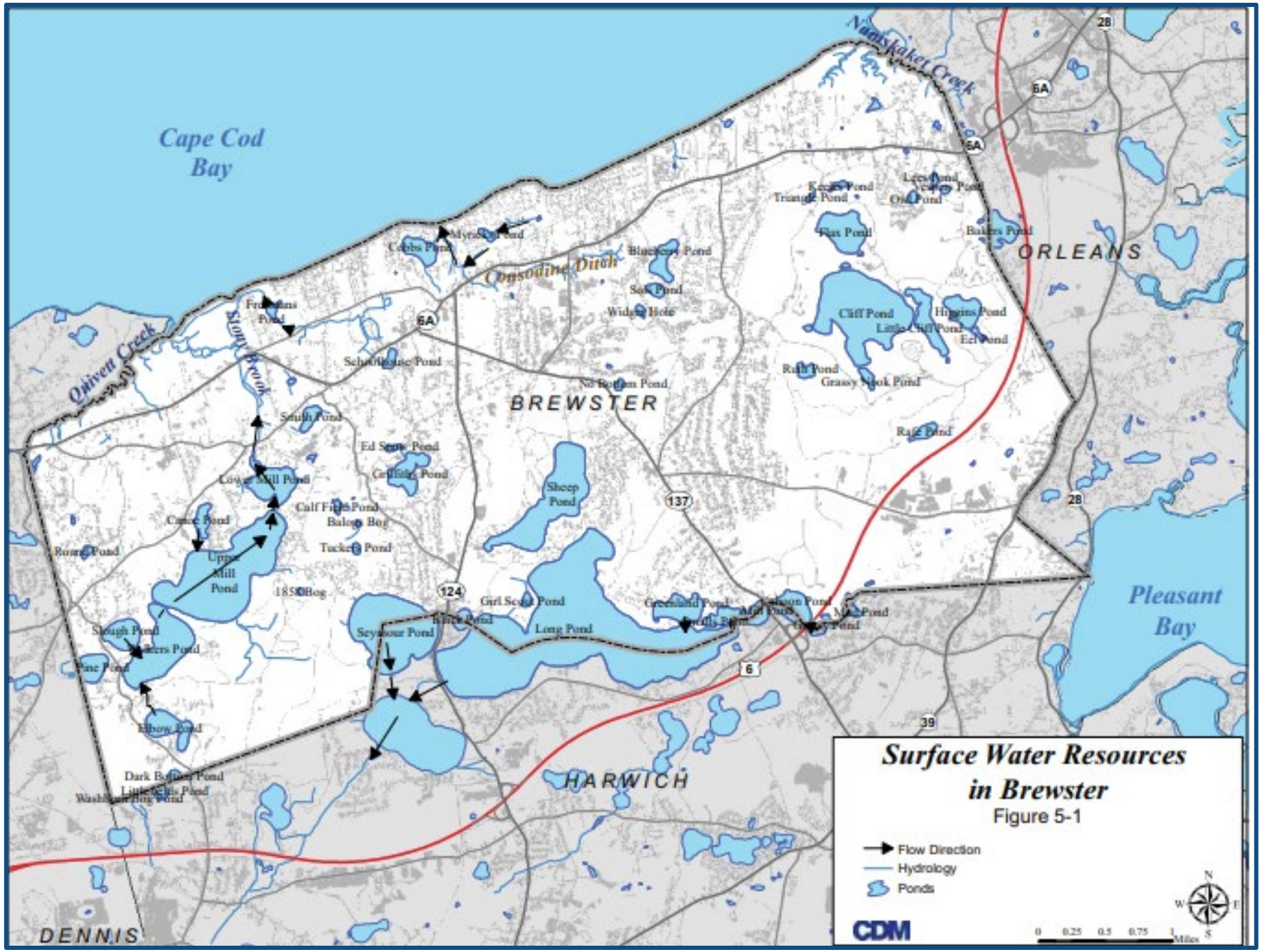
"A lake is the landscape's most beautiful and expressive feature. It is earth's eye; looking into which the beholder measures the depth of his own nature."

