

Boland Pond

Orleans, MA

2001-2023 Water Quality Summary

POND SETTING

Boland Pond is a 5 to 8 acre pond, located to the east of Route 6A, west of Route 28 and north of Eldridge Parkway with no formal public access, but it is adjacent to the Nauset Middle School and Orleans Elementary School properties. Given its relatively small area, it is not a Great Pond, so it is not publicly owned. Review of current Town Assessor parcels suggest the pond surface is owned by multiple owners. The pond is estimated to have a maximum depth of 19 to 20 ft based on sample readings and a 2006 bathymetric map. Most of the pond watershed, which extends to the southwest towards the Lots Hollow Road and Finlay Road intersection, is within later phases of the Town's current sewer scheduling plan. Previous evaluations of stormwater inputs identified discharge locations along the northern and western sides of the pond.

SAMPLING HISTORY

Water column sampling has been completed at least annually since 2001. 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]. Comprehensive review and organization of all available water column data was completed in 2017, but a detailed ecosystem assessment has not been completed.



2023 WATER QUALITY STATUS

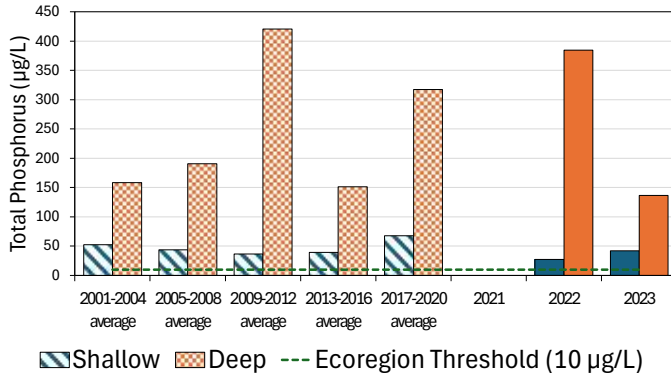
Review of historical water column data gathered in both the spring and summer showed that Boland Pond has exceptionally cold deep water with consistently impaired shallow and deep water quality conditions. Deep dissolved oxygen (DO) readings regularly have little to no oxygen and nutrient concentrations suggest this lack of oxygen is causing regular release of sediment nutrients, especially phosphorus, during the summer. Historical clarity readings show some loss of clarity during the summer, but no long-term trends. Shallow nutrient levels were notably greater than Cape Cod-specific thresholds and chlorophyll levels were ~6X higher than its threshold. Since complementary ecosystem data have not been developed, it is not clear how much of the water column nutrients are due to sediment regeneration and how much are due to watershed inputs (*i.e.*, septic systems or stormwater).

ECOSYSTEM STATUS:

IMPAIRED

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

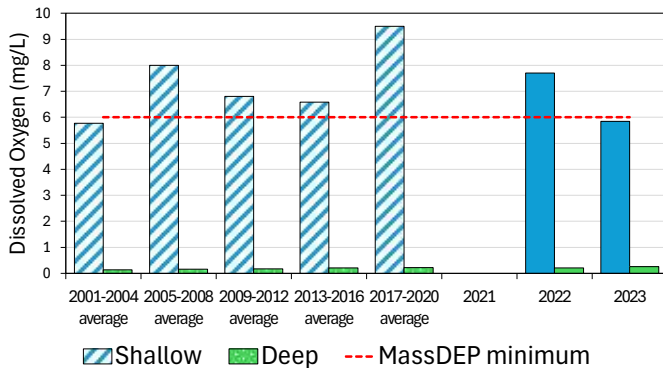
Boland Pond: PALS Total Phosphorus (2001-2023)



TOTAL PHOSPHORUS

Phosphorus (P) 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 Boland Pond, both shallow (42 µg/L) and deep (248 µg/L) average TP levels exceed this threshold during the summer. The higher deep readings were the result of sediment TP additions.

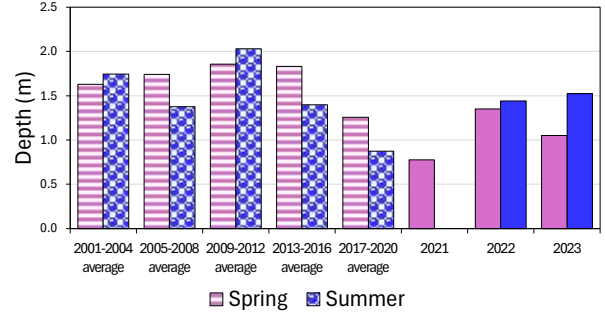
Boland Pond: PALS Dissolved Oxygen (2001-2023)



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 Boland Pond, to have DO concentrations greater than 6 mg/L. Boland Pond generally has acceptable shallow DO concentrations throughout the year. However, deep spring DO concentrations were generally less than the MassDEP minimum and all summer deep levels were anoxic (DO <1 mg/L). Sustained lack of oxygen will cause the release of P from the sediments.

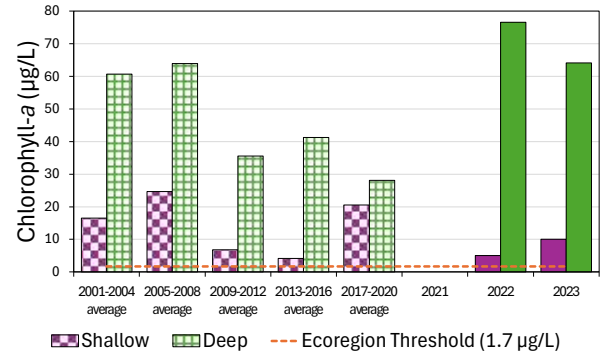
Boland Pond: Clarity, Spring & Summer (2001-2023)



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. Summer and spring clarity in Boland Pond are generally similar.

Boland Pond: PALS Chlorophyll-a (2001-2023)



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. The average summer Boland Pond shallow CHL level (13.7 µg/L) is 8X the regional threshold concentration.