



ENVIRONMENTAL CONSULTANTS

Sound Science. Creative Solutions.®

Amherst Office
15 Research Drive
Amherst, Massachusetts 01002
Tel 413.256.0202 Fax 413.256.1092

MEMORANDUM

To: Karen Beattie
Vice President of Science & Stewardship
Nantucket Conservation Foundation, Inc.
P.O. Box 13
118 Cliff Road
Nantucket, MA 02554-0013

From: Naomi Valentine, Ecological Restoration Team Lead

Date: March 3, 2022

Re: **2022 Summary of Work – Pest House Pond / MassDEP File No. 48-3090**

OVERVIEW AND REGULATORY SUMMARY

Nantucket Conservation Foundation, Inc. (NCF) received an Order of Conditions (OOC) on August 8, 2018 for pond management activities within Pest House Pond, located on Shimmo Pond Road (Map/ Parcel 43/155) in Nantucket, Massachusetts. Pest House Pond is approximately 0.77 acre (33,632 square feet) and, prior to active pond management, had been overtaken by algal blooms for approximately 15 to 20 years. The scope of work associated with this OOC (MassDEP File No. 48-3090) includes herbicide application to invasive phragmites (*Phragmites australis*) with Rodeo (or equivalent) via clip and drip application, the application of copper-based algaecide to manage harmful algae, and the option to apply alum to manage excessive phosphorus concentrations as needed. The goal of this management program is to control invasive phragmites, monitor and manage potentially dangerous algae species, improve water quality, and minimize the output of these negative pond attributes from entering Nantucket Harbor.

NCF requested an extension on the original OOC in August 2021, which was granted by the Nantucket Conservation Commission. The new expiration date associated with MassDEP File No. 48-3090 is now August 8, 2023. Another extension will be requested by July 8, 2023 to continue management activities through 2024.

In compliance with lake and pond management regulations in the Commonwealth of Massachusetts, SWCA submitted an application for a License to Apply Chemicals to Waters of the Commonwealth (license to apply) in 2022. The license to apply is filed under License No. WM04-0001094.

This memo is presented in accordance with Special Condition 22, which requires that a report be submitted to the Nantucket Conservation Commission following each growing season. This memo includes a summary of all pond management activities performed within the reporting year, approximate algae and invasive species coverage and regrowth, and native plant species regrowth.

2022 CONDITIONS IN PEST HOUSE POND

The conditions within Pest House Pond in 2022 were comparable to those in 2021 with lower than average rainfall and high temperatures through much of the growing season. Algaecide applications were required on two occasions throughout the growing season. However, these were targeted spot applications. When algae were suspected or observed throughout the growing season, they were often in low densities and/or quickly cycling out of the waterbody once further analyzed. However, the more prominent growth within the pond is a population of widgeon grass (*Ruppia maritima*), which was prevalent within Pest House Pond in previous years.

NCF conducted water quality sampling on April 20, and October 5, 2022. A different lab was contracted to analyze the water samples for the fall survey and not all analytes tested in the spring were recorded during the fall survey. The results of the water quality sampling are detailed in Table 1. There was a notable increase in total phosphorus during the April (pre-management) water sampling event – approximately twice as high as that same timeframe in 2021. SWCA assumes that this may be due to the annual decomposition of the very dense widgeon grass present within the pond. Widgeon grass was initially observed in 2020 and increased in density in 2021. This large accumulation of biomass is likely the source of additional phosphorus loading in the dormant season, as no other site conditions have significantly changed.

All other water quality parameters analyzed are within typical ranges for freshwater ponds. The conductivity levels are elevated to a concentration that could be stressful for freshwater organisms, but higher conductivity is not uncommon in freshwater ponds. Furthermore, Pest House Pond is slightly saline (salinity of 5.6 3ppt).

