

# **Town of Eastham Comprehensive Plan to Protect Pond Water Quality**



*Herring Pond*

**Eastham Water Management Committee  
Version 1.0  
November 18, 2014**

# Table of Contents

<u>Section</u>	<u>Page</u>
<b>1.0 Introduction.....</b>	<b>3</b>
<b>1.1 Purpose.....</b>	<b>3</b>
<b>1.2 Motivation.....</b>	<b>3</b>
<b>1.3 Charge .....</b>	<b>3</b>
<b>1.4 Objective.....</b>	<b>4</b>
<b>2.0 Roles and Responsibilities.....</b>	<b>4</b>
<b>2.1 Primary Participants.....</b>	<b>4</b>
<b>2.2 Coordinating Organizations.....</b>	<b>5</b>
<b>2.3 Review and Comment Organizations.....</b>	<b>5</b>
<b>3.0 Scope of the Plan .....</b>	<b>6</b>
<b>4.0 Approach.....</b>	<b>8</b>
<b>4.1 Compile a pond issues inventory .....</b>	<b>9</b>
<b>4.2 Analyze the candidate actions for feasibility and potential effectiveness.....</b>	<b>9</b>
<b>4.3 Prioritize the candidate actions .....</b>	<b>9</b>
<b>4.4 Select candidates and coordinate with Selectmen.....</b>	<b>10</b>
<b>4.5 Implement the selected actions.....</b>	<b>10</b>
<b>4.6 Monitor and assess progress.....</b>	<b>11</b>
<b>5.0 Schedule for Completing the First Version of the Plan.....</b>	<b>12</b>
<b>Appendix A Definition of Pond Water Quality .....</b>	<b>15</b>
<b>Appendix B (Draft) History of Related Pond Quality Actions to Date.....</b>	<b>17</b>
<b>Appendix Common and Individual Pond Action Plans .....</b>	<b>20</b>
<b>Appendix D References .....</b>	<b>36</b>

## **1.0 Introduction**

### **1.1 Purpose**

The purpose of this plan is to recommend actions that will be taken to restore water quality in the freshwater ponds in the Town of Eastham, Massachusetts and reduce further pollution. For the purposes of this plan, pond water quality is defined in Appendix A. <sup>1</sup>

### **1.2 Motivation**

The need to take steps to restore the water quality of Eastham's ponds has been demonstrated by studies of our pond water over the past 12 years showing deteriorating water quality, which is likely to continue without intervention to remediate the damage already done and reduce the likelihood of recurrence by addressing the causes of the deterioration. These studies concluded that the main cause of deterioration is the flow of phosphorus into the ponds from individual septic systems in the watersheds, phosphorus held in sediment in the ponds, lawn and garden maintenance, precipitation, road and parking lot runoff, roof runoff and bird droppings.<sup>2</sup>

While long range efforts to deal with excess nutrient flow from phosphorus and nitrogen into estuaries and ponds through the replacement or upgrading of septic systems and other steps offer the possibility of a cure for the problems of our ponds and coastal waters down the road it is imperative to take steps now to protect our waters with tools that are readily available with a reasonable amount of effort. The purpose of this plan is to identify and recommend actions that we believe can be taken with reasonable effort and to restore the water quality of our ponds and reduce conditions that would contribute to a recurrence of the problem.

### **1.3 Charge**

In its letter dated August 13, 2012, the Board of Selectmen requested that the Water Management Committee (WMC) "take the lead on a project to develop and implement a plan to reduce phosphorus in the town's ponds." <sup>3</sup>

The board further requested that the WMC develop "a comprehensive plan to protect town ponds through a policy or regulation for residents on the use of

---

<sup>1</sup> Version 1.0 of the plan and its subversions only address thirteen of Eastham's freshwater ponds because they are included in the current pond water-sampling program. Future versions (2.0, 3.0, etc.) may include other freshwater ponds as well as salt ponds and estuaries.

<sup>2</sup> Table 3-9, pg. 21 of Ecologic Study

<sup>3</sup> The WMC will recommend to the Selectmen that the plan include limiting nitrogen as well as phosphorus as nutrients.

fertilizers, removal of animal wastes, prohibition of phosphate based detergents, and control of storm run-off to ponds [and asked] that the WMC coordinate its efforts with the Board of Health and Conservation Commission and provide a draft plan by the end of November 2012.”

## 1.4 Objective

The objective of this plan is to define a comprehensive and coordinated approach and schedule that will result in well-defined policies, regulations and procedures leading to the remediation of pond water quality and the subsequent maintenance of pond water quality in the Town of Eastham. The WMC will take advantage of the previous work done within Eastham (i.e., Appendix B and Policy on the Content and Application of Fertilizers and Pesticides on Municipal Land in the Town of Eastham) and by other municipalities<sup>4</sup> and groups to provide the basis for reasonable, actionable and effective procedures.

## 2.0 Roles and Responsibilities

The roles and responsibilities of the various organizational entities that will participate in the plan are grouped as follows: Primary Participants, Coordinating Organizations, and Review and Comment Organizations.

### 2.1 Primary Participants

The primary participants in the development of this plan and their roles and responsibilities are:

- The **Water Management Committee** is responsible for drafting the plan, soliciting input from the other primary participants, coordinating a review and comment process to ensure all stakeholders have appropriate input, finalizing the plan and monitoring its execution.
- The **Board of Health** assists in the development and evaluation of the plan by providing input as requested by the WMC and reviewing and commenting on the plan drafts to ensure the content is complete and consistent with respect to Eastham Board of Health regulations.
- The **Conservation Commission** is responsible for supporting the development of the plan by providing input as requested by the WMC and reviewing and commenting on the drafts to ensure the content and the

---

<sup>4</sup> E.g., Best Management Practices for Landscape Fertilizer Use on Nantucket Island, <http://www.nantucketlandcouncil.org/Reports/fertilizerbestpractices.pdf>

responsibilities ultimately allocated to the Commission are complete and consistent with the charge of the Commission.

