The Commonwealth of Massachusetts
Division of Marine Fisheries

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MAURA T. HEALEY, Governor | KIMBERLEY DRISCOLL, Lt. Governor | REBECCA L. TEPPER, Secretary | THOMAS K. O'SHEA, Commissioner | DANIEL J. MCKIERNAN, Director

To: Chris Miller, Town of Brewster, Department of Natural Resources, Harbormaster & Shellfish
From: Bradford Chase, Massachusetts Division of Marine Fisheries
Date: February 16, 2024

RE: River Herring Spawning and Nursery Habitat Assessment for the Stony Brook Watershed, Brewster

The Massachusetts Division of Marine Fisheries (DMF) proposes to conduct a cooperative river herring spawning and nursery habitat assessment with the Town of Brewster for the Stony Brook Watershed (Figure 1) during 2024-2025. The habitat assessment will follow DMF habitat assessment protocols, while integrating additional investigations to learn more of trophic conditions in the watershed. The scope of this project is larger than past assessments (see TR-72, 77,78,80 at DMF link: https://www.mass.gov/info-details/marine-fisheries-technical-reports given the need to sample at least four ponds in the watershed and additional tasks. Coordination will be essential to schedule staff, equipment, sampling dates and integrated investigations. The project proposes to begin in April 2024.

Assessment QAPP. The assessment of river herring spawning and nursery habitat by DMF aids in the management and restoration of diadromous fish resources and the evaluation of water bodies by the Massachusetts Department of Environmental Protection (DEP), as required by Section 305(b) of the Clean Water Act (CWA). The river herring habitat assessment follows a DEP-approved Quality Assurance and Program Plan (QAPP) on water quality measurements for diadromous fish monitoring (Chase et al. 2020). The QAPP relates diadromous fish life history to Surface Water Quality Standards (SWQS), allowing the contribution of data to the 305(b) process (DEP 2019) for assessing the designated use of Aquatic Life. In addition to these broad goals, the proposed habitat assessment will support the Town of Brewster with resource management decisions related to the supporting this regionally important river herring run and improving migratory habitat for river herring in Stony Brook.

Methods. The river herring habitat assessment methodology is fully outlined in DMF's QAPP (Chase et al. 2020). The assessment relates river herring life history characteristics to three categories of reference conditions: Massachusetts SWQS (DEP 2013), US Environmental Protection Agency (US EPA) nutrient criteria recommendations (US EPA 2001), and Best Professional Judgment (BPJ) to relate monthly site visit observations for Fish Passage and Streamflow to QAPP reference conditions. Monthly trips are proposed to Lower Mill Pond, Upper Mill Pond, Walkers Pond and Slough Pond during April-October for 2024 and 2025. Consideration will be made to sample Pine and Elbow ponds and to increase the sampling frequencies as needed. The DMF habitat assessments typically target May-September, to sample the second or third week of each month. This period was selected because it is when (1) water quality can exhibit the most impairment; and (2) most adult river herring spawning and juvenile occupation of the water bodies occurs. For the Stony Brook assessment, the months of April and October will be added to capture the full extent of spawning and nursery periods and to investigate cyanobacterial populations and zooplankton dynamics (Mass DEP 2020, U.S.EPA 2021, Haney et. al, 2022).

Water quality measurements. Will be made with a YSI 6920 multi-sensor water chemistry sonde at the surface (0.3 m depth), at the bottom (0.5 m from bottom), and at 1-m water column intervals for stations greater than 2 m in depth. The following basic water quality parameters will be measured: water temperature, dissolved oxygen (DO), pH, specific conductivity, turbidity, Secchi disk depth, and cyanobacterial biomass as phycocyanin (ug L-1). Water temperature, DO, and pH will be related to DEP SWQS criteria. Monthly total phosphorus (TP) and total nitrogen (TN) samples will be collected at each pond and analyzed at the SMAST laboratory in New Bedford. The TP, TN, and Secchi disk data will be related to US EPA nutrient criteria recommendations.

Finally, QAPP reference conditions for Fish Passage and Stream Flow will be assigned with each monthly visit based on Best Professional Judgement. The sampling data will be combined for the two seasons to produce a classification (*Suitable* or *Impaired*) for each parameter. Criteria excursions of ≤10% or n = 1 (when N = 5-9) for parameter measurements at transect stations are acceptable for a *Suitable* classification. Criteria excursions >10% of transect samples result in an *Impaired* classification (when N ≥ 10).

Assessment Stations. The DMF habitat assessments select sampling stations along a transect from the pond outlet to the pond inlet. Depending on the size, shape and bathymetry of the pond, the transect will typically have 3-5 stations that represent shallow, medium, and deep depth strata. Additionally, off-transect pond stations are sampled once or twice a season to gain supplemental information on other shallow locations that could serve as river herring spawning habitat. Stations are also set at all fishways and pond inlets/outlets to assess fish passage and flow conditions at potential migration limitations in the watershed. These stations are visited monthly to record BPJ assessments; however, they are not sampled for water quality.

The selection of stations will be based on past Stony Brook watershed water quality studies to maintain consistency with long-term sampling stations (Eichner et al. 2014). Coordination with Town staff and cooperative investigators will be needed to integrate the habitat assessment to past and ongoing monitoring efforts. (Leland et al, 2020, Leland et al, 2023).

Figure 1. Stony Brook Watershed, Brewster, MA. Source: MassGIS Diadromous Fish Data Layer.

Citations

Eichner, E., B. Howes, D. Schlezinger, and M. Bartlett. 2014. Mill Ponds Management Report: Walkers Pond, Upper Mill Pond, and Lower Mill Pond. Brewster, Massachusetts. Coastal Systems Program, School for Marine Science and Technology, University of MA Dartmouth. New Bedford, MA. 125 pp.

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