Table 1. 2022 Water Quality Analyses

Analyte	4/20/22	10/5/22	Comments on 2022 Samples
Turbidity (NTU)	9.4	-	Drinking water standard (anything under 10 NTU)
Conductivity (uS/cm)	2,970	9,940	May be stressful to some freshwater organisms
Total Phosphorus (ug/L)	298.3	-	Hypereutrophic (>96 ug/L) - (not sampled in Oct 22)
Free Reactive Phosphorus (ug/L) (FRP)	<5	0.04	Low concentration of readily available phosphorus
Dissolved Oxygen (mg/L)	8.6	-	Able to support most fish and invertebrates
Chlorophyll a (ug/L)	91.5	9.93	Hypereutrophic - mesotrophic (per algae pigment)
Alkalinity (mg/L as CaCO ₃)	38.2	-	Low buffered (≤ 50 mg/L)
Total Hardness (mg/L as CaCO ₃)	271.7	-	Hard (121 - 180 mg/L)
Total Nitrate (mg/L) and Nitrite (mg/L)	0.1	0.08	Typical for freshwaters; typical for saltwater
Nitrite (mg/L)	<0.02	<0.08	See total nitrate and nitrite
Nitrate (mg/L)	0.1	<0.08	See total nitrate and nitrite
Total Kjeldahl Nitrogen (mg/L)	4.4	-	See total nitrate and nitrite
Total Nitrogen (mg/L)	4.5	13.93	See total nitrate and nitrite
pH	7	-	Neutral (typical)

Collection Dates: April 20, 2022 and October 5, 2022

Table 2 includes a summary of water sampling events from 2019 to 2022 within Pest House Pond.

Table 2. Water Quality Analysis Comparison

Parameter	9/19/19*	6/25/20†	10/01/20*	4/11/21 †	10/05/21*	4/20/22 †	10/05/22*
Turbidity	3.5	2.8	8	2.7	2	9.4	-
Conductivity	5,420	12,610	8,710	19,580	5,380	2,970	9,940
Total Phosphorus	94.6	27.4	172.5	30.4	170.8	298.3	-
Free reactive phosphorus (FRP)	7	15	6	<5	<5	<5	0.04
Dissolved Oxygen	9.2	8.1	6	8.3	8.1	8.6	-
Chlorophyll a	17.3	<10	37.4	<10	N/A	91.5	9.93
Alkalinity	56.9	28.7	113.2	97.3	67.9	38.2	-
Total Hardness	200.1	544.6	1136.4	2,689.40	526.1	271.70	-
Total Nitrate and Nitrite	< 0.02	< 0.02	< 0.02	<0.02	0.1	0.1	0.08
Nitrite	< 0.02	< 0.02	< 0.02	<0.02	<0.02	<0.02	<0.08
Nitrate	< 0.02	< 0.02	< 0.02	<0.02	0.1	0.1	<0.08
Total Kjeldahl Nitrogen	1.3	0.6	2.3	0.6	0.9	4.4	-
Total Nitrogen	1.3	0.6	2.3	0.6	1	4.5	13.93
pH	7	4.5	7	7.7	7.3	7	-

† Pre-Algaecide Application Sample; * Post-Algaecide Application Sample

SUMMARY OF 2022 POND MANAGEMENT

SWCA did not conduct any herbicide application to the Bordering Vegetated Wetland adjacent to Pest House Pond in 2022, as there were no invasive plants noted by visual assessment during either of SWCA’s management events.

In an effort to reduce available phosphorus and continued algal growth in 2022, SWCA conducted an alum treatment to the waterbody on June 1, 2022. The water clarity was good and minimal algae were observed. Clarity remained high up until mid-June, when NCF noted the beginning of an algal bloom in early June. SWCA responded with an algaecide application on June 13, 2022. NCF later noted the initial growth of an algal bloom in Pest House Pond on August 4, 2022, for which SWCA conducted an algaecide application on August 8, 2022. Treatments were focused on the perimeter and the eastern portion adjacent to the cattail and BVW. The use reports associated with these management dates are included in Attachment A.

The need for algaecide application is most likely due to rising temperatures and lack of rainfall as well as total phosphorus within the waterbody. While FRP is readily available for uptake by algae and plants, some algae species have the ability to transform other forms of phosphorus into usable compounds. Therefore, future efforts to continue to reduce total phosphorus (TP) may be needed to further reduce the potential for algal blooms at Pest House Pond, which could be accomplished through removal of the widgeon grass, or other sediment removal measures. However, these removal measures may not be feasible for the location and access available to Pest House Pond.

