

Freshwater Initiative

Stakeholder Meeting 2 – Outer Cape Lenses

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CAPE COD
COMMISSION

**FRESHWATER
INITIATIVE**

Agenda

Meeting 2

- Introductions
- Defining the Problems
- Strategies
- Projects
- Priorities
- Next Steps



PLEASE BRIEFLY SHARE THE FOLLOWING:

Name

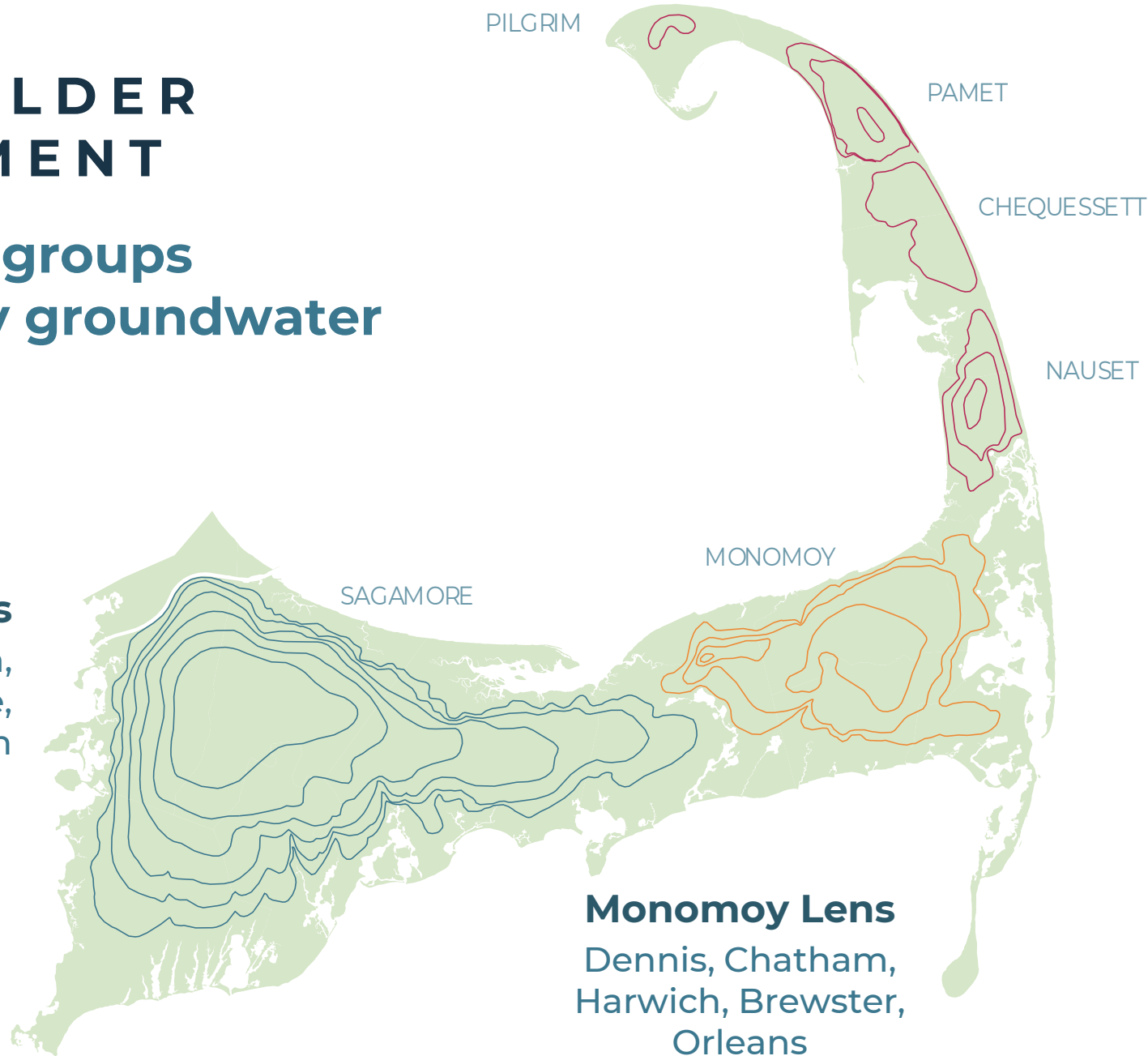
Organizational Affiliation (if any)

One takeaway that stood out to you in meeting 1 or An outstanding question you have about Cape Cod's ponds

STAKEHOLDER ENGAGEMENT

Stakeholder groups
organized by groundwater
lenses

Sagamore Lens
Bourne, Falmouth,
Sandwich, Mashpee,
Barnstable, Yarmouth



**Outer Cape
Lenses**
Eastham,
Wellfleet, Truro,
Provincetown

Monomoy Lens
Dennis, Chatham,
Harwich, Brewster,
Orleans

Stakeholder Meetings

MARCH 19 AND 20

Meeting 1
Defining the Problem

Establish a shared understanding of freshwater systems, the Freshwater Initiative, and stakeholder perspectives

APRIL 22 AND 23

Meeting 2
Exploring Strategies and Priorities

Highlight existing pond management strategies, review breadth of potential strategies and identify priorities, discuss future pond management prioritization

