Designing a Floodwater Management Program in the Assawompset Ponds Complex

Outcome of the Division of Ecological Restoration’s Assawompset Pond Evaluation, Planning, and Prioritization Grant
Project Background and Purpose

From January to June 2020, the Southeastern Regional Planning and Economic Development District (SRPEDD), Manomet, Mass Audubon (MAS), and the Horsley Witten Group, Inc., with support of The Nature Conservancy (TNC) and other Resilient Taunton Watershed Network (RTWN) partners, have been working, with funding secured in the FY2020 state budget and managed by the Massachusetts Division of Ecological Restoration, to set the stage for the implementation of sustainable, on-the-ground priority actions to advance floodwater management in the Assawompset Ponds Complex (APC) and Nemasket River systems. The project team approached this work with two central premises.

First, flooding around the APC is an issue of ever-growing urgency given predictions for shifts in precipitation trends as developed by the Fourth U.S. National Climate Assessment. More intense storms, particularly during the spring, are increasing the frequency of occurrence of what the APC region now experiences as its 100-year base flood. According to Resilient MA’s information for the Taunton Basin, a high emissions scenario predicts an additional 2.56 inches of rain annually by 2050, with almost all of this increase concentrated in the winter and spring seasons. Predictions also suggest an additional 2 days of extreme weather events by 2050, again, seasonally concentrated. These changes pose a threat to APC communities given the Nemasket River’s current limited ability to transport excess water. Given this increasing intensity in rain events, it is imperative that a combination of green and grey infrastructure approaches be put in place to alleviate flooding issues that are already occurring around the APC and the Nemasket River, and which future conditions are expected to exacerbate. Inaction could mean repeated episodes similar to the heavy and prolonged rainfall and resultant flooding that caused evacuations, property damage, septic system failure, and interruption of critical utility and transportation infrastructure in 2010.

Second, while many studies of the APC had been completed since the 1980’s, implementation of the recommendations developed therein had not materialized on the ground. These significant plans and studies amassed a great deal of historical knowledge about the floodwater problems in the APC, and communities had related their recent experience of floodwater events in MVP planning efforts. The crux of the project team’s approach to this grant work was to synthesize this wealth of plans and studies into a program of priority actions for achieving meaningful floodwater mitigation impacts on the ground, with an emphasis on nature-based solutions. We sought a study that wove together the threads of recommendations developed to date with a program for prioritizing actions given current and anticipated circumstances into a cohesive program for floodwater management, with this effort serving as the basis for further funding and implementation of the highest priority mitigation actions.

Project Task Components

The project contained several related efforts. First, the project team convened a steering committee. The existing and slightly expanded Assawompset Ponds Complex Management Team served this role. Next, all pre-existing plans and studies related to flooding in the APC were analyzed for their insights into flood abatement-related recommendations that had been developed to date. Next, these recommendations were “ground-truthed” and expanded upon through engagement with the Management Team. The inclusion of stakeholder experiences with flooding and local buy-in for potential solutions was vital to the execution of a meaningful and effective priority action program. Finally, the project team used their knowledge of the area’s Green Infrastructure Network and of Nature-Based Solutions to broaden the slate of options for potential priority actions to include contemporary grey and green approaches to floodwater management. With a program of priority actions determined, the project team planned to develop the cost and feasibility studies for undertaking the top one to three priority action items. In actuality, the project team was able to provide project component breakdowns and avenues for next steps for six priority projects.

While the project focused on the problem of flooding around the APC and Nemasket, the project team quickly understood flooding to be one challenge across a number of management areas that stakeholders and communities in the region are working to address. Problematic flooding is interwoven
with water quality, habitat, fish passage, sedimentation, recreation, and drinking water supply level maintenance issues. The project team retained its purpose-driven focus on floodwater management in the APC, but also pursued actionable strategies that could elevate co-benefits and improve outcomes for other issue areas.

**Chart of Deliverables as included with the Original RFR Submission**

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<td>1.1: Convene and schedule stakeholder Steering Committee</td>
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**Task 1. Convening the Assawompset Ponds Complex Management Team as the Project Steering Committee**

The existing Assawompset Ponds Complex Management Team served as the Project Steering Committee. The Management Team is a long-standing body with representatives from each community, herring fishery stakeholders, state agencies, and water supply entities. For the purpose of the project, the Team was expanded to include the MVP Core Team Leaders from pondside communities. SRPEDD also intermittently engaged MassDOT (for state roadway, drainage outfall and culvert concerns) and USGS (for...
input on recent flood study and flood elevation work conducted through their office).