- The **Board of Selectmen** is responsible for approving the plan, reviewing progress to ensure the team remains on the right track, reviewing and commenting on the appropriateness of the products proposed to be developed and actions to be carried out in accordance with the plan (e.g., policies, regulations), and monitoring and guiding the execution of the plan.

## 2.2 Coordinating Organizations

Coordinating organizations are entities within Eastham's governance structure, other than the primary participants, who will have responsibilities and duties as a result of the policies and procedures developed under the plan and, therefore, must be given the opportunity to voice their opinions, concerns and recommendations. The specific list of organizations will evolve as the plan unfolds but at this writing the list of coordinating organizations may include the following:

- Public Works Department
- Natural Resources Department Office
- Building Department
- Planning Board
- Zoning Board of Appeals
- Recreation and Beaches

As appropriate, the WMC will inform the coordinating organizations of the intentions of the plan and their potential roles, solicit their inputs and recommendations, and provide the opportunity to review and comment on the plan drafts as well as the drafts of the products during the execution of the plan.

## 2.3 Review and Comment Organizations

Review and comment organizations are the groups external to Eastham's governance structure that may be interested in and concerned about the results of the plan and, therefore, will be given the opportunity to provide inputs and voice any concerns they may have. The specific list of organizations will evolve as the plan unfolds but at this writing the list may include the following:

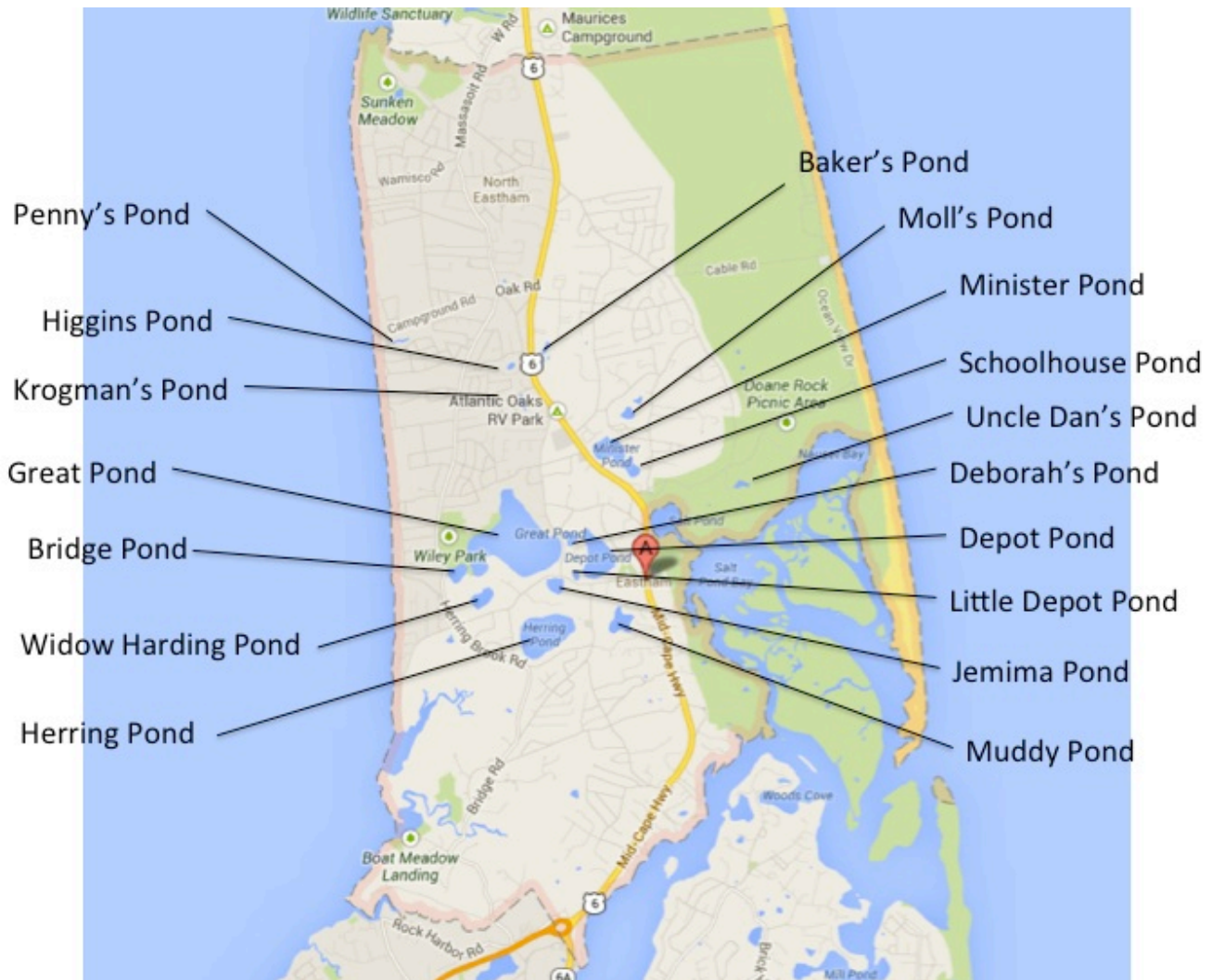
- Eastham town taxpayers
- Eastham pond associations (e.g., Depot, Herring, Minister/Schoolhouse Pond Associations and Widow Harding)
- Pond and Lakes (PALs) Volunteer Group
- Cape Cod National Seashore
- Local landscaping contractors

- Local housing contractors
- Local plant nurseries
- Local realtors
- Cape Cod Commission
- Barnstable County Department of Health and the Environment
- Massachusetts Department of Transportation

It is expected that the review and comment process will include public hearings and the provision of drafts of the plan and associated products consistent with the Open Meeting Law.