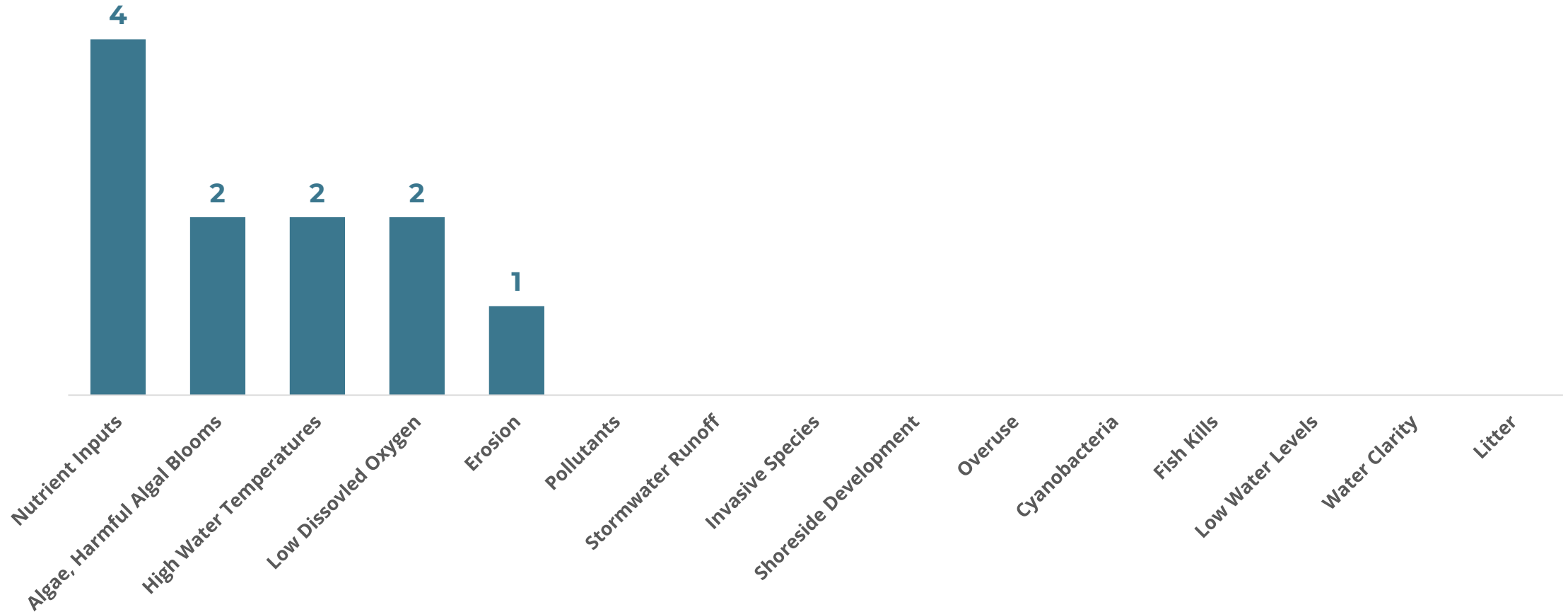
JUNE 3 AND 4

Meeting 3
Reviewing the Implementation Plan

Discuss recommendations and implementation plan; solicit stakeholder feedback

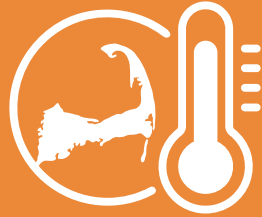
Outer Cape Lenses Meeting 1

Top Threats to Freshwater Pond Health



| THE PROBLEMS

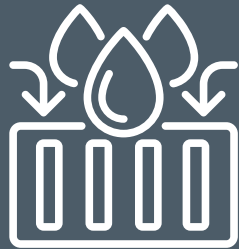
CLIMATE CHANGE



Average ambient temperatures have increased 2.9°F since 1895

Projected 4.6-8.2°F increase by the end of the century

INCREASED STORMWATER



55% increase in heavy precipitation since 1958

Projected 2.5 more ≥ 1 " precipitation days by the end of the century

EXCESS NUTRIENTS FROM STORMWATER, FERTILIZER, AND WASTEWATER



46 of the 50 monitored ponds are at or above the ecoregion threshold for total phosphorus

| POND IMPACTS



.....
WATER COLUMN
MIXING



.....
ALGAE BLOOMS



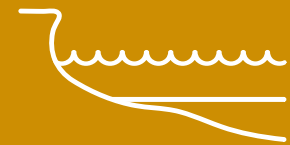
.....
INVASIVE SPECIES



.....
LOW DISSOLVED
OXYGEN



.....
HABITAT IMPACTS



.....
EROSION

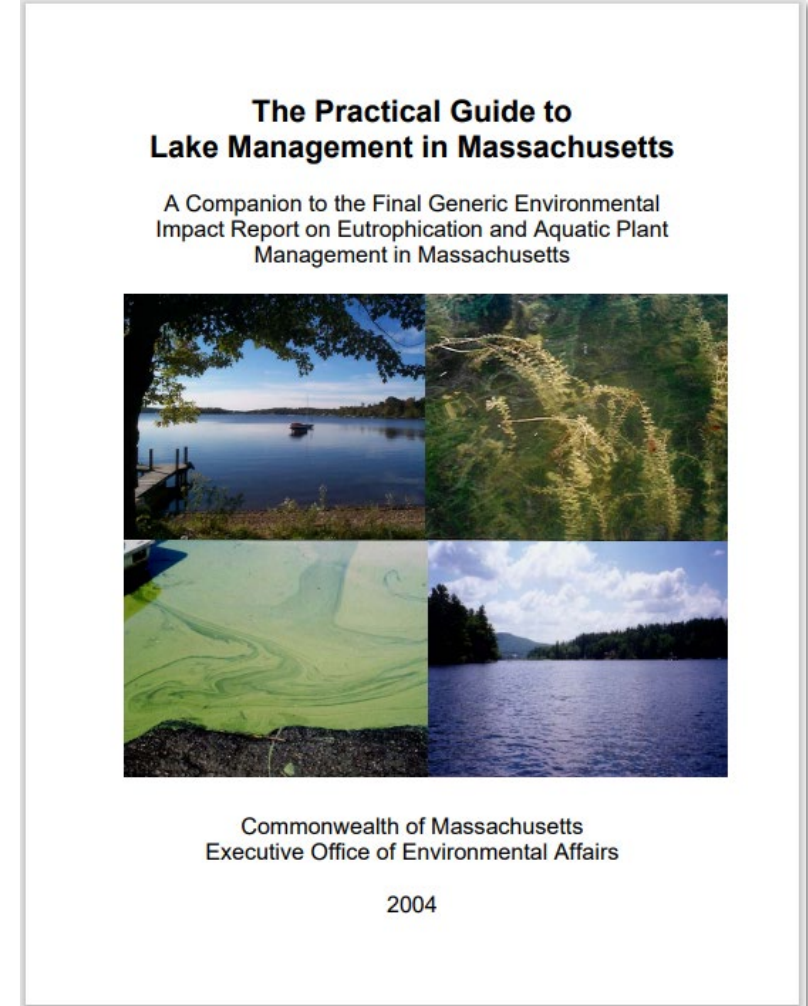
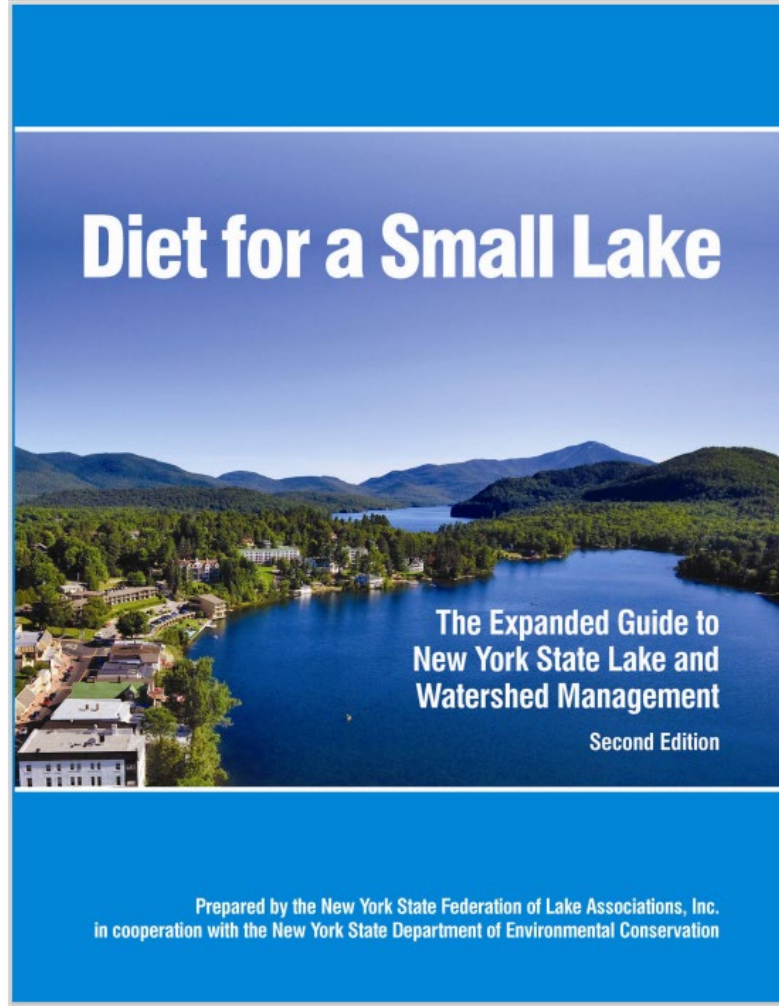
THE PROBLEMS AND IMPACTS

