Our Mission

The Brewster Ponds Coalition is dedicated to preserving and nurturing the natural beauty, healthy habitats and recreational opportunities of Brewster’s ponds, and to safeguard them for current and future generations.
Our Agenda

● Introductions
● Pond Impairment and Ecology
● Case Study of Neighborhood Involvement: Blueberry Pond
● Discussion: What are your interests and concerns?
● Working together: How the Brewster Ponds Coalition can help neighborhoods.
About the Brewster Ponds Coalition

• Began as a group of interested citizens working with the Town of Brewster
• Officially incorporated in October 2014
• We are an independent 501 (c)3 tax-exempt organization

Founding Meeting – October 2014
2016 Board of Directors:

- Tom Vautin (President)
- John Keith (Vice President)
- Gwen Pelletier (Secretary)
- Patricia Monahan (Treasurer)
- Karen Malkus-Benjamin
- Konrad Schultz
- Dawn Walnut

Skating on Sheep Pond
About Our Members

• Over 300 people and families have contributed to the Brewster Ponds Coalition for 2016!
• Only about 50% have Brewster mailing addresses.
• More than 70% are from Massachusetts.
• Members come from 13 states.
• All are committed to protecting Brewster’s environment!
A Framework for Planning: Three Interconnected Themes

- **Action**
  - Projects
  - Educational programs
  - Advocacy

- **Engagement**
  - Member events
  - Volunteer opportunities
  - Extending networks & outreach

- **Structure**
  - Building organizational capacity
  - Developing financial resources
  - Establishing roles and policies
<table>
<thead>
<tr>
<th>Types of Impairment</th>
<th>Indicators</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Dissolved Oxygen</td>
<td>- Low Dissolved Oxygen, especially at bottom</td>
<td>- High nutrient levels</td>
</tr>
<tr>
<td></td>
<td>- Fish kills</td>
<td>- Poor mixing due to thermal stratification and/or low wind</td>
</tr>
<tr>
<td>High Nutrient Levels</td>
<td>- Algae blooms</td>
<td>- Excessive phosphorus</td>
</tr>
<tr>
<td></td>
<td>- Cyanobacteria (blue-green algae)</td>
<td>- Excessive nitrogen</td>
</tr>
<tr>
<td></td>
<td>- High chlorophyll $a$ (indicating algae in water column)</td>
<td></td>
</tr>
<tr>
<td>Turbidity/clarity</td>
<td>- Cloudy or “murky” water</td>
<td>- Storm runoff with lots of silt</td>
</tr>
<tr>
<td></td>
<td>- Floating particles in water</td>
<td>- Algae blooms</td>
</tr>
<tr>
<td>Invasive Species</td>
<td>- Presence of invasive water plants</td>
<td>- Introduction of invasive species by boats, people using lake, wind,</td>
</tr>
<tr>
<td></td>
<td>- Presence of invasive mussels, fish and other fauna</td>
<td>or birds</td>
</tr>
<tr>
<td>Nuisance Plants</td>
<td>- Excessive growth and spread of water plants (i.e. “weeds”)</td>
<td>- High nutrient levels, esp. phosphorus, promoting plant growth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>beyond natural levels</td>
</tr>
<tr>
<td>Shoreline damage (impacting pond ecology)</td>
<td>- Extensive human-created beaches or rock walls</td>
<td>- Shoreline alterations done by homeowners, governments, and/or</td>
</tr>
<tr>
<td></td>
<td>- Lawns to water edge</td>
<td>businesses</td>
</tr>
</tbody>
</table>
Pond Impairment Map - 2009
From 2009 Horsley Witten Report, based on pond testing from 2001 to 2007

Note: Conditions may have changed since map developed
# Brewster Ponds Impairment – Small Ponds

Based on Horsley Witten report, PALs data and recent observation by J. Keith and others