### 3.0 Scope of the Plan

The Town of Eastham has many freshwater ponds of varying sizes and usage, as illustrated in the following figure.





The initial version of this plan includes the eleven freshwater ponds for which there are mature pond sampling and testing programs. Table 1 provides some descriptive data about the ponds.<sup>5</sup>

**Table 1**  
**Town of Eastham Ponds Included in the Initial Version of the Plan**

<b>Pond<sup>6</sup></b>	<b>Surface Area (Acres)</b>	<b>Maximum Depth (Feet)</b>	<b>Watershed Area (Acres)</b>	<b>Impairment</b>
Bridge	6.7	20	7.9	Slightly Impaired
Depot	27.9	33	65	Impaired
Little Depot	2.3	15	2.3	Impaired
Great	109.7	37	226	Highly Impaired
Herring	44.2	35	80	Highly Impaired
Jemima	6.4	15	18	Impaired
Ministers	16	14	151	Highly Impaired
Schoolhouse	6.8	14.5	5.7	Slightly Impaired
Molls	3.4	13	8.1	Impaired
Muddy	10.5	5	40	Highly Impaired
Widow Harding	8.7	13	26	Slightly Impaired

Six smaller ponds do not have specific recommendations for action in this initial version of the plan because there is no or only limited water quality data for those ponds. There is no water quality data for Krogman’s, Baker’s, Uncle Dan’s or Deborah’s because there is no pond sampling program in place for those ponds. There is only limited data available for Penny’s and Higgins because sampling began there only recently. These ponds may be added to a future version of the plan if corrective actions are indicated as a result of sampling.

The most recent study of pond water quality recommends the following town and homeowner actions to mitigate the negative impact and enhance water quality in

---

<sup>5</sup> This section is based on, “Action Plan for the Town of Eastham Ponds,” prepared by EcoLogic, Dec 2011, Cazenovia, NY, and GHD, Hyannis (Final document on Town website. ([http://www.eastham-ma.gov/Public\\_Documents/EasthamMA\\_WebDocs/WaterManagementDocs/FinalReportPondsActionPlan05142012.pdf](http://www.eastham-ma.gov/Public_Documents/EasthamMA_WebDocs/WaterManagementDocs/FinalReportPondsActionPlan05142012.pdf)).

<sup>6</sup> Ponds with beaches include Great and Herring Ponds. Ponds with boat ramps and landings include Great, Herring, and Ministers Ponds. Ponds with other public access or use include Jemima’s, Depot, Widow Harding, and Bridge Ponds.

the Town of Eastham. These actions, and the policies and procedures needed to accomplish these actions, will be considered within the initial scope of this plan.

The following are actions that may be undertaken by the Town:

- Engage in public education
- Promote septic system maintenance/upgrades as required by Massachusetts Department of Environmental Protection and BOH Regulations and recommendations
- Manage storm water runoff from paved surfaces
- Require maximum feasible setbacks from surface water for new or replacement septic systems as required by Massachusetts Department of Environmental Protection and BOH regulations.
- Conduct in-pond treatments as needed (e.g., alum treatment, enhanced mixing)
- Control phosphorus levels through best management practices
- Discourage feeding water fowl
- Identify and acquire open space parcels of land

The following are actions that may be undertaken by individuals and associations:

- Become more aware of the watersheds within which they reside and their needs and sensitivities
- Become more educated as to the best residential practices for lawn care and wastewater management
- Adopt responsible lawn maintenance and gardening practices
- Pursue septic structure maintenance/upgrades
- Restore and maintain vegetated shoreline
- Control residential water runoff
- Implement aquatic plant controls
- Discourage large flocks of birds
- Pick up pet waste

Additional actions may be added if identified during the development or execution of the plan

## **4.0 Approach**

The following steps will be taken to develop and implement the comprehensive plan. Additional details will be added to the plan, including appendices for each individual pond, as specific actions are selected for implementation, with approval of the Board of Selectmen, and will be updated periodically as appropriate.



## **4.1 Compile a pond issues inventory**

In addition to common issues, an inventory of the specific issues of each pond will be compiled and used to develop individual action plans as needed. The issues inventory will be based on prior studies of the ponds, in particular the “Action Plan for the Town of Eastham Ponds”. Additional information may be gathered where there are gaps in information for any individual pond.

## **4.2 Analyze the candidate actions for feasibility and potential effectiveness**

Each of the candidate actions identified in section 3.0 and recommended by the “Action Plan for the Town of Eastham Ponds” will be evaluated as candidates for implementation with the following as guiding principles:

- Degree to which the action may contribute to meeting the plan’s objectives for the Town’s ponds<sup>7</sup>
- Products (e.g., policies, regulations) that may be required to achieve the action
- Processes that may be required to be put in place to achieve the action (e.g., Planning Board review)
- Identification of coordinating organizations that would be involved in executing the action
- Identification of review and comment organizations that would be affected by the action
- Any expense or funding required to achieve the action
- Identification of timeframe within which the action can be initiated
- Identification of timeframe within which positive results would be expected in improving pond water quality
- Quantitative means by which progress can be measured and monitored once implemented

During this process inputs will be solicited from the coordinating and review/comment organizations as appropriate.

## **4.3 Prioritize the candidate actions**

The candidate actions will then be prioritized based on a subjective assessment of:

- Degree to which they are most likely to have the greatest impact on improving water quality of the respective ponds
- Degree to which they can be executed quickly with positive impact and modest cost and effort

---

<sup>7</sup> Different ponds may have different pressing needs that best align with different candidates.

