderson

In full support. Good luck!

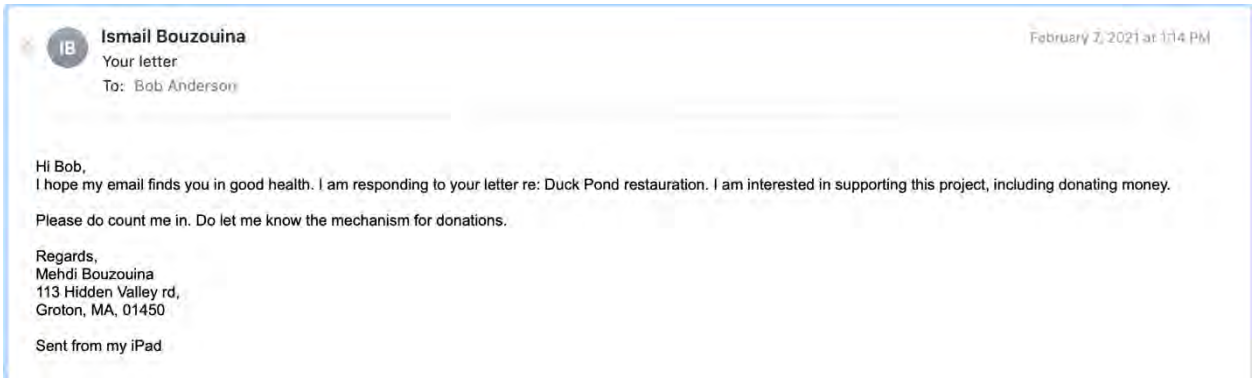
bunkelli@verizon.net Duck Pond Support February 1, 2021 at 4:59 PM
Duck Pond Project
To: Bob Anderson,
Reply-To: bunkelli@verizon.net

Dear Bob,

Thanks so much for the progress report on this very worthwhile project. We support your effort to make this area even more of an asset to the town of Groton and its residents. Good luck!

Bob and Elli Burr
21 New Pond Rd.
Groton, MA 01450

Neighbor Support Letters:



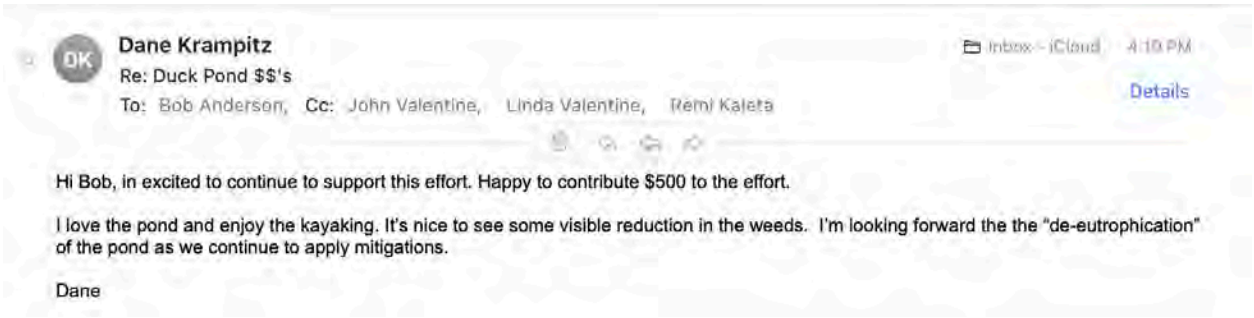
IB **Ismail Bouzouina** February 7, 2021 at 1:14 PM
Your letter
To: Bob Anderson

Hi Bob,
I hope my email finds you in good health. I am responding to your letter re: Duck Pond restauration. I am interested in supporting this project, including donating money.

Please do count me in. Do let me know the mechanism for donations.

