



4TH ANNUAL CAPE COASTAL CONFERENCE

Clear Water Revival: Solarbees on Santuit Pond, Mashpee

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Santuit Pond - Description

- Approximately 170 acre shallow kettlehole pond (maximum depth of 9 feet).
- Outlets to Santuit River on the southern end of pond; location of newly reconstructed herring run.
- Precipitation and groundwater are the dominant sources of water.
- Average flushing rate of approximately 3 times per year resulting in a residence time of 0.33 years (120 days)

Santuit Pond - Description

- Public boat launch on western shore provides boating access.
- Substantial residential housing around the perimeter of the pond (over 600 homes).
- Used recreationally for fishing, swimming, canoeing, and kayaking.
- Provides aquatic habitat for multiple fish species and spawning area for herring.
- Two active cranberry bogs: Baker's Bog on the northern shore and Brackett's Bog on the eastern shore.

Santuit Pond - Description

- Santuit Pond Preserve purchased in 2002 by Towns of Mashpee and Barnstable (approximately 200-acre property on the eastern and southern shores).
- Preserve includes walking trails with scenic vistas for hikers, birders, and others.
- Traditional hunting and fishing ground for the Mashpee Wampanoag Tribe.

Santuit Pond - Problem

- Listed on the "Massachusetts List of Impaired Waterbodies" for nutrients and noxious aquatic plants (Category 5).
- Symptoms include low water transparency, frequent and dense cyanobacteria blooms, and periodic loss of oxygen in bottom waters.
- Mashpee Board of Health posted health advisories in 2006, 2008, and 2010 due to low clarity and the presence of potentially toxic cyanobacteria.
- The Massachusetts Department of Public Health posted a health advisory in 2009 due to presence of toxic producing cyanobacteria.

Photo from 2010, Ed Baker

Santuit Pond - Problem

- Phosphorus identified as limiting nutrient.
- Town hired AECOM in 2009 to conduct diagnostic study to identify phosphorus sources causing the extreme algal blooms and to recommend management strategies
- Total phosphorus (TP) concentration estimated to be 80 µg/L.
- TP concentrations measured in 2009 at the deep spot off Bryants Neck ranged from 40-140 µg/L.
- Cape Cod Commission recommends regional phosphorus criterion of 10 µg/L.

Santuit Pond - Problem

- Internal loading primary source (oxygen depletion in bottom waters allowing phosphorus-rich soft sediments to release available phosphorus).

Internal loading	78%
Direct precipitation	5%
Surface runoff	5%
Groundwater	3%
Active cranberry bogs	3%
Septic systems	5%
Waterfowl	1%

Santuit Pond - Problem

- Average Secchi disk transparency (SDT) from deep spot off Bryants Neck is 2.6 ft (range of 1.2-5.6 ft).
- Average summer SDT readings at the Town Landing were lower (1.8 ft with a range of 0.4-3.0 ft)
- MA State Sanitary Code guidance criterion of 4 ft for swimming.

Santuit Pond – Proposed Solutions

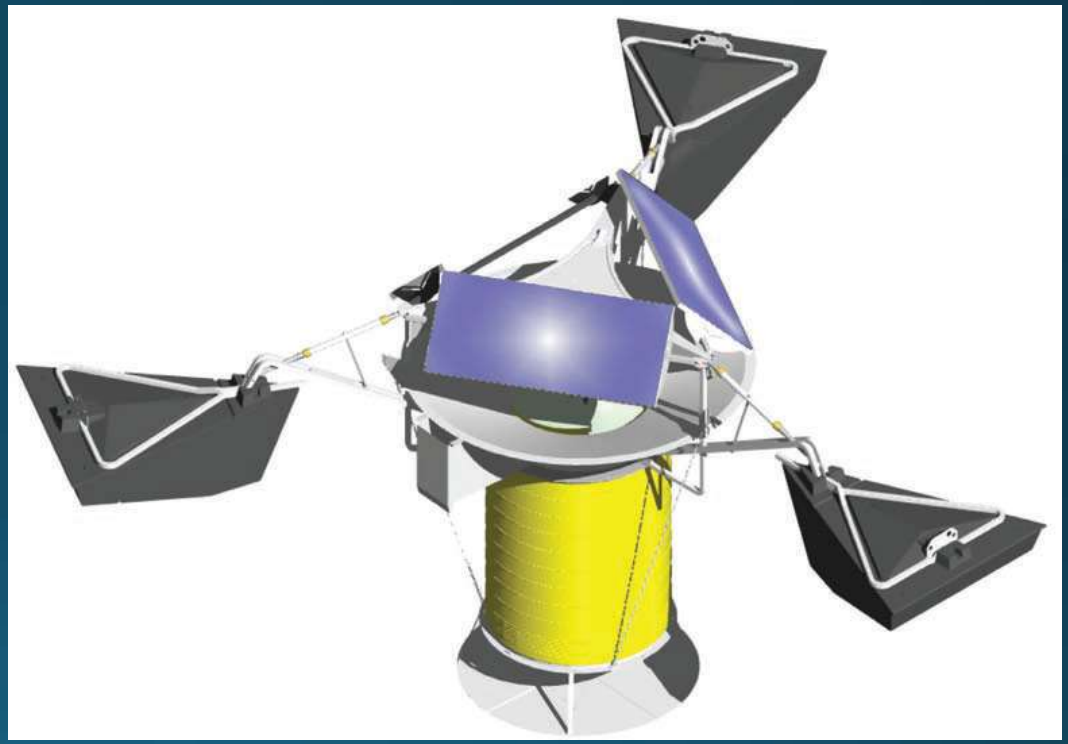
- Comprehensive approach for phosphorus source reduction
- External source reduction
  1) W**atershed management** including stormwater management, fertilizer use, and retention of existing vegetated buffer zones;
  2) **Septic system maintenance and upgrade** including education of the residents and detailed septic surveys;
  3) **Cranberry bog management** including enforcement of best management practices and the use of low phosphate fertilizers; and
  4) **Waterfowl control** including discouraging feeding by residents, and maintaining riparian areas at the shoreline for reduced pollutant input to Santuit Pond.

