

*Lake Hayward*

## **Lake and Watershed Management Plan: Outline**

Lake Hayward Property Owners Association

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## Introduction

This document is an outline of a Lake and Watershed Management Plan (LWMP) for Lake Hayward in East Haddam, CT. For the development of this project the Property Owners Association of Lake Hayward (POALH) contracted with CME Associates, Inc. (CME) to conduct a stakeholder kickoff meeting in January 2015 and to produce this outline. The Lake Quality Improvement Committee (LQIC), a group of Lake residents that include both POALH members and residents from the eastern side of the Lake, was instrumental in the development of this document. LQIC members developed the agenda for the stakeholder meeting and invited and made arrangements to have a broad representation for stakeholders at the kickoff meeting. A list of attendees is attached to this document.

The purpose of this document is to identify topics that the LWMP will address. For these topics the following information will be identified:

- Why is this an important issue to address
- What had been done to date
- How does this topic area connect with others areas
- What stakeholder groups could be partners on this topic
- What are the next steps to continue to make progress in this area

Information for each of these questions is outlined for each topic area of the plan. The lists of stakeholders that are suggested for collaboration is not exclusive or exhaustive. The discussion of next steps includes the continuation of on-going actions, new actions to take in the short-term, and suggestions to consider for future study and possible action.

The outline for this Plan is intentionally not designed to completely conform to the US EPA nine elements approach<sup>1</sup>. While the approach for this Plan relies heavily on the EPA watershed planning approaches, there is no plan at this time to conduct the work required to quantify specific pollutant loads and their reduction. Lake Hayward is not currently designated as an impaired waterbody by the state. As this LWMP is revised and expanded, those elements may be added. Recommendations for relatively simple data collection are made to help create a monitoring record which can aid future analysis of watershed loads.

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<sup>1</sup> Handbook for Developing Watershed Plans to Restore and Protect our Waters.  
[http://water.epa.gov/polwaste/nps/handbook\\_index.cfm](http://water.epa.gov/polwaste/nps/handbook_index.cfm)

## Plan Goal

The primary goal is to restore, maintain and improve the water quality and environmental values of Lake Hayward. The environmental quality of the Lake and its watershed is recognized to be important for the Lake Community, the Towns of the watershed and the larger Eightmile River watershed. The water quality of Lake Hayward affects its aesthetic, ecological, recreational and financial values.

The decision was made to pursue a specific Management Plan for Lake Hayward and its watershed to help meet the goal. The Plan will be used to:

- Maximize the value of existing data by maintaining a database of previous and on-going studies
- Identify areas for additional monitoring, investigation or long-term planning
- Coordinate and prioritize actions in the lake and watershed to best use limited resources
- Help leverage funding and collaborative opportunities

## 1. Lake Water Quality

Importance: The water quality of the lake is a critical indicator for conditions in watershed and is the central focus of the Plan.

What has been done to date: As part of the LWMP initiation, LQIC has gathered available data into central electronic storage and has combined results from several sources into a single spreadsheet file to facilitate analysis.

The Diagnostic/Feasibility Study conducted in 2000-2001 by Northeast Aquatic Research is the most recent water quality study. Recent annual water quality data is available from monitoring conducted by Aquatic Control Technology (ACT) as part of their aquatic invasive vegetation control.

Connections to other plan elements: Water quality is connected to all the other work on the plan. As implementation projects are developed the project plans should consider the inclusion of monitoring to assess the success of projects, if feasible.

Stakeholder partners: ACT and other technical service providers should continue to be a source of water quality data, including Secchi transparency and algae counts. Additionally, LQIC will expand existing water quality monitoring at beaches for bacteria to include Secchi disk transparency and total phosphorus. Regional partners with volunteer monitoring programs include the CT Federation of Lakes and the CT River Coastal Conservation District.

Next Steps: LQIC will begin collection of Secchi transparency and total phosphorus to develop a baseline for water quality information.

Continue to develop the library of previous studies as volunteer time allows. Additional studies are mentioned in the Diagnostic/Feasibility Study that may still be in files of the Association. Obtaining a copy of the UConn thesis of Battoe (1978) would also be useful (scan to create an electronic version).

Additional recommendations in other sections also include action items that relate to water quality.

