Cold Brook
Natural Nitrogen Attenuation Project

Phase 1: Interim Report

Town of Harwich

February 12, 2015

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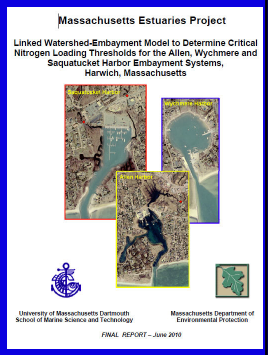
2010 MEP Report on Allen, Wychmere, and Saquatucket Harbors

- Identifies all Harbors as impaired
- Recommends 0.50 mg/L total nitrogen as threshold concentrations to restore
- Saquatucket Harbor assessment includes data that concludes that Cold Brook removes 35% of its watershed N
- At request of the town, report also includes scenario that shows increasing attenuation in Cold Brook by 15% will reduce Harbor TN concentration by 10%


Massachusetts Estuaries Project

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Allen, Wychmere and Saquatucket Harbor Embayment Systems, Harwich, Massachusetts

University of Massachusetts Dartmouth
School of Marine Science and Technology

Massachusetts Department of Environmental Protection

FINAL REPORT – June 2010

Cold Brook Natural Nitrogen Attenuation

Phase I (FY15) – Current Project:

Task 1: Review of Historical Data and Water Quality and Flow Sampling

Task 2A: One year of monitoring water quality and flow

Phase II (FY16) – Not Authorized:

Task 2B: Additional Nutrient-Related Cold Brook Water Quality and Flow Measurements (whole summer of monitoring)

Task 3: Irrigation Pond Water Quality and Physical Characterization

Task 4: Bog Elevation Survey, Volume Estimate, and Habitat Assessment

Task 5: Management Options, Report and Community Presentation

Cold Brook: Initial Review of Management and Assessment History

1927 - Massachusetts Division of Waterways (No. 769) license
2007 - Zaremba Environmental Consulting. Ecological Evaluation.
2010 - SMAST/DEP, Final MEP Report: Saquatucket, Allen, Wychmere Harbors
2010 - Haley and Ward, Inc. Cold Brook Fishway Restoration Report.
2011 - Geosyntec Consultants. Cold Brook Tidal Assessment.
2011 - MassDMF memo, Recommended Water Flow Management for Grass Pond and Cold Brook.
2012 - Horsley Witten Group. Sediment characterization and ground penetrating radar (GPR) assessment.
2013 - Mass. Dept of Fish and Game, Division of Environmental Restoration. Planning process summary.
2014 - Stantec Consulting Services. Site visit summary at Carding Mill Dam

Cold Brook: Initial Review of Management and Assessment History

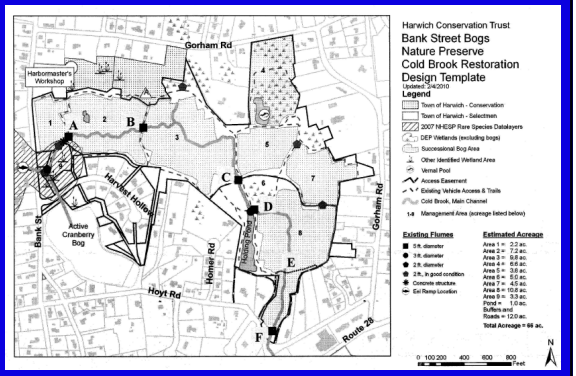
Management Summary Points:

1. The 1927 MassDivision of Waterways license issued to construct and maintain dams and spillways at the Grass Pond berm and at the pond outlet upstream of Bank Street for the purpose of cranberry cultivation is still valid and held jointly by HCT and the 7 acre bog owner.
2. 2011 Recommended Water Flow Plan proposed by DMF was not formally agreed to.
3. MassDEP has completed draft TMDL for Saquatucket Harbor, final awaiting completion of Herring River MEP report according to final 2012 Integrated List and "TBD" according to draft 2014 list.

Cold Brook: Initial Review of Management and Assessment History

2007 - Zaremba Environmental Consulting. Ecological Evaluation of the Bank Street Bog Complex. Completed for the Harwich Conservation Trust. 20 pp.