- Henry David Thoreau

TOWN OF BREWSTER

Ponds Management Plan

A Presentation for Brewster Residents



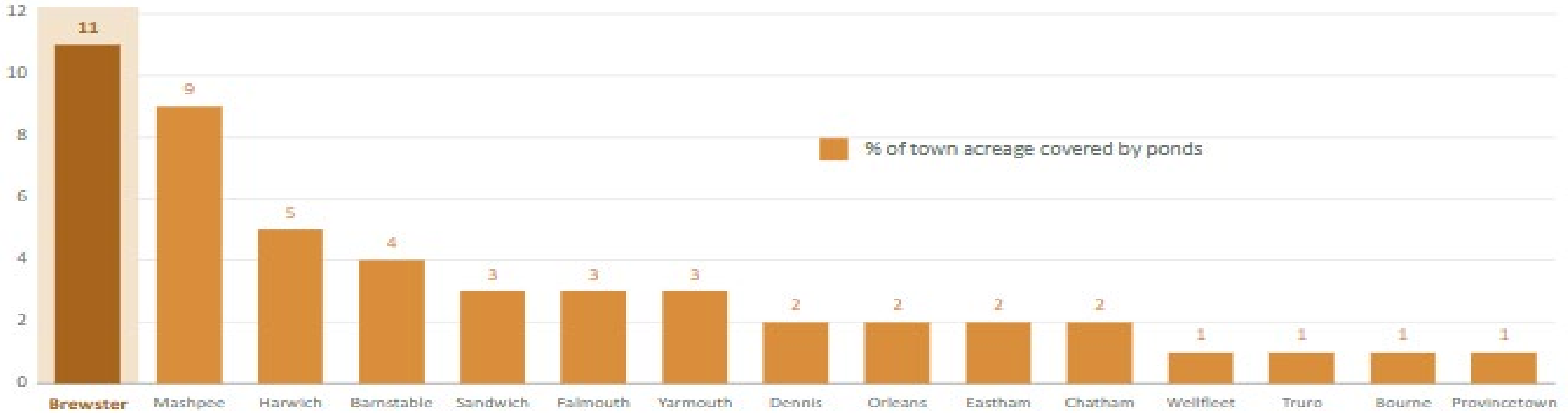
Brewster Pondscape

- 82 mapped ponds in Brewster
- 8 of these ponds are in Nickerson and are managed by MA Department of Conservation and Recreation (MA DCR)
- 21 Great Ponds
  - > 10 acres
  - Special regulatory category
- 3 Anadromous Fish Runs
  - Stony Brook
  - Herring River
  - Bound Brook
- 5 Active Cranberry Bogs
  - Based on active groundwater discharge permit
- 23 ponds managed by the town are actively monitored through PALS Program

WHAT MAKES PONDS MANAGEMENT MORE COMPLEX IN BREWSTER THAN OTHER CAPE TOWNS?

We have the largest percentage of town area covered by pond on the Cape!

- Across Cape Cod, towns vary widely in the size and number of their freshwater ponds — and none has a greater percent of total land area covered by ponds than Brewster
- **Prioritization** and **Economy of Scale** essential to an effective Brewster Ponds Management Plan



Source: Cape Cod Commission

BREWSTER PONDS MANAGEMENT PLAN

A Check-Up for Brewster's Ponds

- Understanding the condition of a pond is a lot like understanding your own health
- At your checkup, the doctor weighs the habits and history that shape your risk over time, against what a hands-on exam and lab work reveal about your condition today to make a treatment plan
- We used a similar process to assess Brewster's ponds

THREATS = PRESENT OR PAST FACTORS THAT MAY INFLUENCE CURRENT CONDITIONS; “RISK FACTORS”

For you, identifying these risk factors means looking at:

- **Your medical history.**
- **Questions about diet and exercise.**
- **Exposures like tobacco, alcohol, or substances at your workplace.**

What is the equivalent for a pond?

- **Legacy nutrients (Internal loading).** Nutrients that were deposited into pond sediments years ago get released back into the water column over time
- **Wastewater.** Nutrients reaching the pond from wastewater disposal in the area around the pond
- **Stormwater.** Runoff carrying nutrients and sediment straight to the water
- **Other specific sources of nutrients to ponds.** Agriculture (Cranberry bogs), herring runs.

