

September 13, 2009

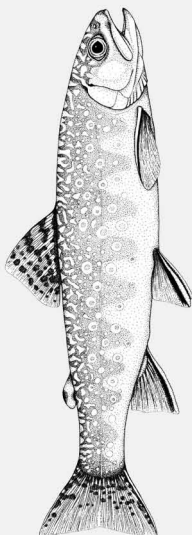
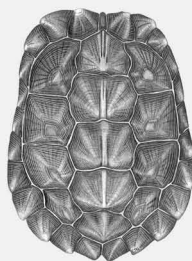
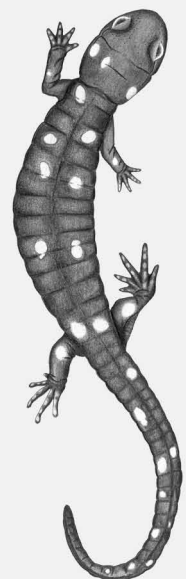
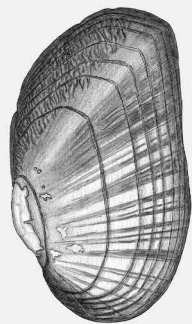
## Freshwater Mussel Survey and Habitat Assessment in Oldham Pond (Hanson and Pembroke, Massachusetts) for a Proposed Chemical Treatment to Control Algae

Biodrawversity LLC surveyed freshwater mussels and assessed habitat of Oldham Pond in Pembroke and Hanson, Massachusetts. The survey was prompted by a proposal to chemically treat Oldham Pond to control excessive algal growth. Oldham Pond is mapped habitat for two state-listed freshwater mussels, including the tidewater mucket (*Leptodea ochracea*) and eastern pondmussel (*Ligumia nasuta*). Some chemicals used to control aquatic plants and algae can have deleterious effects on mollusks, and therefore a mussel study was required to help with the planning and environmental permitting for the chemical treatments.

### Study Site and Methods

Oldham Pond is a 235-acre lake with an average depth of 10 feet and a maximum depth of 15 feet. It does not stratify in the summer. A small tributary, cranberry bogs, and other wetland areas feed it. Its outlet flows into Furnace Pond. Oldham Pond's 2.8 miles of shoreline are heavily developed with seasonal and year-round homes and the pond experiences heavy summer recreational use.

Two surveyors spent two days (August 20-21, 2009) surveying Oldham Pond. Mussels were surveyed by snorkeling in shallow water and SCUBA diving in deep water. An algal bloom was occurring at the time of the survey (an annual occurrence in Oldham Pond) and therefore water clarity was less than one foot. Poor visibility did not permit careful searching within confined plots, therefore unconfined 30-minute searches were completed at seven locations around the lake. At each location, a deep water (4.0-8.0 feet) and shallow water (1.0-4.0 feet) area was surveyed either by SCUBA diving or snorkeling, resulting in a total of 14 30-minute timed searches. In addition, surveyors spent an additional 2.0 person-hours searching for mussels in promising habitat toward the southern end of the lake, and also looked for shells along the shore and in



Shoreline of Oldham Pond. The green color of the water is very apparent in the photo.

shell middens. The following information was recorded for each timed search:

- Number, length, and shell condition of each state-listed species. Shell condition refers to the degree of erosion of the external valves and was subjectively recorded as light (0.0), medium (0.5), or heavy (1.0) and then averaged for all animals to produce a condition index ranging from 0 to 1.
- Presence and relative abundance of all other mussel species
- Habitat parameters including depth, substrate, and presence of aquatic plants
- Site locations using GPS

Spatial data was overlaid onto 1:5000 digital orthophotos to depict pond-wide patterns in mussel diversity and abundance.

## Results

Live animals of five species were found, including the eastern elliptio (*Elliptio complanata*), eastern lampmussel (*Lampsilis radiata*), eastern floater (*Pyganodon cataracta*), alewife floater (*Anodonta implicata*) and eastern pondmussel (Table 1). Eastern floaters and alewife floaters were each recorded as present but we did not distinguish these species when tallying mussels. A total of 33 eastern pondmussels were found in Oldham Pond during 14 30-minute timed

searches in seven different locations, as well as ten additional eastern pondmussels found during a one-hour timed search at the southern end of the pond. Neither live animals nor shells of the tidewater mucket were found.

The average length of the 43 eastern pondmussels was 67.7 millimeters and ranged from 25.0-97.0 millimeters (Table 2), indicating that juveniles were present in the lake and that longevity and/or growth potential were high. Average shell condition was 0.08, indicating light shell erosion. Eastern pondmussels were present at only three of seven shallow sites, and six of seven deep sites, and counts were as high as 12 per 30-minute timed search but averaged only 2.4 animals per 30-minute timed search. In contrast, average counts per 30-minute timed searches of other species were much higher, including 109.2 for eastern elliptio, 19.1 for eastern floater/alewife floater, and 17.0 for eastern lampmussels. Densities of all species were generally lower and more variable in the shallow sites.