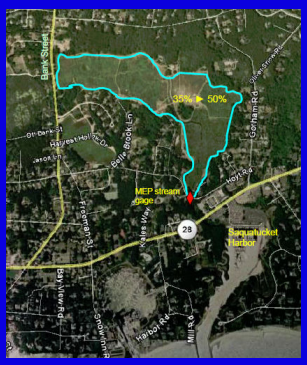
Plant survey of 8 areas
ID of 274 species
Description of densities/frequency, but little quantification



Cold Brook: Initial Review of Management and Assessment History

2010 - SMAST/DEP, Final MEP Report: Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Allen, Wychmere and Saquatucket Harbor Embayment Systems, Harwich, Massachusetts. Boston, MA. 191 pp.

- Linked watershed and estuary water models calibrated and validated to test nitrogen management strategies
- Data collection in watershed and estuary to assess tides, water quality, groundwater and stream inputs, sediments, nitrogen sinks and sources, ecosystem conditions
- Recommended threshold concentration to restore system

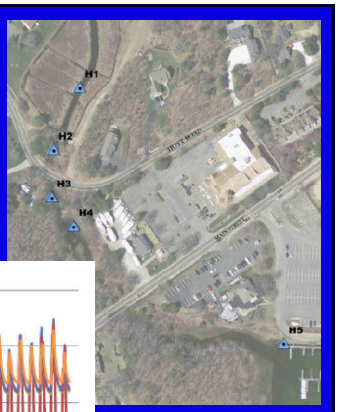


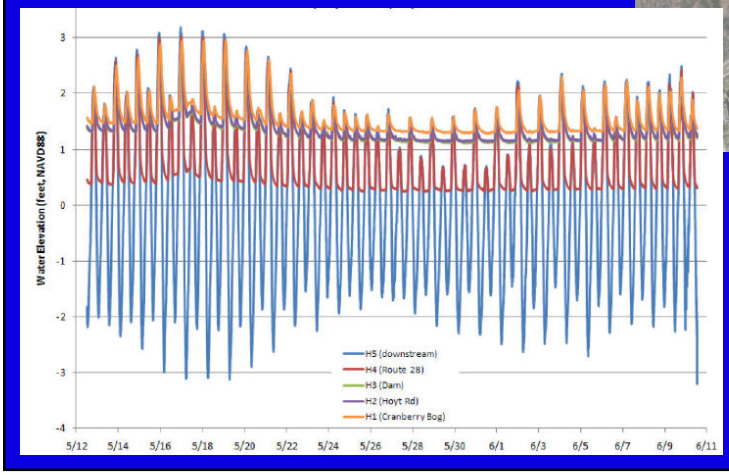
Cold Brook: Initial Review of Management and Assessment History

2010: Haley and Ward, Inc. Cold Brook Fishway Restoration Report. Completed for the Harwich Conservation Trust. 22 pp.

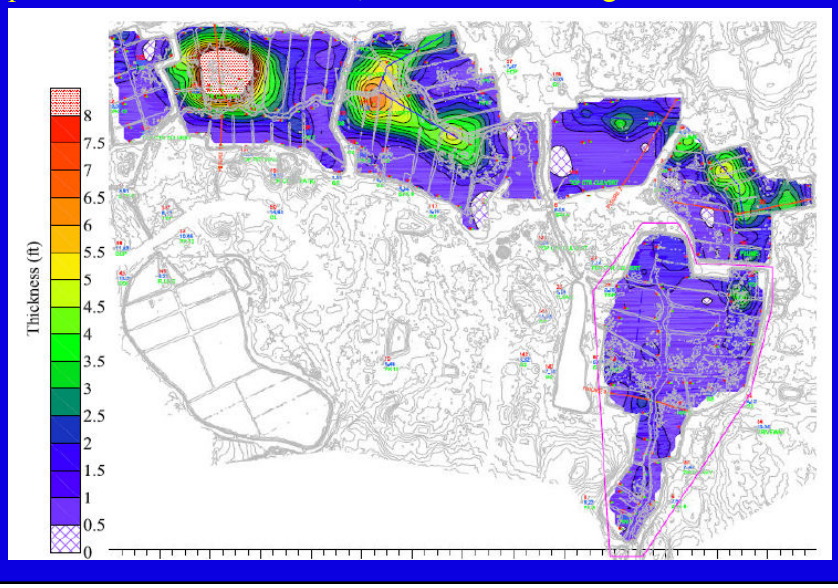
- Elevation survey of selected connections between bog cells
- Collected a single round of streamflow measurements (info not presented in report)
- Used flow measurements to model 25 and 100 year stormflows and proposed designs for replacement and/or removal of existing culverts within the bog
- Developed costs for removing selected flumes at four locations, installing pedestrian walkways and footbridges at four locations, and maintaining road access at one location

2011: Geosyntec Consultants. Cold Brook Tidal Assessment. Completed for Massachusetts Department of Fish and Game, Division of Ecological Restoration. 10 pp.