IMPAIRMENT - SIGNS THAT HEALTH MAY BE DECLINING OR AT RISK

Identified through physical exam and testing

- A doctor first examines you, the performs different types of tests
- Pond impairment assessment involves the same process

EXAM

Measured at the pond:

- Bathymetry

depth and shape of the pond

- Secchi depth

how clear the water is

- Dissolved oxygen and temperature

profiles through the water column

- Appearance of water

signs of an algae bloom

TESTING

Measured in the lab:

- Phosphorus

the nutrient that drives algae growth

- Nitrogen

another essential nutrient

- Chlorophyll-a

a direct measure of algal abundance

- Alkalinity and pH

ONE MORE VERY IMPORTANT QUESTION BEFORE MAKING A TREATMENT PLAN

“What matters to you?”

- A good doctor asks what uses you want to make of your health — run a marathon, garden without pain, or just feel steady day to day.
- For ponds, uses include swimming, boating, or simply enjoying the scenery and wildlife
- Brewster's 2025 **Pond Usage and Management Survey** asked what pond uses matter to Brewster residents

THE SURVEY IS NOT PART OF THE DIAGNOSIS

The survey doesn't factor into the impairment or threat scores. Pond condition is judged on the physical and chemical evidence alone — not on how many people say they use it or how they use it.

BUT IT WILL INFORM THE MANAGEMENT PLAN

It tells us how residents value and use ponds; informing public-interest weighting as to where pilot studies start, especially among ponds with similar threat and impairment scores.

DIAGNOSIS - PUTTING IT ALL TOGETHER

Your doctor summarizes the findings:

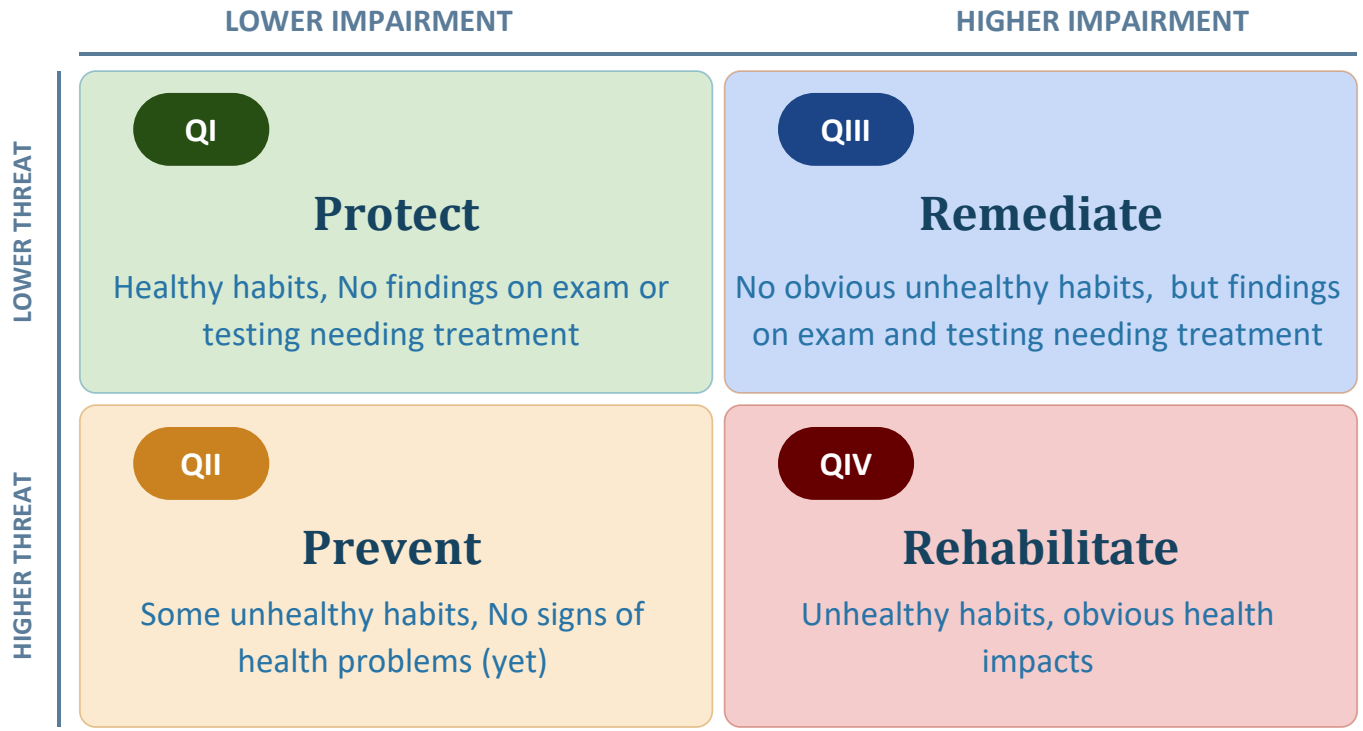
- Evaluates your exam and labs against your habits, history, and what matters to you into one written summary of where things stand (threat and impairment)
- Orders additional tests based on specific concerns
- Formulates an individual treatment plan