Regards,
Mehdi Bouzouina
113 Hidden Valley rd,
Groton, MA, 01450

Sent from my iPad

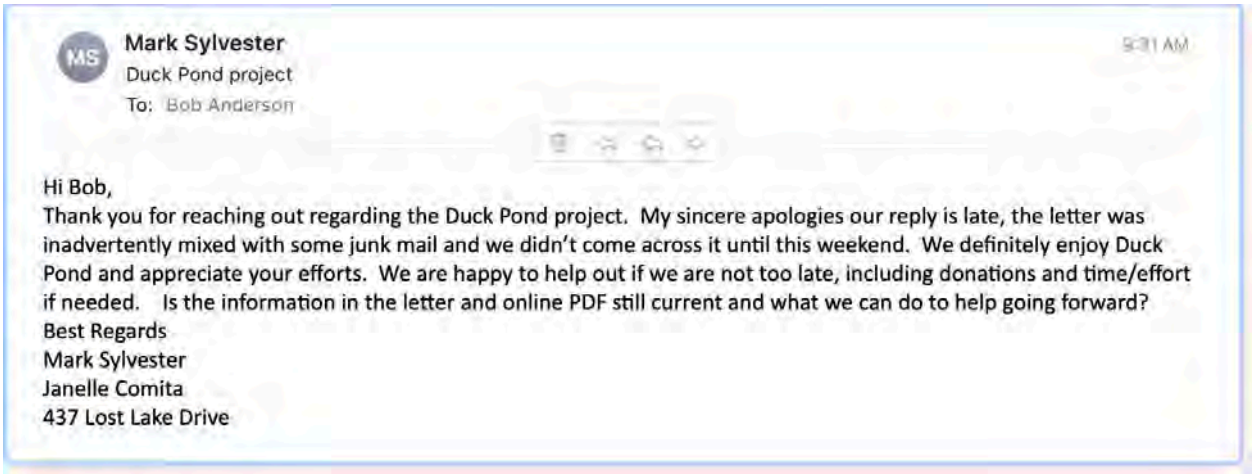


DK **Dane Krampitz** Inbox - iCloud 4:10 PM
Re: Duck Pond $$'s Details
To: Bob Anderson, Cc: John Valentine, Linda Valentine, Remi Kaleta

Hi Bob, in excited to continue to support this effort. Happy to contribute $500 to the effort.

I love the pond and enjoy the kayaking. It's nice to see some visible reduction in the weeds. I'm looking forward the the "de-eutrophication" of the pond as we continue to apply mitigations.

Dane



MS **Mark Sylvester** 5:31 AM
Duck Pond project
To: Bob Anderson

Hi Bob,
Thank you for reaching out regarding the Duck Pond project. My sincere apologies our reply is late, the letter was inadvertently mixed with some junk mail and we didn't come across it until this weekend. We definitely enjoy Duck Pond and appreciate your efforts. We are happy to help out if we are not too late, including donations and time/effort if needed. Is the information in the letter and online PDF still current and what we can do to help going forward?
Best Regards
Mark Sylvester
Janelle Comita
437 Lost Lake Drive

Duck Pond Restoration & Preservation Project, Phase 2
Appendix

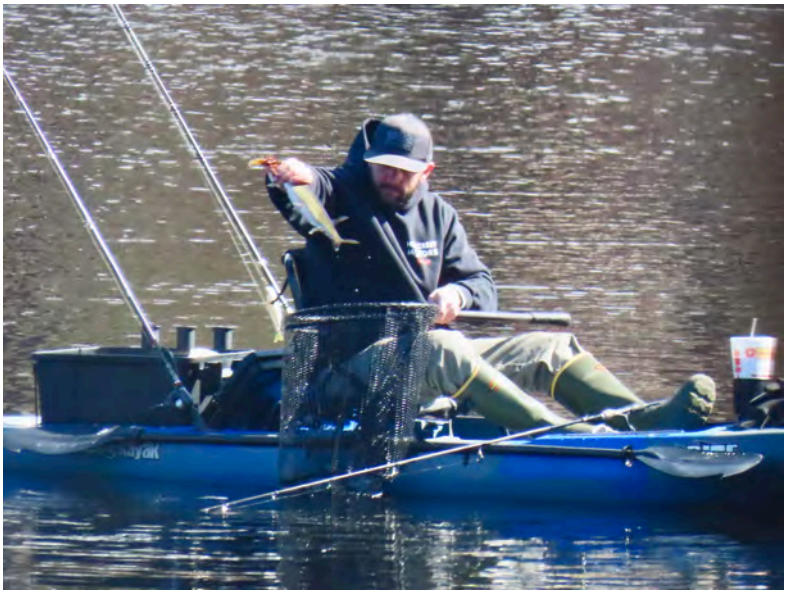
Page A1: Photos of fishing and photo of air bubbles rising from submersed diffuser.

Pages A2-A16: Solitude "2020 Duck Pond Report"

The initial 15 pages: The Report narrative, test result charts, and three maps from Appendix. The complete report, including over 50 pages of water quality and sediment depth sampling data and laboratory reports, is available online at this Dropbox link: https://www.dropbox.com/s/90w3a32vi4z4kju/Duck%20Pond%202020%20Report%20-%20Final%20-%20All.pdf?dl=0

The Water Quality Results on page 5 of the Solitude report have been revised to show the data in date order from left to right, as suggested at the Conservation Commission meeting. (That change was not made in the full report posted on Dropbox at the above link).

The Conservation Commission meeting also asked about Dissolved Oxygen (DO) data as it was shown only in the Report appendix, not in the body of the Report. The difficulty is that there are 237 DO measurements (every foot of depth, at four test sites, three times/year, for three years). There were only 11 data points out of the 237 with DO less than 3 mg/L.



2020 Duck Pond Report

SOLITUDE
LAKE MANAGEMENT
590 Lake Street
Shrewsbury, MA 01545

TABLE OF CONTENTS

Appendix A

- *Maps*
- *Data Tables*
- *Lab Reports*

Introduction

Duck Pond is a 28-acre waterbody located in Groton, Massachusetts. The Town has contracted SOLitude Lake Management since 2018 to evaluate and implement various restoration techniques. Under the oversight of Mr. Bob Anderson, a multifaceted management program was developed to meet the restoration goals, including regular water quality sample collection and analysis, installation and maintenance of a submersed bottom diffuser aeration system, sediment depth sampling, and monthly bacteria augmentation applications.

