

Duck Pond is a 26-acre Great Pond that is deteriorating (“eutrophying”). The symptoms are a recent rapid annual increase in nuisance aquatic weeds and an increasingly thick sediment layer of organic material (“muck”). There also has been a decrease in water clarity and fewer fish (fishermen), otters, beavers, and herons. The weeds and bottom muck also are a recreation barrier and safety hazard. The attached photos show the pond in past years and the recent weed growth. They also show some of the wildlife that used to be plentiful.

The increased weed growth indicates an excess of nutrients (the definition of eutrophication), particularly phosphorus, which was confirmed by Nashoba Analytical in August 2017 (.04-.06 mg/L while the EPA water quality criteria specifies under 0.025 mg/L). An ever-thicker layer of bottom muck indicates insufficient dissolved oxygen (DO), which kills the aerobic bacteria needed to consume the organic material like dead weeds and fallen leaves. The replacement anaerobic bacteria can release hydrogen sulfide that is toxic to fish. The lack of DO also creates a “dead zone” along the bottom, which kills or drives out insects, fish, and other wildlife, and it enables more phosphorus to be released from the nutrient-rich sediment layer to feed plants and algae, thus increasing the biomass.

This deteriorating cycle is illustrated in the red portion of the attached flowchart. Insufficient dissolved oxygen causes the results described above. As the organic material is not consumed completely, the bottom muck gets thicker, making the pond more shallow, enabling more sunlight to reach weeds and becoming a barrier to recreation and a safety hazard as described below. Finally, the excess nutrients in the muck, particularly phosphorus, are released to cause further weed growth, which increases the biomass. The long-term reproduction and decomposition of the large biomass causes rapid sediment accumulation that changes the ecosystem from a pond to a wetland marsh.

In addition to the environmental impact, the eutrophication of Duck Pond will result in the loss of a beautiful, quiet, natural recreation area and viewscape. There already is a safety hazard caused by the thick weeds and quicksand-like bottom muck for anyone falling out of a kayak or canoe. The thick weed cover and decreasing water clarity cause an even greater safety hazard for someone on a stand-up paddleboard (SUP) because unseen submerged branches can be hit with a fin, causing the rider to fall off. There are recreation barriers for all boaters because a barrier of thick muck prevents access to the pond when the water level drops in the summer, and the thick weeds drag on paddles and fins.

Without pond maintenance to slow the eutrophication process, Duck Pond will become a marsh and will lose the diverse wildlife that have been observed and photographed for years. Without pond maintenance, recreation activities such as canoeing, kayaking, stand-up paddle-boarding, fishing, and ice skating will be lost, as well as the attractive viewsapes enjoyed by those using the Groton Conservation Trust and Groton Conservation Commission trails around the pond.

The proposed Duck Pond Restoration Project includes the installation of an aeration system on the shoreline between Duck Pond and Whiley Road, between 228 and 260 Whiley Road. This location is recommended by GELD as it is near electrical power that

can be trenched from a pole to the system. Ten hoses will pipe air from the system to submersed diffusers at the locations shown on the enclosed Vertex map/diagram. The small air bubbles from the diffusers carry low-oxygen water from the bottom to the surface where it mixes with oxygen-rich surface water and atmospheric oxygen before sinking back to the bottom. After sufficient dissolved oxygen has been restored along the bottom of the pond, aerobic bacteria will return naturally to start consuming the muck and re-establishing a healthy environment for fish and other wildlife. A monthly augmentation of beneficial aerobic bacteria will accelerate this process. The result will be the cycle illustrated on the lower (green) portion of the flowchart. Adequate dissolved oxygen will enable aerobic bacteria to thrive, which will consume more of the muck. It also will help phosphorus to bond to other nutrients and become unavailable to plants and algae, reducing weed growth in the long-term. Less muck and less weed growth will reduce the pond biomass.

The objective is a restored healthy ecosystem and recreational resource in Duck Pond.