CONCLUSIONS

The widgeon grass appeared to be the most problematic growth within Pest House Pond and often encroaches in the majority of the water column by mid-year. Although this is a native species, this type of vegetation growth can decrease dissolved oxygen, increase water temperatures, and potentially aid in the persistence of algal populations by adding excess nutrients to the water column after vegetation die-back

at the end of the season. Because this pond is so small and has very limited access, vegetation removal is not being considered at this time.

SWCA anticipates that further nutrient and algaecide management and monitoring will be needed in 2023. Many of the water quality parameters monitored throughout this management season require long-term monitoring and analysis. Furthermore, algal blooms are still apparent within Pest House Pond annually and if left un-managed could return to the conditions seen in 2017, prior to the start of this management program. Those conditions were dangerous to human and wildlife health. Since the management program, algal blooms have been kept to very low concentrations and managed before they could grow to harmful levels.

SWCA suggests implementing a phosphorus inactivation treatment in the spring 2023 if the spring water quality testing indicates that it is necessary. This work will decrease the amount of algal growth and eliminate late-season blooms, as were noted this year. Alum dosing will be calculated by total phosphorus concentrations detected during pre-management sampling. Subsequent water sampling events will follow this treatment to gauge the efficacy of alum in combating eutrophication within the pond. NCF plans to return to using the original lab used for water testing prior to October 2022 so that all analytes will be once again evaluated for comparison purposes.


SWCA will continue to report on the results of algae and phosphorus management through the life of the permit and will adapt management as needed to improve the water quality and habitat value of Pest House Pond.

ATTACHMENT A
Pesticide Use Reports

Pesticide Application- Daily Use Report

Date: 6/1/2022


Time: 5:00 pm -6:00 pm

Applicator(s):		Matt Lewis							
License #(s):		34406							
Job #:		48869-002							
Client:		Nantucket Conservation Foundation							
Location:		Nantucket, MA				Weather:	partly sunny & cool		
Product	EPA Reg.#	Total Product Used	Application Rate	Total Solution Used (product + water)	Method: 1= Foliar 2=Cut-Stem 3= Aquatic 4= Injection	Amount treated & location (acreage/sq.ft.)	Target Species	Comments:	
Captain XTR	67690-9		5.40 gal/ac						
PhosClear	n/a	13 lbs.	40-80 lbs/ac.ft.	n/a	3	0.77 ac	phosphorus	full pond	
Signature(s):									

Pesticide Application- Daily Use Report

Date: 6/13/2022

Time: 5:00 pm -6:00 pm

Applicator(s):		Matt Lewis							
License #(s):		34406							
Job #:		48869-002							
Client:		Nantucket Conservation Foundation							
Location:		Nantucket, MA				Weather:	partly sunny & cool		
Product	EPA Reg.#	Total Product Used	Application Rate	Total Solution Used (product + water)	Method: 1= Foliar 2=Cut-Stem 3= Aquatic 4= Injection	Amount treated & location (acreage/sq.ft.)	Target Species	Comments:	
Captain XTR	67690-9	1.25	5.40 gal/ac	4	3	~0.30 ac	algae	perimeter; most dense at far end	
PhosClear									
Signature(s):									

Pesticide Application- Daily Use Report

Date: 8/8/2022

Time: 4:00 pm -5:00 pm

Applicator(s):		Matt Lewis							
License #(s):		34406							
Job #:		48869							
Client:		Nantucket Conservation Foundation							
Location:		Nantucket, MA				Weather:	partly sunny & hot		
Product	EPA Reg.#	Total Product Used	Application Rate	Total Solution Used (product + water)	Method: 1= Foliar 2=Cut-Stem 3= Aquatic 4= Injection	Amount treated & location (acreage/sq.ft.)	Target Species	Comments:	
Captain XTR	67690-9	1.25 gal	5.40 gal/ac	4.0 gal	3	~0.3 ac	algae sp.	perimeter	
Signature(s):		