What's the equivalent for the ponds?

- We have 23 “patients” within just the monitored ponds in Brewster
- All ponds - like people - are individuals and handle threats in their own way, which may or may not show up as impairment
- BUT - when there are many of them needing care all at once, we look for common factors among them that allow us to divide them into treatment groups
- This grouping process is called **TRIAGE**

TRIAGE — WHEN EVERYONE NEEDS ATTENTION AT ONCE

- Comparing among a group of patients - who needs attention now, who can wait, and who just needs watching
- Before any pond gets a full workup, they are triaged using two criteria:
  - How impaired is the pond today?
  - How much ongoing threat is it under?
- Sorting ponds by those two questions produces four triage categories



Brewster Ponds Data Infrastructure

Before we can triage, we need organized and accessible data

ESTABLISHED 2001

PALS — Pond & Lake Stewardship

- 2001-2007 annual Aug/Sept "Snapshot"; 2008-present Brewster adopted biannual April/May and Aug/Sept sampling.
- Samples are collected by staff and analyzed at UMass Dartmouth SMAST lab and reported to the Dept. of Natural Resources annually
- This is the dataset behind the 2003 Cape Cod Pond & Lake Atlas, 2009 Brewster Ponds Assessment, 2011 IWRMP Phase I - Needs Assessment

LAUNCHED 2022

CCC Freshwater Initiative & Water Quality Data Portal

- County-wide effort pairing a second publicly funded Regional Pond Monitoring Program with a shared public database
- We worked with CCC to host all Brewster PALS data in this database
- Portal applies a QC review & standard public format that is searchable by pond, site, or town

NEW DATA PIPELINE:

1
COLLECT
Sample ponds on a set schedule

2
STANDARDIZE
Lab results & field data mapped to one common format

3
QC & UPLOAD
Portal review checks data before it's added

4
PUBLISH
Public viewer — searchable by pond, site, or town

Sources: Cape Cod Commission, Cape Cod Freshwater Initiative & Water Quality Data Portal; Barnstable Clean Water Coalition, Pond & Lake Stewardship (PALS)

Triage Decision Rules for Brewster's 23 Monitored Ponds

- **Current impairment condition**
  - PALS data 2020-2024 outlier corrected averages
  - Refinement factors:
    - Low dissolved oxygen in shallow ponds
    - Cyanobacteria blooms
- **Current threat condition**
  - Wastewater - septic design flow within 100 feet of the pond and within 300 feet upgradient normalized by pond area
  - Stormwater - impervious surface within 300 feet of the pond normalized by pond area
  - Refinement factors:
    - Presence and size of an active cranberry bog within 300 foot buffer normalized by pond area
    - Herring run spawning pond
- **The order of ponds within each quadrant takes into account:**
  - 2025 Pond Usage and Management Survey response count > 10
  - Regulatory considerations
    - Great Pond
    - Herring run
  - Feedback from scientific reviewers

The Study and Management Matrix

23 monitored ponds in Brewster received the same check-up. Here's where each one landed at triage:

