

**Monitoring Species of Greatest Conservation Need and Habitat in the York River
Wells National Estuarine Research Reserve
February - December 2017
Project Cost: \$25,949.20 (\$16,000 from York River Study; other funds to be
secured by the Wells Reserve)**

Study Objectives and Proposed Methods

The Wells Reserve will conduct a survey of fish species of greatest conservation need in the York River and its tributaries. The survey will assess the presence, location, and condition of migratory fish species with high conservation value (rare or threatened status) for the York River Study Committee, and for federal and state fisheries agencies. The fish species include rainbow smelt, alewife and blueback herring (river herring), American eel, sea lamprey and sea-run brook trout. The survey will provide an update on the status of spawning by target species through quantitative estimates of population size and structure, and available spawning habitat and environmental conditions during the spawning season.

Migratory fish species have experienced dramatic declines across their range in recent decades due to their dual vulnerability to habitat loss in freshwater systems and predation and overfishing in the marine environment. These species are an important source of marine-derived nutrients that enhance the productivity of freshwater and terrestrial ecosystems alike, and are important prey species for commercially and recreationally important fish species. Migratory fish species have been the focus of considerable conservation and restoration efforts in Maine, most notably in the Penobscot River where removal of dams and other stream barriers has led to increases in annual returns of American shad, alewives, and sea lamprey. The York River was found to support populations of migratory fish in a survey conducted by the Wells Reserve in 2001, and the Maine Department of Marine Resources has identified the York River and tributaries as having the potential to support reproduction of rainbow smelt and has documented spawning runs of alewives.

As part of this project, the Wells Reserve will assess the condition and vulnerability of riparian habitat in the York River watershed through analysis of land cover and parcel data. Riparian forest is extremely important for maintaining habitat conditions that support aquatic life including controlling water temperature, preventing sedimentation from erosion, and absorbing nutrient inputs from runoff. This analysis will quantify the amount of riparian land in the York River watershed that is vulnerable to future development as well as the amount of land that is not developable due to site constraints or conservation status.

The data that will be generated from this proposed study will be valuable for future management of the York River, informing land acquisition efforts to protect riparian and stream habitat, identifying stream barrier mitigation and other priority restoration sites, and documenting the status of ecologically significant fish species dependent on the continuing integrity of stream habitat in the York River. This information will also help to guide development of uses such as recreational fishing, interpretive education and outreach, paddling, and nature watching. Additionally the study will provide useful

information in guiding landscape use planning and resource management, particularly with regard to riparian development and drinking water extraction by the York and Kittery Water Districts.

Potential Additional Project (No NPS Wild and Scenic Funds to be used). The Wells Reserve will also pursue outside funding for a companion pilot study using environmental DNA (eDNA) to detect the presence of fish species with high conservation value in the York River. This emerging technology utilizes molecular probes to detect and amplify the genetic signal of target species DNA present in water samples. This genetic material is derived from cast off scales and tissue, carcasses, and waste that is suspended in the water column. Water samples are collected in the field and lab analysis known as polymerase chain reaction (PCR) determines the presence/absence of the target species. This method is an inexpensive technique that has been used to detect the presence of invasive species and rare species that are present in low numbers and might otherwise take considerable effort to detect with traditional sampling techniques. This study will test the application of eDNA in Maine and could lead to wider use by fisheries agencies and partners in the state. Estimated costs for this study are included as an appendix to this proposal. (See Appendix B)

Task I. Fish Sampling (\$20,879.20)

Objective: Quantify the presence and condition of diadromous fish through the targeting of species with high conservation value.

Sampling Time Frame

- Rainbow smelt. Sampling will commence at the end of March and continue for five weeks. If possible, visual surveys may be conducted prior to ice out.
- River herring. Sampling will begin in early May and continue for five weeks.
- American eel, sea lamprey and brook trout. These species will be sampled simultaneously with rainbow smelt and river herring.

Site Selection

- Sites for fyke net sampling and habitat assessment will be selected referencing information from the 2001 study report *Fish Communities and Fresh Water Habitats of the York River (2006)*, state data available from the Maine Stream Habitat Viewer and knowledge of community members.
- Sampling will occur at as many sites as possible for two technicians plus any available additional WNERR staff and volunteers. This is expected to include three to four head of tide fyke net sites during the spring migration season.

Sampling Methods

- Basic biological measurements will be collected for all target species and for the first 30 individuals of each additional species. Scale samples and fin clips will be collected where appropriate for species identification, ageing, or genetic analysis.
- For rainbow smelt

- Sites with suitable spawning habitat will be sampled with fyke nets. Nets will be set downstream of the first potential spawning area above the head of tide. Nets will be oriented with mouths facing downstream, and wings will be deployed to block up to 75% of the channel. The fykes and cod end will be situated in the thalweg of the channel so that fish in the net will have enough water during low tide periods. Nets will be deployed for 3 days per week and tended every 24 hours.
- Weekly visual surveys of spawning habitat will be made to detect the presence of smelt eggs. Surveys will take place prior to fishing each week.
- For river herring
 - Sites with potential or documented runs will be sampled with fyke nets. Nets will be set downstream of the first potential spawning area above the head of tide. Nets will be oriented with mouths facing downstream, and wings will be deployed to block up to 75% of the channel. The fykes and cod end will be situated in the thalweg of the channel so that fish in the net will have enough water during low tide periods. Nets will be deployed for 3 days per week and tended every 24 hours.
- For sea lamprey, sea-run brook trout, and American eel
 - These species are expected to be present during rainbow smelt and river herring migrations. Sampling will take place simultaneously as described above.