The Management Team typically meets quarterly, but for this project, monthly meetings were held from January to June 2020. The APC Management Team participants included: Nancy Yeatts (APC Ranger/Lakeville Con. Comm.), Althea Brady (Freetown), Fred Underhill (Rochester), Patricia Freitas (Middleboro), Cathal O’Brien and Kate Sousa (Taunton Water Dept.), Ymane Galotti and Gary Santos (New Bedford Water Dept.), Jonathan Hobill and Bill Schwartz (DEP-SERO), Joan Pierce/Aaron Best (MA F&G), David Cavanaugh (Middleboro-Lakeville Herring Fisheries Commission). Local MVP Core Team Leaders invited to participate included: Chris McKay (Freetown Planning), Laurell Farinon (Rochester Con. Comm.), Lorraine Carboni (Lakeville Town Coordinator)/Lia Fabian (BOS Chair Lakeville), and Patricia Cassady (Middleboro Con.Comm.).

Management Team meetings were held on January 8, 2020; February 12, 2020; March 11, 2020; April 8, 2020; May 13, 2020; and June 10, 2020. The first three meetings were held at the Lakeville Police Station, before moving to a virtual platform during the COVID-19 pandemic. Agendas and minutes from these meetings can be found in Appendix A.

As the minutes convey, the Streeting Committee held several important project roles. First, the Management Team is, by design, a heterogenous membership group, incorporating stakeholders from a wide range of organizations, each with their own chief concerns for the APC and the Nemasket. As such, it is the forum for communication among stakeholders. It remained as such throughout the project, with different groups representing their interests, but in a way that seeks coordination and overlap between priorities for the APC and Nemasket. Through these interactions, we were able to discern the co-benefits that certain action items could achieve from multiple perspectives.

Second, the Management Team served as a project steering committee in the true sense of the word. The project team relied upon the local knowledge brought to bare by the committee, designing a framework that put the steering committee in the center of project prioritization. The last phase of the project – developing next steps for implementation of priority projects – was directed by the Steering Committee’s arbitration of the most signification local issues through voting exercise and discussion.

Finally, the Steering Committee is the locus of action for the next steps in moving project priorities forward, providing crucial letters of support and extending its existing membership and meeting schedule into a sub-committee structure that will oversee the next set of projects that jump off of this effort, including the hydrological and hydraulic study of the Upper Nemasket, and hopefully the development of an MVP-funded watershed management and climate action plan.

Task 2. Previous Recommendations Synthesis and Project Prioritization

The aim of task two was to review previous recommendations related to floodwater management around the APC and Nemasket River, from both historical and contemporary sources. Delving into previous studies, the earliest of which dates to 1980, was important to leverage all previous work, understand the origins and context of many recommendations, as well as familiarize the project team with available data for the ponds area. The project team gathered the previous studies listed in Appendix B.

Reading these studies, the project team created a matrix of potential solutions that have been proposed to address flooding in the past, categorized by type (i.e. channel improvement, infrastructure improvement, stormwater retention / detention, plans / bylaws / studies / community engagement. The matrix identifies the recommendation proposed, the studies in which it appears, its category of action, and environmental co-benefits that would also be addressed by the recommendation (e.g. habitat restoration, and similar). The full matrix is included in Appendix B. While going through the studies, the project team also recorded recommendations related to Environmental Protection and Restoration, and Recreation. While not the focus of this study, the project team felt it important to preserve all recommendations beyond floodplain management while going through the documents, so that they could be utilized in additional future projects, such as the development of a comprehensive
APC watershed management plan. In total, there were 140 recommendations recorded, with 48 related to floodwater management specifically.

The project team presented this matrix to the Steering Committee for preliminary discussion and review at the February meeting. At the February meeting (pictured below), the project team ran and Community Resilience Building process modeled on the Municipal Vulnerability Preparedness planning process. Using the matrix for reference and discussion, the project team facilitators recorded the Steering Committee’s opinions on the most pressing issues around the APC and Nemasket, some of which were identified in previous studies, and some of which were newly raised issues. In total, the CRB process elevated 26 high priority concerns and proposed action item solutions. The project team then took this list, utilized their best subject area expertise, and assigned High / Medium / Low values to each action item for the action’s ability to address Floodwater Storage / Movement and Floodwater Water Quality (water quality impacts from runoff or flooding), as well as to address the environmental co-benefits of Water Supply Intake Protection, Fish Passage, Habitat Restoration, Ponds Level Management, and Public Safety / Infrastructure Protection (the categorized sheet is located in Appendix B).