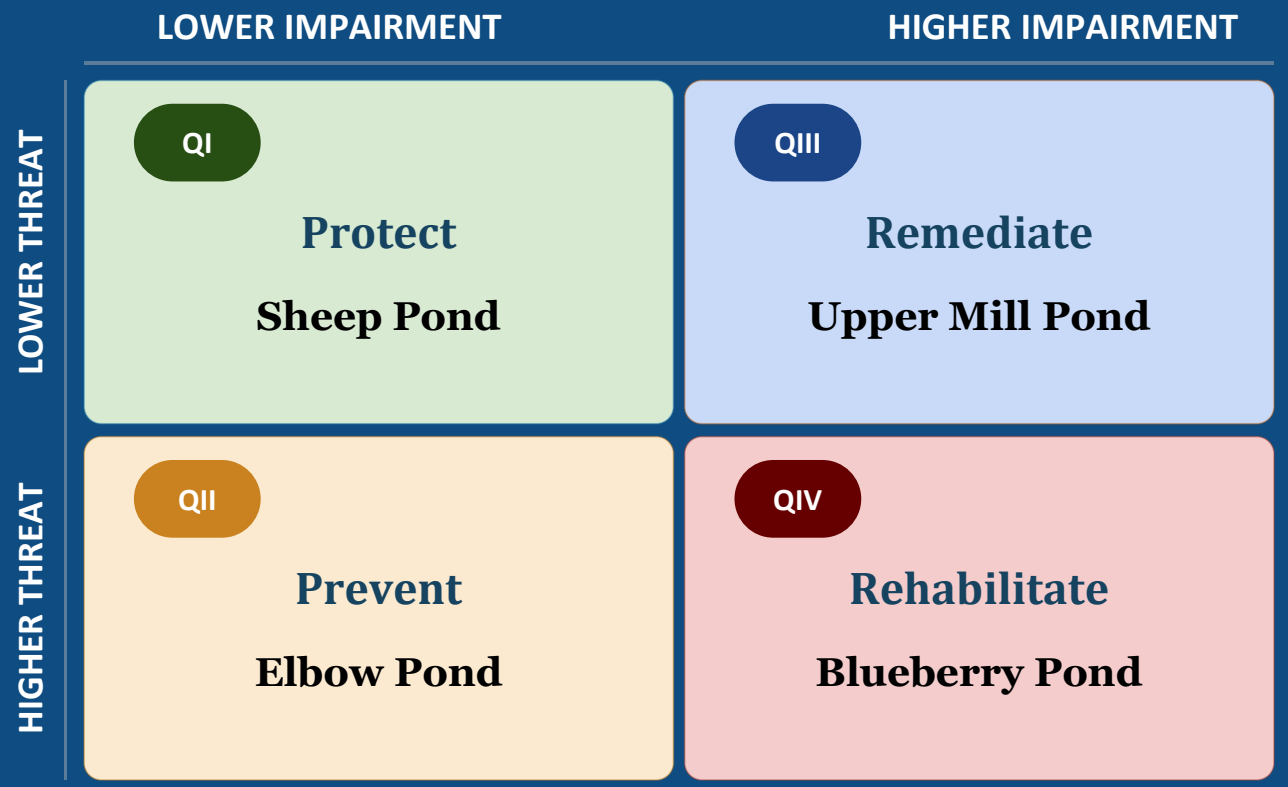
	Lower Impairment	Higher Impairment
Lower Threat	**Quadrant I — Protect** *Good condition, limited pressure* **Sheep**, **Long**, **Greenland**, *Cahoon*, *Mill*	**Quadrant III — Remediate** *Degraded; legacy internal loading, limited external pressure* **Upper Mill**, **Seymour**, **Lower Mill**, **Walkers**, *Smith*
Higher Threat	**Quadrant II — Prevent** *Good condition, ongoing pressure*	**Quadrant IV — Rehabilitate** *Degraded with ongoing pressure*

ond

PILOT STUDIES

"I need to do more tests" - *your doctor*

- Often, your doctor orders additional testing before finalizing a treatment plan
- For the triaged ponds, that's the role of a **PILOT STUDY**
- These studies will be focused in-depth looks at one representative pond in each quadrant
- Pilot Studies are designed to answer specific questions that are raised about ponds in each quadrant
- The ultimate goal is to produce a management plan for the pilot pond from which other ponds in the quadrant can benefit



QUADRANT I — PROTECT

Protect: Brewster's least impaired ponds at lowest threat

Ponds are ranked by comparing water clarity, nutrient, and chlorophyll data against every other pond in Brewster's network — not against a fixed pass/fail line. These four ranked lowest on both impairment and threat: strong condition today, and the least watershed pressure in the system.