The following report summarizes this year's completed tasks as well as results at Duck Pond.

Water Quality

Three rounds of water quality sampling have been performed annually since 2018 in April/May, July, and October. Water column profiles of dissolved oxygen, temperature, pH, and conductivity measurements were collected at four sampling locations (**Figure 1**). In addition, water quality samples are collected, where six parameters including Total Phosphorus, Orthophosphorus, Total Kjeldahl Nitrogen (TKN), Ammonia, Nitrate, Nitrite, and composite algal samples are collected at two of four predetermined locations. Water quality and algal samples were brought to MA-certified laboratories.

Water quality sample bottles without a preservative were rinsed with pond water prior to collection and submersed into the water elbow deep. Samples were then placed into a cooler with ice and immediately brought to the laboratory. Results of the laboratory reports were entered into an excel spreadsheet and sent to Bob Anderson after each sampling event.

Results of the water quality sampling events are summarized in the following paragraphs. Charts 1 & 2 provided at the end of the water quality section provide visual aids in identifying patterns or elevations of each parameter. Please refer to **Appendix B** for 2018-2020 water quality data tables and lab reports.

Nitrogen

Ammonia is a measure of two constituents, NH_3 and NH_4^+, and is a transitional product in the breakdown of organic nitrogen (from plants, waste, etc) into nitrate. It is typically short-lived in the pond environment except under conditions of low dissolved oxygen. Water Bodies that have a high pH and temperature are susceptible to high ammonia

concentration; the higher the pH, the more ammonia will be present within the water column. External sources of ammonia include: fertilizers, wastewater effluent discharge, animal waste, and runoff from agricultural lands. High levels of ammonia are toxic to the aquatic environment, notably fish, and typically indicate a eutrophic pond. Levels higher than 0.100 mg/L can be problematic for aquatic biota, however available dissolved oxygen, pH, and temperature are key factors in 'toxic' levels. *At sample site 1-D, ammonia remained generally un-detected between 2018-2020; however, there was an increase in ammonia during the July sampling event in all three years. At sample site 4-A, ammonia remained below detectable levels, aside from a single event in July of 2018.*

Nitrite is a form of nitrogen commonly identified as a nutrient released in sewage and sanitary wastes, and can become elevated in areas of disturbance, such as heavy development or even fertilization (farms). Regarding human health, the presence of nitrite is concerning for drinking water, where infants are primarily affected. Nitrite interferes with the blood's ability to carry oxygen, which is vital for motor and neuro-function. The levels within a recreational waterbody are less concerning but may still cause illness if water is consumed through recreational activities. Levels of Nitrite (as N) are ideal at <0.020 mg/L, and a maximum of 0.1 mg/L nitrite (as N) is suggested for recreational water bodies. *Nitrite levels remained undetected during all sampling events at both sample sites 1-D & 4-A.*

Nitrate is a form of nitrogen found in the water column. Nitrate is usually the most prevalent form of inorganic nitrogen in the water and results from such things as natural aerobic bacterial activity, fertilizer use, and air-water exchange. It is also the form that is most readily available for plant and algae growth. Levels of Nitrate (as N) are ideal at <0.30 mg/L. A maximum of 10 mg/L (ppm) is set for EPA drinking water standards. *All three sampling years at both samples sites 1-D & 4-A were below or at detectable levels of <0.05 mg/L.*

Total Kjeldahl Nitrogen (TKN) is a measure of the nitrogen contained in organic compounds, such as proteins and amino acids; the summation of ammonia and organic and reduced nitrogen. It is created from biological growth and decomposition. A concentration of 1.0 mg/l or below is considered desirable. *All sampling events at both sample sites, 1-D & 4-A, were below the suggested threshold of 1.0 mg/L.*

Phosphorus

Total Phosphorus measures all forms of phosphorus in the water column (particulate, dissolved, phosphate). Generally, a total phosphorus concentration over 30 parts per billion (ppb, or 0.03 mg/L) is the threshold at which algae blooms or excessive plant growth can be stimulated. Aquatic systems <12 ppb are considered nutrient poor and oligotrophic; 12-24 ppb contain a moderate amount of nutrients and mesotrophic; 25-96 ppb are nutrient rich and eutrophic; >96 ppb contain excessive nutrients and hypereutrophic. *Generally speaking, total phosphorus results at sample site 1-D remained at desirable levels throughout the three year-sampling period; however, compared to all other sampling events, there was a minor spike identified in July of 2019. Regardless, this spike did not surpass the suggested threshold of 0.03 mg/L. At sample site 4-A, total phosphorus concentrations remained well-below the suggested threshold during the three-year sampling period.*

Orthophosphorus is the measure of the phosphate molecule within the sample, and is often considered interchangeable with Reactive Phosphorus. You can have both dissolved and suspended orthophosphate. Dissolved phosphorus is the form of phosphorus that is readily taken up by plants. Produced by natural processes and also found in sewage – a high measurement of orthophosphate can indicate effluent or contaminated runoff. *Orthophosphorus concentrations at both sample sites 1-D & 4-A remained at desirable or undetectable levels (0.05 mg/L).*

Algae

Algae species, both natural algae and cyanobacteria species were present at some level throughout the three-year sampling period; however, overall algae cell counts remain relatively low. Both algae and cyanobacteria occur naturally in freshwater systems and therefore, their presence does not mean a waterbody is "unhealthy" or that the habitat is threatened. Cyanobacteria cells remained well below the World Health Organization's (WHO) national cyanobacteria guidelines of 70,000 cells/mL.

