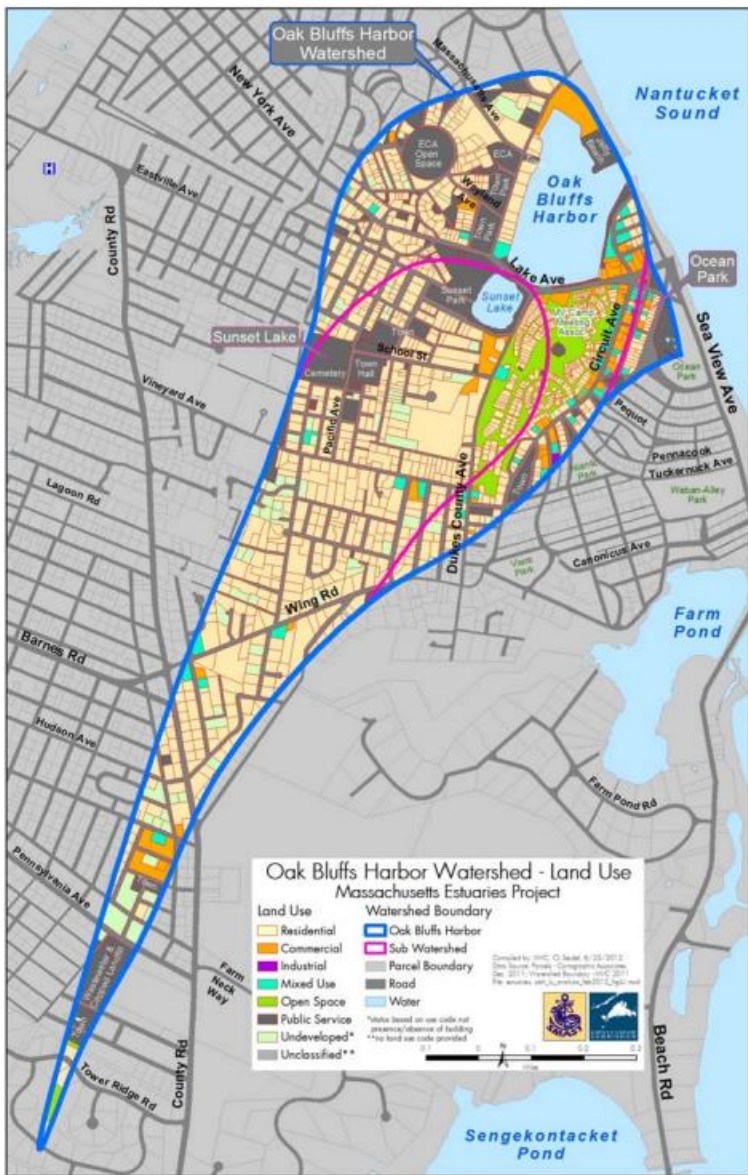


Oak Bluffs Harbor

The Oak Bluffs Harbor is located on Martha's Vineyard, Massachusetts. In 2013, the Massachusetts Estuaries Project (MEP) published its study of the pond. The following are highlights from this study, prepared by staff of the Martha's Vineyard Commission. This should be read in conjunction with "Highlights of the MEP: Nitrogen Loading in Coastal Ponds" which explains some of the process and technical terms referred to in this summary.



1. The Pond and Watershed

- The Oak Bluffs Harbor is a 30 acre estuary in the town of Oak Bluffs
- The Harbor's total watershed is estimated to be around 416 acres, which includes 3 sub-watersheds
- The System also includes another body of water south of the OB Harbor, Sunset Lake (~3 acres)
- The estuary is connected to Nantucket Sound while Sunset Lake is breached through a box culvert under Lake Avenue

2. Current Water Quality

Generally, the water quality in the pond is showing moderate nitrogen enrichment and impairment of both eelgrass and infaunal habitats. Nitrogen management of this system will be for restoration rather than for protection or maintenance of existing conditions.

- **Dissolved Oxygen:** The table below shows the percentage of time dissolved oxygen stayed above the acceptable limit of 6 ppm.

- **Pond-Bottom Habitat:** A study was conducted at 8 stations throughout the Harbor.
- **Eelgrass:** No eelgrass population exists in this system. There is also no evidence this basin has been historically supportive of eelgrass.
- **Algae (Chlorophyll):** A continuous record of dissolved oxygen and phytoplankton over 48-day period indicated that the pond rarely contains too much organic matter with algae exceeding desirable levels showing no significant impairments.

Table 1: Water Quality in Oak Bluffs Harbor

	Dissolved Oxygen (above acceptable limit)	Habitat Rating (degree of impairment)	Existence of Eelgrass Beds	Algae (degree of impairment)
Main Basin	70%	Moderate	No	Healthy
Sunset Lake	-	Moderate	No	Healthy

