

Zebra Mussel (*Dreissena polymorpha*) Early Detection Project in the Housatonic River and Candlewood Lake: 2021 Monitoring

HOUSATONIC RIVER PROJECT, FERC NO. 2576

prepared for

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Candlewood Lake near Dikes Point during the January 2021 winter zebra mussel survey.

INTRODUCTION

Zebra mussels (*Dreissena polymorpha*) were discovered in Lake Lillinonah and Lake Zoar in October 2010, and in Lake Housatonic in 2011, prompting concern about their potential presence elsewhere in the Housatonic River watershed (Biodrawversity 2011, 2012a, 2013). Zebra mussels are also established in several other waterbodies in the region, including the Hudson River in New York, East and West Twin Lakes in Connecticut, and Laurel Lake in Massachusetts. The zebra mussel population in Laurel Lake, discovered in 2009, has been shown to export veligers to the Housatonic River (Biodrawversity 2009, 2013). The Housatonic River is 149 miles long, with approximately two-thirds of its length in Connecticut. With established populations at the northern and southern ends of the Housatonic River, and numerous possible dispersal vectors between infested and other susceptible waterbodies, it was prudent to establish an early detection program for zebra mussels in the Housatonic River and Candlewood Lake.

In 2011, FirstLight Power (FLP) began a monitoring program for zebra mussels in the Housatonic

River at the Falls Village, Bulls Bridge, and Rocky River hydroelectric facilities, and in Candlewood Lake (Biodrawversity 2012b). The plan became part of FLP's *Nuisance Species Monitoring Plan* for its Housatonic River Project (FERC Project #2576). The monitoring plan was developed to gain a better understanding of (1) the presence/absence of zebra mussel adults or larvae, (2) adult population density, (3) colonization rate, and (4) habitat suitability. The plan included visual inspections and SCUBA surveys to search for adult zebra mussels, approximately biweekly collection of veliger samples at four locations from May to October, and deployment of substrate samplers at four locations. The monitoring program was first implemented in 2011 and repeated without modification in 2012. Veliger monitoring was discontinued in 2013, and the use of artificial substrates was discontinued after the 2014 season. Adult zebra mussel surveys in the Falls Village and Bulls Bridge canals, and in the Housatonic River near Boardman Bridge, were discontinued after the 2017 field season. From 2018 to present, the plan focused on early detection in Candlewood Lake. Zebra mussels were detected in Candlewood Lake for the first time in May 2020 (1 individual at Dive Site 5).

More were found during the deep drawdown in January 2021 by FLP and the Candlewood Lake Authority, at multiple points throughout the lake.

This report describes FLPs 2021 monitoring, which included surveys for juvenile or adult zebra mussels in Candlewood Lake during the deep winter drawdown (January), SCUBA surveys throughout the lake in the spring (May), and during the annual inspection of the Rocky River tailrace (October).

METHODS

Candlewood Lake Winter Survey: The 2021 monitoring included checking exposed shoreline areas and nearshore shallow water (<1.0 ft) during the peak of the deep winter drawdown. Fieldwork was conducted on January 30-31. Seven sites were checked (Figure 1), for a total of 12.5 hours of search time. Sites were selected either in areas of Candlewood Lake that were not previously searched in late autumn or winter of 2020/2021, or in areas that were searched but where zebra mussels were not found, based on information provided by the Candlewood Lake Authority in late January. There was light snow cover in most areas, and sheet ice covered some of the rocks in the dewatered zone, but there was still ample exposed substrate to survey.

Candlewood Lake Spring Survey: The spring 2021 zebra mussel monitoring in Candlewood Lake was conducted from May 19-21 by the same biologists who conducted previous monitoring (2011 to 2020). The lake was at 429.0' at the time of the survey. Surveys included SCUBA diving at 10 locations in Candlewood Lake (Figure 1), which included the same locations surveyed in 2018, 2020, and 2021. Biologists spent 1-2 hours per site searching all available/suitable substrate for zebra mussels.

Rocky River Tailrace: On October 6, 2020, one biologist conducted a SCUBA survey in the Rocky River tailrace, inspecting natural surfaces within the tailrace channel, the vertical concrete walls, and the trashracks. A subsample of zebra mussels were collected and measured.