Are there other impacts we haven't captured?

Are there other long-term planning considerations we should be including?

STRATEGIES DATABASE

Developing a pond-specific strategies database that includes a range of technologies, regulatory and voluntary options, and management approaches for protecting and restoring pond water quality



STRATEGIES RESEARCH 208 Plan Technologies Matrix



STRATEGIES RESEARCH Freshwater Pond Restoration Projects Viewer

POND RESTORATION PROJECTS

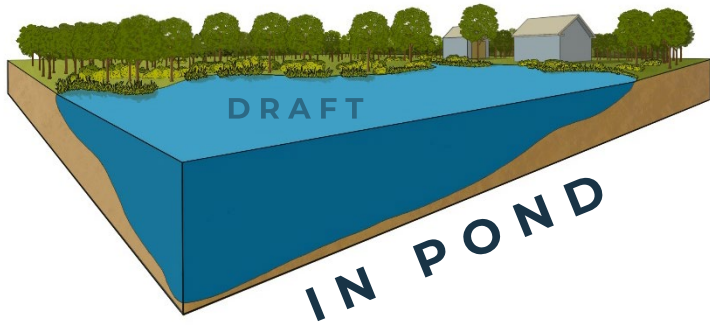
The map displays the state of Cape Cod, Massachusetts, with various towns and geographical features labeled. The towns shown include Brockton, Marshfield, Plymouth, Taunton, Somerset, Fall River, Mattapoisett, New Bedford, Bliss Corner, Falmouth, East Falmouth, Forestdate, South Yarmouth, Barnstable, Orleans, North Eastham, Eastham, Wellfleet, Provincetown, and Pilgrim Heights. The map is overlaid with numerous colored pins representing different restoration projects. A search bar at the top left contains the text "Find address or place" and a magnifying glass icon. To the right of the map is a legend with six categories, each represented by a colored pin icon: "All Management Approaches" (yellow), "Freshwater/Pond Area Regulation" (orange), "Vegetation Management" (green), "Nutrient Management" (red), "Sediment (Watershed) Management" (purple), and "Algae Management" (blue).

Find address or place

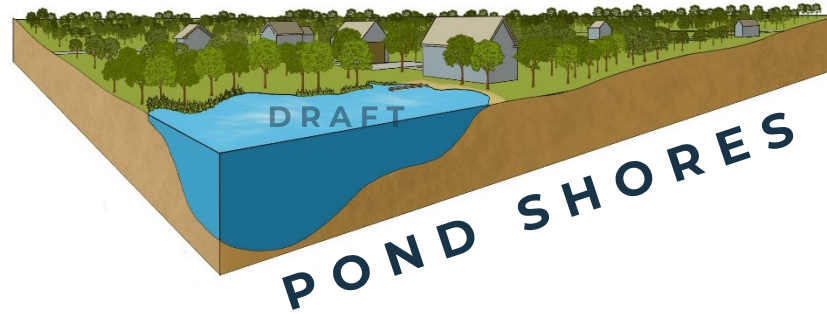
- All Management Approaches
- Freshwater/Pond Area Regulation
- Vegetation Management
- Nutrient Management
- Sediment (Watershed) Management
- Algae Management

POND STRATEGIES DATABASE

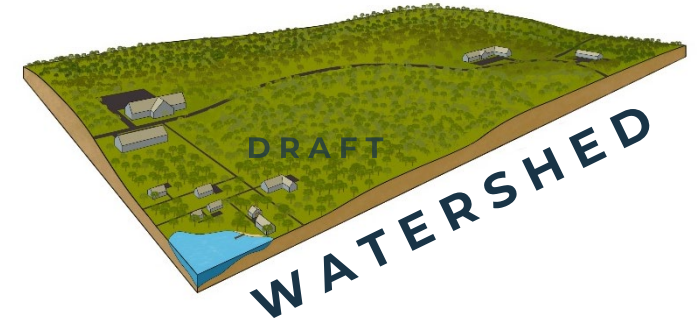
SCALE OF APPROACHES



Sediment, nutrient, algae, and vegetation management approaches



Vegetated buffers, fertilizer management, septic setbacks, I/A septic systems



Comprehensive watershed planning, land use regulations, land protection, advanced wastewater treatment

THREATS
ADDRESSED



Excess
Nutrients



Pollutant
Inputs



Algal
Blooms



Erosion



Invasive/Nuisance
Species

OVERVIEW OF AVAILABLE STRATEGIES

44 STRATEGIES GROUPED INTO 6 MANAGEMENT APPROACHES



Planning & Regulations (7)



Algae Management (5)



Nutrient Management (16)



Vegetation Management (7)



Sediment Management (8)



Fisheries Management (1)

44 STRATEGIES GROUPED INTO 6 MANAGEMENT APPROACHES



Planning & Regulations

- Pond Use Planning & Regulations
- Land Use Planning & Regulations
- Watershed Planning
- Land Protection
- Freshwater Ponds District of Critical Planning Concern (DCPC)
- Comprehensive Wetland Restoration
- Education & Outreach



Nutrient Management

- Pondshore Buffer Plantings
- In-Pond Vegetation Planting
- Floating (Treatment) Wetlands
- Freshwater Aquaculture
- Waterfowl Management
- Hydraulic Control
- Hypolimnetic Withdrawal
- Circulation
- Oxygenation
- Phosphorus Inactivation
- Permeable Reactive Barrier
- Biochar
- Innovative / Alternative (I/A) Septic System
- Composting Toilets
- Urine Diversion Toilets
- Advanced Wastewater Treatment



