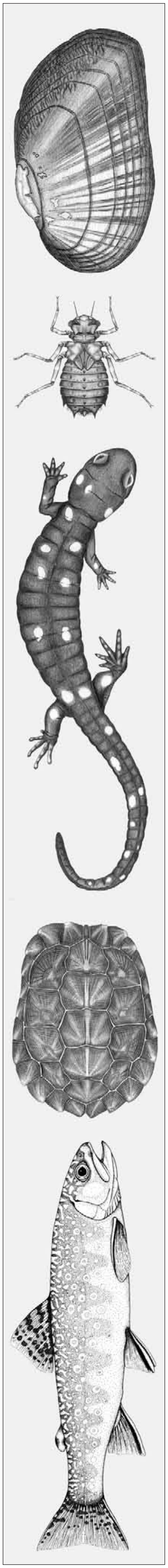

Solitude Lake Management
590 Lake Street
Shrewsbury, Massachusetts

January 3, 2019

REPORT

Aquatic Snail Survey in Roseland Lake in Woodstock, Connecticut

INTRODUCTION

Biodrawversity conducted an aquatic snail survey in Roseland Lake in Woodstock, Connecticut. The target species was the Disk Gyro (*Gyraulus circumstriatus*) that was reported in the pond by Jokinen (1983, 1985). The Connecticut Department of Energy and Environmental Protection (CTDEEP) requested the survey as part of permitting for chemical treatments to control excess algal growth, potentially using chemicals containing copper (e.g., copper sulfate) which may be lethal to aquatic snails at high concentrations. The survey had the following objectives:

- Determine the species composition of aquatic snails in Roseland Lake.
- Characterize snail habitat use and availability, particularly for *G. circumstriatus*.
- Provide recommendations for minimizing effects of algae control on the snail fauna of Roseland Lake.

Roseland Lake is a 96-acre natural lake in the Thames River watershed; it is fed by Muddy Brook and two small streams, and drains southward into Shepards Pond and then into the Little River. Roseland Lake has average depth of 9 ft. and a maximum depth of 19 ft. It is considered highly eutrophic (Jacobs and O'Donnell 2002), with high turbidity (2 ft transparency) in summer due to algal growth, which limits the extent of submerged aquatic vegetation in deeper water. The shoreline is fringed with a variety of emergent,

Roseland Lake in Woodstock, Connecticut (Site 3).

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submerged, and floating-leaved aquatic vegetation, and these are also dense stands of the invasive *Phragmites* along the southwestern shoreline. Fairly extensive shrub and forested wetlands exist at the northern and southwestern ends of the lake. Jokinen (1983) reports a pH of 6.4, conductivity of 78 umhos/cm, and calcium concentration of 7.2 mg/L.

Jokinen (1983, 1985) reported 17 snail species in Roseland Lake. This is unusually high snail species richness compared to other waterbodies in Connecticut, and rivals species richness reported in the large calcareous lakes of western Connecticut. However, sampling was completed monthly from March to January in two consecutive years (1979-1980), and focused on the shallow littoral zone, which is an unusually large amount of sampling effort compared to other snail inventories in Connecticut. This suggests that high species richness was likely related to survey effort rather than unique ecological attributes of the lake. Roseland Lake's snail assemblage includes several tiny, taxonomically challenging, and often overlooked species that occur in a wide range of small permanent and temporary aquatic and semi-aquatic habitats, including ponds, marshes, and swamps. Of the 17 snail species reported in the lake, *G. circumstriatus* is the only one listed as a Species of Special Concern in Connecticut.

