2019
Egg Mat Protype Pilot Study
Final
Summary Report

By
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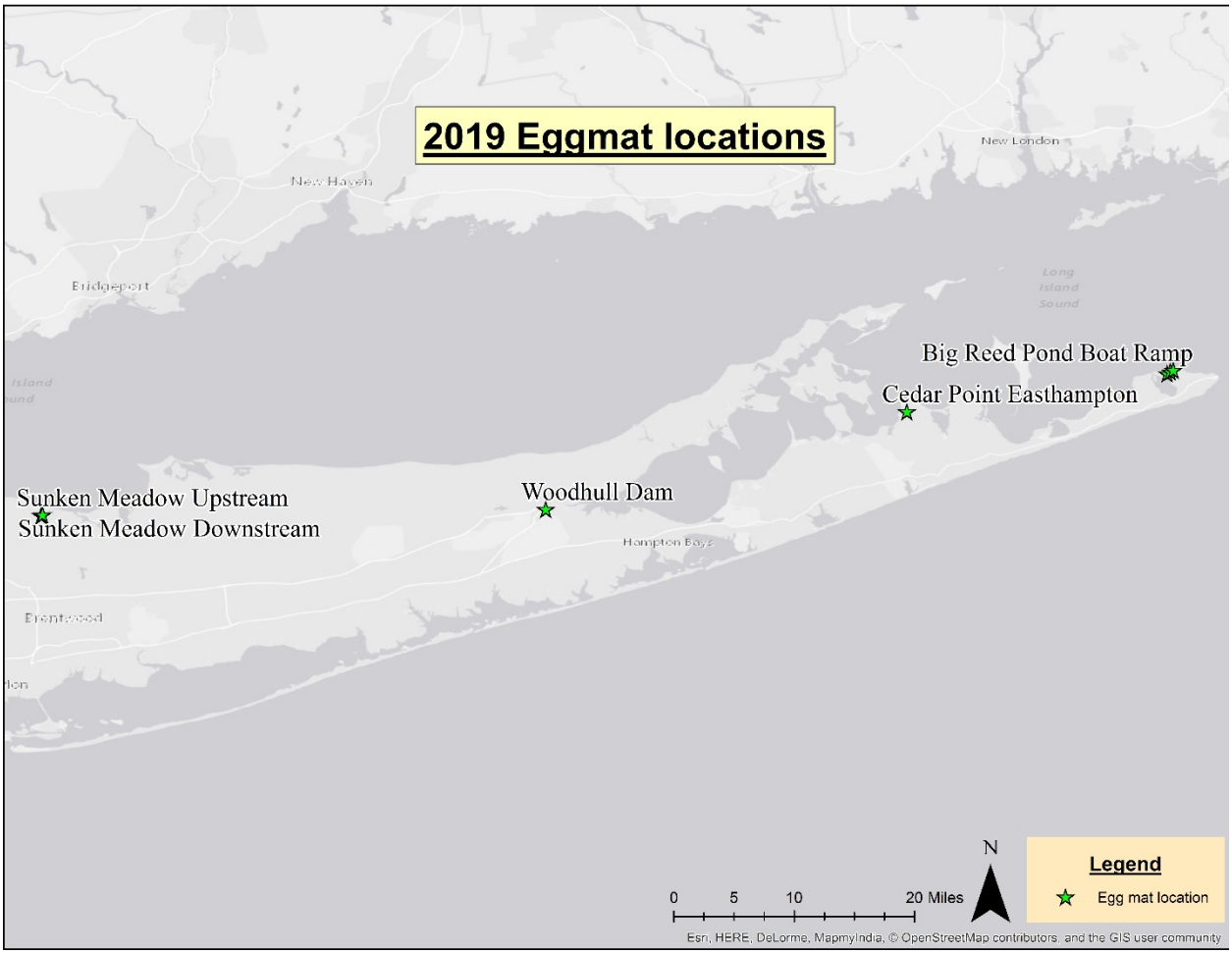
Introduction

River herring (alewife and blueback herring) in Long Island waters have been reduced compared to historical records due to impairments to water quality, overfishing, bycatch, and the creation of barriers, such as dams and culverts, to their freshwater spawning grounds. As a result, numerous environmental organizations across Long Island have been focusing on how to increase the number of spawning runs and determine where remnant runs are located. Since 2008, Seatuck Environmental Association, the Long Island Sound Study, the Peconic Estuary Program, and the South Shore Estuary Reserve has organized the Long Island River Herring Volunteer Survey. This effort to monitor spawning river herring during the spring spawning season has made it possible for resource managers to monitor numerous sites for river herring around Long Island and collect data on remnant runs.