- Identification of which candidates have near-term benefits and which are considered long-term solutions
- Degree to which the candidate is intrusive on the stakeholders and likely to be supported (or not) by the stakeholders

During this process additional inputs will be solicited from the coordinating and review/comment organizations as appropriate.

#### **4.4 Select candidates and coordinate with Selectmen**

Select a set of actions that the WMC, in coordination with the Board of Health and the Conservation Commission, will present to the Board of Selectmen based on the results of the previous steps. Meet with the Board of Selectmen and present the recommendations with the supporting rationale for their approval. Update the comprehensive plan to include the details of the selected actions (i.e., Appendix C).

#### **4.5 Implement the selected actions**

The WMC will work with the other organizations to develop the products and implement the processes for the approved initiatives. It is anticipated that this may include, but is not limited to, the following types of products and activities:

- Town-initiated products and activities such as:
  - New or modified bylaws<sup>8</sup> coordinated with the appropriate organizations (e.g., Planning Board, Zoning Board of Appeals, Board of Health)
  - New or modified permitting processes coordinated with the appropriate organizations (e.g., Building Department, Planning Board, Zoning Board of Appeals, Board of Health)
  - Development or acquisition of educational materials for the public<sup>9</sup> and the conduct of public education forums
  - Targeted education of citizens on such items as how to improve pond quality by better lawn and gardening management practices, including fertilizer and soil conditioners
- Physical activities coordinated with and implemented through the appropriate organizations (e.g., DPW, pond associations), such as:
  - Construct/reconstruct storm water control devices to limit the movement of plant nutrients, in dissolved and solid form, from paved areas directly into surface waters
  - Alum treatment of ponds, such as Herring Pond

---

<sup>8</sup> Such as accelerated replacement of remaining non-Title 5 septic and cesspools.

<sup>9</sup> E.g., "The Massachusetts Lake and Pond Guide," prepared by Mass Department of Conservation and Recreation.

- Consideration of new/alternative technology to limit the movement from septic structures of plant nutrients in dissolved form to nearby surface and groundwater
- Pond restoration/remediation actions to promote a diverse aquatic ecosystem including enhanced water mixing, enhanced dissolved oxygen, and retard release of phosphorus from bottom sediments
- Means to reduce or eliminate cormorant and migratory bird roosting on high voltage, electrical transmission lines over ponds like Little Depot Pond
- Work with land owners to cut, collect and remove rooted, submerged aquatic plants from near shorelines
- Continue pond sampling by PALS volunteers
- Coordination with applicable Barnstable County<sup>10</sup> and Commonwealth of Massachusetts<sup>11</sup> organizations

During this process further inputs and comments will be solicited from the stakeholder organizations either directly or in public hearings. Town Counsel may also be asked to review any materials that may have legal implications or require petitioning outside of Eastham.

#### **4.6 Monitor and assess progress**

Work with the applicable organizations to measure and monitor progress in achieving the plan's objectives. Periodically review progress with the Board of Selectmen. Adjust the plan based on achieved results in coordination with the Board of Health and Conservation Commission, as approved by the Board of Selectmen.

---

<sup>10</sup> E.g., Cape Cod Commission, County Board of Health, Cape Cod Water Protection Collaborative, Cape Cod Cooperative Extension Service

<sup>11</sup> E.g., Department of Environmental Protection, Department of Conservation and Recreation, Department of Fish and Game

## 5.0 Schedule for Completing the First Version of the Plan

Event	Start Date	End Date	Status
Coordinate approach with BoS	11/7/12	11/7/12	Completed
Coordinate approach with Conservation Commission	12/11/12	12/11/12	Completed
Coordinate approach with Board of Health	12/27/12	12/27/12	Completed
Complete pond issues inventory (4.1)	12/4/12	2/12/13	Completed
Complete appendix A and C. Accept changes as version 0.7.	12/4/12	2/18/13	Completed for coordination purposes
Coordinate version 0.7 with ConsCom and BoH	3/28/13	4/23/13	BoH coordinated on the plan on 3/28. Suggested scheduling a workshop with them to coordinate Appendix C actions. ConsCom meeting held on 4/23 and comments received.
Address comments from the ConsCom and BoH (if necessary)	4/23/13	7/1/13	Draft responses provided on 6/11/13  Responses completed on 7/1/13 to be sent to BoH and ConsCom
Coordinate final changes with ConsCom and BoH (if necessary)	7/22/13	11/12/13	Harris presented responses to BoH and provided electronic copy of v0.8 to ConsCom on July 22.  Met with BoH on July 22. BoH met on July 25 to go over the document and provide comments. Received additional comments on July 29 and have included them.

			Received final comments from ConsCom and completed corresponding changes on 11/12/13
Meet with the BOS to seek approval to coordinate with Coordinating Organizations (2.2), to post latest version on the town website and hold a public hearing (if appropriate)	12/2/13	12/2/13	Presentation was given to the BoS and they approved moving ahead as proposed.
Send letter to Coordinating Organizations (2.2) with latest version attached to make them aware of the plan and to offer to meet with them if desired	11/12/13	12/23/13	Letter drafted on 11/12/13 and revised as an email on 12/23/13  Email sent with comment deadline of 2/15/14
If approved by the BOS, post latest version on the Town's website	12/10/13	12/16/13	Posted on the town website under "Hot Topics," "News & Announcements" and in the WMC section
Post a story in the Cape Codder informing of the draft plan on the website and soliciting feedback from Review and Comment Organizations (2.3)	12/10/13	12/16/13	Draft announcement was sent to the Cape Codder on 12/16 and the story appeared in the 12/20/13 edition