**Note: Old, limited or no data on many ponds, so evaluation is incomplete**

<table>
<thead>
<tr>
<th>SMALL PONDS</th>
<th>IMPAIRMENTS</th>
<th>SMALL PONDS</th>
<th>IMPAIRMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balog’s Bog</td>
<td></td>
<td>Littlefields</td>
<td></td>
</tr>
<tr>
<td>Bound Brk (Quivett)</td>
<td></td>
<td><strong>Myricks</strong></td>
<td>Nutrients, DO, Plants, Turbidity, Chlorophyll</td>
</tr>
<tr>
<td>Calf Field</td>
<td></td>
<td>Mud</td>
<td>Plants?</td>
</tr>
<tr>
<td>Dark Bottom</td>
<td></td>
<td>No Bottom</td>
<td></td>
</tr>
<tr>
<td>Ed Snow</td>
<td></td>
<td>Owl</td>
<td>Nutrients, DO, Chlorophyll</td>
</tr>
<tr>
<td>Freeman</td>
<td></td>
<td>Rafe</td>
<td></td>
</tr>
<tr>
<td>Girl Scout</td>
<td>Nutrients, Plants</td>
<td>Round</td>
<td></td>
</tr>
<tr>
<td>Grassy</td>
<td></td>
<td><strong>Ruth</strong></td>
<td></td>
</tr>
<tr>
<td>Grassy Nook</td>
<td></td>
<td>Tucker’s</td>
<td></td>
</tr>
<tr>
<td>Island (Buggy Whip)</td>
<td></td>
<td>Vesper</td>
<td></td>
</tr>
<tr>
<td>Keeler</td>
<td>Turbidity</td>
<td>Widgeon Hole</td>
<td>Nutrients</td>
</tr>
<tr>
<td>Lee’s</td>
<td>Nutrients, Plants</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Brown – Incidents of algae blooms noted in the past, Green – No impairment**
# Brewster Ponds Impairment – Large Ponds

<table>
<thead>
<tr>
<th>LARGER PONDS</th>
<th>IMPAIRMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakers</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>Nutrients</td>
</tr>
<tr>
<td><strong>Blueberry</strong></td>
<td>Nutrients, DO, Plants</td>
</tr>
<tr>
<td>Cahoon</td>
<td>Plants?</td>
</tr>
<tr>
<td>Canoe</td>
<td>Nutrients, Plants</td>
</tr>
<tr>
<td><strong>Cliff</strong></td>
<td>DO</td>
</tr>
<tr>
<td>Cobbs</td>
<td>Nutrients, Plants, Chlorophyll</td>
</tr>
<tr>
<td><strong>Elbow</strong></td>
<td>Nutrients, DO, Plants</td>
</tr>
<tr>
<td>Flax</td>
<td>DO</td>
</tr>
<tr>
<td>Greenland</td>
<td>Plants?</td>
</tr>
<tr>
<td><strong>Griffiths</strong></td>
<td>Nutrients, Plants</td>
</tr>
<tr>
<td>Higgins</td>
<td></td>
</tr>
<tr>
<td>Little Cliff</td>
<td></td>
</tr>
<tr>
<td>Long</td>
<td>DO, Chlorophyll</td>
</tr>
<tr>
<td>Lower Mill</td>
<td>Nutrients, Chlorophyll</td>
</tr>
<tr>
<td>Mill</td>
<td>Turbidity</td>
</tr>
<tr>
<td>Pine</td>
<td></td>
</tr>
<tr>
<td>Schoolhouse</td>
<td>Turbidity, Chlorophyll</td>
</tr>
<tr>
<td>Seymour</td>
<td>Nutrients, Chlorophyll</td>
</tr>
<tr>
<td><strong>Sheep</strong></td>
<td></td>
</tr>
<tr>
<td>Slough</td>
<td></td>
</tr>
<tr>
<td>Small’s</td>
<td>Turbidity, Chlorophyll, Plants</td>
</tr>
<tr>
<td>Smith</td>
<td>Nutrients, Turbidity, Chlorophyll</td>
</tr>
<tr>
<td>Sol’s</td>
<td>Nutrients, DO, Plants</td>
</tr>
<tr>
<td>Upper Mill</td>
<td>Turbidity, Chlorophyll</td>
</tr>
<tr>
<td><strong>Walker</strong></td>
<td>Nutrients, Plants, Turbidity, Chlorophyll</td>
</tr>
</tbody>
</table>
Brewster Pond Ecology - The Eutrophication Process
Classification of Lakes

**Oligotrophic**
Cold, Deep, Low Nutrients

**Mesotrophic**
Increasing in Nutrient Load

**Eutrophic**
Shallow, Warm, High Nutrient Load
Pond Trophic Status from SMAST Data 2001-2007

Need to take these evaluations with caution because the data age. Some conclusions do not match current visual observations.