Recommended volunteer monitoring for 2015 includes Secchi disk transparency every two weeks. This is preferably done at the center/deep part of the Lake between 10:00 and 2:00 on a clear day. This can be done throughout the year from as early to as late as you can get out on the Lake. (Note that ACT also recommended once every two week Secchi measurement)

Additionally collection of a sample for laboratory analysis of total phosphorus. This can be surface water 'grab' sample (hold the sample container into the lake, if the lab gives you bottles with acid preservative sample with an empty bottle and pour into the bottle with preservative). Monthly sampling for total phosphorus through the summer and early fall is recommended.



## 2. Aquatic Vegetation

Importance: The aquatic invasive plants fanwort (*Cabomba caroliniana*) and variable watermilfoil (*Myriophyllum heterophyllum*) are present at Lake Hayward. The proliferation of aquatic invasive plants is a threat to recreation and the ecology.

What has been done to date: Herbicide treatments of various scales have occurred annually since 2003. Additional aquatic plant inventories and public outreach events have been conducted by the CT Agricultural Experiment Station.

In August 2014 the Town of East Haddam implemented a part-time boat launch monitor to perform occasional monitoring of boats entering lakes at the three state boat launches in East Haddam, including Lake Hayward. Connections to other plan elements: Nuisance and invasive aquatic vegetation can cause problems for recreational uses. Aquatic invasive plants also have negative ecological impacts by reducing plant diversity.

The presence and density of rooted aquatic bed plants relate to water quality but additional factors also control their presence and species distribution including; sediment quality, water transparency and depth.

Stakeholder partners: ACT or other management service providers, CT Agricultural Experiment Station, Eightmile River Wild and Scenic Watershed (Eightmile) and Nature Conservancy for coordination with watershed-level invasive management.

Next Steps: Ongoing/short term: Maintain monitoring and treatment to minimize the area of the lake that has aquatic invasive plants. This should reduce the area requiring treatment and reduce costs and herbicide impacts.

Long-term: Explore other management techniques for aquatic invasive plant control beyond herbicide (benthic barriers, dredging, drawdowns, diver assisted suction harvesting, establishing native plant communities...). Examine whether herbicide treatment of the lake increases hypolimnetic anoxia and/or shift in algal community (see Section 6. Physical Feature for additional discussion of hypolimnetic anoxia or loss of oxygen in bottom waters)





### 3. Residential

Importance: Residential groups are the most important stakeholder group for this Plan. Residential areas are a source for increased nutrient loading to the lake.

What has been done to date: POALH and LQIC have been active in outreach and education to lake area residents. Programs include septic maintenance, invasive aquatic plant identification workshop and a shoreline landscaping demonstration project.

Connections to other plan elements: Residential land use is important as a source of nutrients and bacteria to the lake. Residents are the primary recreational users. Residential and infrastructure (roadway and stormwater) are topic areas related by users. Stormwater and on-site wastewater are both sensitive to soil and groundwater conditions in the watershed.

Stakeholder partners: All governmental and non-governmental groups are possible stakeholders with residents to support outreach and education on the range of topics presented in this Plan.

Next Steps: Shoreline and watershed residential landscaping is an area for on-going outreach. Improved practices at residences can reduce runoff volume, retain nutrients on the landscape, minimize Canada geese presence and improve shoreline ecological conditions. Use Association spaces as models for individual residential practices.

Residential wastewater (septic systems): At present continue to encourage residential maintenance. A longer-term assessment of wastewater issues should include an assessment of soils in developed areas to determine where problems may occur and examine possible solutions including smaller scale systems with leach fields in the surrounding area or longer piped connections to existing area sewer systems.

Pet waste is another nutrient and bacterial source that requires outreach and voluntary compliance by residence to achieve results. Disposal of leaves in the lake increases nutrient loading and sediment build-up. Outreach on these topics should be combined with other residential outreach and education efforts.



#### 4. Infrastructure

Importance: Impervious surfaces and stormwater alter watershed hydrology and impact water quality. Roads, bridges, culverts and the embankment at the Lake are all important area infrastructure.

What has been done to date: The study funded by LISS (Jacobsen and Eightmile) has reviewed outfall conditions throughout the watershed and identified priorities for maintenance and repair.

Stormwater was identified as a priority during the development of this Plan and discussed at length at the stakeholder meeting.

Connections to other plan elements: Infiltration capacity is related to soil and groundwater conditions, physical features which are also important for residential wastewater disposal.