2012: Horsley Witten Group. Sediment characterization and a GPR assessment of sand and peat horizons. Completed for Massachusetts Department of Fish and Game, Division of Ecological Restoration.



2013: Massachusetts Department of Fish and Game, Division of Ecological Restoration. Planning process summary. 6 pp.

Proposed plan for changes to HCT bog system with management goals in each bog cells, including:

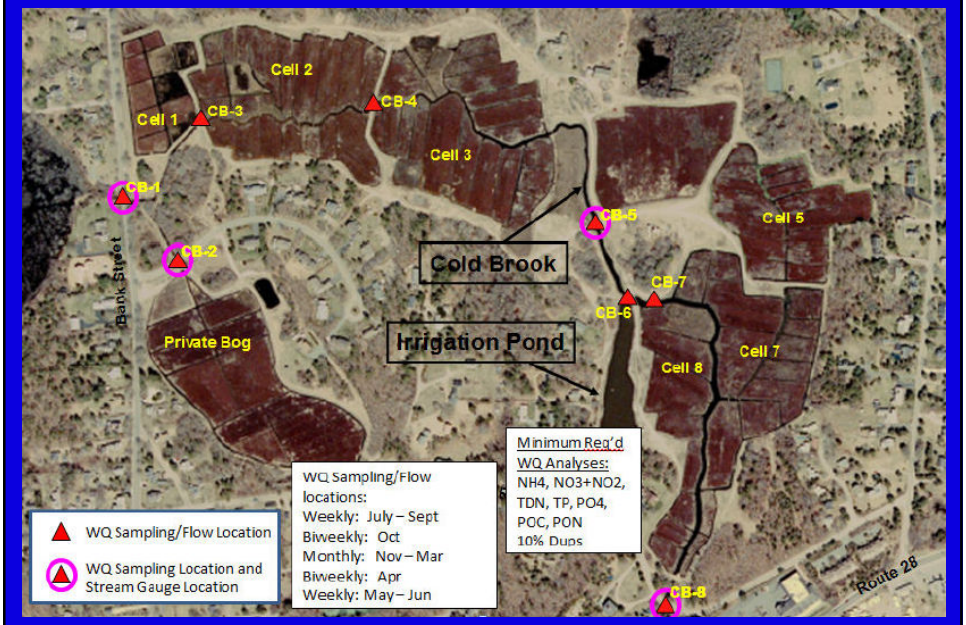
a) reorientation of existing berms and construction of walking trails
b) reorientation of stream channel and digging of new portions,
c) filling and grading of irrigation pond and parts of existing stream channel,
d) excavation of sand from large areas of southern bogs,
e) removal of large areas of underlying peat in northern bogs,
f) modification of the Bank Street culvert,
g) removal of dam at south of Hoyt Road.

Alternatives are also presented for more extensive system changes.

No management proposals are offered for Grass Pond or assessment of potential impacts on Saquatucket Harbor or meeting its nitrogen TMDL.

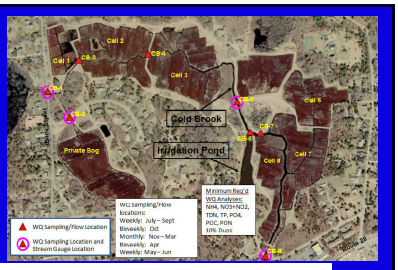
2014: Stantec Consulting Services, Inc. Letter summarizing site visit at Carding Mill Dam on Cold Brook between Hoyt Road and Route 28. Completed for Massachusetts Department of Fish and Game, Division of Ecological Restoration. 5 pp.