Methods

In this protype pilot study the NYSDEC was looking for a passive way to monitor the presence of river herring for absence or presence. The methodology for this study was modified from the protocol established by the NYSDEC Region 3 office in the Hudson River tributary area (Kowalik & Eakin 2019). The protocol for this study can be found in the NYSDEC document titled *Detecting River Herring in Long Island NY Waters Using Egg Mats Pilot Study 2019*. (Simpson & O'Neill) During the 2019 alewife spawning run season the egg mat prototype was tested at 4 high priority locations. Egg mats were left out 1-5 days in the field before being retrieved and analyzed in the lab. Site location and timing was chosen based on the greatest possibility of egg collection. In the next section each location will be discussed separately.

The egg mats themselves cost approximately $30-$40 per egg mat with a construction time of approximately 10-20 minutes depending on if you have PVC cutting tools available. Each egg mat took between 2-4 hours to be processed in the lab depending on sediment accumulation in the mat. Picture 1 depicts the areas that eggs mats were located across Long Island. Table 1 indicates the locations and the dates they were deployed and retrieved. Map 1 depicts the locations of the egg mats.



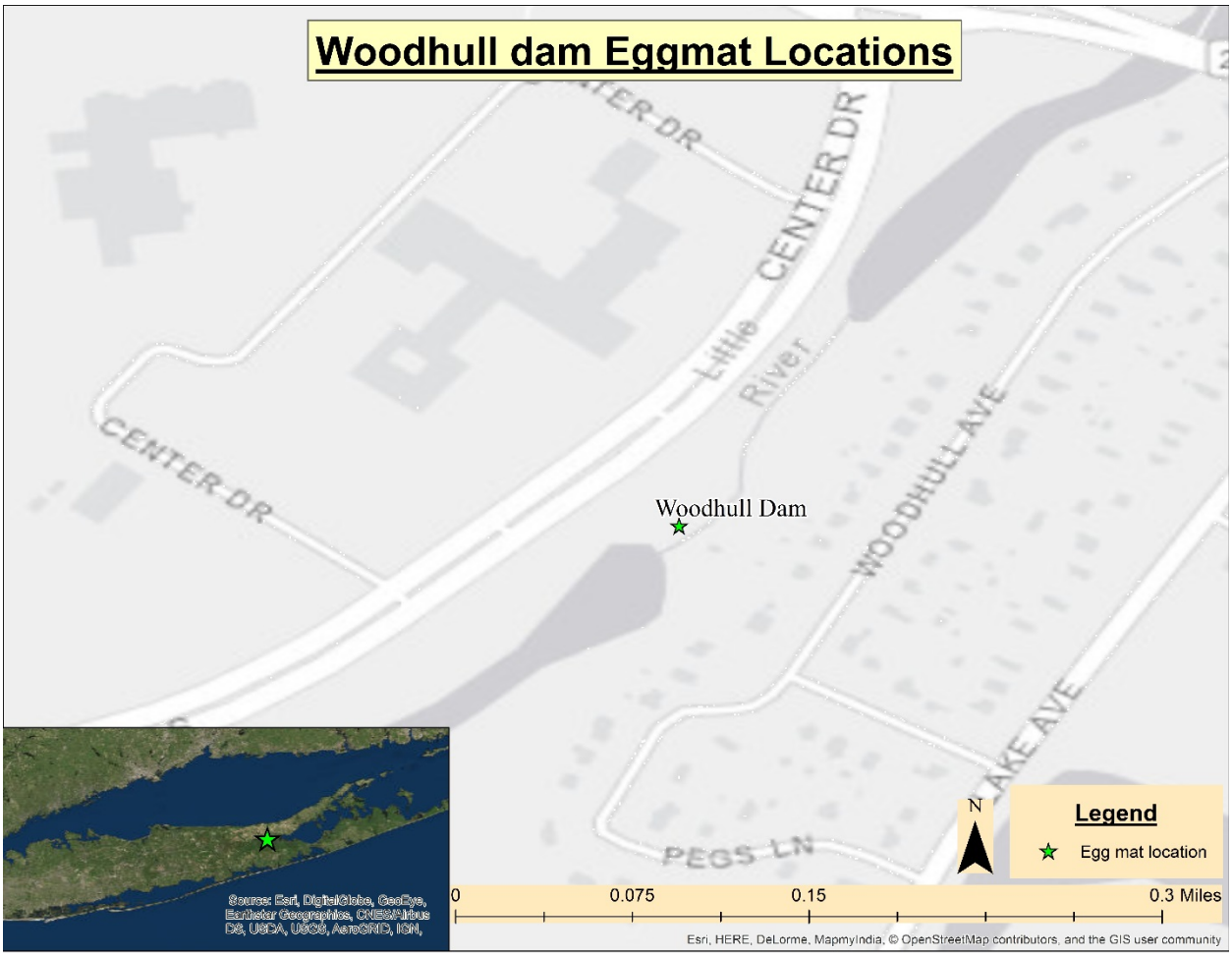
Map 1 Egg mat locations across Long Island in 2019