Santuit Pond – Proposed Solutions

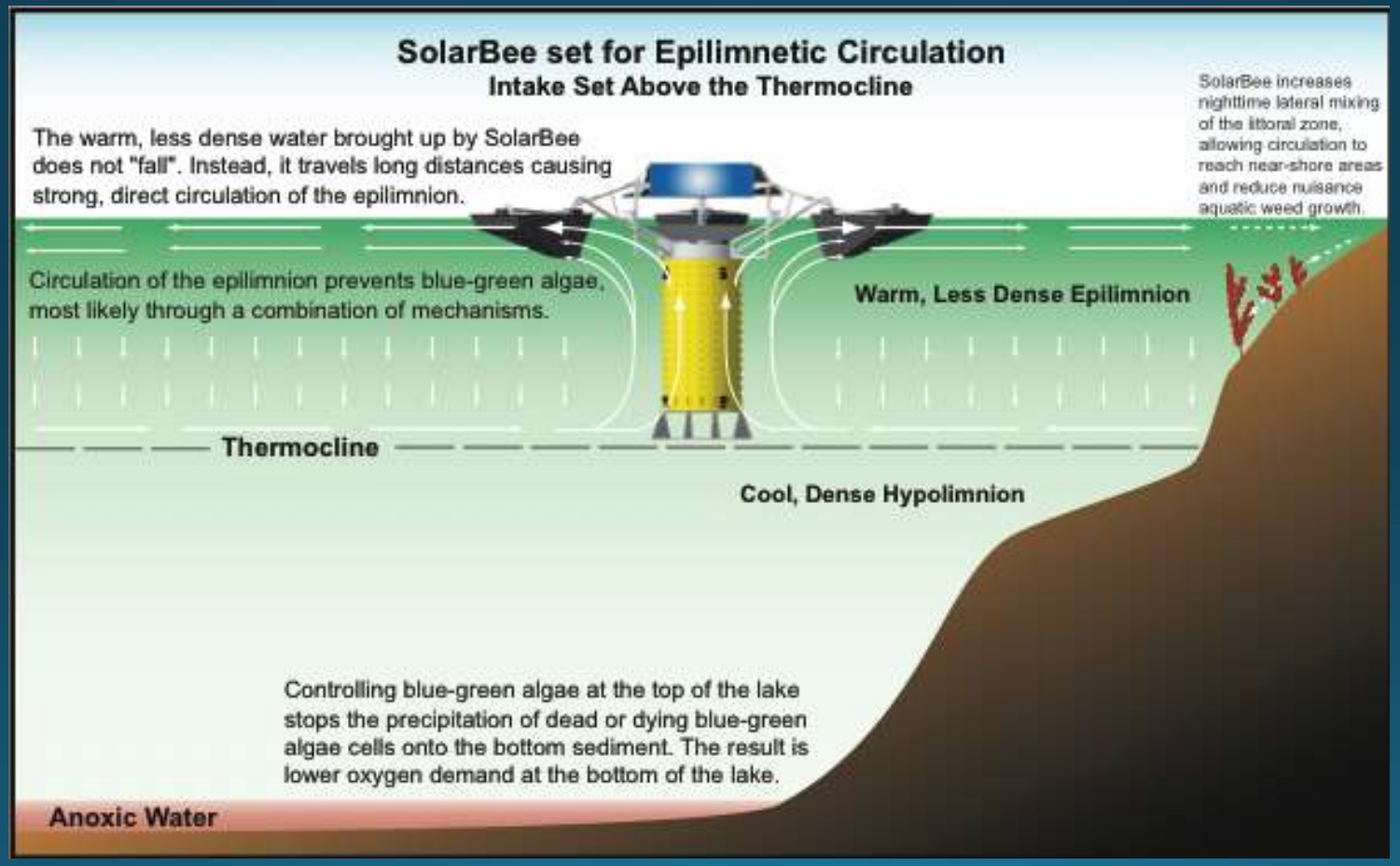
- Internal reduction options
  1) Dredging involving removal of bottom sediment
  2) Phosphorus inactivation involving alum treatment
  3) Artificial circulation involving introduction of oxygen into bottom waters to limit phosphorus release

Santuit Pond – Artificial Circulators

- Received Community Preservation Act (CPA) funding for purchase of 6 SolarBee artificial circulators in 2011 (approximately $321,000)
- Permitted by Mashpee Conservation Commission through Request for Determination of Applicability



Santuit Pond – Artificial Circulators



Santuit Pond – Artificial Circulators

- Six (6) SB10000 v18 machines installed with a 10-foot hose; each unit covering approximately 30 acres.
- Units installed in May 2012

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- Semi-annual maintenance and water quality testing through "BeeKeeper" program (approximately $19,000 per year)
- "Success" measured by SDT
- Latest SDT from 10/15/16
  - T1 Bottom
  - T2 8 feet
  - T3 Bottom

Santuit Pond – Artificial Circulators

Dissolved Oxygen (DO), mg/L

Depth	10/1/09	10/15/16
0.5	11.87	10.19
2.0	11.82	10.62
4.0	11.7	10.74
6.0	11.7	10.81
7.0	6.4	10.99
8.0	2.5	10.05

Total Phosphorus (TP), µg/L

Depth	8/26/09	8/27/14
0.5	109	40.3
5.0	-	41.2
8.5	113	-

Questions?