Finally, the project team presented these High / Medium / Low rankings to the Steering Committee at the March meeting, and a vote was taken whereby all Steering Committee members selected their top six priorities (see Appendix B for pictures of the tallied vote). With a vote tally, six top priority projects had been identified, in the following order:

1. Remove Sediment Deposition in the first 500 ft of the Nemasket River and install Silt Trap
2. Develop a long-term, scientifically-based hydro model for the APC and Nemasket to support water supply operations, determine firm yield, and support fish passage
3. Develop a Management Plan for the APC with best practices for handling the dam, sediment, fisheries, Nemasket flow, aquatic invasives management, floodplain, water quality and supply, etc.
4. Replace undersized culverts at the snake River and Route 105
5. Assawompset Dam Replacement
6. Wetland restoration at Bridget Street, Wood Street, Wareham Street, Vaughn Street

These top priorities moved to the next stage of advancing priority projects.
Task 3. Developing Additional Nature-Based Solutions

In addition to the suite of historical and contemporary existing solutions proposed for floodwater management along the APC and Nemasket, the project team wanted to elevate the importance of nature-based solutions by selecting an area of analysis for additional or alternative nature-based mitigation measures.

Given that wetland restoration was included in the top six priority issues, the project team selected this area for investigation and detailed analysis of potential nature-based flood mitigation alternatives. The project team began with an initial investigation of wetland restoration potential in the specific Nemasket River road crossing areas that the Steering Committee identified (Bridge Street, Wood Street, Wareham Street, and Vaughn Street). However, after initial investigations and further conversations with the Steering Committee, some of these specific sites were found to have other potential use interests, such as recreational watercraft launches, or did not have as large a potential to sequester floodwater as originally anticipated.

In subsequent meetings the Steering Committee and project team decided to broaden the search area for potential wetlands restoration sites to encompass the entire APC watershed and to emphasize flood control as the top priority in that analysis. Once the search area had been expanded, the project team worked with the Steering Committee to identify a set of priority subareas based on flood control needs and perceived wetland restoration opportunities.

The findings and recommendations, contained in Appendix C, are based on a watershed-wide geospatial analysis. This analysis significantly expands the number of candidate wetlands restoration sites beyond those identified in previous studies.

It is important to note that additional field work will be required to select the best restoration sites from the priority areas identified in the geospatial analysis. Factors to be evaluated in the field include current soil, hydrologic and vegetation conditions, proximity to potentially conflicting land uses, and condition of surrounding infrastructure. In addition, a comprehensive hydrologic analysis of the APC watershed is needed to both better characterize the flooding issues in the watershed and to optimize both green and gray infrastructure solutions.

Task 4. Priority Project Scoping

In task four, the project team committed to providing further details on the top one to three priority action items, depending on factors such as relative impact on flood reduction or desynchronization; size, complexity, and scope of the projects, and develop estimated planning level cost estimates and feasibility assessment for permitting and implementation. The purpose of this task was to prepare these projects for follow-on funding proposals to carry forward their design and permitting, and ultimately their implementation.

The project team elected to use a one-pager informational summary format to scope the next steps, cost estimates, likely permit requirements, and involved parties for the top six priority projects. The one-pagers can be found in Appendix D.

After the development of the one-pagers, the project team developed a final work plan for each of the six priority projects for the remainder of the grant term. This work program can be found in Appendix D, but to highlight some important points, it included the following activities:

- An application, successfully awarded, to the Southeastern New England Network program to obtain technical assistance in the amount of $70,000 for the completion of an initial hydrological and hydraulic model of the Assawompset Dam area and upper Nemasket River that will inform additional priority projects such as the development of the APC/Nemasket Watershed Management Plan and solutions to the sedimentation issue within the Nemasket River.
- An application, successfully awarded, to the Taunton River Stewardship Council to obtain a
specialized community outreach consultant in the area of dam repair and removal and riverine corridor interventions, in order to execute a community engagement process around the potential interventions to be investigated by the H&H study (award amount: $34,500).

- An application, award decision pending, to the MVP program for an Action Grant to prepare an Assawompset Ponds Complex and Nemasket River Management and Climate Action plan.
- A set of permit pathway documents describing the permitting agencies and types of permits likely to be required for the priority projects. Horsley Witten Group, Inc. (HW) compiled an anticipated permitting pathway for the three Priority Projects of: Assawompset Pond Dam Repair and Replacement Project, Snake River Culvert Replacement Project, and Nemasket River Sand Trap and Sediment Removal Project (included in Appendix D).
- Engagement with MassDOT District 5 on the Snake River culvert, which they own and maintain, around the potential for culvert access, assessment, and a partnered approach to replacement.
- Engagement with the Middleboro-Lakeville Herring Fishery Commission on their contemporaneous work with engineering consultants to survey sections and wetlands delineations of the Assawompset dam and upper Nemasket to Vaughn Street.

A summary document of upcoming intended work in the Nemasket River is also included in Appendix D.