Stakeholder partners: The watershed municipalities and other roadway owners. The CT River Coastal Conservation District and Eightmile are also partners for information about the previous studies and coordination of watershed area efforts.

Next Steps: Stormwater – Obtain additional information available for Colchester that isn't in the East Haddam reporting that is already in the files of POALH. Reviewing and extracting information from the existing studies for just the Hayward watershed could make the information more accessible. Observe priority outfalls identified in that study in the spring and during rainfall events.

Priority Stormwater outfalls at pavilion; next step conduct a feasibility study and cost estimate.

- A. Map the specific drainage area using existing topography and field investigation to confirm connections in the drainage system.
- B. Develop design alternatives to incorporate Low Impact Development (LID) retrofits to the system, if feasible based on site conditions. Possible improvements include removal of curbing, disconnecting drainage areas, infiltration, vegetated swale, tree box filters. Determine if work will be required outside of road right-of-way and if drainage easements would be required.
- C. Size hydrodynamic separator unit for installation at lower end of the system using engineering modeling of the catchment area. Consult with Town for coordination on cleaning of the unit. During this consultation review the possible benefits of removing sand from winter roadway treatment.
- D. Develop cost estimate for construction of system elements.
- E. POALH and East Haddam coordinate on implementation of feasibility plan.

Other infrastructure: Note roadway shoulders in the immediate vicinity of the lakeshore that have stability or erosion problems. Review vegetation management at lakeshore roadways to maintain both vegetative buffers and roadway safety.

Review driveway and drainage ordinance standards to ensure that driveway and roadway stormwater flows are compatible. For example make sure that a driveway allows for roadway gutter flow of stormwater.

Keep up with required spillway and embankment maintenance and examine possible drawdown options if dredging is studied.

Lake Hayward Road Bridge: examine whether flows through the bridge as the main inlet to the Lake, impact sedimentation and hydraulics of water flow through the Lake. This isn't a priority but would be worth investigation if repairs are proposed to the existing bridge.

If any consumptive water diversions or interbasin water transfers are proposed in the watershed the proposals should be examined for impacts to the Lake. Confirm that no significant diversions occur in the watershed at present.

## 5. Land use

Importance: The watershed of Lake Hayward includes portions of the Towns of East Haddam, Colchester and Salem. The export or loading of nutrients varies based on land use. Developed land increases nutrient loading and alters watershed hydrology. Minimizing these changes by improving conditions at developed sites can minimize impacts to water quality.

What has been done to date: Studies of CT land use and lakes have been conducted at the CT Ag. Experiment Station<sup>2</sup> and Connecticut College<sup>3</sup> and have included Lake Hayward. These studies have included land use analysis and development of export coefficients.

GIS land use cover data layers are available for recent time periods. Use of land use data from GIS and research studies needs to understand the limitations of the data sources.

Connections to other plan elements: The residential and infrastructure topics relate to land use.

Stakeholder partners: Town land use offices and local commissions for planning, zoning, inland wetlands, conservation and agriculture. Area land trusts and Eightmile are also potential partners.

Next Steps: Seek to limit additional development in the watershed if feasible.

Work with local regulators to make sure that new projects meet current standards for stormwater, including renovation and expansions of existing single family homes that expand existing impervious surfaces. Promote the use of pervious driveways and other residential areas (patios).

If there are lake watershed districts in the Town regulations make sure that those areas require specific standards for limiting total lot percentage of impervious area and limitations on increasing peak flow runoff.

Work with agricultural and forest land owners/producers (in conjunction with USDA-NRCS) to promote best practices. As with residential outreach, this requires willing landowner cooperation.

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<sup>2</sup> Norvell, Frink and Hill, 1979. Phosphorus in Connecticut lakes predicted by land use. Applied Biology 76:11, 5426-5429

<sup>3</sup> Estimating the effects of changing land use patterns on Connecticut Lakes. 1996. Journal of Environmental Quality 25:2 325-333.



## 6. Physical features & Hydrology

Importance: Physical features in the lake and watershed can influence water quality. These features include rainfall, temperature, sediment conditions and water depth

What has been done to date: The recent suction dredging project addressed sediment accumulation in a cove.

Additional information about lake and watershed area physical features are described in the Diagnostic/Feasibility report.