PONDS IN THIS QUADRANT

Sheep, Long, Greenland, Cahoon, Mill

Pilot: Sheep Pond

Why this pond

Brewster's highest-quality monitored pond, and its most heavily used — 318 reported users in 2025, 273 swimmers. A strong test of proactive protection under real recreational pressure.

What the study will do

Build a monitoring baseline, characterize watershed inputs, and assess development risk. Desired outcome: continued monitoring and voluntary buffers, no structural work required yet.

QUADRANT II — PREVENT

Prevent: good condition, real pressure

These ponds rank well on current impairment but face meaningful watershed loading. Canoe, Griffiths, and Black placed here on their base threat scores alone. Elbow and Pine were moved up from Lower to Higher Threat because of their connections to cranberry bogs (40% and 20% bog-to-pond area ratios) which may increase nutrient loading independent of other watershed threats.

PONDS IN THIS QUADRANT

Elbow, Slough, Canoe, Cobbs, Black, Griffiths, Pine

Elbow Pond

Why this pond

Its cranberry bog connection is this pond's defining pressure. It also has some prior study and management and an engaged pond shore community likely to be receptive to shoreline vegetation strategies.

What the study will do

Characterize the loading pathways and design a targeted reduction strategy before impairment sets in. Findings should generalize to Brewster's other bog-connected ponds.

QUADRANT III — REMEDIATE

Remediate: damage done, external pressure isn't the current driver

These ponds show real impairment despite comparatively limited external loading at present — pointing to internal sediment phosphorus cycling as the likely driver, rather than watershed inputs. Seymour was moved up from Lower to Higher Impairment based on documented cyanobacteria advisory history.

PONDS IN THIS QUADRANT

Upper Mill, Seymour, Lower Mill, Walkers, Greenland, Smith

Upper Mill Pond

Why this pond

Combines elevated sediment phosphorus, cyanobacteria advisories, and low dissolved oxygen. An active herring spawning pond, so work here requires coordination with the state Division of Marine Fisheries.

What the study will do

Diagnose the internal loading process directly and design an in-pond intervention, paired with watershed protection so new loading doesn't undo the gains.

QUADRANT IV — REHABILITATE

Rehabilitate: damage ongoing, pressure still active

Brewster's most complex management cases: real impairment combined with intense, ongoing watershed loading. In-pond treatment alone won't hold in this quadrant — the external loading has to come down too.

PONDS IN THIS QUADRANT

Blueberry, Smalls, Myricks, Owl, Schoolhouse, Sols

Blueberry Pond

Why this pond

The clearest combination in the network: severe impairment, the highest composite threat score. A strong template for the rest of the quadrant.

