

## THE NEMASKET RIVER

The Nemasket River is truly special in the ecosystem of southeastern Massachusetts. Connecting Assawompset Pond to the Taunton River, it is the last stage in the largest run of herring and alewives on the east coast. The Nemasket River run supports Herring and Alewife that annually travel between their freshwater spawning grounds in Assawompset Pond and the salt water of Narragansett Bay. The river corridor also contains significant historical and archeological sites tied to the fish run.

The river's headwaters are at the outlet of the Assawompset Ponds Complex (APC), a connected network of ponds that is the drinking water source for a quarter of a million people, including the cities of New Bedford and Taunton. The APC is currently connected to the Nemasket River by an engineered berm and dam infrastructure completed in 1904 to support that water supply mission. The topography of the river is gradual, dropping only 30' over its 11.2-mile course from the ponds headwaters to the Taunton River.

Recently, the Massachusetts Division of Ecological restoration (DER) funded an Assawompset Ponds Complex Flood Management Program, which brought a coalition of area experts together to evaluate existing information and advance key priority projects to help address those concerns. On the basis of stakeholder input and previous studies,

the Upper Nemasket area between its origin at the Assawompset Pond Dam in Lakeville, and the Wareham Street Bridge (aka Basucle Dam) in Middleboro (shown at right) emerged from the process as a locus point for further study and functional enhancement.



Today, as always, sediments eroded from the shore of Assawompset Pond are carried eastward by longshore currents to the outlet of the Assawompset Pond dam. Sediments spilling over the dam tend to accumulate at the headwaters of the Nemasket River as flow velocities decrease. This results in the formation of sandbars along the first few hundred feet of the Nemasket. Sandbar formation and river channel reconfiguration are likely a natural process that has occurred for millennia but may, over the past century, have become more prevalent as the river seeks to regain equilibrium following the extensive channel modifications that occurred during the construction of the dam roughly a century ago. According to local sources, the sandbars lead to flooding by blocking the passage of water from moving rapidly downstream during intense storms. During such episodes, the pond and river reportedly remain at the same level, with water backing up elsewhere around the ponds complex. Also according to local sources, the accumulation of sandbars and growth of vegetation (including invasive species) that has continually encroached farther into the excavated Nemasket River channel may also hinder the annual alewife run. Sandbars also reportedly build up at several points further downstream of the dam - notably, at the junction of the Nemasket River and Fall Brook and above the Wareham Street Bridge (buildup at this location is reportedly due to runoff from an earthen boat ramp on the east side of the Nemasket River).

In deciding how to address these issues, it is informative to consider the Nemasket's form at a more distant period in time. Our predecessors engineered specific changes to the geomorphology of the river during the installation of dam and water supply infrastructure, relocating the original channel at the outlet of the ponds 1,000' to the west. The present course of the Nemasket River, for at least 2,000 feet downstream of its outlet from Assawompset Pond, was excavated through a peat bog. The excavated Nemasket River channel immediately below the dam is likely significantly wider than the natural geomorphology of the system would support. One possibility is that the observed sediment transport and accumulation below the dam is simply a natural process as the system seeks to return to an appropriate hydraulic and sediment transport equilibrium. As is frequently the case, potential conflicts arise when human infrastructure is built in areas that are vulnerable to longer term natural processes and climatic variation. One key goal of the various proposed studies and projects discussed below is to evaluate how we can now best balance natural system and human infrastructure concerns in the Upper Nemasket region in as sustainable a manner as possible. This is especially relevant in light of changing climatic conditions that have altered the hydrologic patterns to which we have become accustomed over the course of the last century.

We are at a critical juncture in expanding our understanding of the Upper Nemasket River, the knowledge of which will enable ponds communities to select the set of technical solutions that will best support fish passage, invasive species control, water transport, flood mitigation, and possibly, natural channel restoration. Out of the current DER grant work, five projects are immediately being pursued toward actionable, community supported interventions in the Upper Nemasket River. Two of these projects are **technical studies**, aimed at synthesizing and collecting data to model the mechanics of the Nemasket River. One focuses on **community outreach** and arriving at a collective understanding of restoration alternatives and collective decision making around potential actions to improve the river. Finally, two projects are **contextual**, considering the best management practices for supporting water quality and floodwater controls within the larger Nemasket and APC watersheds.

## **TECHNICAL STUDIES**

### **1. Topographic and Bathymetric Surveys of the Upper Nemasket River (total funding – up to \$35,000)**

Outback Engineering, working on behalf of the Middleboro-Lakeville Herring Fishery Commission, will be conducting survey work from the Assawompset Pond Dam to Vaughn Street. The purpose of this work is to gather data on the Nemasket's channel, and the sedimentation and vegetation that have encroached into it. There are three main tasks identified in the scope of work. First, the project team will survey the topography, bathymetry, and structures from 50' upstream of the Assawompset Pond Dam through the first 500' downstream of the Nemasket River, producing sections of the primary stream channel every 100.' Second, the project team will conduct sediment sampling and testing, wetland resource delineation, and invasive species assessment within the stream channel, using various methods from the dam to the Vaughn Street Bridge. Finally, the project team will prepare a preliminary conceptual plan for sediment removal and a sediment trap to be installed in the Nemasket. The data gathered in this work will directly inform the Hydrological and Hydraulic (H&H) Study, described below. Next step action – whether to pursue dredging and a sediment trap in implementation – will be informed by the results of this project and the H&H study.