Capstone Public Event

Finally, the project team was committed to holding a public meeting at which the project team and the Steering Committee will request feedback from the APC communities at-large on the identified priority action items for flood mitigation. The team had intended for this public meeting to take place after initial project prioritization, but before any detailed project scoping in Task 4, in order to make adjustments to the prioritized projects based on community feedback as necessary.

Unfortunately, the onset of the COVID-19 crisis put the organization of a public hearing off until later in the process than originally envisioned. A Zoom meeting was held on June 24, 2020, from 6:00 to 7:30 PM, so that the project team could describe the grant task process, prioritization outcomes, and next steps research to the general public for questions, comments, and feedback. A press release was sent to the Middleboro Gazette and the Standard Times newspapers (see Appendix E). Approximately seven to eight members of the general project outside of the project team participated in the event. The meeting was recorded, and sent to the communities of Lakeville and Middleborough for posting on their town website so that it could be viewed after the fact for those with interest who could not attend the meeting. At the end of the presentation (available in Appendix E), the public was provided a link to a survey. We asked participants to select their 6 top priority projects, to see how they would compare with those selected by the Steering Committee, and to provide any open-ended comments as necessary. Those responses are included in Appendix E.

Though the community meeting was not all we had hoped for going into the grant, it provided a set of video, presentation, and survey materials that can be available to the public on an ongoing basis. The project team is also buoyed by the fact that there is significant public engagement opportunities built into next phase projects, including two to three meetings devoted to possible interventions in the Nemasket River between the Assawompset Pond Dam and the Wareham Street Dam, as well as six meetings associated with the potential Assawompset Pond Complex Management Plan MVP Action Grant.

Interestingly, the five responses obtained from the public was somewhat in synch with the top six priorities identified by the Steering Committee, but with differences in the specific priorities that emerged. Additional top priorities include; (1) address country drainage along
roadways; (2) limit pesticides and treatments over and around the APC through Integrated Pest Management and better communication with DPH; (3) install a washing station and educate about invasive transmission; (4) work with legislators and environmental / transportation agencies to review legislation and how it works with proposed pond fixes; (5) replace the railroad bridge over the Nemasket; (6) remove sandbars and MassDOT broken drains; (7) look at existing MOU’s / maintenance plans that exist and improve or renew if necessary; (8) and remove vegetation from Wareham Street Pond. All five responses indicated that the development of an APC Watershed Management Plan is a top priority.
Appendix A. APC Monthly Meeting Agendas and Minutes
APC Meeting
January 8, 2020  9:00AM
Lakeville Police Department Meeting Room
323 Bedford Street
Lakeville

Designing a Floodwater Management Program
Assawompset Ponds Complex

AGENDA

1. Call to Order
2. Introductions
3. Overview of the Division of Ecological Restoration’s Floodwater Management Program Grant process
4. The SRPEDD Team Scope of Work – January through June 30, 2020
   - Elements of the Work Program – Planning with you, not at you! This is a TEAM approach
   - What’s going on out there? Projects/elements that are already underway
   - Key Personnel assigned to tasks – working subcommittees
   - Key Resources - Project and Documents page (lots of information is posted; reports/documents from the 1980’s to present day)
   - Key Recommendations from past research/reports – let us know what you think is relevant and should be prioritized
   - Meeting schedule – monthly meetings and working subcommittee meetings as necessary (particularly for field work)
5. Next Steps
6. Adjourn
APC Meeting Notes
1/8/2020

1. Call to order
2. Introductions
3. Overview of DER Floodwater Management Program Grant process
4. Elements of the Work Program – Planning with you, not at you! This is a TEAM approach
   a. Just got our notice to proceed yesterday, 1/7/2020
   b. APC is just as much a part of the team, working together, equal footing
   c. We’ve looked back at all reports for information
      i. Found a lot of orphaned projects - we’d like to see if they are still viable
   d. Whole idea of grant is to get projects all in one place, determine viability, see where we want to go with them, and prioritize projects
   e. Looking at original DEF RFR solicitation, second page, the goals of the grant are to:
      i. Review past reports and studies – we’ve started compiling already
         1. Setting up a project page that everyone will have access to
      ii. Work with stakeholder coalition (the APC)
      iii. Major goal is the advancement of priority actions
         1. Ex: If we do elect to pursue a hydrology study, determine what would it entail, what would it include, etc
   f. Including the information that Horsley Witten already has obtained through study
   g. DEP – Michele Craddock is going to be actively engaged and can assist as a stream restoration specialist
   h. Building on existing work of TNC and Horsley Witten’s evaluations of wetland areas for flood storage
   i. Bottom line – we want to get specific; exact locations for next step action
   j. Bottom line – advance actions: doable, feasible, sustainable actions – socially, fiscally, environmentally sound actions
   k. Our BID response
      i. Scope of work sections (page 5 in BID response) discussed:
      ii. Understand the recommendations for priority actions that have been developed to this point in time
      iii. Ground-truth these recommendations through the engagement of community stakeholders around the APC
      iv. Expand upon these recommendations with knowledge of the area’s Green Infrastructure Network and of Nature-Based solutions to broaden the slate of grey and green infrastructure options for floodwater management
1. Eric discussed green infrastructure approach – look at how existing natural context functions and look forward to future climate conditions