Fisheries Management

- Liming



Sediment Management

- Biological Sediment Digestion
- Dredging
- Reverse Sediment Layering
- Sediment Capping
- Erosion Control
- Stormwater Management (Structural)
- Stormwater Management (Non-Structural)
- Stormwater Management (Source Controls)



Vegetation Management

- Vegetation Harvesting
- Benthic Barriers
- Shading
- Herbicide
- Biocontrol
- Water Drawdown
- UV-C Light Exposure



Algae Management

- Algaecide
- Ultrasonic
- Biological Control
- Algae Harvesting
- Shading

Technical Advisory Group

Non-Profit & Academic

Association to Preserve Cape Cod, Rensselaer Polytechnic Institute, UMass Boston, UMass Amherst

Government

Cape Cod National Seashore, MA Department of Conservation and Recreation, MA Division of Fisheries and Wildlife, MA Department of Environmental Protection, MA Alternative Septic System Test Center

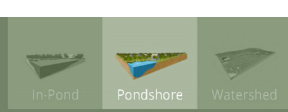
Consultants

Water Resource Services, Fuss & O'Neill, Princeton Hydro, Anchor QEA



Pondshore Buffer Plantings

STRATEGY SCALE



THREATS ADDRESSED

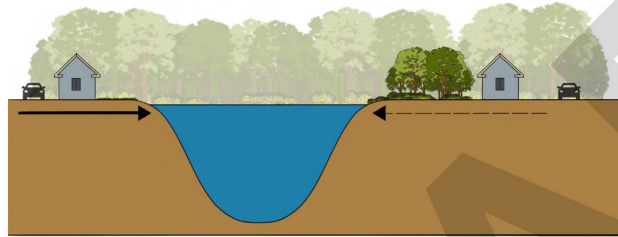
- Excess Nutrients
- Pollutant Inputs
- Algal Blooms
- Erosion
- Invasive/Nuisance Species

STRATEGY GOALS

- Protect
- Manage
- Rehabilitate

STRATEGY CO-BENEFITS

- Habitat
- Aesthetics
- Recreation



CAPE COD APPLICATION

- Permittable in Massachusetts**
Local review through the Conservation Commission may be required. See a list of potential permits [here](#)
- Implemented on Cape Cod**
See examples of pond projects implemented on Cape Cod [here](#)
- Listed in 208 Plan Technologies Matrix**
Learn more about the nutrient management strategies in the Tech Matrix [here](#)

DURATION OF BENEFITS

- Less than one month
- One season or year
- Multiple seasons or years*

*The benefits of pondshore buffer plantings are expected to last many years

MAINTENANCE REQUIREMENTS

- Monthly
- Annually
- Infrequent*

*If appropriate native plantings used, maintenance is expected to be minimal

DESCRIPTION

Pondshore buffer planting involves the planting of native, beneficial plants within a buffer area along a pond shoreline. It may include enhancing existing pondshore plantings or replacing lawn, invasive species, and impervious surfaces within a certain distance (e.g., 100'-300') of the pond edge with native plants suitable for the pondshore environment. Through pondshore buffer planting, plant roots and associated soils prevent erosion, intercept sediments, absorb stormwater, nutrients and other pollutants and prevent these from entering and degrading ponds.

ADVANTAGES

- Simple to implement
- Low-maintenance if native plants used
- Enhances pondshore aesthetics and habitat value
- Depending on scale, may provide recreational opportunities

CONSTRAINTS

- Need to source or grow appropriate plants
- Up-front costs to purchase and install plants
- Plants require monitoring and maintenance
- Competition among plants will affect results



Pondshore Buffer Plantings



IMPLEMENTATION

POTENTIAL ACTORS

- Towns:** Towns can install vegetated buffers on town-managed pondshores
- Private Landowners:** Installing and maintaining vegetated buffers is something the private homeowner can do to protect ponds
- Land Trusts:** Land trusts with pondshore properties can install and maintain buffers as well as providing a supportive role through education
- Pond Groups:** Pond groups can provide a supportive role through education.

SITING REQUIREMENTS

All ponds, especially those with developed or altered pondshores

INFORMATION NEEDED

- Shoreline vegetation survey
- Landscape/restoration plan



Credit: Allison Leitch

IMPLEMENTATION EXAMPLE

A homeowner on Nyes Pond in Falmouth installed a pondshore buffer of native trees, shrubs and perennials. The project required an Order of Conditions from the local Conservation Commission. After the plants were established, the homeowner reported a noticeable increase in bird and insect activity.

RESOURCES

- The Berkshire Regional Planning Commission developed the [Massachusetts Buffer Manual](#) for MassDEP in 2003. Other states, agencies, and pond organizations have developed buffer guidance including Maine's [Buffer Handbook](#), Vermont's [Guide to Healthy Lakes Using Lakeshore Landscaping](#), and the Southeast New England Program's [Buffer Restoration Guide](#).
- The Massachusetts' Department of Conservation and Recreation's [Lakes and Ponds Program](#) provides related resources.

COST

RELATIVE COST

COST: Variable

FINANCIAL CONSIDERATIONS

Cost: Depends on scale of planting project. Varies depending on extent of planting area, sourcing of desired vegetation, planting method, monitoring level, and labor

Assessment: Planning, design, and permitting (if applicable)

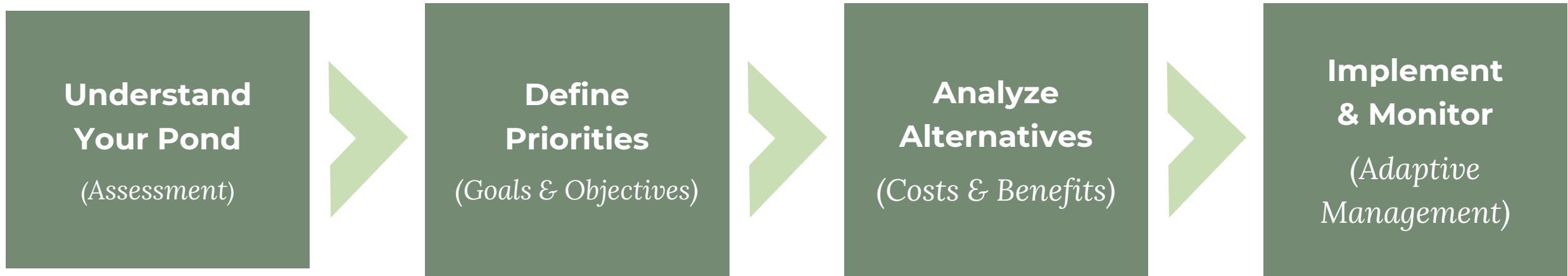
Implementation: Cost of plants, equipment and installation costs (rent vs. purchase, hire landscaper or DIY)

Maintenance: Monitoring plants, landscape maintenance, and replacement plants, as needed

POTENTIAL FUNDING SOURCES

- Community Preservation Act
- Capital Budget
- Grants
- Private Funding

| SELECTING A STRATEGY



PRIORITIES

When considering pond management strategies, what are your priorities?