### **2. Hydrological and Hydraulic (H&H) Study (total funding – est. \$69,000)**

Funded by a SNEP Network Technical Assistance Grant, Horsley Witten Group will perform an H&H study of the Upper Nemasket River corridor, from the head of the Nemasket River at the Assawompset Ponds Complex (APC) in Lakeville downstream to the Wareham Street Dam in Middleborough. No full hydrological and hydraulic (H&H) models of the Nemasket River currently exist. In 2010, Professor Neil M. Fennessey of UMass Dartmouth produced an analysis of the historic water level range of the Assawompset Pond, and recommended that a long-term hydrological study would be key to the planning and decision-making process. This project will start this effort in the Upper Nemasket River. This project has three main tasks. First, the project team will conduct field assessments and assess existing data, including the outcomes of the Outback survey work and SRPEDD drone imagery. Second, the project team will update and refine an existing U.S. Army Corps of Engineers (USACE) Hydraulic Engineering Center (HEC) River Analysis System (RAS) model, which will be able to provide the critical tool to evaluate the hydraulic impacts of the proposed projects in the Nemasket under various hydrologic conditions. Finally, based on the outcomes of the Nemasket Community Outreach project described below, the project team will run the model on four to six potential interventions in the Upper Nemasket riverine system. In this way, the H&H study and model will be used to evaluate, recommend, and prioritize potential restoration projects, defining parameters for on-the-ground projects, including combinations of potential grey infrastructure projects (dam repair, dam removal, silt trap construction) and nature-based solutions (floodplain expansion, habitat restoration, wetlands improvements).

## **COMMUNITY OUTREACH PROJECT**

### **3. Nemasket Community Outreach Plan (total funding - \$34,500)**

Anticipated to be funded through a grant from the Taunton River Stewardship Council, Emily Vogler, Landscape Architect and Professor at RISD, with assistance from SRPEDD, will conduct a public engagement effort aimed at coming to a community consensus around the best interventions for improving fish passage, flow, flood management issues on the Nemasket River. Given these three underlying issues, there is an opportunity to bring people together to discuss possible ways to help

strengthen the resilience of the local community to future floods, improve the ecological and hydrological connectivity along the river and improve recreational opportunities in the region. A broader systematic approach that takes a holistic approach to addressing these interconnected issues will lead to greater opportunities to find alternatives that create multiple social, ecological, and hydrological benefits than if the river is addressed in a piecemeal way (ex. looking at one dam at a time, dredging the river or removing the invasive aquatic plants without addressing the larger issues of flow). The project goal is to help support and facilitate a discussion based on scientific facts and community values, but not to advocate for any specific solution. There will be 3 main components of this work that will happen concurrently and will inform one another at various stages of the process: First, the team will convene an advisory committee to guide the framing, process, and objectives/performance measures for community engagement. Second, the project team will execute three public meetings to engage the surrounding community in a discussion about the future of the river. Finally, the project engages with the H&H modeling effort to run the H&H model for four to six alternatives for restoration actions, looking at the current and projected flow with various alternatives, ecological impacts of alternatives on fish and other species, and cost of the alternatives.

## **CONTEXTUAL PROJECTS**

### **4. WMOST EPA Modeling (total project value not yet estimated)**

The EPA has indicated availability to apply their Watershed Management Optimization Support Tool (WMOST) in the APC and Upper Nemasket Watershed. The WMOST analysis accounts for water and pollutant loads at the watershed scale, identified water-related goals and constraints, evaluates potential integrated management practices (in areas such as stormwater capture, drinking water quality, wastewater treatment, and land conservation), and then optimizes the solution set to minimize the cost of solutions in the watershed to achieve water quality, flood abatement, and other identified goals. The EPA has identified the following potential management options for the APC and Nemasket watersheds that intersect with available management options in the WMOST model: land conservation, cranberry bogs restoration, wetland restoration, riparian buffer management, LID/stormwater green infrastructure, water conservation, and water reuse. The project team will begin the process by identifying targets that should be set within WMOST, including water quantity targets related to shoreline flooding from the ponds and nutrient loadings that encourage invasive species growth. Data developed in the H&H study and surveying and community preferences articulated in the Nemasket Public Outreach project can be input and integrated into the WMOST model. The WMOST model can, in turn, inform the APC Watershed Management Plan.

### **5. APC Watershed Management Plan (total funding – est. \$125,000)**

Anticipated to be funded through a regional MVP Action Grant, with probable federal match, the project team will develop a comprehensive management plan for the APC and Nemasket River watersheds that equally addresses water supply and quality, floodwater mitigation, preserving critical habitat, maintaining recreational access, and improving resilience of the Ponds and surrounding communities. The plan would consider the APC and Nemasket systems as a whole, and identifying a coordinated and balanced set of goals and strategies to ensure that all stakeholders and interests can work together to implement nature-based solutions that protect critical green infrastructure, encourage low impact development, enhance floodplain storage, reduce the amount of nutrients and sediments entering the ponds, and adopt consistent local regulations compatible with regional goals for protecting the APC.

There are several tasks involved in drafting the watershed management plan. First, the project team will design an inclusive stakeholder engagement process, including identification of communications networks between stakeholder groups, and establish a plan development committee. Next, the project team will solidify the scope of the management plan's contents, and determine data needs. Data not available from previous studies, such as area-wide land use data, will be collected for desktop data analysis (land cover, ownership, etc); and (3) field assessments. As a specific portion of data collection, determine best climate change predictions for the area and what impacts they will have on water levels, habitat types, and other conditions in the APC. The management plan will include a review and analysis of surrounding communities' bylaws, land owner management practices, and entity MOU's and annual state, local, and utility work plans to optimize and standardize best management practices that support management plan goals. The project team will draft the management plan with ongoing stakeholder engagement. All previous Nemasket work will inform the management plan as it is developed.

**SEE THE ATTACHED PROJECT SCHEDULE FOR AN ESTIMATE OF PROJECT IMPLEMENTATION TIMELINES AND PROJECT INPUT / OUTPUT INTERACTIONS**

