Experimental Stocking of Inoculated American eels in the Susquehanna River Watershed

2014 Annual Report

PURPOSE: Payments to the eel stocking fund as mitigation for the Penn House Commons Redevelopment project.

PROJECT TITLE: Experimental Stocking of Inoculated American eels in the Susquehanna River Watershed

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INTRODUCTION

American eel populations have been declining along the Atlantic coast. Although the Chesapeake Bay and tributaries support a large portion of the coastal eel population, the Susquehanna River comprises 43% of the Chesapeake Bay watershed and until recently was devoid of eels above Conowingo Dam. Construction of large mainstem dams in the 1900's effectively closed the river to upstream migration of juvenile eels (elvers). Before dams were constructed, the annual harvest of silver eels in the Susquehanna River was nearly one million pounds. While eels were stocked in the Susquehanna and its tributaries sporadically from 1938 to 1980, there is currently no commercial harvest and very little recreational fishery for eels. Dams on the Susquehanna River not only eliminated a once abundant eel fishery; they likely had a profound effect on the way the ecosystem functions.

Research conducted by the U.S. Geological Survey (USGS), Northern Appalachian Research Laboratory (NARL) and the U.S. Fish and Wildlife Service (USFWS), Maryland Fishery Resources Office (MFRO) indicates that American eel is a successful host fish for the freshwater mussel, *Elliptio complanata* (eastern elliptio) in the Susquehanna River. The larvae (glochidia) of freshwater mussels must parasitize a host fish to complete metamorphosis to the independent juvenile life stage. Glochidia from eastern elliptio collected in the Susquehanna River have higher metamorphosis success rates on American eels (≥ 90% success) than on other fish species found in the Susquehanna River (Lellis et al. 2013). While eastern elliptio is the most abundant and widespread freshwater mussel species in the northeastern United States, there are fewer eastern elliptio in the Susquehanna River watershed than nearby watersheds (Lellis 2002, personal communication, James McCann, MDDNR). In some streams and rivers, they comprise the most abundant biomass of any fauna in a watershed and can provide great filtration capacity. For example, the estimated 280 million eastern elliptio in the Delaware

River have the potential to filter between 2 billion and 6 billion gallons of water and remove 78 tons of sediment from the water column each day (Spooner and Lellis 2010). If eels are important to reproducing eastern elliptio populations in the Susquehanna River, restoring eels could also restore mussels, which could result in ecological benefits throughout the watershed.

PROBLEM STATEMENT

Many tributaries to the Susquehanna River have few or no eastern elliptio. In tributaries that have populations of eastern elliptio, stocking eels can benefit the mussels by providing a missing link in the reproductive cycle. However, restoring eastern elliptio to tributaries with small or no populations of eastern elliptio could take many years.

To jumpstart the reintroduction of eastern elliptio in streams where there are few or none, it may be more expedient to manually inoculate eels with eastern elliptio glochidia for release in selected streams.

HYPOTHESIS: Introduction of inoculated American eels to Susquehanna River tributaries will result in eastern elliptio population increases.

In order to test this hypothesis and as mitigation for the Penn House Redevelopment, the objectives of this project are to:

1. Release at least 2000 American eels inoculated with eastern elliptio glochidia over a 3 year period from 2014 to 2016.
2. Release at least 10% of the inoculated eels in cages in the streams.
3. Each year that inoculated American eels are released, at least 15 eels will be retained for laboratory verification that attached glochidia transform to juvenile mussels.
4. Survey freshwater mussel populations downstream of caged eel locations to collect baseline mussel population data (2014) and to assess recruitment to the mussel populations 4 years (2017) and 6 years (2019) after the first reintroduction of inoculated eels.

METHODS and RESULTS

Eel translocation

Gravid female eastern elliptio were collected from Buffalo Creek near Lewisburg, PA on May May 5, 2014 when water temperature was 11.5° C, May 12, 2014 when the water temperature was 17.5°C, and May 29, 2014 when the water temperature was 15.7°C and from Penns Creek near Krazterville, PA on May 13 when water temperature was 18.5°C. The mussels were held in a temperature controlled environment at 11.9 °C to delay glochidia release to coincide with eel availability. An elver ramp was deployed below Conowingo Dam in 2014 from May 29, 2014 through September 5, 2014. Captured elvers were sedated, measured, and counted. Eels were held in aerated tanks until 2100 eels were collected. Beginning on May 29, 2014, water temperature was raised 1.5 degrees each day until June 5 when the water temperature was 19.1°C. On June 6, 2014, when the water temperature was raised to 20.3°C, eastern elliptio

collected from Buffalo Creek on May 29, 2014, released glochidia. On June 7, 2014, 2100 eels were inoculated with freshwater mussel larvae (glochidia). Glochidia were siphoned from mussel aquaria. The number of glochidia collected was estimated volumetrically by extracting 1 ml three times and counting the number of glochidia in each milliliter, averaging the number and then scaling up to the number of milliliters containing glochidia. It was estimated that 4000 glochidia were released from the gravid mussels. The glochidia were taken to Conowingo Dam and added to a tank containing the 2100 eels and 60 liters of 23°C. The water was aerated with Oxygen to encourage attachment of glochidia to elver gills.

After the elvers were inoculated, 15 individuals were brought back to the laboratory. Ten of the eels were dissected to inspect the gills for gravidity. Five were held in laboratory tanks to watch for transformed juveniles to fall off to determine when juvenile eastern elliptio would fall off of the elvers in Penns Creek. Of the 10 eels dissected, 7 were found to be infested with glochidia. The number of attached glochidia ranged from 0 to 4 per eel with an average of 1.4 glochidia per eel. On June 18, 2014 the 2100 inoculated eels were relocated to Penns Creek. Cages holding 700 elvers each were deployed at three locations; New Berlin, just above the Rt. 204 Bridge, Millmont, just above the Cold Run Rd Bridge, and Glen Iron, just above the Rt. 235 Bridge. On July 25, 2014 eels were released from cages and cages removed from Penns Creek.

Mussel survey

At cage locations and potential cage locations in Penns Creek, we conducted qualitative searches in 2 miles of stream using mask and snorkel gear. Data were recorded after each 200 meter section was complete to determine a catch per unit effort (CPUE). Qualitative surveys were conducted in July, August, and September of 2014 above the Kratzerville Rd bridge, above and below the Rt 2003 bridge in New Berlin, above and below the Rt 3003 bridge in Millmont, and above the Rt 235 bridge in Glen Iron. At these sites in 15.9 hours of searching, 92 easten elliptio were found for a CPUE of 5.79 eastern elliptio per hour. More mussels were found at the downstream sites of Kratzerville and New Berlin, with CPUE of 13.7 and 5 eastern elliptio/hr respectively, than at the upstream sites of Millmont and New Berlin, with CPUE of 1.3 and 0 eastern elliptio/hr respectively. Quantitative surveys were conducted in August of 2015 at the New Berlin, Millmont, and Glen Iron sites as well as sites in Penns Creek, Stein Lane in Kratzerville, and near the Rt 1015 Br. Near the Little Mexico Campground in Winfield. Data from these surveys has not yet been analyzed.

At four years (2017) and six years (2019) after the first stocking of inoculated eels in Penns Creek, we will conduct mussel surveys near stocking sites. We will conduct qualitative mussel surveys (using the methods described above) and quantitative surveys at cage deployment sites to detect sub-adult mussels.

EXPECTED OUTCOME

At the completion of this project we hope to find an increase in juvenile eastern elliptio near the release sites. Mussel surveys throughout the project will indicate success when compared to baseline data.

REFERENCE

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