RESULTS

Candlewood Lake Winter Survey: Three individual zebra mussels were detected, including two at Site 1 near the Rocky River intake, and one at Site 6 on the Route 39 causeway separating Candlewood Lake from

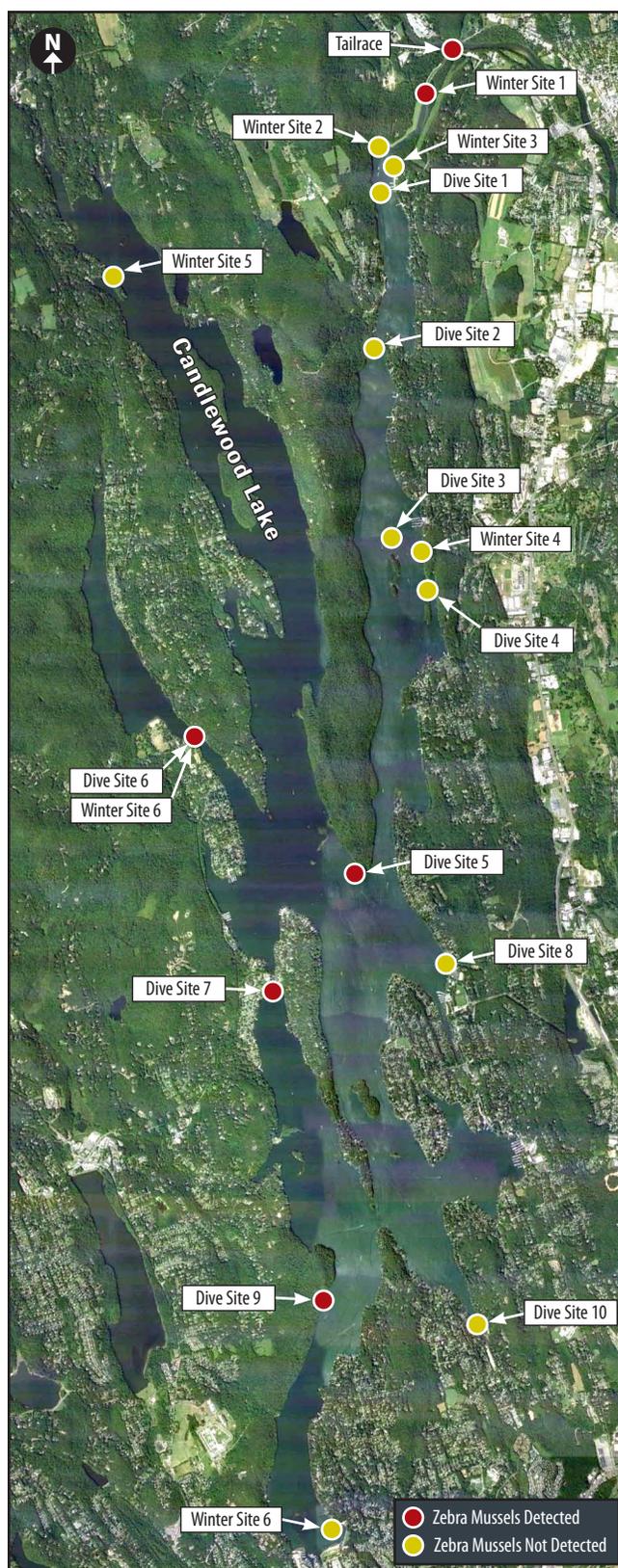


Figure 1. FirstLight Power's 2021 monitoring sites in Candlewood Lake, showing where zebra mussels were detected.

Table 1. Summary of survey sites, zebra mussel counts, and zebra mussel shell lengths for the 2021 zebra mussel monitoring in Candlewood Lake and the Rocky River tailrace.

Statistic	Winter Drawdown	Spring Dive	Rocky River Tailrace	Total
Number of Survey Sites	7	10	1	18
Sites with Zebra Mussels	2 (1, 6)	3 (5, 7, 9)	1	6
Number of Zebra Mussels	3	5	12	20
Average Shell Length (mm)	16.7	22.1	27.7	24.6
Min Length (mm)	8.0	16.5	25.0	8.0
Max Length (mm)	23.0	29.5	30.5	30.5

Squantz Pond (Figure 1). At Site 1, the zebra mussels were found attached to rocks approximately two feet above the water line (corresponding to a water depth of approximately 8 ft when the reservoir is full). These were 19.0 and 23.0 mm in length, likely first-year mussels. At Site 6, one juvenile zebra mussel (8.0 mm) was

found on a large rock (riprap) on the Candlewood Lake side of the Route 39 causeway, approximately 3.5 ft above the water line.