Site	Date Deployed	Date Retrieved
Woodhull Dam	3/25/2019	3/28/2019
Big Reed Pond Boat Ramp	4/15/2019	4/17/2019
Big Reed Pond Culvert	4/15/2019	4/17/2019
Big Reed Pond Montauk off shoot	4/15/2019	4/17/2019
Cedar Point Easthampton	4/15/2019	4/17/2019
Sunken Meadow Downstream	4/18/2019	4/23/2019
Sunken Meadow Upstream	4/18/2019	4/23/2019

Table 1

Individual Sites

1. Woodhull Dam, Peconic River, Riverhead, NY (map 2)
   The first site was Woodhull Dam in Riverhead. Deployed 3/25 and retrieved on 3/28



Map 2 Woodhull Dam egg mat location

This site was used as our initial proof of concept. During the deployment and retrieval, river herring were easily seen in the pool/spillway below Woodhull Dam. Upon retrieval the egg mats were covered in river herring scales. When taking the samples back to the lab they were found positive for alewife eggs. Due to circumstances we were not able to preserve these eggs for expert verification of species. However, we concluded these mats to be a success due to the large number of scales on the mats which signified presence of alewife. At the time these samples were processed we did not have a 500-micron sieve. Hence, 3" by 3" pieces of the egg mat were analyzed until what was determined to be an egg was found. Below is an image of the eggs that were found (Photo 1).