If desired by the BOS, hold a public hearing on the draft plan			Only one comment was received. A public hearing is not required.
Address comments from the Coordinating (2.2) and Review and Comment (2.3) Organizations	12/20/13	4/15/14	
Prepare the final draft of v1.0	4/15/14	6/10/14	
Coordinate final draft of v1.0 with BoS, BoH and ConsCom. Revise if necessary.	9/11/14	11/18/14	No comments were received from the BoS, BoH or ConsCom
Approve v1.0	11/18/14		
Publish v1.0 on town website			
Revise v1.0 in future sub-releases (v1.1, v1.2, etc.) to reflect updates as described in 4.6			As required

## Appendix A

### Definition of Pond Water Quality

Water quality in Eastham is defined in terms of its effects on the safe and pleasurable use of the ponds by residents and guests. “Over fertilization,” which results from nutrient accumulation in the ponds, stimulates the growth of algae, which in turn causes several water quality problems in these surface waters including:

- Loss of water clarity which makes swimming, fishing, and boating less attractive
- Algae settling to the bottom of the estuaries and ponds where it decays, using up dissolved oxygen (DO) in the process; the impacts of decaying algae and associated low DO can kill fish and shellfish
- Loss of animal habitat and the production of odors from the rotting algae.
- Occurrence of Blue-green algae resulting in toxic blooms.

Good water quality is also essential to the well being of humans and to the ecology of our ponds. In Massachusetts, water quality standards are found in the regulations written to interpret the Massachusetts Clean Water Act, General Law c. 21 Parag. 26-53. These regulations are found in the Massachusetts Surface Water Quality Standards (314 CMR 4) in the section that applies to ponds that are not drinking water supplies. It is against these standards that the Eastham ponds were evaluated in 2009 and again in 2011. These studies found that all Eastham ponds are currently impacted by nutrients, particularly phosphorus.

In technical terms a lake or pond is usually classified as being in one of three possible classes: *oligotrophic*, *mesotrophic* or *eutrophic*. Lakes and ponds with extreme trophic indices may also be considered *hyperoligotrophic* or *hypereutrophic*. The table below demonstrates how the index values translate into trophic classes.

*Relationships between Trophic Index (TI), chlorophyll (Chl), phosphorus (P, both micrograms per litre), Secchi depth (SD, metres), and Trophic Class (after Carlson 1996)<sup>12</sup>*

TI	Chl	P	SD	Trophic Class
<30—40	0—2.6	0—12	>8—4	Oligotrophic
40—50	2.6—20	12—24	4—2	Mesotrophic
50—70	20—56	24—96	2—0.5	Eutrophic
70—100+	56—155+	96—384+	0.5—<0.25	Hypereutrophic

<sup>12</sup> Carlson R.E. and J. Simpson (1996) A Coordinator's Guide to Volunteer Lake Monitoring Methods. North American Lake Management Society; <http://www.secchidipin.org/tsi.htm>



Oligotrophic lakes generally host very little or no aquatic vegetation and are relatively clear, while eutrophic lakes tend to host large quantities of organisms, including algal blooms. Each trophic class supports different types of fish and other organisms, as well. If the algal biomass in a lake or other water body reaches too high a concentration (say  $>80$  TI), massive fish die-offs may occur as decomposing biomass deoxygenates the water.

## Appendix B

### **(Draft) History of Related Pond Quality Actions to Date**

2001: Eastham Water Resources Advisory Board (WRAB) initiates annual Water Quality Monitoring Program involving about 60 private wells to be tested for nitrogen. Volunteers trained by Cape Cod Commission (CCC) and Cape Cod National Seashore staff begin to sample Eastham freshwater ponds for Nitrogen (N), Phosphorus (P), chlorophyll-a, dissolved oxygen and clarity.

2002: Eastham Wastewater Management Planning Committee (WMPC) is founded.

2003: Water Quality Monitoring Program expanded to include town wide well testing with town divided into three sections with wells in each section to be tested every three years.

2004: WRAB and WMPC merge in order to work together on the closely linked issues of drinking water protection and wastewater treatment planning. Eastham Health Agent named Eastham rep to Cape Cod Wastewater Planning Collaborative (CCWPC).

May 2006: Town meeting funds an initial wastewater management planning Article; Stearns and Wheler selected as consultant. Technical subcommittee begins to work with the consultant to determine the needs of the town for wastewater management planning .

2006: Barnstable County Department of Health and Environment formulates a report on the effectiveness of Eastham's many Innovative/Alternative (I/A) sewage treatment systems. Pond sampling data for years 2001-2006 submitted to CCC water quality staff for evaluation, interpretation and recommendations.

Jan. 2008: WMPC technical subcommittee, having reviewed the draft Rock Harbor MEP report which had been received in fall 2007, sends questions regarding its findings to Dept. of Environmental Protection (DEP) via BOS.

May 2008: Town meeting approves a formal study of Eastham's wastewater management planning needs.

Dec. 2008: BOS approves WRAB-WMPC name change to Water Management Committee (WMC) and revised mission statement for WMC that adds pond water quality charge.

March and June 2009: Two Stearns and Wheler reports, *Final Interim Needs Assessment and Alternatives Screening Analysis Report* and *Wastewater Project Plan Evaluation Report*, received and presented publicly. The report recommends that the town either sewers the pond watershed or treats impacted ponds with alum. (Executive Summary of the latter available at <http://www.eastham-ma.gov/>)

[Public Documents/EasthamMA\\_WebDocs/  
WaterManagementDocs/WWMgtFinalExecSum.pdf](http://www.eastham-ma.gov/Public_Documents/EasthamMA_WebDocs/WaterManagementDocs/WWMgtFinalExecSum.pdf) )

May 2009: *Eastham Freshwater Ponds: Water Quality Status and Recommendations for Future Activity*, prepared by UMass Dartmouth and CCC Water Resources Program received and presented at a public meeting. (Available at [http://www.eastham-ma.gov/Public\\_Documents/EasthamMA\\_WebDocs/WaterManagementDocs/PondsFinalRpt.pdf](http://www.eastham-ma.gov/Public_Documents/EasthamMA_WebDocs/WaterManagementDocs/PondsFinalRpt.pdf) )

May 2010: Town Meeting approves the inclusion of funds for pond restoration planning in the five year capital plan.