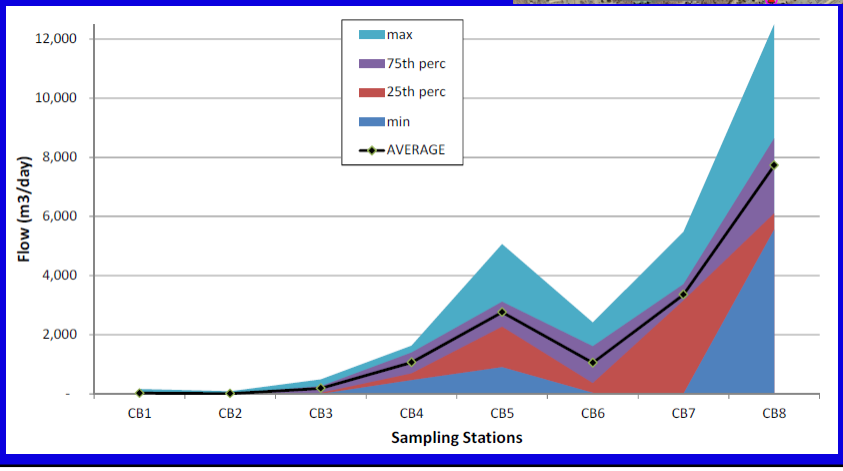
- Site visit completed to "observe the dam and adjacent structures"
- Concluded that "the severely deteriorated condition of the dam necessitates that immediate measures be taken to substantially remove or repair it."
- Dam was removed in March 2014 by Town DPW