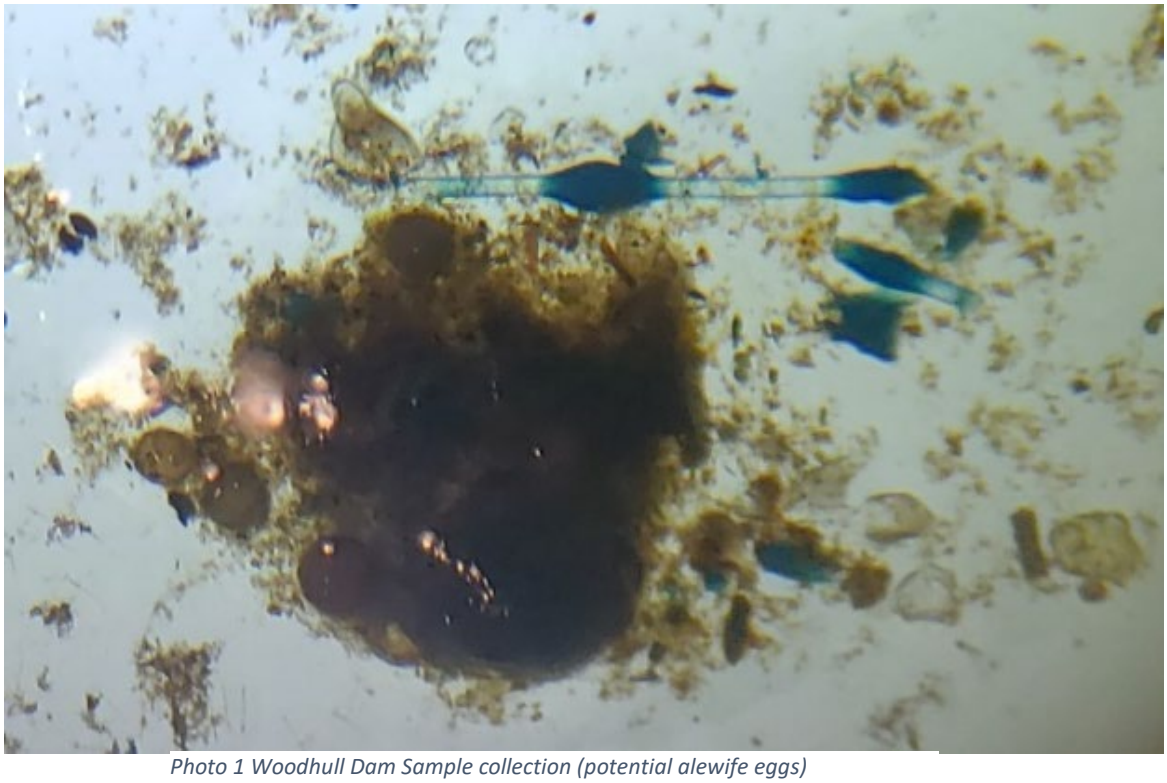
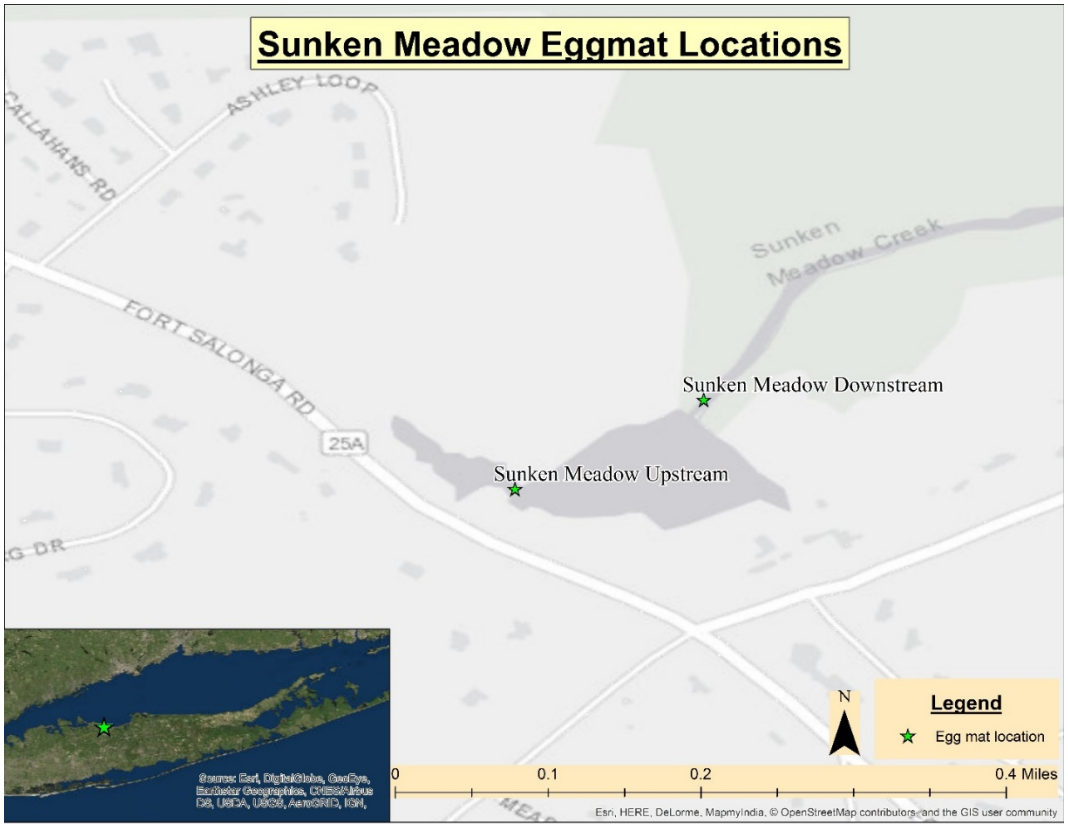