Depth Profile

Dissolved oxygen is a crucial component of aquatic systems supporting aquatic fauna; organisms such as fish and zooplankton breath the water containing dissolved oxygen for survival. Oxygen enters the water through flow, atmosphere, and photosynthesizers (plants and algae). And, fluctuations in oxygen will occur based on the amount of photosynthesizers present in the water (more sunlight = more oxygen). However, with high volumes of plant and algae decay, dissolved oxygen is consumed and causes oxygen deficient environments (eutrophy, anoxia, etc). Dissolved oxygen is also inversely related to

temperature, where high temperatures coincide with low dissolved oxygen. Somewhat predictable levels of oxygen are available throughout the water column, where the dissolved oxygen can be measured vertically from surface to bottom for a profile. This profile can identify waterbody stratification or habitat availability for aquatic wildlife. Values above 5.0 mg/L are desirable for most aquatic life, including most fish species, however lower values commonly occur near the sediment layer where oxygen and nutrient exchange is at a minimum. *Generally speaking, the April/May & October oxygen levels remain at desirable levels (above 5 mg/L); however the July oxygen levels decline at most of the sample sites. Although the July oxygen levels hover around 4-5 mg/L, oxygen levels do not go completely anoxic. The ten bottom diffusers aid in keeping oxygen levels present throughout the water column at all sampling sites.*

Temperature is one of the limiting factors for algae and plant growth; as temperature increases, biological activity (photosynthesis, respiration, and decomposition) increases to a point. Temperature is directly related to the amount of available dissolved oxygen, where warmer water holds less oxygen. In deeper water bodies, temperature stratification occurs; a thermocline occurs at depth where the top layer is warmer and actively exchanges nutrients with the air. The bottom layer is distinctly cooler and isolated from surface impacts. *All temperature profiles were relatively consistent throughout the years, displaying seasonal patterned temperature profiles. Duck Pond's coldest recorded temperature was in 2018 at WQ site 3-B at 7.6°C (45.6°F) and warmest temperature was also in 2018 at WQ site 1-D at 28.5°C (83.3°F).*

pH Ranges from 0-14, where zero is extremely acidic, seven is neutral, and 14 is most basic. pH represents the concentration of hydrogen ions (h+) in solution. There is no 'perfect pH' value or definitive range for all aquatic life; normal ranges are specific to various biota. For example, a range of 5.5-8.5 is typically best for maintaining a healthy fishery. Within this range, there are specific ranges for fish species, which can be appropriated to environmental regions and water chemistry. Therefore, a stable pH (± 1)is also important – fluctuations can adversely affect water chemistry and pond biota (fish, snails, plankton, plants, etc.). *pH ranges generally remained within desirable levels; however, 2018 at all four sites in October displayed more acidic pH levels than in 2019 & 2020 (<6 pH units). July 2018 at WQ site 1-D also displayed more acidic levels than the other WQ sites (<6 pH units).*

Conductivity is a measure of the water's ability to conduct electricity and is related to the quantity of dissolved minerals that are present in the water. Conductivity increases with salinity. Most natural waters have conductivity readings between 50 and 500 µmhos/cm, where significant changes in conductivity over time can be an indication of impairment. Conductivity remained within the stable range suggested above, and was recorded between 85.6 mhos/cm and 197.7 mhos/cm throughout the three-year sampling period.