Cost, impact, time to see results, co-benefits, other?

STRATEGIES DISCUSSION

STRATEGIES INFORMATION

Is there other information you need?

Are the co-benefits meaningful to you? Are there others you'd like to see included?

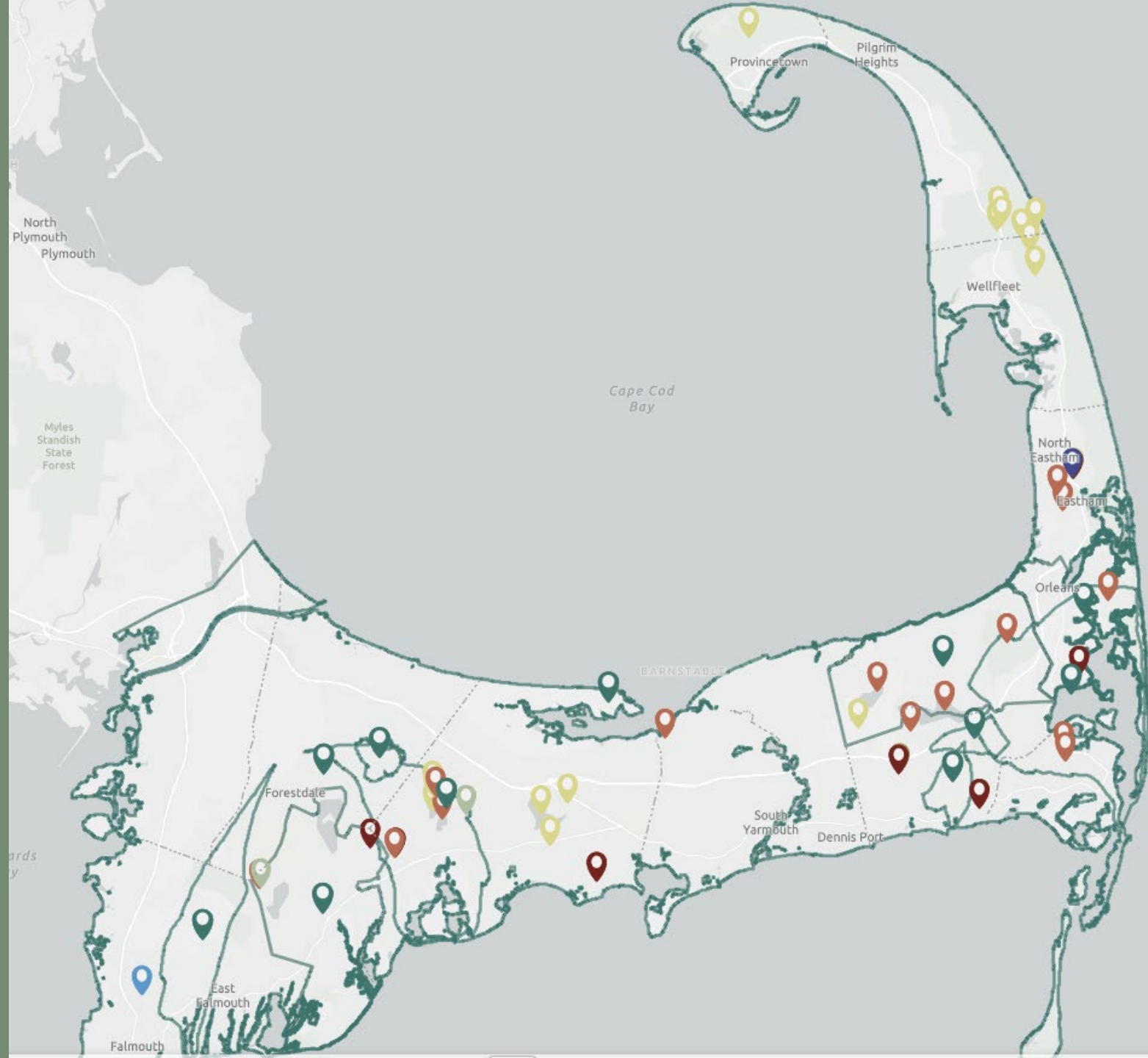


Pond Management Actions

Freshwater Pond Restoration Projects Viewer

A map-based resource showing pond-specific projects, years implemented, and results to help inform further action.

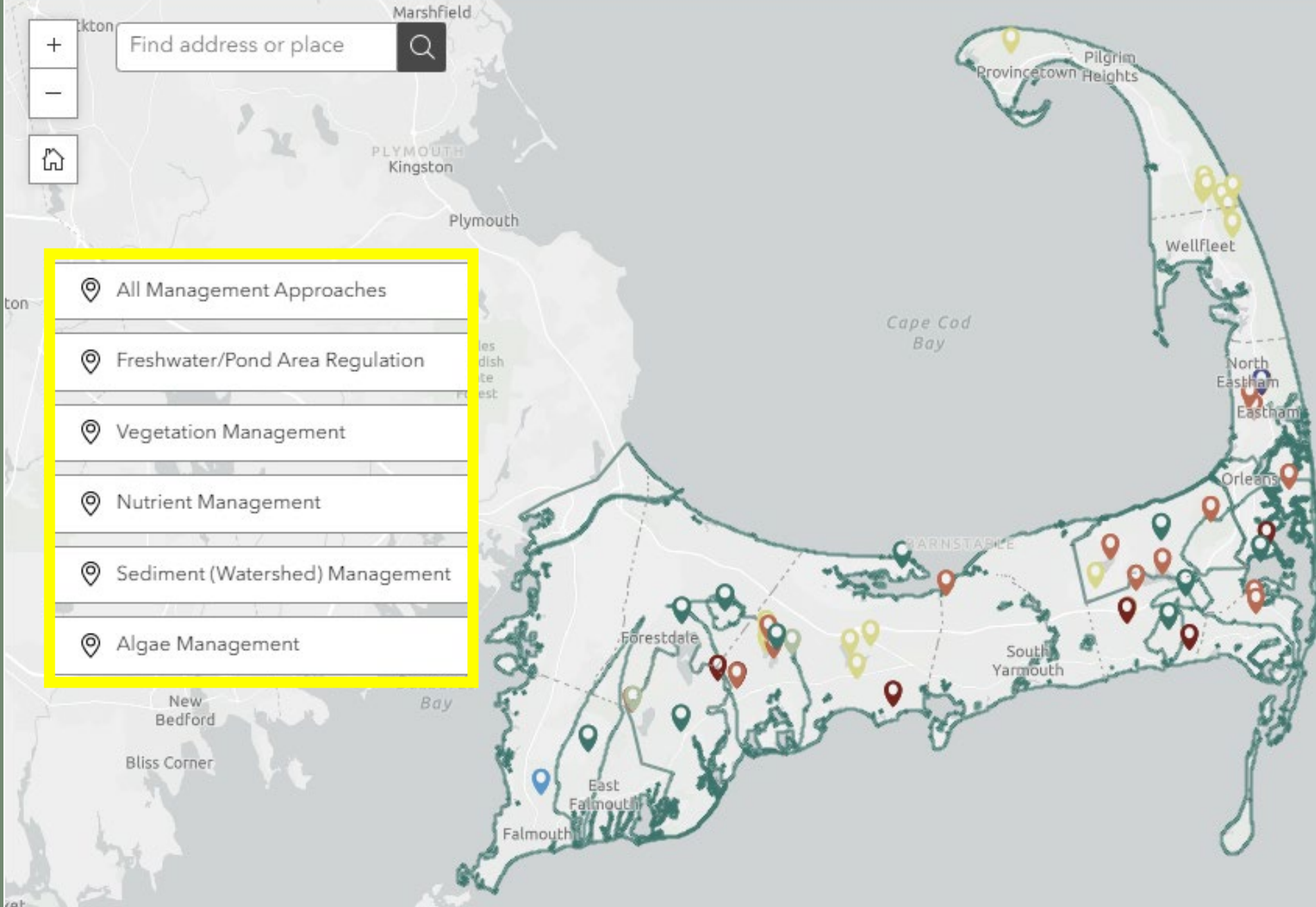
[Freshwater Pond Restoration Projects | Cape Cod Commission](#)