Photo 1 Woodhull Dam Sample collection (potential alewife eggs)

2. Sunken Meadow Creek, Sunken Meadow State Park, Kings Park, NY (map 3)
   The second site was Sunken Meadow Creek Upstream and Downstream. Deployed on 4/18 to 4/23.



Map 3 Sunken Meadow Creek Egg mat locations

Alewife have been reported in this creek for several years but the total numbers are minimal (a few dozen river herring). To combat this the egg mats were placed in areas with narrow passage to hopefully acquire eggs or scales as the fish were coming up or down river. These samples had a large amount of sediment accumulation. The mats were rinsed, and the water was filtered through a 500-micron sieve. The remnants were then place in a 50% ethanol solution and then analyzed using a dissecting microscope. No river herring eggs were found, however, multiple other species and eggs from amphipods were found. To the right Photo 3 shows of one of the egg mats deployed and Photo 3 & 4 show eggs of amphipods and other unidentified species.

Photo 2 Sunken Meadow Creek downstream Egg mat

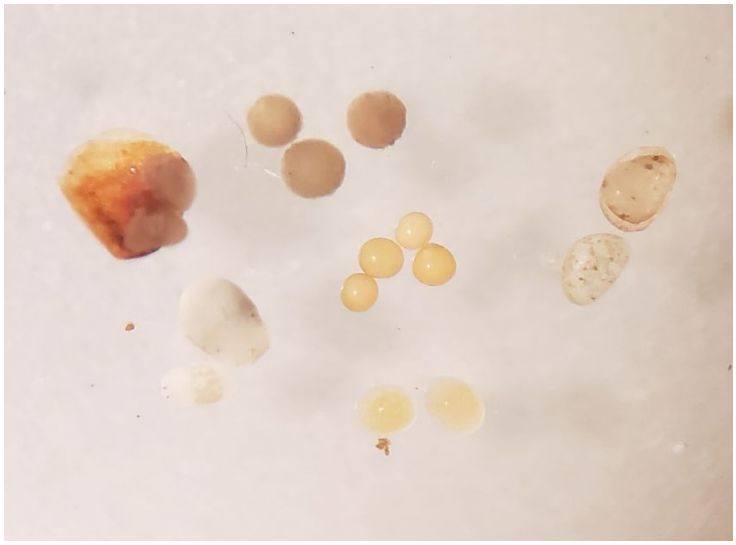


Photo 3 Sunken Meadow Samples

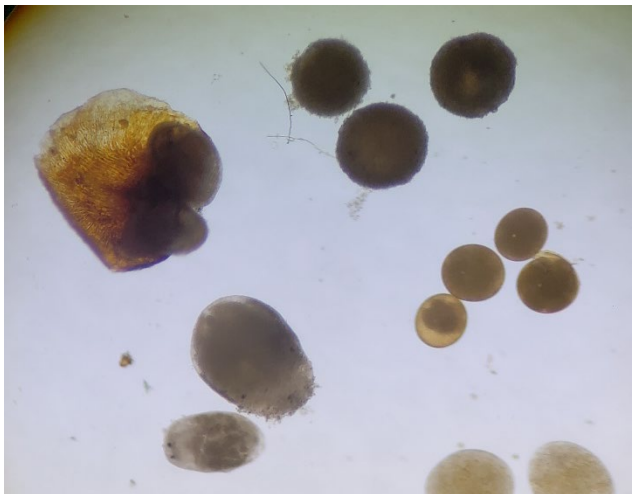
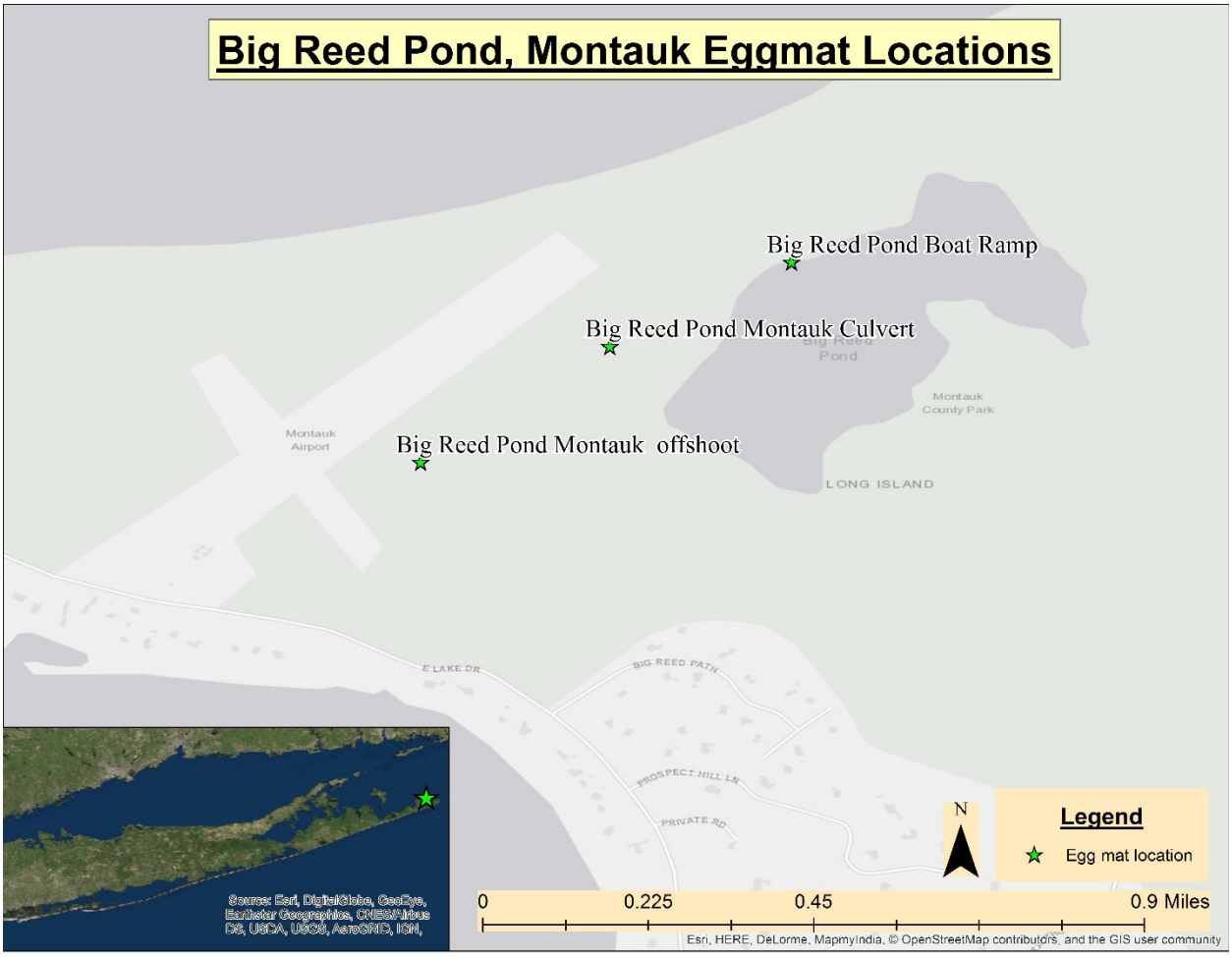


Photo 4 Sunken meadow samples

3. Big Reed Pond, Montauk, NY (map 4)

The third site were in the Big Reed Pond System and included the offshoot pond, culvert, and



boat ramp. All three egg mats were deployed on 4/15 and retrieved on 4/17.