Chart 1: Water quality sample site 1-D 2018-2020 results

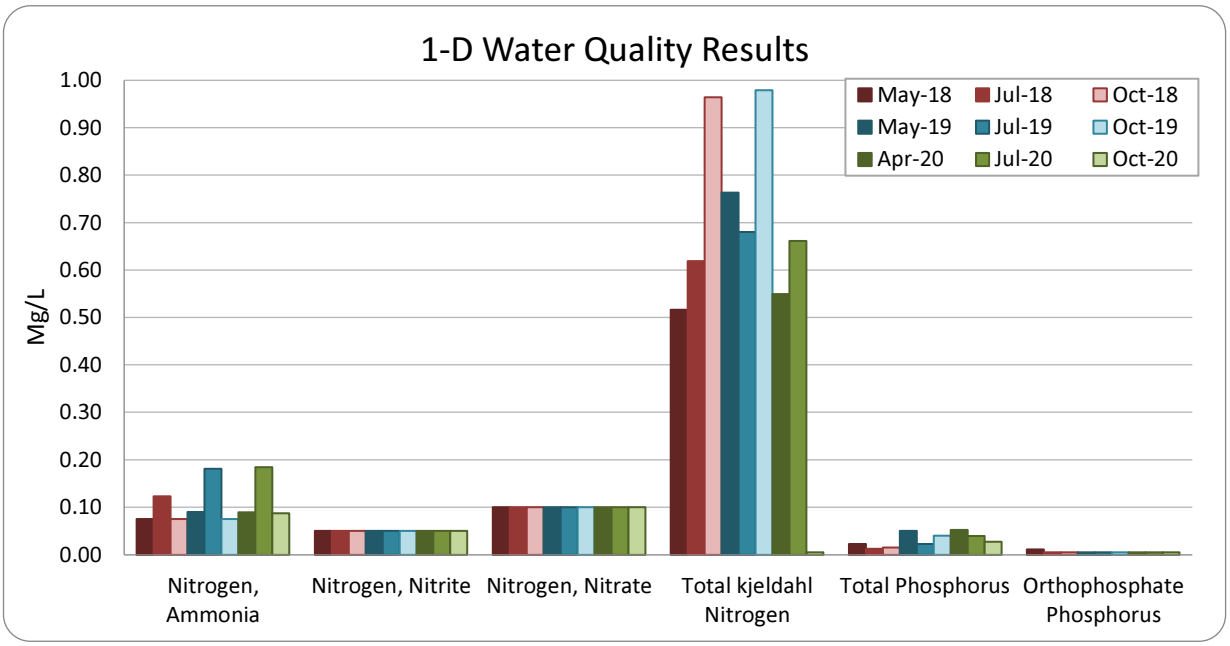
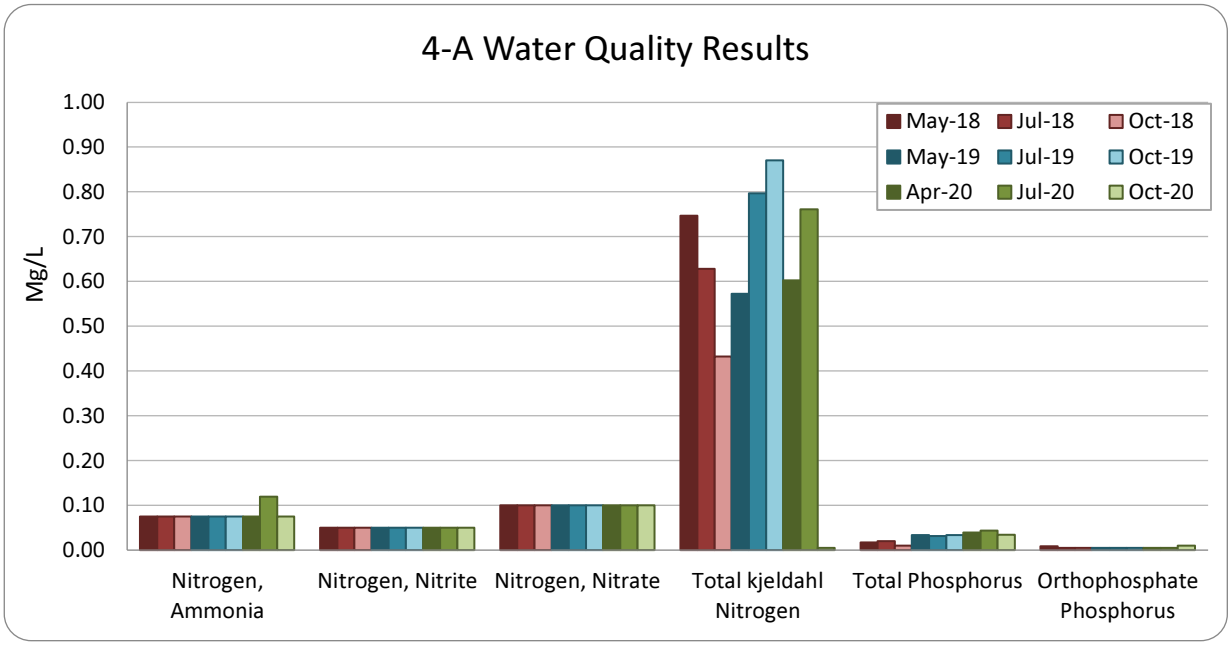


Chart 2: Water quality sample site 4-A 2018-2020 results



Aquatic Vegetation

Annual submersed aquatic vegetation surveys were performed during the July visit every year during this program. The vegetation survey was performed from a canoe or a 10-foot jon-boat. A hand-held Garmin GPS was used to collect GIS-referenced data points where vegetation occurred. A throw-rake and aqua-scope were used to collect the plant species from the bottom of the pond where visual identification was difficult. Plant species were identified down to species and a general map was created to display vegetation throughout the 3-year program. Table 2 below lists the vegetation species present in Duck Pond between 2018-2020.