Figure IV-1. Trophic Status Index (TSI) in Brewster Ponds 2001-2007
# Phosphorus - The Key Limiting Nutrient

(though nitrogen also impacts type and quantity of plants and algae)

<table>
<thead>
<tr>
<th>Source</th>
<th>Phosphorus Contributors</th>
<th>Seasonality</th>
<th>Control?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm runoff</td>
<td>Lawn fertilizer, road salts, animal waste, vegetation</td>
<td>Occurs all year</td>
<td>Significant control</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Septic systems, lawn fertilizers</td>
<td>Highest in summer when population is high</td>
<td>Significant but difficult</td>
</tr>
<tr>
<td>Surface streams</td>
<td>Inlet streams in any, cranberry bog drainage (may include fertilizers)</td>
<td>Highest in rainy years, high GW table; bog drainage early spring</td>
<td>Depends on upstream situation</td>
</tr>
<tr>
<td>Birds</td>
<td>Bird droppings</td>
<td>Low in winter</td>
<td>Low control</td>
</tr>
<tr>
<td>Vegetation deposition</td>
<td>Leaves, twigs, pollen falling in water</td>
<td>High in autumn</td>
<td>No control</td>
</tr>
<tr>
<td>Rain &amp; snow deposition</td>
<td>Particulates washed by rain (from road dust, power plants, etc.)</td>
<td>Varies some year to year</td>
<td>No control</td>
</tr>
</tbody>
</table>

Note: Cape soil is very low in phosphorus so generally does not leach much phosphorus to rain or ground water.
Pond Phosphorus Mass Balance

Understanding the balance is critical to determine what to do

- Storm runoff in
- Surface flow in
- Groundwater flow in
- Bird waste
- Rain deposition
- Deposition of vegetation (leaves, etc.)
- Surface flow out
- Groundwater flow out
- Uptake and release by water plants and algae
- Deposition to and uptake from sediments
- Uptake and release by fish and other fauna
Phosphorus Accumulation in Ponds Over Time

Natural Phosphorus Sources:
- Leaves, needles, vegetation detritus
- Birds
- Groundwater inflow

Human Phosphorus Sources:
- Road runoff
- Septic tanks
- Livestock
- Fertilizer
- Acid rain
- Pets

(Blue – common major sources of phosphorus)

Pre human development:
Long term average flat or very slowly increasing

After human development (roads, houses, livestock and fertilizer use):
Long term average increasing – rate depends on type and extent of development impact

Bottom sediments store P from season to season, resulting increased water concentrations in warm seasons when P is released from sediments
Phosphorus Accumulation in Ponds Over Time

**Natural Phosphorus Sources:**
- Leaves, needles, vegetation detritus
- Birds
- Volcanic ash deposition
- Groundwater inflow

**Human Phosphorus Sources:**
- Road runoff
- Septic tanks
- Livestock
- Fertilizer
- Acid rain
- Pets

**Pre-human development**

**Mesotrophic Zone**

**After human development** (roads, houses, livestock and fertilizer use)

**Eutrophic Zone** – algae blooms and poor quality very likely

Problems develop when P rises to Eutrophic Zone – even if just in summer
Macrophytes (water plants)

Note ring of green around ponds
- Some patches are normal, a complete dense ring is not
- May also float beneath surface (e.g. milfoil)
- Classified as a nuisance plants if in excess
- Cause: excess nutrients, just like algae
- Macrophytes compete with algae for nutrients
- Removal before phosphorus is addressed may exacerbate algae risks
The town has mapped ground-water flow for all ponds.
Only Four Ways to Address Phosphorus in our Ponds

