

Crystal Lake

Orleans, MA

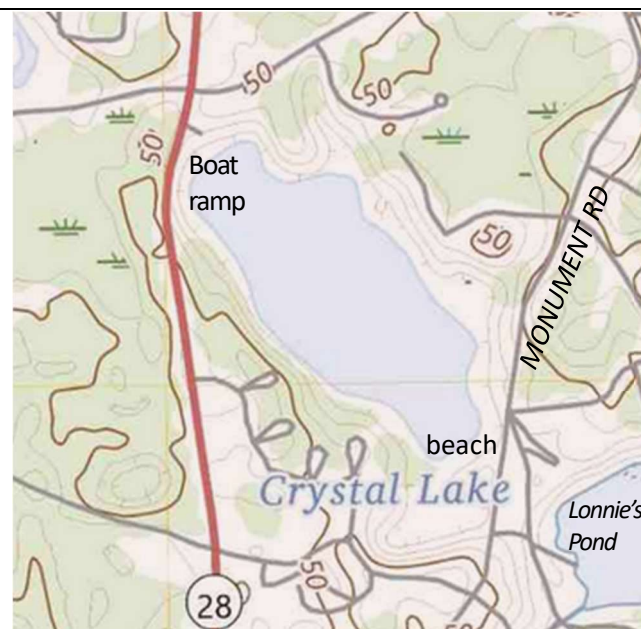
2000-2023 Water Quality Summary

POND SETTING

Crystal Lake is a 38 acre Great Pond, located between Route 28 and Monument Road and north of Lonnie's Pond with public access at a boat ramp off Route 28 and a beach off Monument Road. It has a maximum depth of 56 ft (17 m), based on a 2019 bathymetric survey completed during the Crystal Lake Management Plan. The Plan showed 1) impaired ecosystem conditions and 2) identified watershed septic systems as the primary source of the impairments. Watershed sewerage is planned and a preventative alum treatment was completed in May 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 2021 Management Plan completed 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

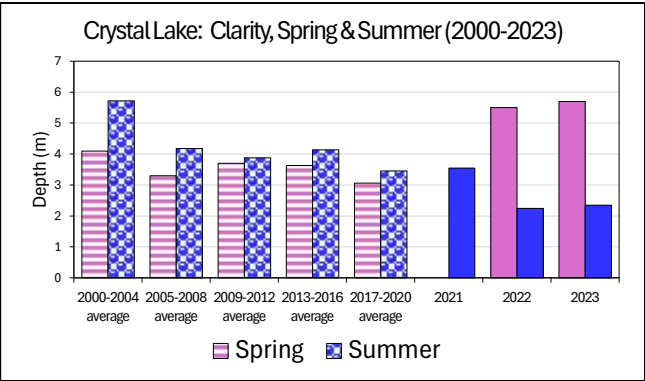
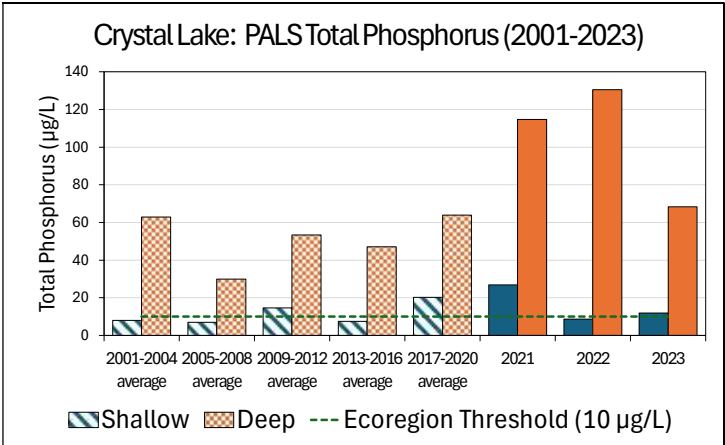
The Crystal Lake Management Plan reviewed historical water column data and 2019 collection of complementary measures (e.g., sediments, stream flows and nutrient loads, watershed land use). The plan review showed that the lake had notably impaired deep conditions (*i.e.*, anoxia) that were slowly making shallow conditions more impaired (*i.e.*, loss of clarity). Phosphorus controls water quality conditions and watershed septic systems were the largest TP source (48%). Watershed sewerage is necessary to address the ecosystem impairments and is planned in Phase 3 of the Town wastewater plan. In the interim, the Town completed a May 2024 preventative alum treatment to protect the pond while awaiting sewerage.

ECOSYSTEM STATUS: IMPAIRED

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

Crystal Lake Management Plan is available on the Town website:

<https://town.orleans.ma.us/DocumentCenter/View/3663/Crystal-Lake-Management-Plan-Final---Jan-2021>

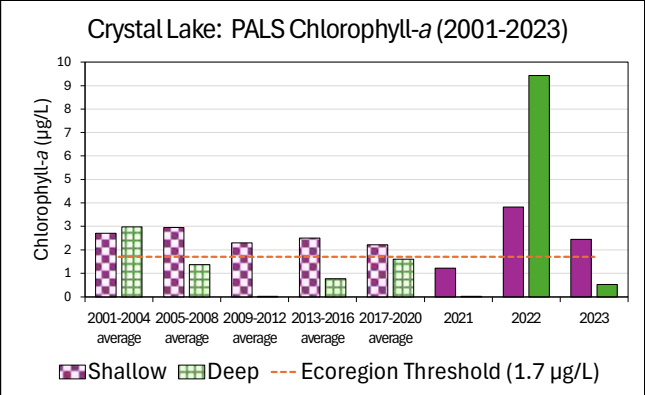
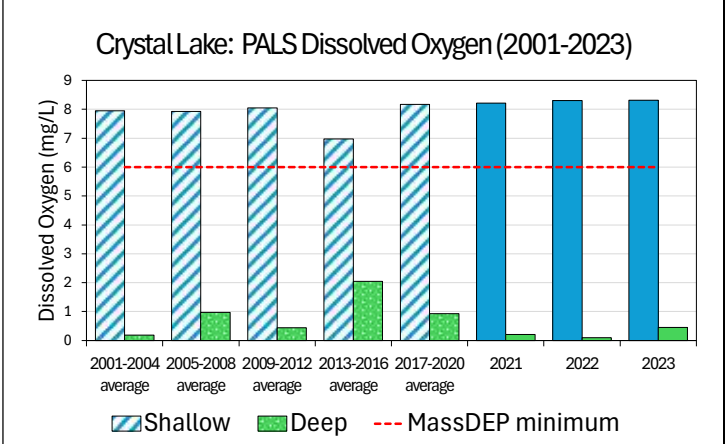


TOTAL PHOSPHORUS

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 TP was developed. In Crystal Lake, both shallow (11 µg/L) and deep (63 µg/L) TP concentrations exceed this threshold. The higher deep reading were the result of sediment TP additions.

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 Crystal Lake has decreased ~ 2 m (6.6 ft) since 2000.



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 Crystal Lake, to have DO concentrations greater than 6 mg/L. Crystal Lake generally has acceptable shallow DO concentrations 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.

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 Crystal Lake shallow CHL level (2.6 µg/L) is above the regional threshold.