June 2010: Brochure describing the conclusions of the June 2009 Stearns and Wheler Wastewater Project Plan Evaluation Report sent to all homeowners. [Get a copy for WMC records]

Sept.- Dec. 2010: WMC meets with Orleans Citizens Peer Review Committee and Brian Howes and Ed Eichner of the UMass Dartmouth Coastal Systems Group regarding the Draft Rock Harbor MEP report, DEP's Brian Dudley observing, and BOS meets with Brian Dudley.

Dec. 2010: WMC prepares a Request for Proposals (RFP) for pond restoration study and submits it to BOS accompanied by a request that BOS request Town Meeting approve funding for pond restoration in the capital budget in May 2011.

May 2011: Town Meeting approved expenditure of \$65,000 to fund a study by a consultant of the 11 ponds in Eastham to evaluate their water quality and recommend at least two of the ponds for remedial action. RFP is issued and Ecologic LLC and GHD selected to perform pond study.

August 2011: Ecologic and GHD present Review of Findings and lead public discussion of how to set priorities for action at a joint session of BOS, WMC, Board of Health (BOH) and Conservation Commission (ConsCom)

October 2011: Ecologic and GHD submit their Draft Report which is posted on Town website and subsequently present highlights of the Report for comment and public discussion at a joint session of BOS, WMC, BOH and ConsCom.

November 2011: WMC recommends that one deep pond, Herring, and one shallow pond, Minister/Schoolhouse be selected as candidates for remediation to test alternative approaches appropriate to ponds of different depths and decides to seek approval from BOS to make an application for Community Preservation Committee (CPC) funds to support remediation consistent with the previous motion on priorities and recommendation on costs.

December 2011: Ecologic and GHD submit Final Ponds Action Plan

December 2011: BOS approves selection of Herring and Minister/Schoolhouse for priority remediation.

WMC applies to Community Preservation Committee (CPC) for a grant of \$280,000 to cover the cost of remediation at both ponds.

WMC recommends that BOS proceed with an application for a permit for alum treatment for Herring Pond, Ecologic's recommended treatment method for that pond and that BOS have further discussions with Ecologic with respect to a treatment method for Schoolhouse/Minister.

February 2012: WMC receives Ecologic/GHD memorandum detailing cost estimates for remediation of Herring and Minister/Schoolhouse at a total cost of \$280,000. In response to request from CPC that WMC limit its grant application to \$140,000 for treatment of Herring, WMC decides to submit amended application.

March 2012: [ck date] CPC submits Article for Town Meeting Warrant to authorize expenditure of \$140,000 for alum treatment at Herring Pond.

April 2012: [ck date] Application for permit to treat Herring submitted to ConsCom by consultants.

August 2012: ConsCom files permit and Order of Conditions with Mass. DEP. Permit issued.

## Appendix C

### Common and Individual Pond Action Plans

#### C.1 Overview

This appendix delineates the specific actions that will be taken. These include common actions that will apply to all ponds and actions that are specific to individual ponds.

#### C.2 Common Actions that Will Benefit All Ponds

The follow actions will be taken that apply to all ponds.

Action	Start Date	End Date	Lead(s)	Status
<b>Regulation</b>				
Encourage maximum possible setbacks from pond shorelines for new and replacement septic systems	Ongoing		Conservation Commission	This is already within the ConsCom's authority and is an ongoing activity.
Work with the ConsCom to encourage pond abutters to maintain or reestablish a 100' buffer zone of native plantings on the pond side	Ongoing		Conservation Commission	This is already within the ConsCom's authority and is an ongoing activity.
<b>Pond-related Public Works Management</b>				
Work with DPW to develop a prioritized schedule for needed corrections for controlling storm runoff at ponds				Harris to meet with DPW in December to fully understand his plans for storm water runoff.
<b>Pond Monitoring and Remediation</b>				

Continue pond sampling to monitor water quality by means of the Barnstable County supported Ponds and Lakes Steward (PALS) Program, or similar program, as needed to assure its continuation and expansion if necessary	Ongoing			
BoH continues to conduct water sampling and testing for harmful bacteria at ponds used by the public	Ongoing		Board of Health	Ongoing, business as usual in accordance with state regulations. Information is available to the public in multiple ways, including town web site.
Develop a strategy and schedule for seeking funding for and conducting treatment of remaining ponds that require treatment (see pond plans for specifics)				
Monitor ponds to identify the presence of large flocks of birds, analyze the extent to which it is possible to restrict/deter large flocks of birds and identify steps to discourage their presence where needed				Example of possible actions: Orleans recommendations for Cedar Pond on Orleans web site.
Coordinate pond-related activities with the respective pond associations				Ongoing activity
<b>Public Education/Communication</b>				
Develop strategy for educating the public about best practices to protect pond water quality	5/14/13		Dumas	Target list of groups and candidate methods to reach them was created on 6/9/13.
Develop awareness brochure of good practices for property owners for distribution within the town, e.g. what to look for	12/12		Sisterson	Version 2.3 of draft brochure on 5/4/13. Version 2.4 of draft

<p>in fertilizers</p>				<p>provided on 6/8/13.  V2.4 presented to BoS on 7/1/13.  Updated drafts sent to WMC on Sept 6 and Oct 4.  WMC is developing recommendations as to the numbers to be printed and distribution methods for submission to BoS.  6000 copies were printed and picked up in May 2014. The WMC has begun distributing the brochures.</p>
<p>Acquire funding for printing awareness brochure</p>			<p>Harris</p>	<p>Graphic Arts at Cape Cod Regional High School can print for \$0.19/copy for 2000 or more copies.  Town has agreed to pay for cost of printing the brochure after BoS approval.  6000 copies were printed and picked up in May 2014. The WMC has begun distributing the brochures.</p>