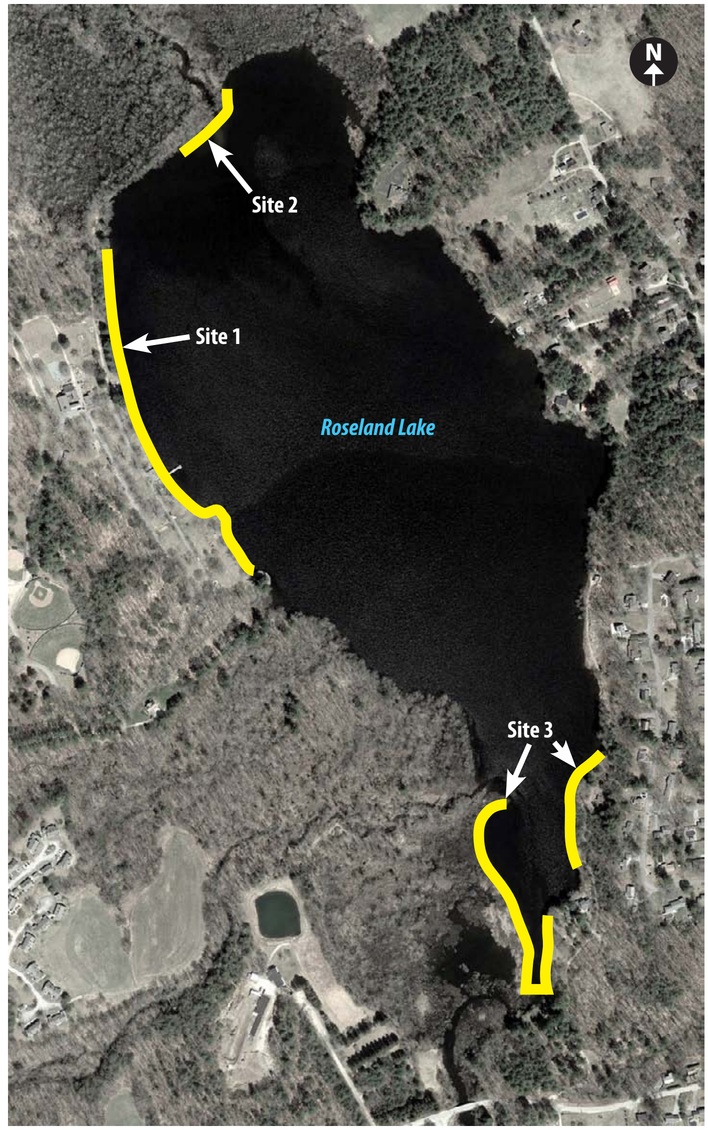


Figure 1. Snail survey sites in Roseland Lake in Woodstock, Connecticut.

G. circumstriatus has been found in only three ponds in Connecticut: Freshwater Pond (Enfield), Mansfield Hollow Pond (Mansfield), and Roseland Lake. These three ponds vary widely in terms of size, habitat, and water chemistry. As noted in Jokinen (1983), *G. circumstriatus* has been considered an inhabitant of temporary woodland ponds and wetlands and may also occur in lakes (Clarke 1973, Baker 1928). Burch and Jung (1992) state that it is a species of "*ephemeral habitats – temporary woods pools, intermittent streams, and transient seepage areas*". They offer the following explanation of the habitat segregation between *G. circumstriatus* and the closely related look-alike, *G. parvus*: "G. circumstriatus *and* G. parvus *do not occur together, i.e., their habitat requirements are different enough to prevent that. In the one locality where we found the two species at the same place, at Hook Point, Douglas Lake, each species lives in a different habitat.* G. parvus *is restricted to submerged vegetation in the lagoon, while* G. circumstriatus *is restricted to several centimeters of water in a seepage area at the black muddy shoreline. Here* G. circumstriatus *is found on decaying leaves from the surrounding forest*." Jokinen (1992) reported it from a variety of habitats in New York, ranging from a ditch, to a temporary pond, to a river, but in no instance was the specific (micro-) habitat noted. Overall, habitat accounts suggest that *G. circumstriatus* may exist primarily near the margins of lakes, especially in areas transitional between permanent and temporary, and between aquatic and semi-aquatic, and therefore may have been undersampled in past snail inventories.

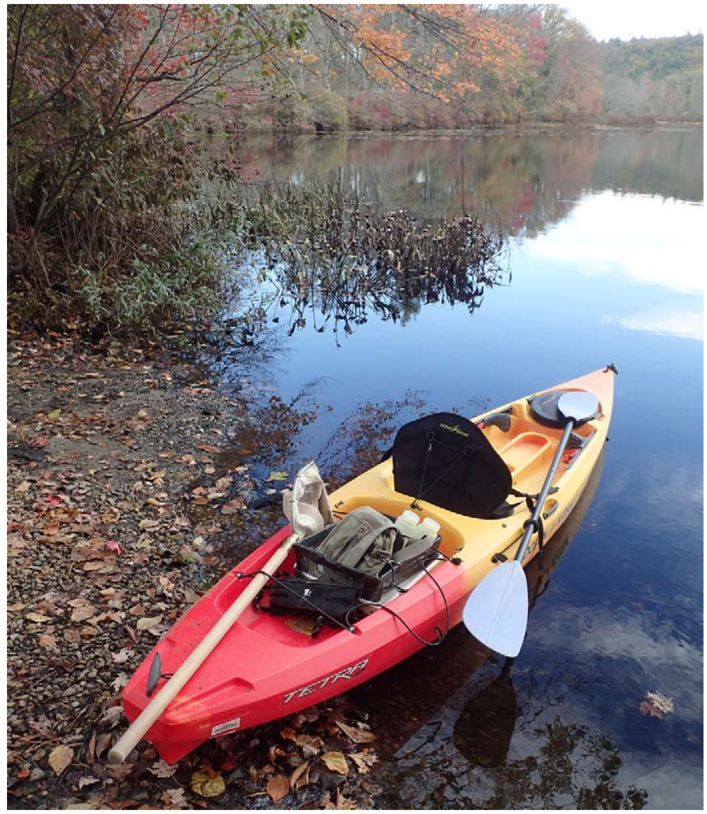
All of the *Gyraulus* species known to occur in Connecticut (*G. deflectus*, *G. parvus*, and *G. circumstriatus*) are taxonomically challenging. *G. deflectus* is the largest, up to 6 mm in diameter, and somewhat distinct morphologically, but both *G. parvus* and *G. circumstriatus* are tiny (up to 4 mm in diameter) and the morphological differences are subtle and variable (Jokinen 1983, 1992; Burch and Jung 1992). *G. parvus* is considered widespread in Connecticut, found in 22% of all sampled waters. Jokinen (1983, 1985) reported *G. deflectus* and *G. circumstriatus* in Roseland Lake, but not *G. parvus*.

