Baker Pond

Orleans, MA

2000-2023 Water Quality Summary

Pond Setting

Baker Pond is a 28 acre Great Pond, located west of Route 6 and south of Route 6A, straddling the town line between Orleans and Brewster. It has public access over a beach area off Bakers Pond Road. The pond has a maximum depth of 66 ft (20 m), based on a 2019 bathymetric survey completed during the Baker Pond Management Plan. The Plan data showed 1) impaired ecosystem conditions and 2) identified watershed septic systems and internal sediments as the primary sources of the impairments. No management actions have been planned as of August 2024.

Sampling History

Water column sampling has been completed at least annually since 2000. Citizen volunteers have participated in the annual Cape Cod Pond and Lake Stewardship (PALS) Snapshots each August/September and more recently added Spring sampling. Snapshot protocols include: dissolved oxygen and temperature profiles, Secchi clarity readings, and water sample analysis for pH, alkalinity, photosynthetic pigments, and nutrients [total phosphorus (TP) and total nitrogen]. The 2022 Management Plan completed a more detailed ecosystem sampling, reviewed historical results, and addressed important data gaps for management, including sediment analysis, phytoplankton sampling, and stormwater runoff measurements.

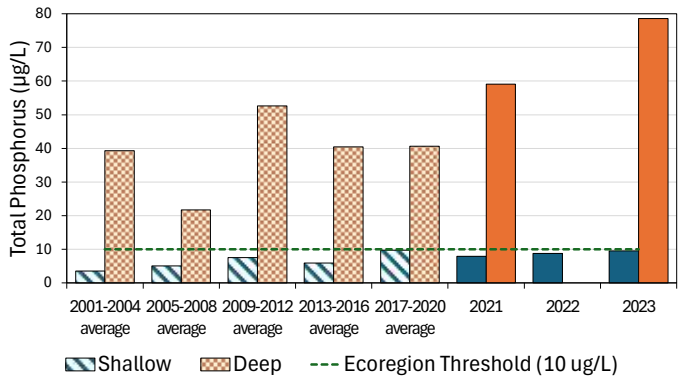
2023 Water Quality Status

The Baker Pond Management Plan reviewed historical water column data and 2019 collection of complementary measures (*e.g.*, sediments, stormwater, watershed land use). The plan review showed that the pond had notably impaired deep conditions (*i.e.*, anoxia), but only slightly impaired shallow conditions. Phosphorus controls water quality conditions and review of historical shallow TP levels showed a significant increasing trend. Watershed septic systems were the largest TP source (45%) followed closely by deep sediments (41%). Review of management options showed that an alum treatment, hypolimnetic aeration, dredging, or watershed sewering could address average summer impairments.

ECOSYSTEM STATUS: IMPAIRED

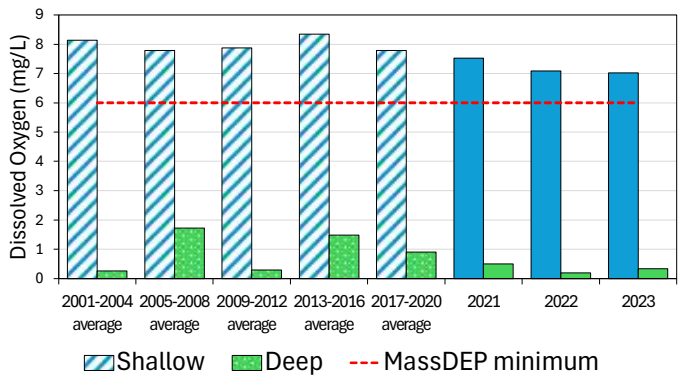
by excessive phosphorus and chlorophyll levels, loss of clarity, and deep anoxia.

Baker Pond Management Plan is available on the Town website:
https://town.orleans.ma.us/DocumentCenter/View/2547/Baker-Pond-Management-Plan-PDF



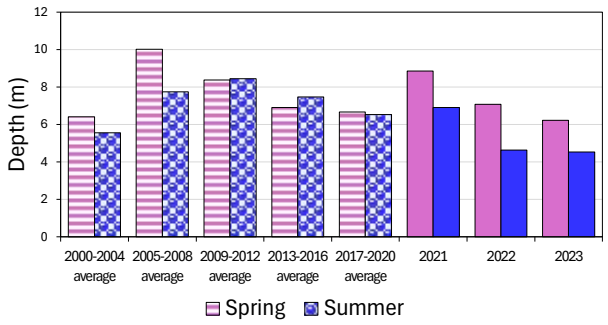
TOTAL PHOSPHORUS

Phosphorus determines the amount of plant growth in freshwater ponds. Excessive P harms ecosystem health and causes algal blooms and bottom anoxia. On Cape Cod, a regional threshold goal of 10 µg/L total phosphorus (TP) was developed. In Baker Pond, summer shallow TP levels have slowly increased and recent averages were at the threshold, while deep levels regularly exceed the threshold (41 µg/L long-term average). The higher deep reading were the result of sediment TP additions to the water column.



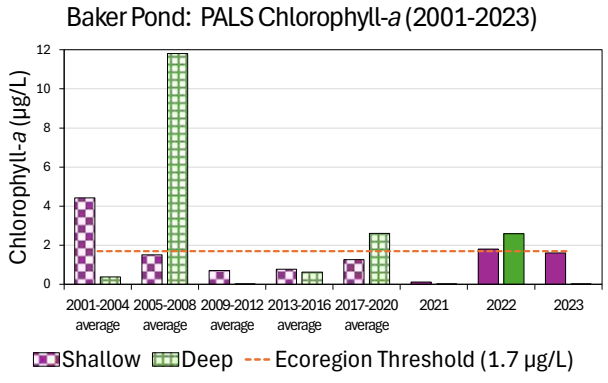
DISSOLVED OXYGEN

Dissolved oxygen (DO) is a primary regulatory criteria used to assess the ecological health of freshwater bodies. MassDEP regulations require cold water ponds, like Baker Pond, to have DO concentrations greater than 6 mg/L. Baker Pond generally has acceptable shallow DO levels throughout the year and acceptable deep DO levels in the spring. However, during the summer, when the lake has a shallow warm layer and a deep cold layer, the deep layer always becomes anoxic (DO <1 mg/L) and when this happens P is released from the deep sediments.



Water Clarity

Water clarity measured with a Secchi disk is an easy way to measure how deep light can penetrate into a pond water column. Clarity is an indirect measure of phytoplankton density and where plants can grow on a pond bottom. In Cape Cod ponds and lakes, clarity tends to be greater in the spring and reduced in the summer as phytoplankton populations increase. Average clarity in Baker Pond improved from 2001 to 2011, but has decreased ~ 0.3 m (1 ft) per year since 2012.



Chlorophyll-*a*

Chlorophyll-*a* (CHL) is the primary pigment that most plants use for photosynthesis, so its concentration is often used as an indirect measure for the size of the phytoplankton population. Phytoplankton are a natural portion of all pond ecosystems, but nuisance populations or "blooms" may occur when excessive nutrients are present. On Cape Cod, a regional threshold goal of 1.7 µg/L CHL was developed. Recent summer Baker Pond shallow CHL levels have been just above or just below the regional threshold level.

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