## Appendix C, Annex 1 Bridge Pond Action Plan

### CA1.1 Bridge Pond Issues Inventory

Bridge Pond is hydrologically connected to Great Pond for inflow and outflows to Herring Brook, which in turn outflows to Cape Cod Bay. Therefore, Bridge Pond inherits some Issues from Great Pond. The specific issues are:

- Deep waters have low dissolved oxygen
- Possible sediment release of phosphorus
- Water runoff from Herring Brook Road

### CA1.2 Bridge Pond Actions

The following actions are and will be taken with regard to Bridge Pond:

Action	Start Date	End Date	Lead(s)	Status
Coordinate remedial actions to reduce phosphorus with Great Pond actions	As required			
Monitor Eastham DPW upgrades to Herring Brook Road relative to Bridge Pond	Fall 2012			Construction under way as of March 2013
Take actions to improve and maintain shoreline vegetative buffers of 100'				

## **Appendix C, Annex 2 Depot Pond Action Plan**

### **CA2.1 Depot Pond Issues Inventory**

The specific issues of Depot Pond are:

- Most likely phosphorus sources: Septic, birds, roads, roofs
- Deep waters have oxygen depletion in summer
- 6 residences within 300' up-gradient with one other developable parcel
- Septic system contribution may increase as discharges slowly reach the pond
- Sediment phosphorus release

### **CA2.2 Depot Pond Actions**

The following actions are and will be taken with regard to Depot Pond:

<b>Action</b>	<b>Start Date</b>	<b>End Date</b>	<b>Lead(s)</b>	<b>Status</b>
Plan and conduct alum treatment if necessary				
Take actions to improve and maintain shoreline vegetative buffers of 100'				

## **Appendix C, Annex 3 Great Pond Action Plan**

### **CA3.1 Great Pond Issues Inventory**

Great Pond is hydrologically connected to Bridge Pond. Therefore, actions taken for Great Pond will also benefit Bridge Pond. The specific Issues of Great Pond are:

- Deep waters have oxygen depletion in summer
- Most likely phosphorus sources: Sediment, precipitation, septic
- 22 properties within 300' up-gradient
- Septic system contribution may increase as discharges slowly reach the pond (time of travel estimated 35-81 years)
- Sediment phosphorus release
- Water runoff from roads, Town Beach and Wiley Park

### **CA3.2 Great Pond Actions**

The following actions are and will be taken with regard to Great Pond:

Action	Start Date	End Date	Lead(s)	Status
Plan and conduct alum treatment	2/4/13	6/6/13	Blong, Board of Health	<p>Application submitted to Community Preservation Committee for \$220K on 2/4/13.</p> <p>The proposal was approved at Town Meeting and an implementation schedule has been developed by BoH.</p> <p>Staff meeting with Ecologic and company to schedule site visit and address questions/issues that all town departments might have.</p> <p>Sediment sampling done in late July.</p> <p>Will be used to determine chemical dose.</p> <p>ConsCom Orders of Condition have been registered and is available on their web site.</p> <p>Alum treatment was completed by October 6, 2013.</p> <p>Draft EcoLogic report provided on October 23,</p>

				2013. Results reported to be very positive at Town pond meeting on September 5, 2014.
Consider actions to replace septic systems with sewers				
Take actions with DPW to curtail road and parking lot run-off				
Take actions to improve and maintain shoreline vegetative buffers of 100'				

## Appendix C, Annex 4 Herring Pond Action Plan

### CA4.1 Herring Pond Issues Inventory

The specific Issues of Herring Pond are:

- Abundant algae
- Dissolved oxygen depletion in deep water
- Increasing phosphorus
- Most likely phosphorus sources: Sediment, roads, precipitation, roofs, septic
- 20 leach fields within 300' up-gradient
- Septic system contribution may increase as discharges slowly reach the pond (time of travel estimated 35-81 years)
- Sediment phosphorus will continue to be important

### CA4.2 Herring Pond Actions

The following actions are and will be taken with regard to Herring Pond:

Action	Start Date	End Date	Lead(s)	Status
Monitor the results of alum treatment			Crowley	Encouraging report on 6/18/13  Crowley reported on Aug 13 that results so far are very positive.  Results reported to be very positive at Town pond meeting on September 5, 2014.
Take actions for aquatic plant controls				
Take actions to improve and maintain shoreline vegetative buffers of 100'				

## **Appendix C, Annex 5 Jemima Pond Action Plan**

### **CA5.1 Jemima Pond Issues Inventory**

The specific Issues of Jemima Pond are:

- 6 residences within 300'
- Most likely phosphorus sources: birds, septic, precipitation, road runoff
- Septic system contribution may increase as discharges slowly reach the pond (time of travel estimated 35-81 years)

### **CA5.2 Jemima Pond Actions**

The following actions are and will be taken with regard to Jemima Pond:

<b>Action</b>	<b>Start Date</b>	<b>End Date</b>	<b>Lead(s)</b>	<b>Status</b>
Monitor Samoset Road shoulder for indication of possible road runoff flowing into the pond				
Take actions to improve and maintain shoreline vegetative buffers of 100'				



## Appendix C, Annex 6 Little Depot Pond Action Plan

### CA6.1 Little Depot Pond Issues Inventory

The specific Issues of Little Depot Pond are:

- 3 residences within 300'
- Most likely phosphorus sources: birds, septic, precipitation, road runoff
- Septic system contribution may increase as discharges slowly reach the pond (time of travel estimated 35-81 years)

### CA6.2 Little Depot Pond Actions

The following actions are and will be taken with regard to Little Depot Pond:

Action	Start Date	End Date	Lead(s)	Status
Take actions with DPW to curtail road runoff from Samoset Road				
Take actions to improve and maintain shoreline vegetative buffers of 100'				
Take actions to discourage cormorants from perching above pond as required				

## Appendix C, Annex 7 Minister Pond Action Plan

### CA7.1 Minister Pond Issues Inventory

Minister Pond is hydrologically connected to Schoolhouse Pond. Phosphorus concentrations are presently stable but may increase over time as septic system contributions increase.

