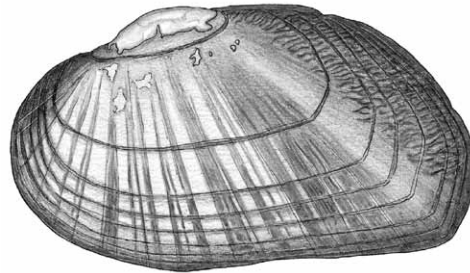


REPORT

Freshwater Mussel Survey in the Lamprey River



prepared for

Lamprey River Advisory Committee

prepared by

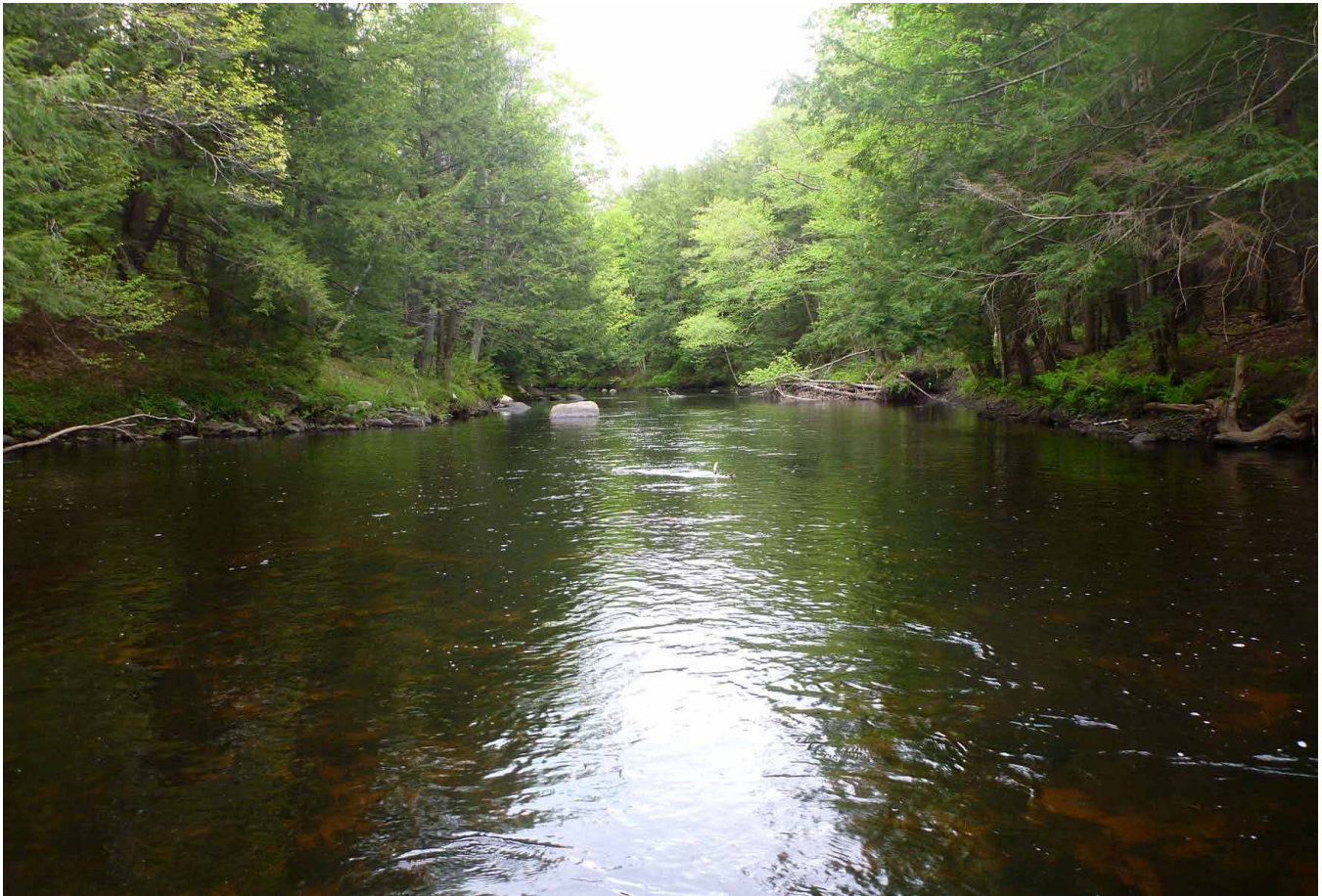
biodrawversity



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Lamprey River between Blake Road and Main Street (Epping) where most Brook Floater, and highest quality mussel habitat, were documented.