l. Make sure that we are also considering drought management in the course of this study

m. Going to have to think through items and the tensions / multiple benefits of certain actions (flood storage, environmental restoration, among others)

n. What data do you use, what happens when these items conflict – try to keep recommendations neutral

o. Going to be comprehensive in our approach – err on the side of keeping things in even if they are not only related to flood storage – these recommendations can be forwarded to the appropriate places

p. Historical drought cycle seems to occur every decade

q. We know that the river is clogged – first three miles of the Nemasket River, dam to Wareham Street

   i. Banks have deteriorated and eroded into the river

   ii. Water department clears sediment twice a year – working on the sand trap issue

r. Long Pond perspective – would be saying that their water level is the most important thing

   i. Culverts under 105 issue there

   ii. Channel siltation

s. Where does MassDOT fit into all of this?

   i. We have mapped all the MassDOT outfalls make sure this is in the folder

   ii. Three-year maintenance agreement permits in place - document when maintenance has been occurring

t. What resources can be brought to bear to make projects affordable?

   i. DER culvert restoration program

   ii. DEP dam restoration program

   iii. MVP Action Grant program – extent to which this is framed as a climate issue (intensifying flood-drought cycle), to which we can show this is a regional approach – things that the state is hungry for

u. Lack of an APC Management Plan that is comprehensive

v. Safe yield impact – will this be a consideration?

   i. We want to bring in dam committee to help with this

   ii. Horsley Witten can also help address this

5. Team approach – we need to know what else new is going on out there – what’s happening now? What issues are there?

   a. Fish and Wildlife (Aaron): most of land around complex falls under umbrella of fish and wildlife CR’s – specific about what can occur on the land; just keep that in mind and make sure that there are not conflicts and consistent with CR parameters

      i. Are there copies of the CR’s? Aaron will send shapefiles – some degree of arbitrariness in
CR’s that cross parcels in the mapping

b. Lakeville development of Highland Terrace – how will that affect the sub-watershed?
   i. Flood / droughts would impact them as well
   ii. How will the development affect water quality?
   iii. John Hobill’s letter from DEP – engineering team could take a look at that

c. Set trends for how a management plan would approach new developments around the APC
   i. Sampling approaches
   ii. Inspection procedures

d. Forest Management Plan – we need to get that; City of New Bedford keeps an eye out for land that is available to purchase and would have a positive ecological impact

e. Having botanists look at the habitat – look at areas that have changed over the last 30 years

f. Culvert next to Parkers – outlet area is now clogged with phragmites, brush, etc – culvert that drains a swamp

g. Purple loosestrife – bio-controls that are working and could be implemented?

h. Long Pond – what is draining the whole complex is 30 ft at the Nemasket River that is clogged – has to be a huge focus

i. Japanese knotweed – just beginning on the Nemasket around Bond Street bridge

j. Restoring to conditions of 100 years ago might not be the best approach given the changing conditions we are anticipating

k. Abandonment of cranberry bogs – what happens to culverts, dams, water control structures associated with these bogs?
   i. Look at what is around the ponds in the way of these bogs and add this into a potential future management plan

l. Need to map out the various stakeholder groups that are involved in this plan (make a list in the google drive)
   i. Need to figure out public workshop in advance – book at the library
   ii. Public-facing project page versus working group folder – set up bot

m. Need to determined what the subcommittees will be – Bill will send around a link to get an idea of what people are interested in and check with project partners / DER

Summary of outcomes:

- Discussed intended project outcomes
- Discussed project process and meeting dates
- Next step: form sub-committees
- Next step: press release and plan public workshop
- Next step: distribute access to project folders
APC Meeting
February 12, 2020 9:00AM
Lakeville Police Department Meeting Room
323 Bedford Street
Lakeville
Designing a Floodwater Management Program
Assawompset Ponds Complex

AGENDA

1. Call to Order
2. Introductions
3. Review of the Division of Ecological Restoration’s Floodwater Management Program Grant process
4. The SRPEDD Team Scope of Work – January through June 30, 2020
   • Elements of the Work Program – where we are in the Work Program
   • Key Resources - Project and Documents page where lots of information is posted; reports/documents from the 1980’s to present day; has everyone looked at it or been able to access it? Any problems?
   • Review of Key Recommendations from past research/reports:
     - overview of the key recommendations from past reports and studies
     - which recommendations do you think are still relevant?
     - which recommendations do you think should be prioritized?
     - what additional information/contacts do we need going forward?
     - protocol for accessing watershed lands during field season?
     - using this information to create a projects map
5. Next Steps
6. Adjourn
Introductions / Scope of Work