Table 1: Submersed aquatic plants present in Duck Pond between 2018-2020

Common Name	Scientific Name	2018	2019	2020
Yellow Waterlily	Nuphar variegata	X	X	X
White Waterlily	Nymphaea odorata	X	X	X
Watershield	Brasenia schreberi	X	X	X
Ribbon-leaf Pondweed	Potamogeton epihydrus	X	X	X
Thin-leaf Pondweed	Potamogeton pusillus	X		X
Long-leaf Pondweed	Potamogeton natans		X	X
Leafy Pondweed	Potamogeton foliosus	X	X	X
Purple Bladderwort	Utricularia purpurea	X	X	X
Common Bladderwort	Utricularia vulgaris	X	X	X
Floating Bladderwort	Utricularia radiata	X	X	X
Humped Bladderwort	Utricularia gibba	X	X	X
Spineless Hornwort	Ceratophyllum echinatum			X
Floating Burreed	Sparganium fluctuans		X	X
Pickerelweed	Pontederia cordata	X	X	X
Mermaidweed	Proserpinaca palustris		X	X

Aeration System Maintenance / Bacteria Augmentation Applications

In 2018, an aeration system utilizing ten bottom diffusers was installed in the pond (**Figure 3**) to increase dissolved oxygen for the benefit of aquatic life, while also reducing excess nutrients, the build up of organic matter on the bottom and

suspended particles. In 2019, an added management approach of aerobic bacteria augmentation was implemented. Duck Pond was visited monthly by a SOLitude Environmental Scientist for these aerobic bacteria augmentation applications. This application utilizes bacteria as a natural way to maintain and improve open water habitat by breaking down organic material that may be suspended in the water or building up on the bottom and reducing pond depth. Aerobic bacteria is used in contrast to anaerobic bacteria because this type of bacteria uses up oxygen to break down organic material more quickly. This aerobic bacteria is designed to supplement the existing bacteria in the pond's bottom sediment. Additional oxygen created by the bottom diffusers assists the natural cycle of the waterbody to continually provide oxygen throughout the water column during times when warm water temperatures and drought conditions might deplete the available oxygen.

Over time, beavers and other forces have undoubtedly taken their toll in damaging the hoses which feed the bottom diffusers, reducing efficiency or disconnecting them all together. For this reason, requests were made throughout the 2020 season when damaged sections of the aeration bottom hoses were identified. All damaged hoses were located, spliced and returned to full operation. In addition to these repairs, an extension was added to a section of hoses to reroute it's path to be less vulnerable to potential damage as it had become exposed along the shoreline as a result of the local drought experienced through the season.

Sediment Depth Sampling

Sediment depth sampling has been performed twice per year (April & October) in 2019 & 2020 at 20-predetermined GPS locations (Figure 1). In addition, two separate sediment depths were collected in April & October (#50 & 51) (Figure 1). Sediment depth sampling coincides with the bacteria applications and determines the efficacy of the bacteria applications. Sediment depth sampling is performed on the water in a jon-boat with a 10-foot pole measured in intervals of one (1) foot. The pole is placed vertically into the water where the water depth is measured first. As soon as the sediment is reached, the pole is pushed downwards into the sediment and measured by one (1) foot intervals until the pole reaches bedrock. Data collected at each GPS point includes water depth, sediment depth, and sediment type.

There are three types of sediment: organic matter, sand, and a combination of both (organic matter/sand). Bacteria specifically works to break down organic matter and does not affect the depth or texture of sand. Four (4) of the twenty (20) sites are sand and therefore, did not display much difference. All other sites have organic matter or a

combination of both. Please refer to the appendix for data associated with sediment depth sampling.

The two-year sediment depth sampling data displayed variable results that did not confirm positive decline in organic matter from the bacterial applications nor determined the bacterial applications ineffective. Several natural factors influence organic matter depth and can potentially counteract Duck Pond's management plan. Factors such as aquatic vegetation life-cycles which contribute to the organic matter annually, terrestrial organic matter such as leaf-litter and erosion, and rainfall which influences the water depth, clarity, and temperature. This management strategy will require several more years of data collection to confirm sufficient evidence of effectiveness. The bacteria may be functioning as anticipated, but instead of a visible decrease in sediment depth, could be causing the sediment to become less consolidated, and thus appear deeper; unfortunately, there is no measurable way to confirm if this may be occurring or not. This year's lower water levels due to local drought could have also influenced how the bottom sediment was distributed, as well as any of the air leaks from the damaged hoses (if they were located in close proximity to the sediment depth sample locations).

Summary

- Oxygen levels have increased throughout the pond due to the aeration bottom diffuser systems.
- Considering nutrient level, depth of organic matter, and presence of algal species, Duck Pond is considered to be in a eutrophic state.
- Nutrient levels within the pond are very common for ponds similar to Duck Pond in Massachusetts.
- Due to the shallow nature of Duck Pond, aquatic vegetation flourishes throughout the pond.
- The aeration systems and bacteria applications have not altered the density or distribution of aquatic vegetation.
- Results of the sediment depth sampling are inconclusive.