INTRODUCTION

Biodrawversity LLC conducted a freshwater mussel survey in select areas of the Lamprey River as a follow-up to watershed-wide mussel surveys that were conducted in 2010 and 2011 (Biodrawversity 2012). The 2012 report includes historical context for the 2010–2014 mussel surveys, as well as background information on the regional conservation status of the state-endangered Brook Floater (*Alasmidonta varicosa*). The 2014 survey focused on areas where Brook Floater were found in 2010 and 2011, and also in areas of the Lamprey River that were not surveyed during either of those years. The primary objectives were to compare the 2014 results to the 2010 and 2011 survey results, and to attempt to find Brook Floater in other areas of the Lamprey River. In addition, quantitative sampling of all mussel species was conducted in a reach downstream from the former Bunker Pond Dam to document changes in mussel density from 2011 to 2014 that may have resulted from dam removal.

STUDY SITES

The 2014 qualitative surveys focused on the following areas of the Lamprey River, ordered from upstream to downstream (Table 1):

- Blake Road to Main Street (Epping): Much of this reach was surveyed in 2010 and 2011. Brook Floater were documented at very low densities in this reach. The 2014 survey included a resurvey of areas where Brook Floater had been found, and surveys in areas that had not been surveyed before.
- Route 87 Bridge to North River Confluence: This reach was not surveyed in 2010 or 2011.
- Wadleigh Falls to Lee Hook Road: This reach was surveyed in 2010, and Brook Floater were documented at very low densities. The 2014 survey included a resurvey of areas where Brook Floater had been found to compare the low population densities.
- Lee Hook Road to Wiswall Road: This reach was not surveyed in 2010 or 2011. This is the upper impoundment of the Wiswall Dam.

Table 1. Survey results for the five reaches that were qualitatively surveyed for this report.

Reach	Town	Date	Survey Duration	Species Found*					
				AlVa	AlUn	StUn	LaRa	ElCo	AnIm
Bunker Pond Dam to Blake Road	Epping	8/15/11	1/2 day (1 person)	1	>30	0	>30	1000s	0
Blake Road to Main Street	Epping	5/20/14	1 day (2 people)	4	3	0	5	1000s	0
Route 87 Bridge to North River Confluence	Epping	7/11/14	1 day (2 people)	0	~5	0	~10	1000s	0
Wadleigh Falls Dam to Lee Hook Road	Lee	5/21/14	1 day (2 people)	1	58	0	10	1000s	1
Lee Hook Road to Wiswall Road	Lee	5/22/14	1 day (2 people)	0	8	0	4	1000s	0

*AlVa = *Alasmidonta varicosa*, AlUn = *Alasmidonta undulata*, StUn = *Strophitus undulatus*, LaRa = *Lampsilis radiata*, ElCo = *Elliptio complanata*, AnIm = *Anodonta implicata*

In addition, freshwater mussels (all species) were quantitatively sampled in a 400-meter reach downstream from the former Bunker Pond Dam in Epping in 2011 and 2014.

METHODS

1. Qualitative Surveys

Two biologists conducted snorkel and SCUBA surveys in May and July of 2014. The duration and location of each survey were recorded. Surveys were adaptive; more time was spent searching in suitable Brook Floater habitat. Biologists recorded precise counts for uncommon mussels and either counted or estimated abundance of common species; only Eastern *Elliptio* (*Elliptio complanata*) was too numerous to count. Biologists recorded shell length, shell condition, microhabitat (depth, substrate, flow conditions), a photograph, and location of each Brook Floater encountered during the survey. Representative habitat photographs were taken at all sites.

2. Bunker Pond Dam Removal Study

- Biologists conducted a pre-removal quantitative baseline survey and qualitative survey (2011) and two post-removal quantitative surveys (2011 and 2014) to document downstream effects of the Bunker Pond Dam removal on mussels.
- One biologist conducted a snorkel survey in the 1,000-meter reach between Bunker Pond Dam and Blake Road to locate any Brook Floater. The biologist recorded locations (using GPS), habitat, and shell length/condition for all Brook Floater observed, and also noted the locations and densities of other mussel species.
- Biologists established cross-channel transects every 5-10 meters, with some wider gaps in poor habitat, in a ~400-meter reach primarily downstream from the deep pool at Blair Park. The pre-removal survey included 34 transects, but only a subset were resurveyed (15 for the 1-month follow-up and 16 for the 3-year follow up).