METHODS

One biologist completed the snail survey on October 26, 2018. Snails were surveyed at three sites (Figure 1), in near-shore littoral habitats to a maximum water depth of 4.0 ft. Deeper areas were not surveyed. An aquatic D-net and basket sieve were used to collect snails from a variety of substrate types, including leaf litter and detritus, woody debris, emergent shrubs, emergent aquatic vegetation, floating-leaved vegetation, submerged vegetation, silt, sand, gravel, natural rocks (when present), and concrete surfaces near the lakehouse at Roseland Lake Park. Snails were collected and preserved in the field, and a small quantity of mixed substrate from each site was also collected and returned to the lab to look more closely for small snails under a dissecting microscope. Snails were identified under a microscope using keys of Jokinen (1983, 1992) and Burch and Jung (1992).

RESULTS

Nine snail species were found (Table 1), with *Amnicola limosa* by far the most abundant species at all sites. Six species were found at Site 2, and nine species were found at both Site 1 and 3. *G. circumstriatus* was found at Site 1 and Site 3. Approximately 25 *G. circumstriatus* were found, with higher numbers (~20) from Site 3. Individuals were tiny (<2.0 mm shell diameter). They were collected in the composite sediment sample taken from these two sites, and were too small to individually observe/collect in the field, and therefore we do not know precisely which microhabitat they occupied at each site. However, snail abundance (all species) seemed highest in the detritus and dense vegetation in shallow nearshore areas, and very few snails were collected from sediment in deeper water, and therefore we think *G. circumstriatus* also inhabited the shallowest areas. At Site 2, near the Muddy Brook confluence, most of the sampling was done in relatively deep water (1-3.5 ft) and this area lacked the more extensive densely vegetated littoral habitat that was present at both Site 1 and Site 3.



Kayak access point at Roseland Lake Park (north end of Site 1).

Table 1. Snail species found in Roseland Lake during the October 2018 survey.

	Site		
Species	**1**	**2**	**3**
Campeloma decisum	X	X	X
Amnicola limosa	X	X	X
Lyogyrus granum	X	X	X
Pseudosuccinea columella	X		X
Physa ancillaria	X	X	X
Gyraulus circumstriatus	X		X
Helisoma anceps	X	X	X
Helisoma campanulatum	X	X	X
Laevapex fuscus	X		X

DISCUSSION

Confirming Jokinen (1983, 1985), *G. circumstriatus* still exists in Roseland Lake. Habitat descriptions in regional publications, and the previous study conducted in Roseland Lake (Jokinen 1985), suggest that it is not a lake-dwelling species per se, but rather inhabits the shallow littoral zone among dense aquatic vegetation and allochthonous detritus (e.g., leaf litter). The extensive emergent, shrubby, and forested wetlands bordering the northern and southwestern sides of the lake may be more critical than open water habitats for *G. circumstriatus* and some of the other snail species in Roseland Lake.

Some chemicals used to control aquatic algae may have lethal or sublethal toxic effects on aquatic snails, especially those that contain copper (reviewed in Eisler 1997). Therefore, herbicide treatments in Roseland Lake for the purposes of controlling algae should carefully consider the type(s) of chemicals that are used, possibly using a copper-free alternative with similar efficacy. Conservative herbicide use, in terms of dosage and spatial extent of treatments, should be considered. *G. circumstriatus* appears to inhabit the complex, shallow littoral zones of Roseland Lake and this distribution might allow for a targeted open-water (limnetic) chemical treatment that has little or no effect on the nearshore littoral zone.

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Littoral zone along the west side of Roseland Lake (Site 1).

North end of Roseland Lake near Muddy Brook inlet (Site 2).

South end of Roseland Lake (Site 3).