Connections to other plan elements: Physical features in the watershed interrelate to land use where both impervious surfaces and soil conditions influence rainfall infiltration and subsequently hydrology. Summer temperature stratification and hypolimnion anoxia (loss of oxygen in bottom waters) can lead to internal loading of phosphorus from sediment to the Lake. Temperature can influence water quality and ecology including dominant algae and aquatic plant species.

Stakeholder partners: Analysis of physical features by service providers and publically available data sources.

Next Steps: Monitoring physical features can provide useful data for a more complete assessment of water quality data. Monitoring to consider includes:

- Weather data with a local weather station
- Lake level monitoring with a staff gage
- Summer temperature and oxygen profiles

The Diagnostic/Feasibility report stated that internal loading of phosphorus was not an issue based on the results of monitoring in 2000-2001. It would be worth monitoring anoxia and bottom water phosphorus concentrations in anoxic waters to examine whether internal loading continues to be a less important source of phosphorus. Herbicide treatment may increase hypolimnetic oxygen demand (increased decomposition) which increases the chances for loss of phosphorus from sediment.





## 7. Ecology

Importance: Healthy ecological conditions in the lake and watershed promote better water quality.

What has been done to date: Algae counts and identification and aquatic vegetation mapping by ACT, CT Ag. Experiment Station.

Ecological information is included on a larger scale in the Eightmile River watershed plan

Connections to other plan elements: Manipulation of species in the Lake and watershed relate to the Lake ecology. These types of manipulations are on-going for aquatic invasive vegetation management and fish stocking (recreation section).

Stakeholder partners: ACT, Nature Conservancy (Japanese silt grass control for example), DEEP inland fisheries. Academic researchers would make nice collaboration partners on ecology and water quality issues confronting the Lake. UConn, Yale and Conn College all have active lake and ecology research programs and have all studied Lake Hayward in the past. Previous studies at the Lake may be valuable for new projects.

Next Steps: Consider algae identification and counts for cyanobacteria (blue green algae) if blooms are observed. Cyanobacteria are an increasing problem in CT lakes for water quality and public health. See DEEP/DPH guidance on cyanobacteria for addition information.

Monitor emerging issues in forest health including invasive species (Japanese barberry) or pests (emerald ash borer). Work with forest landowner partners to maintain healthy forests in the watershed.

Fish can have an influence on algae type and density through their predation on zooplankton. A complete study of appropriate fish stocking rates and the influence of fish additions would require monitoring of phytoplankton and zooplankton communities.

Additional study of Canada geese would be required to quantify their impact beyond anecdotal notes of their presence and absence. Managing shoreline lawns and buffer areas to minimize their use of the area should be conducted regardless of additional data on their population.

The DEEP's Natural Diversity Database reports several rare species of invertebrates associated with the wetlands north of the lake. That is a sign that the wetlands in that area are in good condition. Monitoring of the conditions in the wetlands north of the Lake could be considered as an indicator for how well that wetland retains nutrients and the water quality of the waters that enter the wetland.



## 8. Recreation

Importance: Recreation is a critical value of the Lake.

What has been done to date: Internal combustion motors are restricted from the Lake.

DEEP public boat ramp allows for public access and DEEP stocks fish at the lake.

Recent dredging project and on-going aquatic invasive plant management to maintain boating uses.

Beach monitoring for bacteria as required by health regulation for swimming use. See the guidelines for public beaches for additional information.

[http://www.ct.gov/deep/lib/deep/water/beach\\_monitoring/beachguide.pdf](http://www.ct.gov/deep/lib/deep/water/beach_monitoring/beachguide.pdf)

The State guidance on cyanobacteria should also be referred to for information about exposure to cyanobacteria (blue green algae)

<http://www.ct.gov/deep/cwp/view.asp?A=2719&Q=510024>

Connections to other plan elements: Recreation values are important for residents and the community. Water quality and aquatic vegetation can impact recreational values. Fish stocking and fishing can influence the lake ecosystem. Boaters need to be aware of aquatic invasive plants to avoid spreading them to or from the lake by transporting plant fragments on boats and trailers.

Stakeholder partners: Users of the lake for boating, fishing and swimming. CT DEEP boating and fisheries divisions.

Next Steps: The majority of needs for recreation overlap with guidance for water quality, aquatic vegetation and ecology. If there are individuals who are frequent recreational users of Lake Hayward and not otherwise connected to existing Lake groups LQIC might seek feedback and support from those users who would support the on-going work at the Lake.