- Six 0.25m² quadrats were evenly spaced along each transect. This resulted in 204 quadrats for the pre-removal survey, 89 quadrats for the first post-removal survey, and 96 quadrats for the second post-removal survey.
- The following data were recorded for each quadrat: (1) water depth, (2) visual estimate of substrate distribution, (3) visual estimate of aquatic plant coverage, (4) visual estimate of instream wood coverage, (5) counts for each species.

RESULTS

1. 2014 Qualitative Surveys

Blake Road to Main Street: Four live Brook Floater were found in this reach in 2014. They ranged in length from 51.8 to 59.8 mm and each exhibited moderate to heavy shell erosion. They occurred in depths of 2.5–3.0 feet, in moderate flow velocity, and in sand-gravel-cobble substrates. Three Triangle Floater and five Eastern Lampmussel were also found, as well as several thousand Eastern *Elliptio*. This reach contained the highest-quality Brook Floater habitat observed in the Lamprey River.

Route 87 Bridge to North River Confluence: Neither Brook Floater nor Creeper were found in this reach. Eastern *Elliptio* was common, and very few Triangle Floater and Eastern Lampmussel were encountered. Generally, this low-gradient reach was not ideal for Brook Floater.

Wadleigh Falls to Lee Hook Road: Only one Brook Floater was found in this reach; it was 50.7 mm in length and was very heavily eroded. A total of 58 Triangle Floater were found, including 13 just below Wadleigh Falls and 24 just upstream from Lee Hook Road. Triangle Floater ranged in length from 24.0 to 58.5 mm, and exhibited only light to moderate shell erosion. Ten Eastern Lampmussel were found throughout the reach, and one Alewife Floater was

Table 2. Summary mussel count and density data for the quantitative monitoring downstream from the former Bunker Pond Dam.

	Pre-Removal	~1-Month Post-Removal	2014
Quadrat Count	204	89	96
Species Counts			
Eastern Elliptio	1,352	633	1,014
Eastern Lampmussel	68	27	12
Triangle Floater	6	1	3
Creeper	0	0	1
All Species	1,426	661	1,030
Species Density (#/m ²)			
Eastern Elliptio	26.5	28.4	42.3
Eastern Lampmussel	1.33	1.21	0.50
Triangle Floater	0.12	0.04	0.13
Creeper	0.00	0.00	0.04
All Species	28.0	29.7	42.9

also found. Many thousands of Eastern Elliptio were observed. Much of this reach contained high-quality habitat for Brook Floater and other species, though sedimentation and channel instability were prevalent throughout.

Lee Hook Road to Wiswall Road: Neither Brook Floater nor Creeper were found in this reach. Eight Triangle Floater, four Eastern Lampmussel, and several thousand Eastern Elliptio were observed. The highest quality habitats were located near Lee Hook Road and near an island about 1.5 miles downstream from Lee Hook Road (Figure 2).

2. Bunker Pond Dam Removal Study

Mussel count and density data from the quantitative study are provided in Table 2. There was no significant change in mussel density or species detected between the pre-removal study and the one-month follow up. By 2014, Eastern Elliptio density (and total mussel density) was significantly higher than at the prior two sampling periods. Four species were detected in 2014 compared to three in 2011; one Creeper was found in 2014. Eastern Lampmussel density was lower in 2014 than in 2011. There did not appear to be any change to instream habitat from 2011 to 2014 for the measured parameters.

DISCUSSION

1. Mussel Species in the Lamprey River

Eastern Elliptio: There was evidence of viable Eastern Elliptio populations throughout the lower Lamprey

River. All size classes of Eastern Elliptio were present, perhaps skewed toward smaller animals, suggesting high level of recruitment with some evidence of limited longevity or high adult mortality.

Eastern Lampmussel: This species was present throughout the lower Lamprey River but occurred at low densities. Highest density was found in the areas downstream from the former Bunker Pond Dam.

Triangle Floater: The Triangle Floater was widely distributed in the Lamprey River but usually occurred at very low densities. Relatively high densities were found in three patches: downstream from Bunker Pond Dam (and upstream from Blake Road), downstream from Wadleigh Falls, and upstream from Lee Hook Road.