Conclusion & Recommendations

Although the results of the sediment depth sample data are inconclusive, overall conditions within Duck Pond are not worsening. Water quality data has remained relatively stable, with slight fluctuations since 2018 but is still within a range that is similar to many waterbodies in Massachusetts. The aeration system is still providing sufficient dissolved oxygen throughout the pond to not only benefit the overall aquatic ecosystem, but to be coupled with the bacteria augmentation applications.

Continuation of the program is not anticipated to further impair Duck Pond; based on the ongoing management goals for the pond by the Town of Groton , we recommend continuing with operation of the submersed aeration system and coupling that effort with bacterial augmentation. Consistent use of bacteria products will only benefit the pond as time progresses; however, due to variable conditions not only from site to site, but year to year, for any waterbody, the specific amount of time it will require to observe and/or document a noticeable difference in sediment levels varies and is truly unknown. As such, the length of time to continue and degree of bacterial application for Duck Pond in future years can be at the discretion of the Town and any additional constraints they may have.

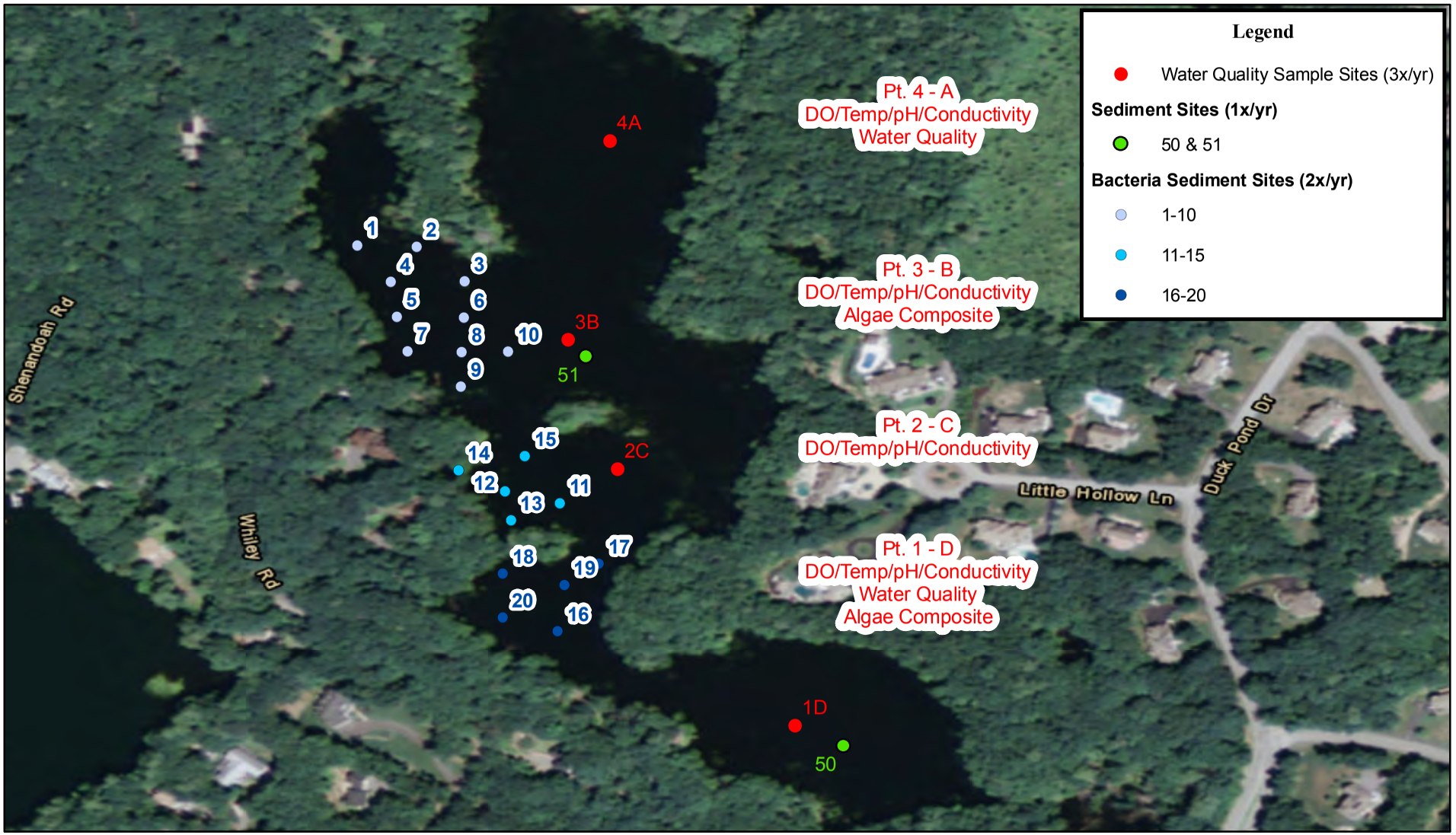
We enjoyed working with Bob Anderson & the Town of Groton on the restoration of Duck Pond. We look forward to working with you again in the future.