Map 4 Big Reed Pond Egg Mat locations

Juvenile alewife were captured in Big Reed Pond during the 2016 NYSDEC Freshwater Fisheries net and electrofishing surveys. Since this is a large pond and has the potential to house a large amount of spawning river herring three egg mats were deployed in different areas throughout the system. The first egg mat farthest West was located at a smaller pond North of Big Reed Pond. Due to the flow of water fish could potentially run up river and go to the smaller pond instead of Big Reed pond. The second mat was placed at the culvert along the dirt road going to Big Reed Pond. This mat had the highest potential for collection of eggs due to the narrowing location of where all water was either entering or leaving the system. The last egg mat was place near the old boat ramp. This area is completely open and encompasses all of Big Reed Pond. Once back at the lab, the mats were rinsed, and the water was filtered through a 500-micron sieve. The remnants were then placed in a 50% ethanol solution and then analyzed using a dissecting microscope. No river herring eggs were found; however, eggs of copepods,

amphipods, and other unidentified species were found. Below are pictures of said other species and eggs. (Photos 5-8)

Photo 8 Big Reed Pond Egg Mat Samples

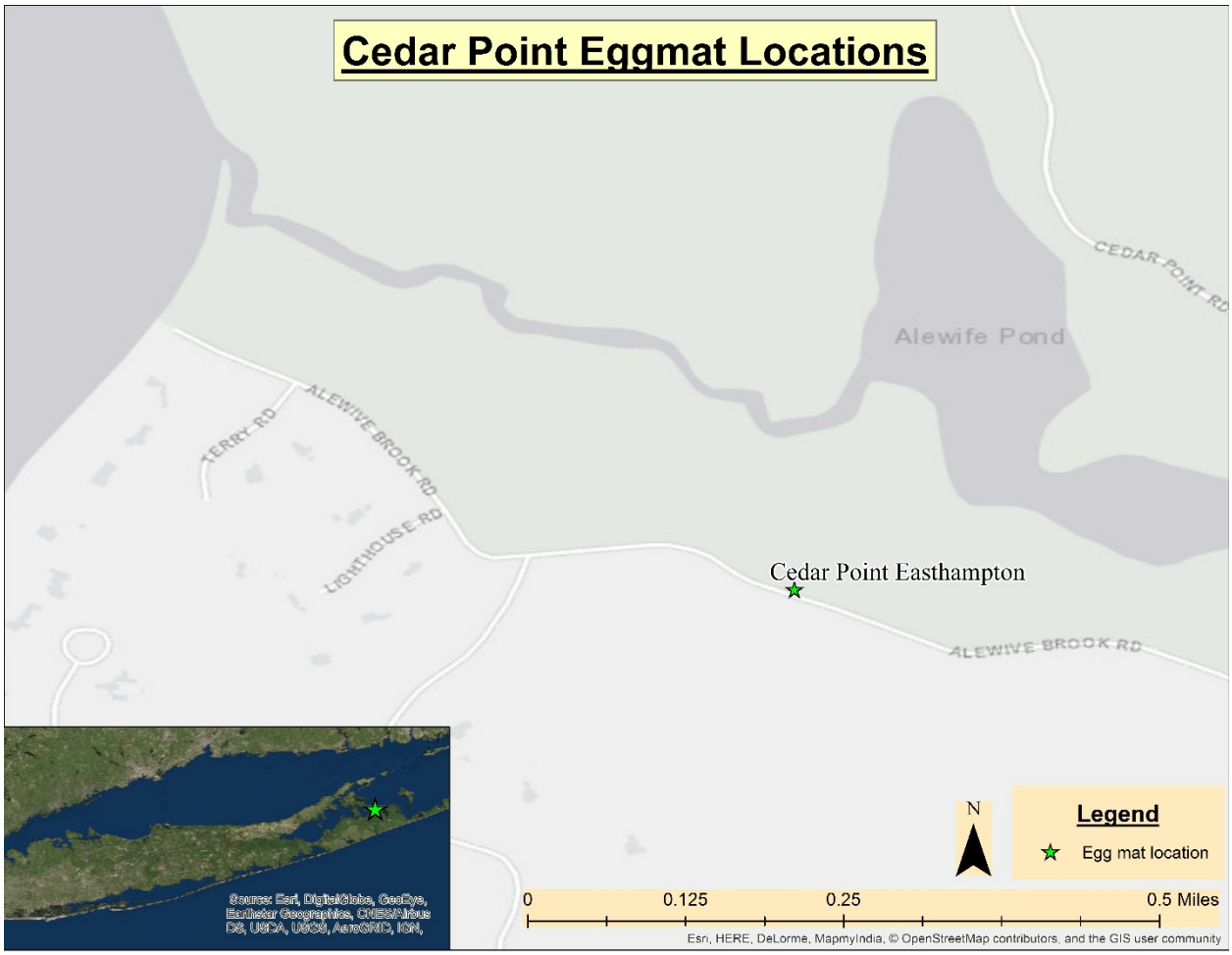
Photo 5 Big Reed Pond Egg Mat Samples

Photo 7 Big Reed Pond Egg Mat Samples

Photo 6 Big Reed Pond Egg Mat Samples

4. Cedar Point, Cedar Creek, East Hampton, NY (map 5)

The Fourth site was at Cedar Creek in Cedar Point in East Hampton, NY. The egg mat was deployed at a culvert north of Alewife Brook Road on 4/15 and retrieved on 4/17.



Map 5 Cedar Point Egg Mat location

Alewife have been seen in Alewife Pond, but little is known if they are migrating through the culvert to go further upstream to Scoy Pond. Once back at the lab, the mats were rinsed, and the water was filtered through a 500-micron sieve. The remnants were then placed in a 50% ethanol solution and analyzed using a dissecting microscope. No river herring eggs were found, however, multiple other species and eggs from amphipods and copepods were found. Below is a picture of said unknown eggs.

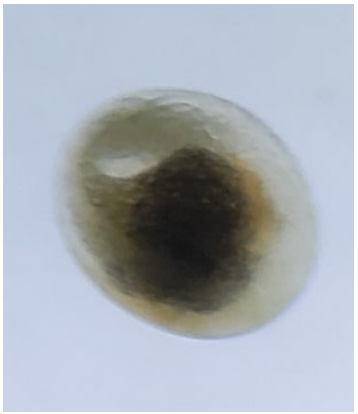


Photo 9 Cedar Point Egg mat sample

Summary