Alewife Floater: One live animal was found downstream from Wadleigh Falls in 2014. This species is usually found in coastal streams and rivers which support runs of alewife, blueback herring, and American shad. Little is known about Alewife Floater distribution downstream from the Wiswall Dam, but if there is a population from that dam downstream to the freshwater estuary, then migratory fish that are able to ascend Wiswall Dam could transport larvae upstream.

Creeper: Only four live Creeper were found in the Lamprey River in 2010, none in 2011, and one in 2014. Overall, the creeper population is likely terminal in the Lamprey River; it is difficult to fathom any other outcome for such a low-density population unless they are concentrated in areas that we did not survey.

Brook Floater: Only 11 live Brook Floater, and no shells, were found in the Lamprey River in 2010. One was found in 2011, and five were found in 2014. Of these 17 animals, five were found in the reach between Wadleigh Falls Dam and Lee Hook Road in Lee, and 12 were found in the reach between Bunker Pond Dam and Main Street in Epping (Table 3). More than 150 person-hours were spent looking for Brook Floater from 2011 to 2014, resulting in one of the lowest CPUE values for any river in New England where Brook Floater still occur. There was no evidence of recruitment, and most of the mussels exhibited moderate to severe shell erosion.

Biodiversity has studied Brook Floater populations in almost 40 rivers in New England. Studies were generally conducted using the same methods as the Lamprey River surveys, allowing for comparisons of

Table 3. Location, size, condition, and habitat for each Brook Floater encountered in the Lamprey River from 2010 to 2014.

Year	Reach	Length (mm)	Condition*	Water Depth (m)	Substrate**
2010	Blake Road to Main Street	47.0	0.75	0.50	S/G
2010	Blake Road to Main Street	49.0	0.50	0.50	S/G
2010	Blake Road to Main Street	51.0	1.00	0.50	S/G
2010	Blake Road to Main Street	53.5	1.00	0.15	G/C
2010	Blake Road to Main Street	54.0	0.25	0.30	S/C
2010	Blake Road to Main Street	55.0	0.50	0.25	S/C
2010	Blake Road to Main Street	58.5	1.00	0.20	G/C
2014	Blake Road to Main Street	55.2	0.75	0.75	S/G/C
2014	Blake Road to Main Street	59.8	1.00	0.75	S/G/C
2014	Blake Road to Main Street	52.3	0.50	0.80	S/G/C
2014	Blake Road to Main Street	51.8	0.50	0.75	S/G/C
2011	Bunker Pond Dam to Blake Road	58.9	0.50	1.00	S/G/C
2010	Wadleigh Falls to Lee Hook Road	47.0	1.00	0.25	S/G
2010	Wadleigh Falls to Lee Hook Road	49.0	0.50	0.50	S/Bed
2010	Wadleigh Falls to Lee Hook Road	56.0	0.00	0.25	S/G
2010	Wadleigh Falls to Lee Hook Road	60.0	1.00	0.25	S/C
2014	Wadleigh Falls to Lee Hook Road	50.7	1.00	0.75	S/G/C
Average		53.5	0.69	0.50	-
Range		47-60	-	0.15-1.0	-

*A numeric score is assigned to each mussel indicating the degree of shell erosion. 0 = little or none, 0.25 = light/moderate, 0.5 = moderate, 0.75 = moderate/heavy, and 1.0 = heavy. These are averaged for all individuals to produce an index of shell condition for the sampled population ranging from 0 to 1. Index values close to 0 indicate animals have healthy, intact shells, whereas index values close to 1 indicate that animals are heavily eroded due to physical or chemical factors.

**Substrate: S = Sand, G = Gravel, C = Cobble, Bed = Bedrock

CPUE, demographics, shell condition, and spatial distribution. Compared to other rivers in the region, the Lamprey River contains one of the lowest density populations, an age structure skewed toward older animals, no evidence of recruitment, a very high degree of shell erosion, and a highly restricted distribution. Overall, we believe that the Lamprey River Brook Floater population is terminal.

2. Effects of Bunker Pond Dam Removal

It does not appear that dam removal had any adverse effects on habitat or mussel density in the large mussel bed that exists along and downstream of Blair Park.

FURTHER READING

Nedeau, E.J. 2008. Freshwater Mussels and the Connecticut River Watershed. Connecticut River Watershed Council, Greenfield, MA.



Two heavily eroded Brook Floater found during the 2014 survey.