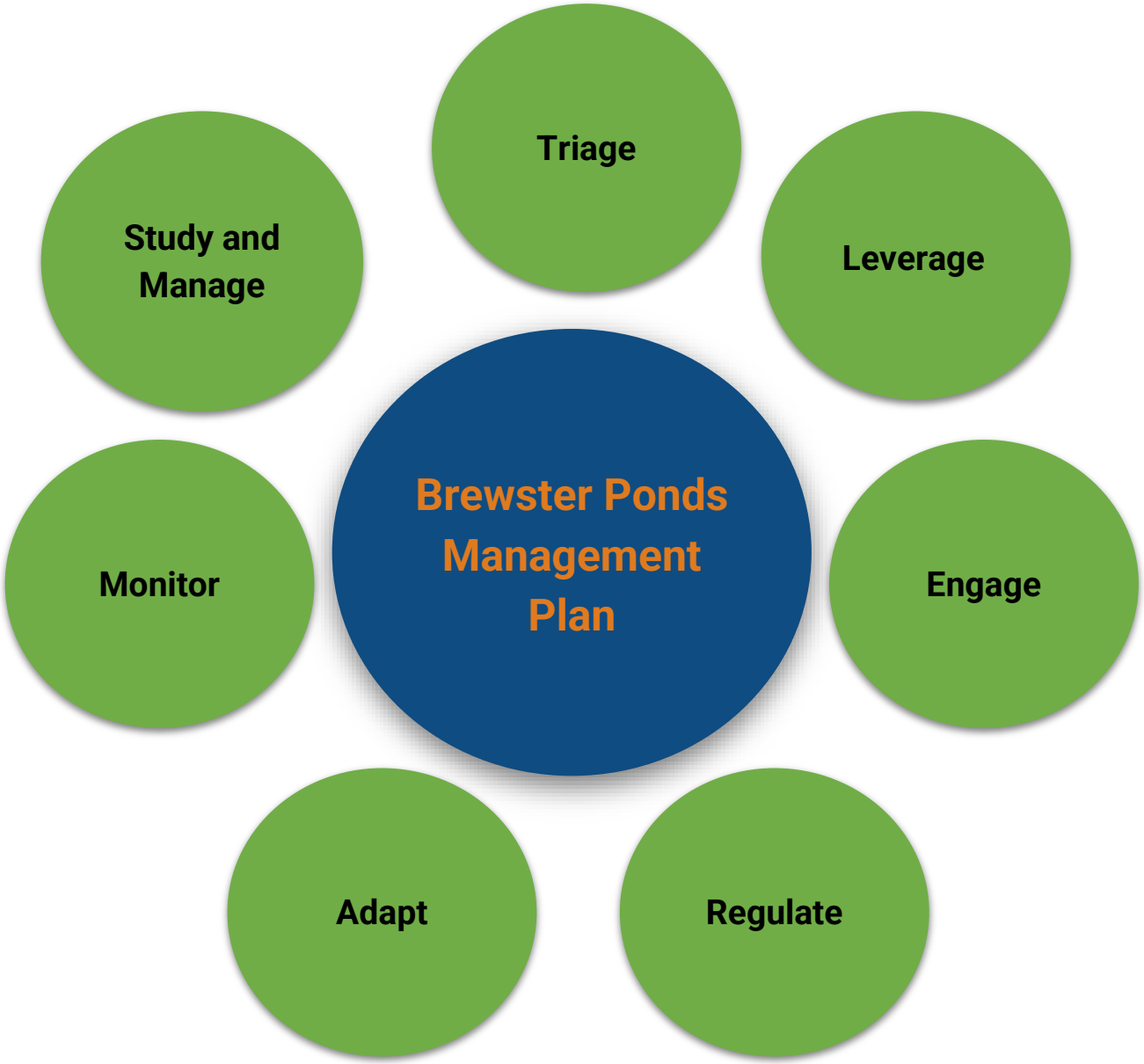
What the study will do

A full diagnostic assessment across watershed, shoreline, and in-pond zones, to design the integrated rehabilitation plan this quadrant's ponds require.

Beyond the Matrix: Other Parts of the Plan

Triage of the ponds and the pilot studies are the initial steps. The full Draft Ponds Management Plan also covers:

- **Individual Pond Assessment Sheets —** Data and trend analysis on each of Brewster's monitored ponds
- **Management best practices —** The watershed, shoreline, and in-pond toolkit each quadrant draws from
- **Regulatory recommendations —** Bylaw and permitting enhancements to support long-term pond protection
- **Governance & implementation —** Roles for the Natural Resources Advisory Commission, DNR, and partners
- **Funding strategy —** Town appropriations, grants, and partnerships like the Brewster Ponds Coalition
- **Monitoring & adaptive management —** How PALS data keeps informing the matrix, and the five-year review cycle
- **Community education & stewardship —** How residents can get involved beyond the survey