1) **Reduce** inputs to below outflow levels (i.e. prevention)
   - **Essential to achieve long term success**
   - Focus on controllable sources: septic systems, fertilizer use, storm runoff, pets/livestock
2) **Remove** phosphorus stored in sediments
   - Macrophyte harvesting
   - Dredging of sediments and vegetation at bottom
3) **Aeration**
   - Prevents anoxic zones at bottom, decreasing P release from sediments
   - Improves DO throughout pond, improving overall water quality
4) **Inactivation**
   - Most commonly by use of alum
   - Precipitates P into biologically unavailable solid that settles to bottom
   - Quick and effective in short term, but with limited longevity
A Growing Concern: Harmful Algae Blooms (HABS)

- Increasing incidents of cyanobacteria (blue/green algae) blooms
- Some HABS produce harmful toxins
- Mostly in late summer and fall – warm water conditions.
Other Threats to our Ponds

- Excess nutrients are not the only problem:
  - Mercury in native fish
  - Invasive species
  - Surface runoff
  - “Compounds of emerging concern”
  - Other human behaviors
- What goes into the ground and the air ends up in the water.
Blueberry/ Sol’s Pond
Water Quality
Improvement Planning

Summary Presentation: July 2016

Marty Lucenti, MVA
Jan McGann, BHPOA
Mike Medirous, OE

Blueberry Hills Property Owner’s Assoc.
Millstone Village Assoc.
Ocean Edge Resort Inc.
Save Blueberry & Sols Pond
Organization
Legend:
OW= Open water
SS= Schrub Swamp
WS1= Wooded Swamp Deciduous
WS2= Wooded Swamp Coniferous

Lines:
Blue=Shoreline
Green=Apparent Wetland Limit
Dark Blue=Hydrologic Connection
Purpose

Improve the **water quality** and **habitat** surrounding Blueberry and Sol’s Pond by short term preventive and remedial measures while collecting load details necessary to take longer term corrective action.
Plan Objective

Improve Recreational Uses:

➢ Swimming
➢ Fishing
➢ Boating

Reduce Light Pollution
Reduce Noise Pollution

**WHY:** Doing nothing means uses above will deteriorate
Millstone Village Catch Basins (8/16/2014)

Total = 30

End of Capt Fitts

Swale (Oct. 2014)

Known Runoff Issue (BCT owned)

Cherrystone Near Unit D31

Near Playground

Across From Unit D90/29

Millstone Village Catch Basins

(8/16/2014)
Blueberry Hills Property Owner’s Association
Catch Basin Map

Cape Cod Rail Trail

Potential Issue

Blueberry Pond

Blueberry Pond Beach

#357
#368
#147
#170
#199
#126
#84
#27
Leverage/ Partnerships

- BHPOA, MVA, and OE have 2 ponds (Sol’s & Blueberry)
  - Ocean Edge borders both ponds
- Both ponds are impaired (phosphorous & dissolved oxygen issues)
- Current pond conditions are a product of existing water quality bylaws/ regulations/ development
- Blueberry & Sols Ponds have no public access (therefore, low public funding priority)
- Ocean Edge is the largest tax payer in town and has influence
  - Associations have 225+ residences - they also have influence
- MVA, BHPOA and Ocean Edge have a common interest - water quality (for recreational purposes)
- Align our local pond efforts with the Brewster Ponds Coalition
- Continue to pursue other water quality initiatives/ funding and leverage our accomplishments with other pond organizations - share best practices.

The most interested parties own property on or near the ponds
Activities Matrix/ Agenda

- **By-Laws**
  - BPC Participation/Integration
  - Dock Policy Compliance
  - Bylaws Update
  - Identify Issues
  - Support BPC Initiatives
  - List of Recomm. Products

- **Funding**
  - Articles of Incorp
  - OE Partnership
  - 501C(3)
  - Annual Yard Sale
  - Identify Issues/ Mitigations
  - Maintain Catch Basins
  - Install Swales/ Rain Gardens

- **Education**
  - Comm Plan/ Data Base
  - Email Flyers - Tips
  - List of Recommended Products
  - Aquatic Study/ Training
  - Mitigation Measures
  - Pets - waste removal

- **Analysis: See Management Plan which follows in this presentation**

- **Septic**
  - Identify Issues
  - Support BPC Initiatives
  - List of Recomm. Products