Task II. Habitat Monitoring (\$5,070)

Objective: To locate and quantify existing potential Rainbow smelt spawning habitat, assess environmental conditions during spawning, and to assess the current condition of the Riparian Buffer and its future potential for development.

- Potential spawning areas for Rainbow smelt will be identified in GIS, field verified and recorded for size and quality of substrate.
- Environmental conditions during spawning season will be assessed at potential spawning locations through the deployment of water quality loggers.
- Smelt egg surveys will be conducted weekly for five weeks.
- Riparian Buffer including 250 feet on each side of the main stem and tributaries will be mapped in GIS using the latest available land cover data. Riparian buffers will be rated and mapped for vegetation cover, impervious surface, permanent protection and vulnerability to future development. Results will include current conditions and the amount and location of area at risk to future alteration and potential degradation.

Task III. Products (Cost included above)

- **Fish Survey**
 - Summary report of methods and results
 - Maps of fishing locations
- **Habitat Monitoring**

- Summary report of methods and results
- Maps of location and extent of rainbow smelt spawning habitat
- Maps of the Riparian Buffer detailing vegetation cover, development (impervious surfaces), conserved land and land available for development.

Task IV. Timeline

- Data products and GIS layers will be produced from September to December 2017.
- Reporting will be completed in December 2017.

Appendix A. Budget Narrative and Budget

- **Fish Sampling**
 - Travel is calculated for tolls and mileage to and from field sites for the purpose of project planning and sample collection.
 - Personnel costs are calculated for field activities, project planning, equipment maintenance, data management and analysis, outreach, and reporting.
 - Research Assistant (per/person) – Field work and related 320 hours, data management and lab analysis 80 hours.
 - WNERR Staff – Field work and related 30 hours, project planning 40 hours, data management and analysis, reporting, and GIS 150 hours.

- **Habitat Monitoring**
 - Personnel costs are calculated for lab based equipment calibration and maintenance, training, GIS analysis, map production, and reporting.
 - Research Assistant – training 1 hour.
 - WNERR Staff – Calibration and maintenance of equipment 24 hours.
 - WNERR GIS Staff – GIS analysis 100 hours, map production 15 hours, reporting 5 hours.

I. Fish Sampling		Description	Cost/Unit	Quantity	Total
Travel					
		Mileage	\$0.55	2000	\$1,100.00
		Tolls	\$0.90	88	\$79.20
Personnel					
		Research Assistant 1	\$15.00	400	\$6,000.00
		Research Assistant 2	\$15.00	400	\$6,000.00
		WNERR Staff	\$35.00	220	\$7,700.00
Sub-Total					\$20,879.20
II. Habitat Assessment Monitoring		Description	Cost/Unit	Quantity	Total
Personnel					
		Research Assistant 1	\$15.00	1	\$15.00
		Research Assistant 2	\$15.00	1	\$15.00
		WNERR staff	\$35.00	24	\$840.00
		WNERR GIS staff	\$35.00	120	\$4,200.00
Sub-Total					\$5,070.00
Total Project Cost					\$25,949.20

Appendix B. eDNA Study (Funding would come from other grants – No NPS Wild and Scenic funds to be used)

Budget costs are presented as low cost and high cost scenarios depending on a range of potential lab costs associated with the development of molecular markers and costs per sample.

- Travel costs are calculated for this component of the project only for any sampling that will take place after fishing activities have ended, since field activities can for the most part be accomplished in conjunction with fish sampling or habitat assessment activities.
- Personnel costs are calculated for sample collection, lab processing, and training.
 - Research Assistants – Field collection 16 hours, lab processing 64 hours, training 32 hours.
 - WNERR Staff – Field collection 10, lab processing 8, training 16 hours, planning 16 hours, reporting 80 hours.
- Supplies costs are calculated for sample collection and processing including field collection jars, filters, ethanol and preservation vials.
- Contract costs are calculated for project planning and technical support, lab analysis and DNA marker development. A range of costs are given for lab analysis and DNA marker development to anticipate potential low cost if DNA markers are already developed for target species and if lab costs can be negotiated.

eDNA Analysis	Description	Cost/Unit	Quantity	Total	Total High End
Travel	Mileage (50 mile, 1day/week, 4 weeks)	\$0.55	200	\$110.00	
	Tolls	\$0.90	8	\$7.20	
Staff Time	Research Assistant 1	\$15.00	112	\$1,680.00	
	Research Assistant 2	\$15.00	112	\$1,680.00	
	WNERR Staff	\$35.00	130	\$4,550.00	
Supplies	2000 ml sample bottles (pack of 6)	\$78.00	1	\$78.00	
	Ethanol (1 gal)	\$15.00	1	\$15.00	
	Speciman vials (50/bag)	\$18.00	2	\$36.00	
	Filters (100)	\$100.00	1	\$100.00	
Contract	Lab Analysis (1-3 samples/species)	\$35 - \$50	48	\$1,680.00	\$2,400.00
	Lab Setup (\$2,000 - \$3000/species)	\$3,000.00	0-3	\$0.00	\$9,000.00
	Technical Support (UMaine)	\$40.00	37.5	\$1,500.00	
Total				\$11,436.20	\$22,836.20