Candlewood Lake Spring Survey: Biologists detected live zebra mussels at Dive Sites 5, 7, and 9) (Figure



Rocky River penstock in January 2021, where two adult zebra mussels were found.



Route 39 causeway between Candlewood Lake and Squantz Pond, where one juvenile zebra mussel was found.



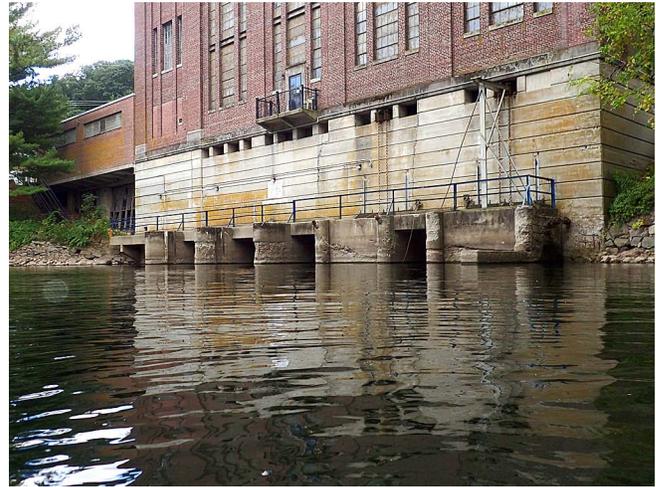
Zebra mussel found near the Rocky River penstock.



Zebra mussel found near the Route 39 causeway.



Candlewood Lake survey site 5, where two adult zebra mussels were found in May 2021.



Rocky River tailrace, where 12 adult zebra mussels were found in October 2021.



Zebra mussels found at Candlewood Lake survey site 5.



Zebra mussels found at the Rocky River tailrace.

1). At Dive Site 5, two were found at depths of 10.0 and 12.0 ft (419.0 and 417.0 ft, respectively). At Dive Site 7, two were found at depths of 12.0 and 16.0 ft (417.0 and 413.0 ft, respectively). At Dive Site 9, one was found at a depth of 13 ft (416 ft). Shell lengths ranged from 16.5 to 29.5 mm (average = 22.1 mm), and these could have all settled during the previous year. Most were likely sexually mature and capable of reproducing in 2021. As in previous years, biologists detected low densities of Asian clams and native mussels (eastern elliptio and eastern floater) throughout Candlewood Lake.

Rocky River Tailrace: Adult zebra mussels were found at low densities throughout all of the areas that were searched, including the natural substrate (boulders) in the tailrace channel and the vertical concrete walls. Most were found on the concrete walls. They were

found at depths ranging from 2.0 to 18.0 ft. Twelve were collected; these ranged in length from 25.0 to 30.5 mm (average = 27.7) (Table 1).

CONCLUSION

Based on the spring 2021 results, combined with results of the January monitoring during the draw-down, we think it is likely that zebra mussels have established a reproducing and self-sustaining population in Candlewood Lake. They occupy water depths that will make it difficult to control them using deep drawdowns, although drawdowns could be an important tool for limiting their abundance and distribution in shallow areas of the lake (i.e., 420.0 to 429.0 ft). The rate of colonization, abundance, and stability of zebra mussel populations in Candlewood Lake, and ecological effects, are difficult to predict at this time. There is

still uncertainty about the potential success of zebra mussels in Candlewood Lake where calcium concentrations and pH are marginally suitable.

Consistent with the 2016-2020 monitoring, zebra mussels were found in the Rocky River tailrace. Based on the presence of zebra mussels within the tailrace, it seems likely that pumping from the Housatonic River to Candlewood Lake could transport either eggs, sperm, veligers, juveniles, or even adults that may be unattached or that are attached to small objects (e.g., detritus, aquatic vegetation, etc.).

Zebra mussels have now been documented in all of the areas that FLP first began monitoring in 2011, including throughout Candlewood Lake. FLP will continue to consult with stakeholders to review, modify if necessary, and continue to implement the *Nuisance Species Monitoring Plan* for its Housatonic River Project.

REPORTS CITED

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