Pond Restoration Projects Viewer



POND RESTORATION PROJECTS





POND RESTORATION PROJECTS



Find address or place



 All Management Approaches

 Freshwater/Pond Area Regulation

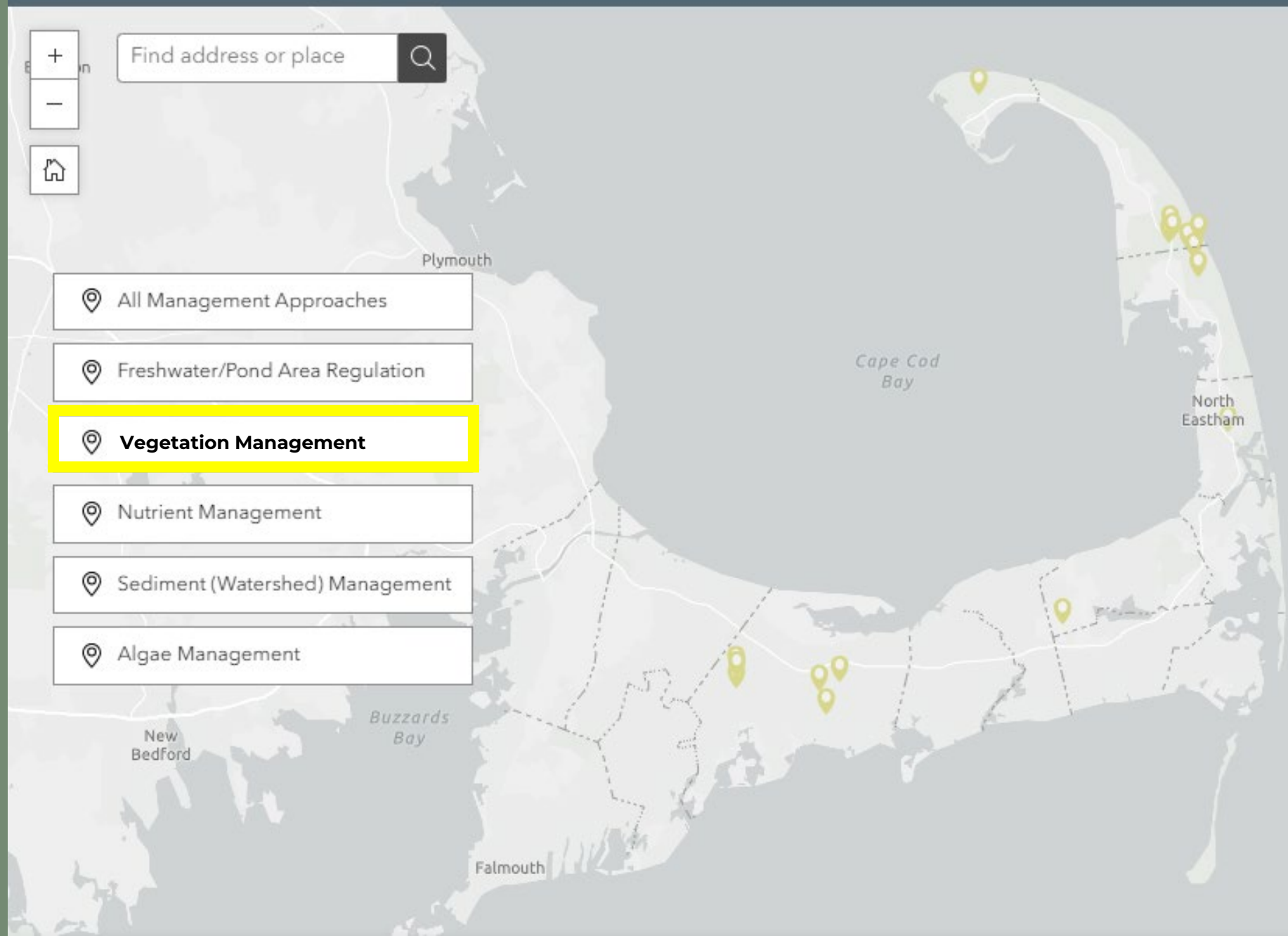
 **Vegetation Management**

 Nutrient Management

 Sediment (Watershed) Management

 Algae Management

Select a specific type of management





POND RESTORATION PROJECTS



All Management Approaches

Freshwater/Pond Area Regulation

Vegetation Management

Nutrient Management

Sediment (Watershed) Management

Algae Management

Great Pond Provincetown

Zoom to

Management Approach	Vegetation Management
Project Strategy	Loosestrife- Eating Beetles
Problem Addressing	Invasive Plant Species (Loosestrife)
Results	The Galerucella Beetle was introduced to control Purple Loosestrife, an invasive wetland plant species that invades areas and excludes native species from