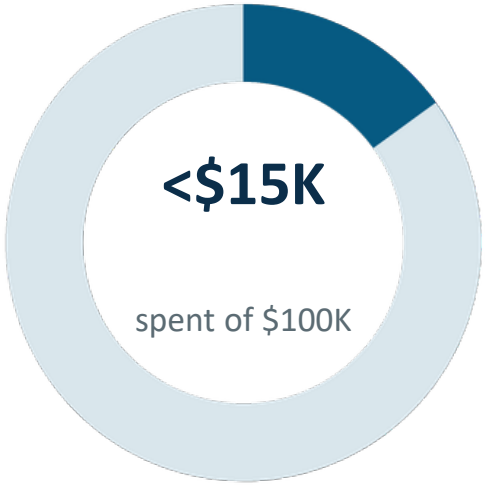
Ponds Management Plan Action Steps:

- **Triage** = Impairment/Threat Matrix
- **Study and Manage** = Pilot Studies/Management Plans
- **Monitor** = PALS/Additional monitoring associated with management plans
- **Adapt** = Reevaluate and make any necessary changes every 3-5 years
- **Regulate** = Review relevant policy and make necessary changes
- **Engage** = Report/Inform/Collaborate/ Support/Recruit
- **Leverage** = Maximize external funding opportunities to minimize reliance on local tax revenues

Funding & Cost-Effectiveness

Ponds Management Plan — Development & Pilot Studies

BUDGET STEWARDSHIP



- **$100,000 allocated** — Fall 2023 Town Meeting, for plan development & pilot studies
- **Under $15,000 spent to date** — primarily technical consultant work
- **Remaining work by town volunteers, Brewster Ponds Coalition, & town staff** — stretching plan funds well beyond consultant rates
- **Brewster Ponds Coalition** — additional funding for pilot studies

CCC CAPE-WIDE ECONOMIC STUDY OF FRESHWATER PONDS (2024)

$70–89M

Annual GDP contributed by Cape Cod pond & lake activity

656–833

Jobs supported annually by pond & lake visitor spending

+$22,300
home sale price

+$189/wk
rental rate

Near a clear-water pond vs. an algae-impaired one

ADDITIONAL SOURCES OF FUNDING AND/OR PROFESSIONAL SERVICES SUPPORT

- **Grants**
  - **Walkers Pond Watershed Study**
- **Academic partnerships**
  - **University of New Hampshire, University of Massachusetts**
- **Professional society outreach**
  - **National Lake Management Society**

Source: Cape Cod Commission, Cape Cod Freshwater Initiative Economic Study, Final Report (ERG, 2024)

What You Can Do for the Ponds

Simple actions residents and visitors can take today

Go easy on fertilizer & pesticides

Minimize use on your property; fertilizer nutrient runoff is a leading cause of pond nutrient pollution

Keep a natural shoreline

Follow wetland best practices and maintain a vegetated buffer along the pond's edge

Keep trash out of the water

Pack out what you bring in, and pick up litter you find along the shore

Pick up after your pets

Pet waste adds nutrients and bacteria that degrade pond water quality

Report signs of algal blooms

Contact the Brewster Health Department or the Brewster Ponds Coalition

Volunteer

Become a Pond Monitor, join a shoreline survey, or serve as a Pond Educator

Watch for stormwater runoff

Notice spots where pavement or hardscape drains directly into a pond, and flag them to the town

Questions or concerns about a specific pond? Brewster Health Department • Brewster Ponds Coalition

Timeline for Review & Approval

Brewster Draft Ponds Management Plan (DPMP) — July through November 2026

Jul 24
DPMP included in Select Board public meeting packet

Jul 27
Public presentation of DPMP to the Select Board

Jul 28
DPMP Public comment period opens

Aug 15
DPMP Presentation at BPC Annual Meeting

Aug 21
Public comment period closes

Fall
Comments reviewed & incorporated into final draft

Nov 4
NALMS scientific peer review presentation*

Nov
Final draft to Select Board for approval

* "***From Diagnosis to Action: An Integrated Impairment and Threat Framework for Managing Groundwater-Dependent Kettle Ponds***"

SB = Select Board • BPC = Brewster Ponds Coalition • NALMS = North American Lake Management Society