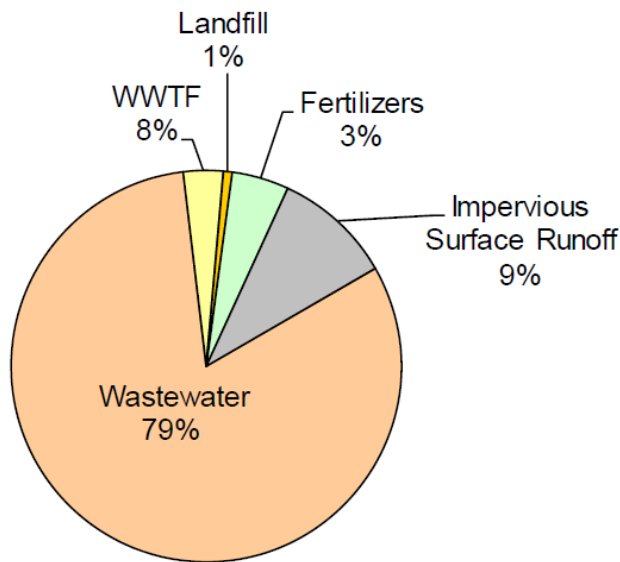
Table 2: Sources of Nitrogen Loading to Oak Bluffs Harbor

Sources of Nitrogen Loading	Amount (kg/y)	Share of Manageable Load	Share of Total Load
Septic Systems (WW)	3,896	81%	78%
Treatment Facility (WW)	158	3%	3%
Landfill	35	1%	1%
Fertilizer	226	5%	5%
Runoff	469	10%	9%
Manageable Total	4,784	100%	95%
Atmospheric Deposition	180		4%
"Natural" Surfaces	51		1%
Total Load	5,015		100%

3. Current and Projected Nitrogen Loading

Sources of Nitrogen

Current sources of nitrogen are shown in Table 2 on the opposite page, which shows both the *Manageable and Total Loads*. The full MEP report gives detail by sub-watershed.



Sources of Manageable Nitrogen Load

- **Septic Systems (Wastewater):** Based on Census in 2010, MEP was able to estimate the amount of nitrogen contributed by the on-site septic systems using average per capita water usage results in 79% of the watershed’s manageable nitrogen load.
- **Waste-Water Treatment Facility:** The treatment facility (WWTF) treats wastewater from a sewer collection system generally concentrated in the most densely developed portions of town, contributing 8% of the nitrogen load.
- **Landfill:** Although capped in 1998, the landfill continues to release nitrogen through groundwater.
- **Fertilizer Application:** Fertilizer from residential/commercial lawns represents 3% of the overall contribution of nitrogen. This is based on established loading rates, and

acres of residential lawns within the watershed. A leaching rate to groundwater of 20% is used.

- **Runoff:** Precipitation and other water sources traveling on impervious surfaces (i.e. asphalt, concrete, rooftops, etc.) will go directly into the pond and/or potholes, carrying nitrogen and other harmful nutrients with no treatment, contributing 9% of the total manageable load.
- **Atmospheric Deposition:** Acid rain deposits nitrogen from polluted air, largely from upwind coal-fired power plants and other industrial sources off-Island.
- **“Natural” Surfaces:** Sources of nitrogen that enter the pond through land (permeable surfaces) within the watershed through groundwater.

Tidal Flushing

Tidal flushing of this system has been highly altered over the past 150 years by storms and human alteration. Circulation in the Harbor is dominated by tidal exchange with Nantucket Sound. The average tide range offshore from the harbor is 1.8 feet. The lack of significant tide range attenuation at Sunset Lake produces a very efficient tidal flushing throughout the entire Harbor system, which also indicates that both the culvert between Oak Bluffs Harbor and Sunset Lake and the inlet to the harbor do little to restrict the tidal flow. Fundamentally, restrictions of tidal exchange increase the sensitivity of an estuary to nitrogen inputs, but this is less the case in the OB Harbor which has a well maintained navigational channel.

4. Goal and Nitrogen Limits

Goal

For the Oak Bluffs Harbor, the MEP set the goal of restoring and maintaining SA waters or high habitat quality. This is defined as supportive of eelgrass and infaunal communities.

Nitrogen Concentration Limits

The current overall nitrogen loading – an average of levels that vary from 0.270 parts per million (ppm) to 0.410 ppm – is:

0.340 ppm.

The MEP sets the target for maximum average total nitrogen concentration at:

0.45 ppm.

Meeting this target does not require any reductions to deal with current loads. As long as the current loads are maintained and/or reduced in the future, the amount of dissolved oxygen and algae will be acceptable and a healthy infaunal habitat can clearly be maintained and achieved. It should be mentioned that while the present total nitrogen concentration is below the threshold level, Sunset Lake should be watched and maintained in a careful manner going forward to keep the total nitrogen concentration of the lake below the threshold.

5. Approaches to Improving Water Quality

It is important to note that load reductions can be produced by reduction of any or all sources or by increasing the natural attenuation of nitrogen within the freshwater systems to the embayment. However, at present since it is not necessary to reduce the nitrogen loading, the community must find ways to maintain or reduce the total nitrogen loadings moving forward that negatively impact the Oak Bluffs Harbor System. Having said this, a study was conducted to determine the maximum allowed additional nitrogen load to the Sunset Lake, 100 kg/y, which would increase the total manageable load to Oak Bluffs Harbor and Sunset Lake by 15.3% and 31.4%, respectively.

Another approach is to examine the Best Management Practices for landscape fertilizer use to reduce the nitrogen inputs from the agricultural and lawn fertilizer uses.

Note: These highlights were prepared by MVC staff, which made every attempt to accurately summarize the MEP report. However, for full and accurate information please use the original report, especially for decision making. Funded by grants from the Edey Foundation and the Massachusetts District Local Technical Assistance program.

The full MEP report on Oak Bluffs Harbor is available at:

http://www.oceanscience.net/estuaries/report/OakBluffsHarbor/OakBluffs_MEP_FINAL-5MB.pdf



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