- Review of the DER Grant Process – Michelle Craddock comments
- Bill and partners – descriptions of what we do
- Elements of the work program – where we are, on track with what we said

Mapper Activity – Key Recommendations

Environment

- General protection of water quality, biodiversity
- NOI’s along long pond – septic systems causing nutrients problems that lead to invasive growth
  - 208 study stuff: in-home, permeable reactive barriers – has come up in the past and this is of interest now
- Forest management practices where fish and wildlife have their CR’s
  - In the process around Little Quittacus – keep going around other CR’s
  - Forestry management plans coming out of the MVP regional action grant?
- Cranberry bog restoration projects – looking at reuse of water in lagoons for use in cranberry bogs
- Number 66 environmental – drainage along roads, every rainstorm dumping silt into wetlands and streams; rather than putting paved swales into streams, put sumps in addition to swales – resolve drainage issues (country drainage – ex in Plympton)
- Public education component – trees, laws, floodwater management relative to Mass Wildlife Publication (rec 65 enviro.)
- Nemasket River – inhibited flow by vegetation and sediment blockages
- Herring commission – undersized culverts
- Focus on removing invasive species, especially along state boat ramp (MOU with Freetown that controls funds – money is supposed to be put back in to the management of ponds, not general funds) Long Pond (rec 52 enviro.)
  - Institute a boat washing station there with a ranger to enforce
  - Ensure there is a dedicated funding stream – generate money from funding stream
- Updating MOU’s – look at what is permitted
  - Look at consistency between them
- Look at blanket permits with MassDEP – order of conditions
  - Ex: MassDOT – look at salting on Route 18 that seems to be occurring again (5-yr maintenance plans/3-year outfall maintenance permits – better coordination)
- Look at maintenance plans of DPW’s
- Sand bars in the Nemasket – collapsed drain – state has taken no responsibility to remove from the river upstream of 495
  - Other sandbars down stream from route 44 – a few others
- 12-17, 39, 40 recs – fish management; prioritizing weed control, manage fisheries and habitat
  - Long Pond water quality
- Snake River culvert (undersized) [Parkhurst-Tamarac Park] and others on route 105 (perched?) and blocked with vegetation
- Places / wetlands where there could be flood storage; swamp area behind
  - Off Old Bridge street – attaches to Ocean Spray would be accessible; downstream all native, upstream all invasives
  - Washburn area off of Wood Street – Atlantic White Cedar be careful not to threaten those
- Bond street parking lot – washes into river, same on Bridge Street
  - Repurpose parking lot to have nature-based infiltration solutions
- Maintaining a minimum pond level
- What are some of the effects of spraying for Triple E on biodiversity – pesticides and treatment plans / accidentally flew over the ponds where they shouldn’t have
  - Dept of Public Health needs to look at their timing and management of this; integrated pest management solutions that are proactive; they did say they were going to, so what is the status of this?
  - Traps at Pratt Farm to see how spraying affected other animals
• General need to be more proactive in management – esp of flooding
• Work closer with Bridgewater State University – internships and assistance; ATP grant
• Surveys done in Middleborough – get those from Trish Cassidy
  o Old news stories – need to pull those together
  o News articles from flood of 68 – couple on Vernon Street
• River studies – Fish and Wildlife “Riffles” report – that included pictures in 2010
• Stream survey Pam Trisdale from MassDEP
• Freshwater mussel survey – an important factor for determining water quality
  o Ex: study in the three-mile river
  o Sensitive to water quality
  o Vital to fisheries
  o Pain to get a permit from state agencies to do the diving
  o One survey not enough due to reproductive life-cycles