Cape Cod National Seashore

Wellfleet



POND RESTORATION PROJECTS



Find address or place



All Management Approaches

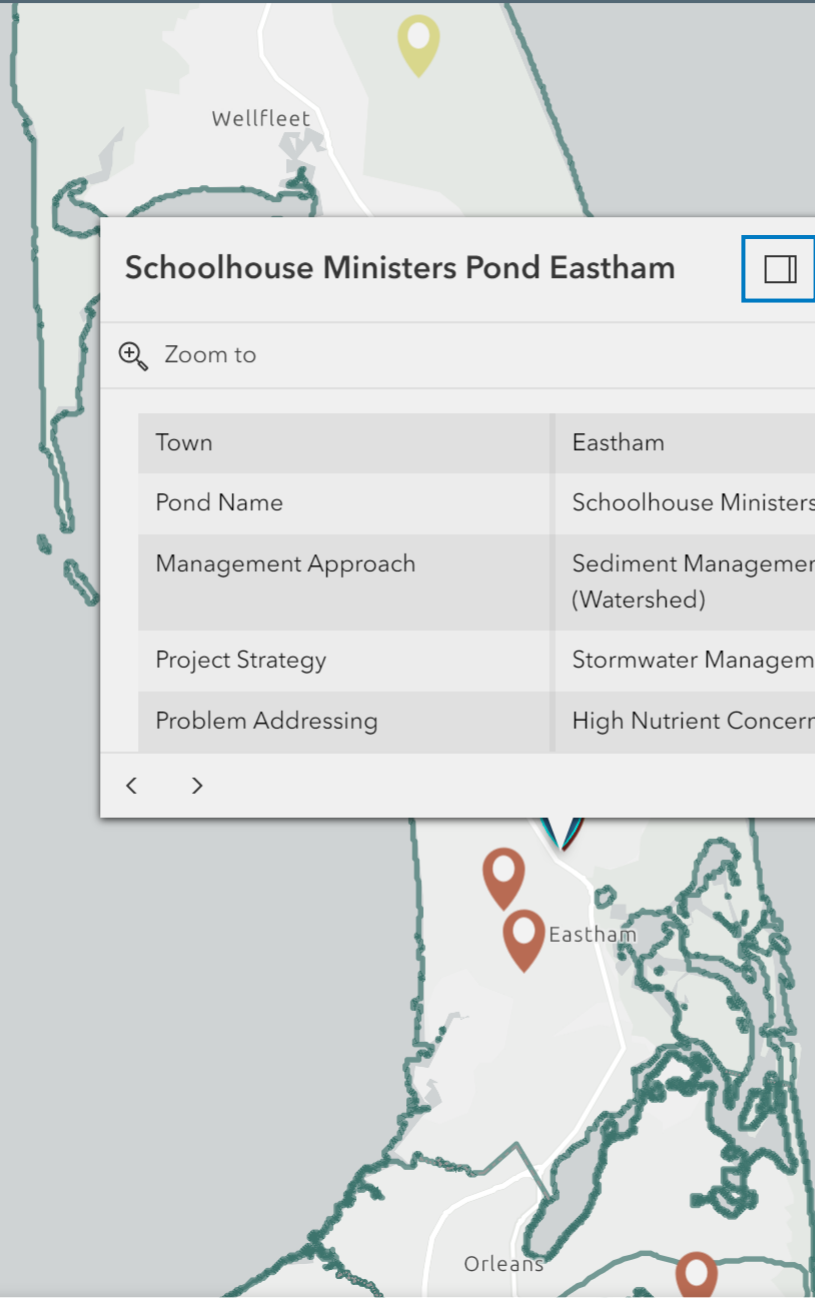
Freshwater/Pond Area Regulation

Vegetation Management

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Sediment (Watershed) Management

Algae Management



Schoolhouse Ministers Pond Eastham



Zoom to

Town	Eastham
Pond Name	Schoolhouse Ministers Pond
Management Approach	Sediment Management (Watershed)
Project Strategy	Stormwater Management
Problem Addressing	High Nutrient Concentrations



1 of 3



POND RESTORATION PROJECTS



📍 All Management Approaches

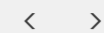
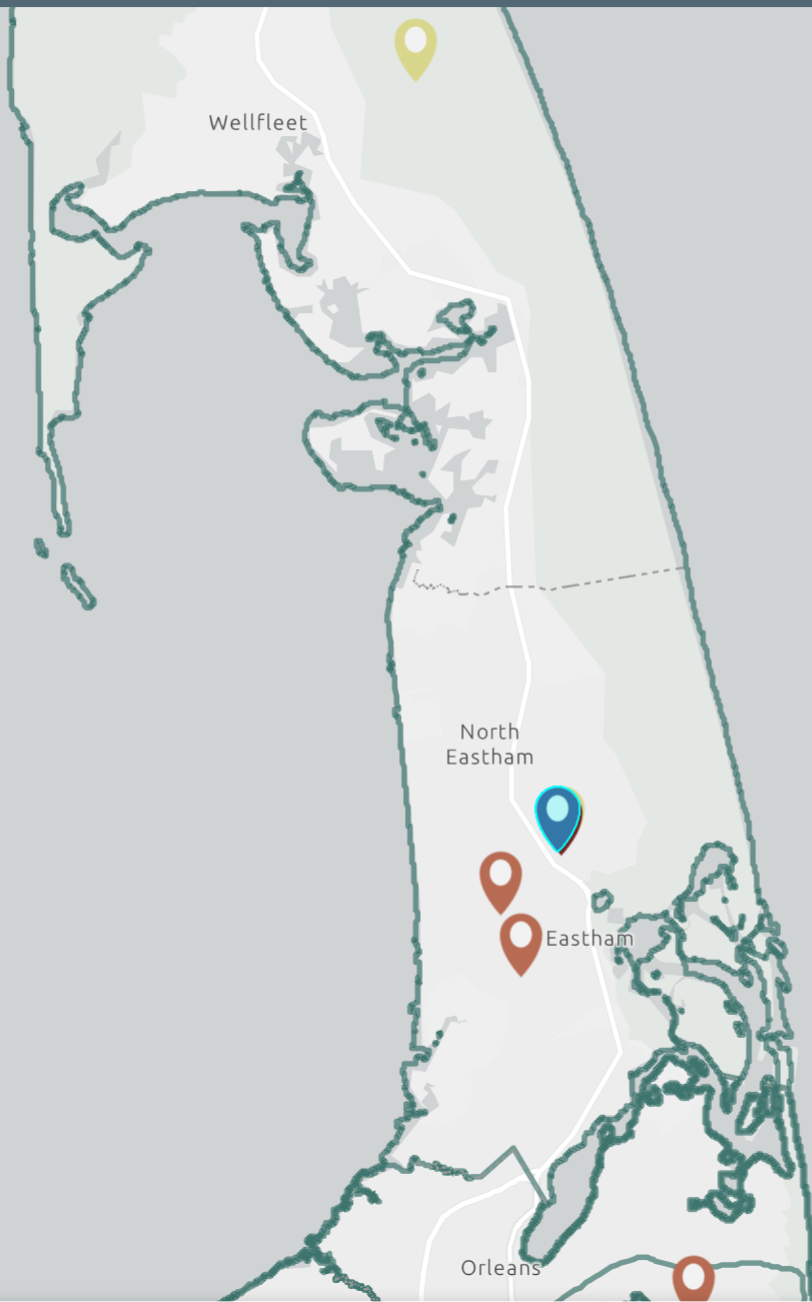
📍 Freshwater/Pond Area Regulation