The specific Issues of Minister Pond are:

- Dissolved oxygen loss in deep waters
- Most likely phosphorus sources: birds, septic, precipitation, road runoff
- Approximately 18 residences within 300'
- Septic system contribution may increase as discharges slowly reach the pond (time of travel estimated 35-81 years)
- Receives substantial storm water runoff from Route 6

### CA7.2 Minister Pond Actions

The following actions are and will be taken with regard to Minister Pond:

Action	Start Date	End Date	Lead(s)	Status
Take actions to improve and maintain shoreline vegetative buffers of 100'				
Request MassDOT expedite construction of a storm water runoff infiltration structure to replace direct discharge from Route 6 into the pond				
Pursue temporary means to deflect Route 6 storm water inflow from entering into water body				
Coordinate actions with Schoolhouse Pond actions	As required			
Take actions to increase circulation in the pond				

## **Appendix C, Annex 8 Molls Pond Action Plan**

### **CA8.1 Molls Pond Issues Inventory**

The specific Issues of Molls Pond are:

- Occasional low oxygen in deeper waters
- Most likely phosphorus sources: Roads, septic, sediment
- 16 residences within 300' and 2 developable parcels
- Septic system contribution may increase as discharges slowly reach the pond (time of travel estimated 35-81 years)<sup>13</sup>

### **CA8.2 Molls Pond Actions**

The following actions are and will be taken with regard to Molls Pond:

<b>Action</b>	<b>Start Date</b>	<b>End Date</b>	<b>Lead(s)</b>	<b>Status</b>
Take actions to improve and maintain shoreline vegetative buffers of 100'				

---

<sup>13</sup> There was an incident of potentially harmful algae bloom (Microcystin toxin) in July 2012.

## Appendix C, Annex 9 Muddy Pond Action Plan

### CA9.1 Muddy Pond Issues Inventory

The specific Issues of Muddy Pond are:

- Dense aquatic plant growth
- Most likely phosphorus sources: Roads, septic, birds, precipitation
- 5 residences within 300' up-gradient
- Septic system contribution may increase as discharges slowly reach the pond (time of travel estimated 35-81 years)

### CA9.2 Muddy Pond Actions

The following actions are and will be taken with regard to Muddy Pond:

Action	Start Date	End Date	Lead(s)	Status
Take actions to improve and maintain shoreline vegetative buffers of 100'				
Take actions for aquatic plant control				
Take actions to increase circulation in the pond				

## Appendix C, Annex 10 Schoolhouse Pond Action Plan

### CA10.1 Schoolhouse Pond Issues Inventory

Schoolhouse Pond is hydrologically connected to Minister Pond. Phosphorus concentrations appear stable. The specific Issues of Schoolhouse Pond are:

- Most likely phosphorus sources: Birds, roads, precipitation, input from Minister Pond
- Occasional stratification and low oxygen may allow sediment phosphorus release
- One leach field within 300' up-gradient
- Some road runoff from the landing

### CA10.2 Schoolhouse Pond Actions

The following actions are and will be taken with regard to Schoolhouse Pond:

Action	Start Date	End Date	Lead(s)	Status
Coordinate actions with Minister Pond actions	As required			
Take actions with DPW to curtail road runoff				
Take actions to increase circulation in the pond				
Take actions to improve and maintain shoreline vegetative buffers of 100'				

**Appendix C, Annex 11  
Widow Harding Pond Action Plan**

**CA11.1 Widow Harding Pond Issues Inventory**

The specific Issues of Widow Harding Pond are:

- Occasional stratification and low oxygen may allow sediment phosphorus release
- Most likely phosphorus sources: birds, septic, precipitation, road runoff
- 11 residences within 300' up-gradient
- Septic system contribution may increase as discharges slowly reach the pond (time of travel estimated 35-81 years)

**CA11.2 Widow Harding Pond Actions**

The following actions are and will be taken with regard to Widow Harding Pond:

<b>Action</b>	<b>Start Date</b>	<b>End Date</b>	<b>Lead(s)</b>	<b>Status</b>
Take actions to improve and maintain shoreline vegetative buffers of 100'				

## Appendix D

### References

1. "Policy on the Content and Application of Fertilizers and Pesticides on Municipal Land in the Town of Eastham," July 2013
2. "Action Plan for the Town of Eastham Ponds," prepared by EcoLogic, Dec 2011, Cazenovia, NY, and GHD, Hyannis (Final document on Town website) ([http://www.easthamma.gov/Public\\_Documents/EasthamMA\\_WebDocs/WaterManagementDocs/FinalReportPondsActionPlan05142012.pdf](http://www.easthamma.gov/Public_Documents/EasthamMA_WebDocs/WaterManagementDocs/FinalReportPondsActionPlan05142012.pdf))
3. Best Management Practices for Landscape Fertilizer Use on Nantucket Island, <http://www.nantucketlandcouncil.org/Reports/fertilizerbestpractices.pdf>
4. "The Massachusetts Lake and Pond Guide," prepared by Mass Department of Conservation and Recreation.
5. Carlson R.E. and J. Simpson (1996) A Coordinator's Guide to Volunteer Lake Monitoring Methods. *North American Lake Management Society*; <http://www.secchidipin.org/tsi.htm>