Infrastructure
• Railroad bridge over the Nemasket – choke point for water coming out of the Nemasket
• Middleborough MVP
• Assawompsett pond down to the first bend – the 1900 cubic yards that were referenced for removal in the first 500 ft (rec 2/3 flood manage)
  o City of New Bedford – twice a year clean around the box, but not enough that has been done
• Assawompsett Pond Dam – not a reason to replace from water management supply perspective, but if there are better technologies for related issues such as fish passage
  o How much is that contributing to the silt downstream in Nemasket?
  o 4-foot impoundment = “extra” body of water on top of natural waterbody
  o It’s a colonial era dam...
• FM rec 14 – explore elevating Bedford Street
• State grant permits and waivers for routine inspections – grant MOUs for organizations to conduct routine surveys to conduct wildlife surveys; wouldn’t need to keep going – could you do it through an emergency order through Con Comm?
• 2014 – Green Design manual new things supposed to take into consideration enviro factors
• Work with state agencies to see how their actions might conflict with corrective actions we are trying to take
• Murdock Street Bridge – 2010 had to put a metal plate in road
• Area by boat ramp – Squam Book – floods regularly
• Low-lying – route 18 side – flooded across route 18 – flooded in back (Staple Shore Road)
  o Assess natural areas that can hold these waters
  o Gradient only 3 feet from dam down to wareham street – not a fast flow
• NOI – MassDOT for outfalls, routine maintenance plans – appetite for other agencies to provide? Two water districts – 5-year ONM plans?
  o Work with local towns
  o Some ONM maintenance that used to go on quite a bit – but fallen out
• Assawompsett Ponds Management Plan
• 2010: Icing on pond – ground water very high – 17 inches of rain
• Study to hydrological study
  o Snippetuit / Black Brook
• 1 – 4, 38, 46-48 flood management: combining many things – pond drainage
• Ocean spray parking lot? Some retrofit happened along driveway, but go back and see what else can be done – green parking lot, rooftop water reuse – sustainability coordinator position
  o Water quality testing down stream of Ocean Spray?? As evidentiary info...
• Existing parking lot at Lakeville station that will be partially abandoned (where parking will be moved to Middleborough, but 200 spaces less)
  o Retrofit Lakeville side
• State has an office in same parking lot – why not improve their office?
• Lake district? Lakeville and Freetown – sounds like it is an extra assessment? Or what?
APC Meeting
March 11, 2020 9:00AM
Lakeville Police Department Meeting Room
323 Bedford Street
Lakeville
Designing a Floodwater Management Program
Assawompset Ponds Complex

AGENDA

1. Call to Order
2. Introductions
3. The SRPEDD Team Scope of Work – January through June 30, 2020
   • Elements of the Work Program – where we are in the Work Program
     - involvement of other parties/efforts in a holistic approach to the APC projects/plans
   • Key Resources - Project and Documents page where lots of information is posted; reports/documents from the 1980’s to present day; has everyone looked at it or been able to access it? Any problems? – ongoing
   • Review of Key Recommendations from past research/reports:
     - overview of the key recommendations from past reports and studies - completed
     - which recommendations do you think are still relevant? - completed
   • TODAY’S ACTIVITY - PRIORITIZATION of PROJECTS
     - using PRIORITIZATION information, create a working projects map and assign project team leads to priority project areas/tasks
   • What additional information/contacts do we need going forward?
     - protocol for accessing watershed lands during field season?
     - set up a guided trip around the watershed
4. Next Steps?
5. Adjourn
Assawompsett Ponds Complex Committee Meeting
March 11, 2020, Lakeville Police Station
Facilitated by Bill Napolitano, SRPEDD

Notes by Horsley Witten group (Jonas Procton, reviewed by Ellie Baker)

☒ Attendance
  ☒ Committee/Stakeholders
    ☒ Ron Burgess, Herring Commission
    ☒ Pat Freitas, APC Middleboro Rep.
    ☒ Nancy Yeatts, Lakeville
    ☒ Joseph Osborne, Middleboro
    ☒ Michael Arruda, Taunton
    ☒ Caitlin Rowley, Sen. Michael Rodrigues
    ☒ Althea Brady, Freetown
    ☒ Aaron Best, DFW
    ☒ Jim Pavlik, Outback Engineering
    ☒ Ymane Galotti, New Bedford
    ☒ Gary J Sautos, New Bedford
    ☒ Tom Barron, Herring Commission
    ☒ Patricia Cassady, Middleboro
    ☒ Mike Schroeder, Lakeville Open Space
  ☒ Project Team
    ☒ Bill Napolitano, SRPEDD
    ☒ Helen Zincavage, SRPEDD
    ☒ Sara Burns, TNC
    ☒ Michelle Craddock, MA DER
    ☒ Danica Warns, Mass Audubon
    ☒ Eric Walberg, Manomet
    ☒ Ellie Baker, HW
    ☒ Jonas Procton, HW

☒ Current Status
  ☐ Documentation has been/is being compiled by SRPEDD
  ☐ 26 Recommendations have been collected for prioritization, from prior APC meeting
Discussion

- Recreation benefits were not included in the co-benefit matrix. It was stated that restoration is necessary before recreation features can be created. Recreation could also be incorporated into project construction processes.

- Surveying the APC/drainage system was expected to be a higher priority, and is beneficial for planning the prioritization of other projects. It was pointed out that surveying is incorporated into Actions #25 & #26 (Developing a long-term hydro model & developing a management plan for best practices).