Overall, there was limited success using the egg mat method adopted from the Hudson River Tributary region (a methodology used for the estimation of abundance of alewife) in the tributaries found on Long Island. The only location where alewife eggs and scales were collected on the mats was at Woodhull Dam, where there is a large (30,000-80,000 fish), known population of spawning adults. The other locations captured spawning activity of other species (copepods and amphipods) but did not capture the scales or eggs of alewife. These sites may have failed due to a lack of abundance of alewife (either no known spawning adults in the system or minimal numbers) during the times of deployment or a design failure for the more turbid waters of Long Island, producing a heavy sediment load.

There is a potential for these egg mats to have greater success if they are deployed during the entire river herring spawning run season (mid-March to mid-May). Mats could be deployed for 1-5 days at a time, retrieved and analyzed, and replaced into the system. Having the mats in place the entire length of the spawning season will increase the chances of capturing any presence of spawning river herring. This change in monitoring strategy would incumber many man hours in the field and lab to deploy, retrieve, and analyze the samples. NYSDEC does not have the staff or resources to commit to this amount of effort. Due to the extensive amount of time to analyze the samples in the lab this would develop into a large project for any river system large or small.

Other new technologies may provide more cost-effective options for presence/absence studies of alewife. One suggestion is using eDNA technology to analyze for presence or absence of river herring during the spawning season. This new technique is developed for gene sequencing and sorting and egg mat samples, or water samples, collected from tributaries could possibly be tested for river herring DNA in the future. (USDA, 2019)

Citations

Kowalkik, M. David & Eakin W. William; 2019 N-Mixture Modeling of River Herring Egg Abundance and Distribution in the Tributaries of the Hudson River. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 11:48-61, 2019 DOI: 10.1002/mcf2.10060

United States Department of Agriculture; 2019 Research and Development *eDNA* https://www.fs.fed.us/research/genomics-center/edna/

Simpson, Liana & O'Neill, Victoria; 2019 Detecting River Herring in Long Island NY Waters Using Egg Mats Pilot Study 2019. NYSDEC