Tens of thousands of shells (all species) were observed throughout the lake, suggesting mass mortality within the last ten years, probably related to eutrophic conditions and low dissolved oxygen. The MassWildlife profile for Oldham Pond states that a mussel kill occurred in 1999, and it seems likely that this phenomenon may occur annually (although the magnitude of these events may vary). Mussels are still relatively common in the lake, especially the eastern elliptio, suggesting that the mussel community is persisting despite annual algal blooms and anoxic conditions. But the tidewater mucket



Aerial photo of Oldham Pond showing survey sites.



Eastern pondmussels from Oldham Pond.

Table 1. Habitat and mussel data for the 14 30-minute timed searches.

Site	Longitude	Latitude	Pair	Depth	Habitat			Mussel Species***			
					Substrate*	Vegetation**	EiCo	LaRa	PyCa/AnIm	LiNa	
1	-70.830987	42.062436	Shallow	1.5-2.5	1	-	172	11	8	1	
			Deep	5.0-6.0	1,3	-	125	22	20	2	
2	-70.832172	42.066244	Shallow	1.0-2.0	1	1,2,3	175	10	23	5	
			Deep	4.0-5.0	1	1,2,3	152	35	31	4	
3	-70.836251	42.071217	Shallow	1.5-3.0	1,3	-	4	2	2	0	
			Deep	4.0-6.0	1,3	-	170	81	12	2	
4	-70.843616	42.068193	Shallow	1.5-3.0	2,3,4	-	0	0	3	0	
			Deep	5.0-7.0	2,3,4	-	4	0	14	0	
5	-70.837792	42.066239	Shallow	1.5-3.0	2,3	-	10	6	1	0	
			Deep	5.0-7.0	2,3	-	166	0	16	3	
6	-70.836157	42.060425	Shallow	1.0-3.0	1,4	-	129	29	49	2	
			Deep	4.0-7.0	1,4	-	199	12	29	12	
7	-70.833055	42.059697	Shallow	1.0-2.0	1,2	1	96	12	28	0	
			Deep	3.5-4.5	1,2	1	127	18	32	2	
							Total Shallow	586	70	114	8
							Total Deep	943	168	154	25
							Total	1,529	238	268	33

\* 1 = Sand, 2 = Gravel, 3 = Cobble, 4 = Muck/Detritus

\*\* 1 = Vallisneria sp., 2 = Elodea sp., 3 = Potamogeton sp.

\*\*\* EiCo = Eastern Elliptio, LaRa = Eastern Lampmussel, PyCa/AnIm = Eastern Floater or Alewife Floater, LiNa = Eastern Pondmussel

was not encountered during the survey, even though it was reported to occur in Oldham Pond within the last 25 years. Habitat seems appropriate for the tidewater mucket and it does occur in nearby ponds (Silver Lake and Monponsett Pond). A low-density and/or highly localized population of tidewater muckets might still occur in Oldham Pond, but our two-day survey in conditions of poor visibility did not provide any evidence of this.

### Recommendation

Oldham Pond is clearly impaired by eutrophication and excessive algal blooms. Oldham Pond is on the state's list for impaired waterbodies (Category 4c of the 2002 Integrated List of Waters), mainly for non-native plant species, although in recent years its water quality seems to have deteriorated from nutrient enrichment and excessive algal blooms. Nearby Furnace Pond, which is downstream but closely linked to Oldham Pond, is higher on the state's list of impaired waterbodies (Category 5 of the 2002 Integrated List of Waters for organic enrichment and low dissolved oxygen). In recent years, there is a general sense that water quality in Oldham Pond has deteriorated to more closely resemble that of Furnace Pond. It is understandable that lake stewards are proposing chemical treatments for algal growth, although control of nonpoint source pollution from the heavily developed upland landscape would provide more lasting benefits to the lake.

The eastern pondmussel occurs throughout Oldham Pond, although low densities suggest that its population might be at risk. While efforts to control algal growth, curb eutrophication, and improve oxygen levels in the pond will provide benefit to freshwater mussels, it is important that methods used to achieve these results will not harm freshwater mussels. Several chemicals used to control algae contain copper, which is known to be lethal to mollusks and fish even at low concentrations. Therefore, if chemical treatment is permitted, then we recommend a more benign chemical that has fewer effects on non-target animals.

Please let us know if you have any questions about this assessment.

Table 2. Length and condition statistics for the 43 eastern pondmussels encountered in Oldham Pond.

Statistic	
Count	43
Mean Length (mm)	67.7
Min Length (mm)	25.0
Max Length (mm)	97.0
StDev Length	11.55
Mean Condition	0.08