Appendix A

- Maps
- Water Quality & Sediment Depth Sampling Data
- Laboratory Reports

Figure 1: Duck Pond Sediment and Water Quality Sample Sites

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Duck Pond
Groton, MA

Duck Pond

0 220 440 880 1,320

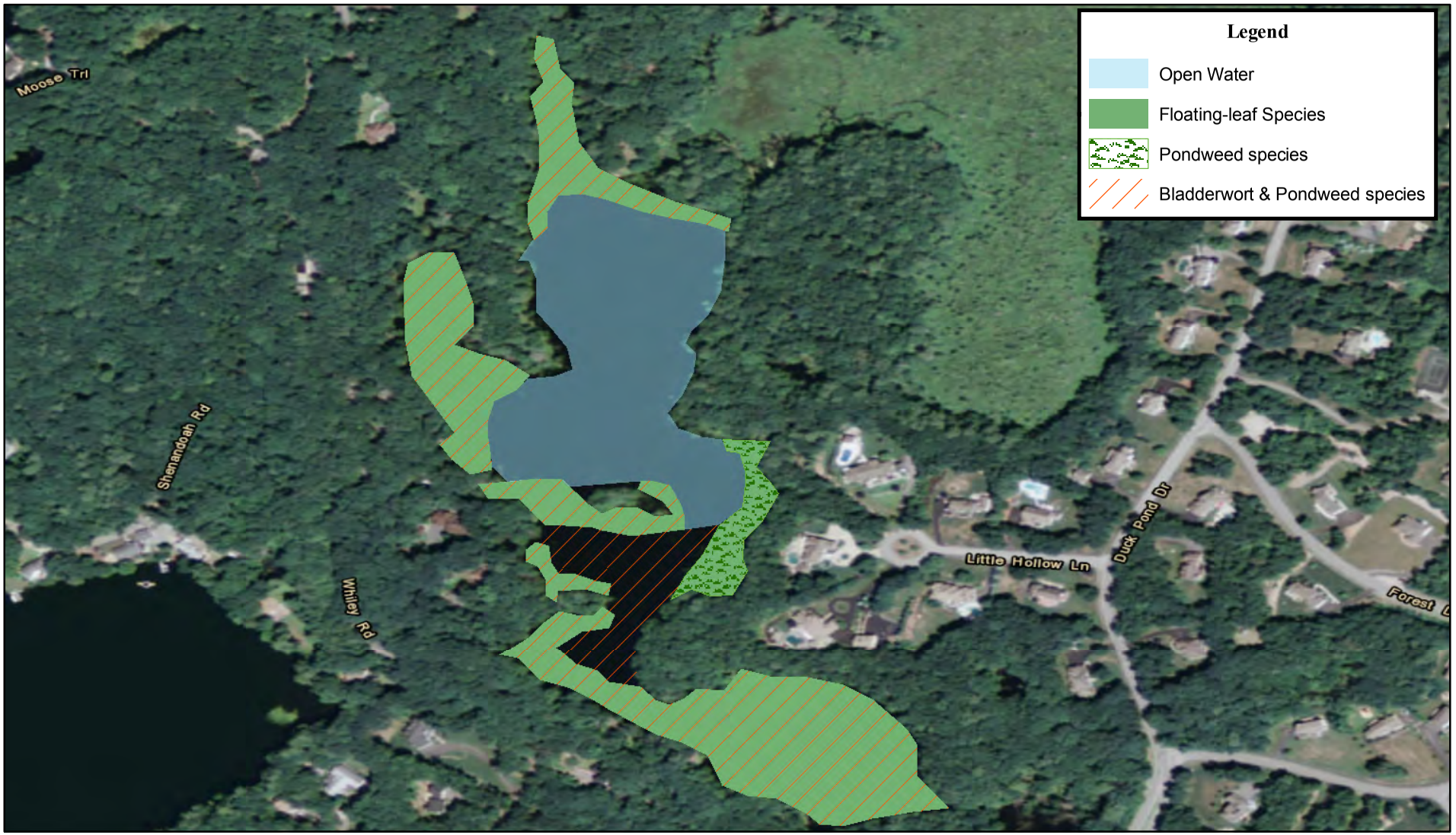
1:4,000 Feet

N

Map Date: 08/02/2019
Prepared by: ALM
Office: Shrewsbury, MA

Figure 2: Submersed & Floating Aquatic Vegetation in Duck Pond

SOLITUDE
LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Duck Pond
Groton, MA

Duck Pond

0 262.5 525 1,050 1,575

1:5,000 Feet

N

Map Date: 01/06/21
Prepared by: ALM
Office: Shrewsbury, MA

Figure 3: Submersed Aeration Unit Sites

SOLITUDE
LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

Duck Pond
Groton, MA

Duck Pond

0 265 530 1,060 1,590

1:5,000 Feet

N

Map Date: 01/06/21
Prepared by: ALM
Office: Shrewsbury, MA