📍 Vegetation Management

📍 Nutrient Management

📍 **Sediment (Watershed) Management**

📍 Algae Management



☰ 1 of 3

Schoolhouse Ministers Pond Eastham



🔍 Zoom to

Town	Eastham
Pond Name	Schoolhouse Ministers Pond
Management Approach	Sediment Management (Watershed)
Project Strategy	Stormwater Management
Problem Addressing	High Nutrient Concentrations
Results	The retrofit project was applied at Fishermen's Landing to treat stormwater before discharging into the pond, and reduce ponding. A wet swale was used to collect and treat stormwater.
Year(s) of Implementation	
Responsible Entity	Town of Eastham
...	...

Pond Restoration Projects Viewer

Updates and additional projects are needed. To add or edit a pond restoration project go to:

<https://www.surveymonkey.com/r/CapeCodPondProjects>

Add Or Edit Pond Restoration Projects

Cape Cod Pond Remediation Project Information Inquiry

Cape Cod Freshwater Initiative

To provide a regional resource to track management efforts and share lessons and results about remediation strategies, **the Cape Cod Commission is calling for information on pond remediation implementation projects across Cape Cod.**

Use this form to add information about additional projects not yet included in this regional resource, or to edit the information on projects already featured in the viewer (LINK). You can fill out this survey to add or edit projects as many times as needed.

OK

0 of 33 answered

<https://www.surveymonkey.com/r/CapeCodPondProjects>

POND MANAGEMENT ACTIONS DISCUSSION

TOWN ACTIONS

Implementation Example: What were the considerations or driving factors in picking a strategy?

Pond resource management: Applying science to understand and improve pond condition

Sophia E. Fox, Ph.D.

Aquatic Ecologist, Cape Cod National Seashore





Changes in the ponds in recent decades

- Pond waters are less acidic due to air quality improvements from the Clean Air Act
- Pond waters are becoming significantly warmer at the same rate as air temperatures are warming – approx. 5° over last two decades
- Pond stratification (layer formation) is longer and stronger, making ecological conditions more stressful for pond biota & changing pond chemistry
- Considerable pond shore buffer (shoreline & nearshore) damage – bare sediments and shoreline areas



Shoreline impacts from recreation

Bank erosion & vegetation trampling





Great Pond, Truro

- Native plantings and jute

Before

Shoreline restoration

After





Shoreline restoration

Great Pond, Truro

- Native plantings and jute





Shoreline restoration

Dyer Pond, Wellfleet

- Native plantings and jute

Before



After





Shoreline restoration

Dyer Pond, Wellfleet

- Native plantings and jute





Shoreline restoration

Spectacle Pond, Wellfleet

- Native plantings and jute in closed areas with platform steps to pond
- Seeking funding for larger shoreline restoration project

Before



After





Shoreline restoration

Spectacle Pond, Wellfleet

- Native plantings and jute in closed areas with platform





Shoreline restoration

Spectacle Pond, Wellfleet

- Native plantings and jute in closed areas with platform steps to pond
- Seeking funding for larger shoreline restoration project

Before



After





Invasive *Phragmites australis* treatment

Gull and Herring ponds, Wellfleet

- Worked with professional NPS Invasive Plant Management Team
- Treated small stands of *Phragmites* with Imazapyr
- Worked with homeowners on Gull Pond, who were so happy to support the effort
- Highly effective!! All other plants and wildlife are unaffected
- Will return in 2023 to check on re-growth





Summary - Management & science underway

- Partnerships are essential!!!
 - CCNS, Towns, County, Association to Preserve Cape Cod (APCC), Center for Coastal Studies, Cape Cod Commission, Americorps Cape Cod, consulting firms, academic institutions...
- Continuing the critical long-term monitoring of water quality
 - CCNS, APCC, Towns, non-profits, citizen scientists – Brewster Ponds Coalition is a pioneer





Summary - Management & science underway

- Research on ecology, climate change, water quality, species of concern
 - e.g. odonates, herring, cyanobacteria
- Wastewater management - Septic upgrades, cesspool removals, I/A systems
- Pilot programs for alternative mitigation strategies (Town of Eastham is a pioneer – aeration, hydro-raking, Permeable Reactive Barrier (PRB), stormwater management)
- Public outreach – videos, public meetings, web content, brochures





Thank you!

Any questions:

Dr. Sophia Fox, Cape Cod National Seashore

Sophia_Fox@nps.gov

POND MANAGEMENT ACTIONS DISCUSSION

TOWN ACTIONS

Implementation Example: What were the considerations or driving factors in picking a strategy?

What questions do you have about how or why towns chose certain approaches?

POND MANAGEMENT ACTIONS DISCUSSION

INFORMATION

Implementation Example: What, in hindsight, do you wish you had asked, considered, or researched?

What other information could have been helpful?

POND MANAGEMENT ACTIONS DISCUSSION

INFORMATION

What do you see as successes?

What worked or didn't work with the strategies?



Prioritizing Ponds



Schoolhouse/Minister's Pond, Eastham

Potential Criteria for Prioritizing Ponds

- **Pond physical characteristics**
- **Pond water quality**
(such as TMDL, trophic status, water quality data, bacterial closures)
- **Watershed metrics / CWMP**
- **Prior management actions**
- **Pond ownership and access**
(such as public/private, public access, amenities eg bathrooms or parking)
- **Sensitive resource areas, habitat**
- **Community involvement**
- **Environmental Justice**

PRIORITIZING PONDS FOR MANAGEMENT

Are there additional criteria you would include?

Are there criteria you would remove?

Are there criteria you would weigh more heavily?

*Are there superseding factors that would elevate a pond's
priority?*

UPCOMING STAKEHOLDER MEETINGS

APRIL 22 AND 23

Meeting 2

Exploring Strategies and Priorities

- Strategies Overview
- Identifying Priorities
- Comment and Discussion

JUNE 3 AND 4

Meeting 3

Reviewing the Implementation Plan

- Incorporating Stakeholder Feedback
- Recommendations
- Implementation
- Discussion



Other questions or feedback?

www.capecodcommission.org/freshwater

Thank you!

www.capecodcommission.org/freshwater

STAKEHOLDER MEETING 2 | APRIL 2024



CAPE COD
COMMISSION