- **Runoff**
  - Identify Issues/ Mitigations
  - Maintain Catch Basins
  - Install Swales/ Rain Gardens

- **Birds**
  - Install Swales/ Rain Gardens

- **Light Pollution**
  - Spotlight Limitation
  - Low Voltage Down Lights
  - Use of motion sensors

- **Noise Pollution**
  - Observe sunrise/sunset only activities
  - Signage
  - Horsepower Limitation

- **Habitat**

- **Water Quality**
  - Install Swales/ Rain Gardens
  - Identify Issues/ Mitigations
  - Maintain Catch Basins

- **Habitat**

- **Water Quality**
The swale/ Rain Garden

Swale Funding: SBP Fund
Rain Garden/s: HOAs
Example of runoff remedial action. Consider also for North Pond runoff issue on Brewster Conservation Trust property.
Coordinator: Nancy Bentivegna
Please coordinate all plant donations

Rain Garden Plants:
Sweet Pepper Bush
Oak Leaf Hydrangea
Inkberry
Winterberry
Mountain Laurel
Pussy Willow
Low Bush and High Bush Blueberry
Ferns (Ostrich, Sensitive, Hay Scented)
Accomplishments

➢ Formed joint Millstone/ Blueberry Hills Home Owner’s Assoc. Organization
➢ Completed a settlement agreement with Ocean Edge Resort Inc.
➢ Partnered with Ocean Edge Inc. to pursue water quality improvements
➢ (4) new MVA Catch basins installed - Millstone Betterment ($20K)
➢ (26 - MVA; 12 BHPOA) Catch basin clearings/ maintenance (annually)
  - 42 Total catch basins
➢ (1) Swale/ Rain Garden ($5K)
➢ (2) Yard sales (fund raising annual events) (raised $13K)
➢ Signage posted at Millstone Beach
➢ Water Quality Improvement Plan - (Initiated - On Going)
  - Objective: Identify and select from technically viable courses of actions (options)
➢ Initiated stormwater runoff project on North Pond Drive
What can we do together?

• We can speak for the Ponds!
• Raise awareness throughout our community (residents and visitors).
• Collect quality environmental data and monitor trends of pond health.
• Lead and help organize projects to protect and improve ponds.
• Assist with permitting and regulatory processes.
• Enjoy and promote our beautiful natural resources!
Tools and Resources: How the Brewster Ponds Coalition Can Help

- Pond Waterfront Improvement Guide
- Funding for neighborhood projects
- Regulatory engagement:
  - Stormwater
  - Septic systems
  - Pond remediation projects
Pond Waterfront Improvement Guide

Prepared by AmeriCorps Member Ben Howard

and

Gwen Pelletier, Jan McGann, & John Keith
of the Brewster Ponds Coalition

7/20/2016
A Funding Option for Neighborhood Projects

As a 501(c)3 charitable organization, the Brewster Ponds Coalition is willing to accept tax-deductible donations for specific pond improvement projects and hold those funds in a restricted account.

**Basic requirements:**
- The recipient organization must be a non-profit entity. (The BPC cannot accept funds that benefit individuals or for-profit organizations.)
- Funds collected must be used for purposes that protect or improve the health of Brewster’s Ponds.
- Neighborhood organizations and the BPC document the purpose, expected time frame, and other details in a simple agreement.
- The BPC will disperse funds to the neighborhood association as the project moves forward.
Regulatory Engagement

- Active participation in Town and regional developments affecting ponds and groundwater.
- Advocating for sound, science-based policies.
- Seeking involvement of neighborhood leaders.
BPC Events, Programs and Volunteer Opportunities

• 2016 Events
  – Healthy Ponds Art Fest at the Cape Cod Museum of Natural History
  – PALS volunteer reception and program review
  – Beautify Brewster Volunteer Clean-up Day
  – Weed Watchers Workshop
  – Brewster Conservation Day
  – Ponds & Neighborhood Summit

• Upcoming Programs
  – August 13 – Brewster Ponds Coalition Annual Meeting
  – August 20 – Bike to Ponds Summer Celebration

• More to Come!
Thank You!

For more information or to join us:

Go to
www.brewsterponds.org