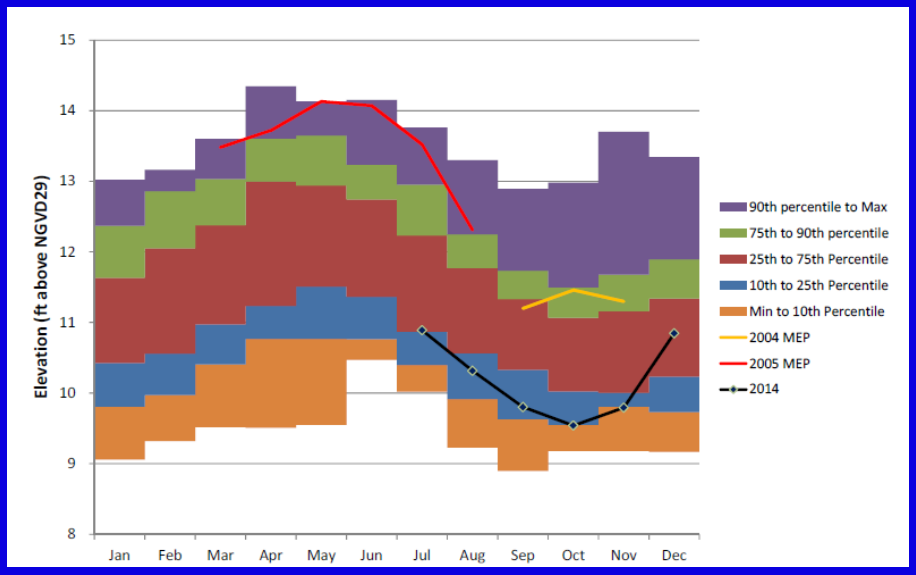
Cold Brook: Interim Flow

July through October



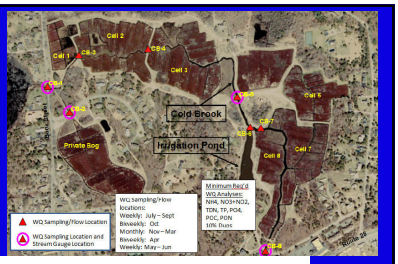


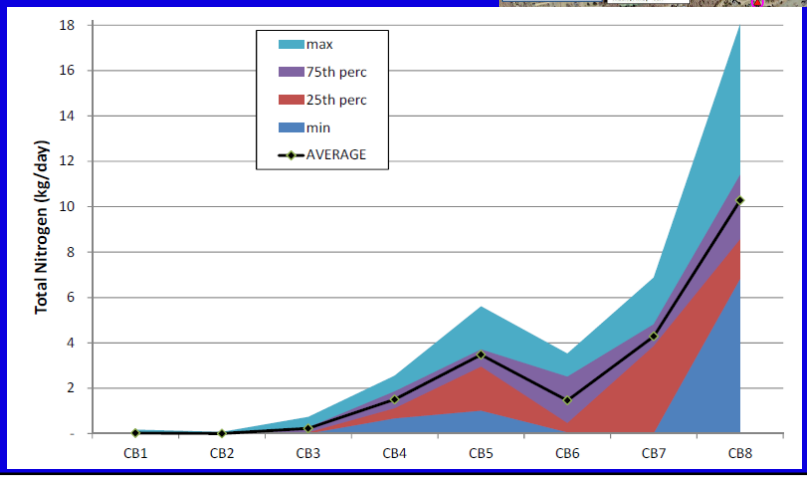
Cold Brook: Regional Groundwater Levels



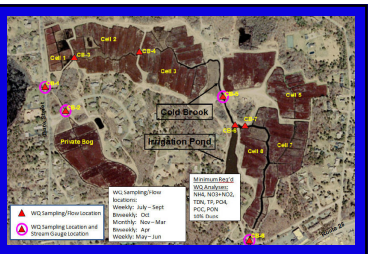
Cold Brook: Interim Nitrogen

July through October





Cold Brook: Other interim WQ findings



1. <u>Pond appears to be holding tidal water.</u>

CB-6 had the highest average salinity (5.4 ppt). CB-5, which is next closest station upstream, had an average salinity of 0.1 ppt. Next closest downstream station (CB-7) had an average salinity of 2.6 ppt.

2. <u>Cranberry bog (CB-2) water was different than rest of the system</u>:

i) average TP concentration >3X any of the other station averages,
ii) average DIN concentration <10X any other averages,
iii) particulate carbon concentrations >4X any other averages,
iv) particulate organic nitrogen >4X any other averages, and
v) nitrogen to phosphorus ratio ~50% of average ratios at any of the other stations.

Cold Brook Natural Nitrogen Attenuation: NEXT STEPS?

Phase I (FY15) – Current Project:

Task 1: Review of Historical Data (summary in Tech Memo)

Task 2A: One year of monitoring water quality and flow (on-going; will continue through June with increased frequency as temperatures rise)

Phase II (FY16) – Not Authorized:

Task 2B: Additional Nutrient-Related Cold Brook Water Quality and Flow Measurements (whole summer of monitoring)

Task 3: Irrigation Pond Water Quality and Physical Characterization

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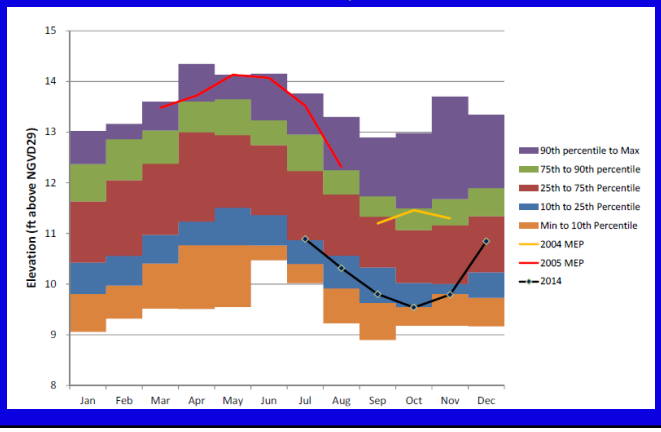

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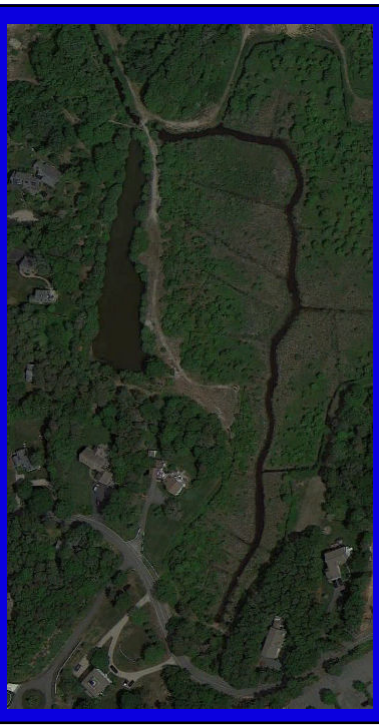

Cold Brook Natural Nitrogen Attenuation: NEXT STEPS?

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Task 4: Bog Elevation Survey, Volume Estimate, and Habitat Assessment

Cold Brook Natural Nitrogen Attenuation: NEXT STEPS?

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Task 5: Management Options, Report and Community Presentation

Coastal Systems Program
University of Massachusetts Dartmouth

Science for Management

Questions & Discussion

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