- It was noted that cost is not included in the prioritization matrix. This is because the planning process is meant to identify priority projects, separate from addressing their costs.

- Action #11 was edited to specifically address septic system upgrades at Clark Shores and Churchill Shores, both along Long Pond, where communities are most dense and cesspools most present.

- Actions #11 & #12 were noted as very related to one another (septic system upgrades & installing permeable reactive barriers to filter nutrients). The items remained separate for voting.

- Water quality was not explicitly included in the prioritization matrix, although water quality issues related to flooding were. The co-benefit “Water Supply Intake Protection” was stated to be more or less a proxy for water quality.

- Actions #20, #22, and #23 were noted as very important, since pesticides have had significant impacts on water quality of the APC.

- Actions #25 & #26 were questioned by some in terms of relating more to planning than actions to relieve flooding. It was noted that planning is a necessary part of the action process, and that prioritizing plans leaves room to prioritize other actions as well.

- It was noted that the prioritization process should be viewed holistically, as several items are interrelated and have many co-benefits. This relates to the connection of the APC (Little Quitticas -> Great Quitticas -> Pocksha -> Assawompsett -> Long) and flow pattern/drainage variation between the summer and the winter. Extreme events such as drought and flooding exacerbate both water quality and quantity problems that result from the flow patterns.

- “Water Quality and Supply” was added to Action #26 as a part of the Management Plan.
Voting Results

<table>
<thead>
<tr>
<th>Priority Number</th>
<th>Action ID and Description</th>
<th>Votes</th>
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<tbody>
<tr>
<td>1</td>
<td>#4 &amp; #3: Remove Sediment Deposition in the First 500 ft of the Nemasket &amp; Install Nemasket Silt Trap. March 18th call - need to know clearly what Outback is working on here. Charge is related to (1) invasive species in the area right past the dam in the Nemasket planned for two-week period in August - separate town/city money (Lakeville, Middleborough, New Bedford - 15,000k) permitting for volunteer work (connected to habitat restoration plan for Red Bellied Cooter - federal approval connection); and (2) legislative funds (35,000) related to silt and sediment but not sure what their precise scope is yet. Could we see their scope of work before it is approved? Did they allocate some of their funding for participation in the rest of our meetings? We are waiting until the end of the week to see what their scope will be. If outback is focused on the silt trap - presumably that would leave the dredging to us. There is a dredging rig in Plymouth county, but you need to get it and hire a driver. What kind of permits would be required? DMF would be an ally in this effort - have pulled emergency permits before.</td>
<td>(10) &amp; (7)</td>
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NEXT STEP - ONE PAGER DEVELOPMENT, Ellie lead

put together one-pager on what is possible and what permits are needed, where dredge spoils might go. Put together an issues paper on each of these things.
<table>
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<th></th>
<th><strong>25:</strong> Develop Long-Term, scientifically-based hydro model for the APC and Nemasket to support water supply operations, determine firm yield, and support fish passage. March 18th call - should probably come before the Management Plan. How big of an ask is this study? Ellie to talk through with Neil at her shop, especially given background with Taunton study. Have to account for both surface water and groundwater, where only limited modeling may have been done to date. Gardner Bend from USGS has also done a lot of work in the APC and should be looped in. Are there short-cut studies that could be done to answer the questions we’re trying to answer [want to understand movement of water into and through ponds system and out the nemasket.] Existing conditions - field work and data collection will be necessary. Flooding is the issue and retention of adequate water supply “firm yield” / pond levels. Water suppliers have been using the Fennessy document to set levels since it was issued - 2013-2015 adjusted floodplain levels. Are we dealing with an unconfined aquifer that will be affected by SLR? Must include this question in face of climate change as a factor that could double down on the problem. Tidal influence reach only during unique events? Groundwater has been very high in recent years. <strong>ONE PAGER DEVELOPMENT:</strong> Ellie/Neil lead, w/ Eric assist and Bill bringing USGS contacts into loop</th>
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<td><strong>26:</strong> Develop a Management Plan for APC with best practices for handling the dam, sediment, fisheries, Nemasket flow, aquatic invasives management, floodplain, water quality and supply, etc. March 18th call - identified in all local MVP plans - hydro model study could be folded in as step 1 here. Treat as two separate, but one-pager can acknowledge precursor of hydro model. Build in Climate Change recommendations / bylaw review to support land use decisions with <strong>ONE PAGER DEVELOPMENT:</strong> Lead Bill, Helen, Danica, Eric - one-pager going to lead to the development of the general outline for a Management Plan</td>
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<td></td>
<td>Action</td>
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<tr>
<td>4</td>
<td>#1: Replace culverts at Snake River and Route 105 March 18th call - MassDOT is sending us their engineering specs from last time it was updated (1990’s). Won't be able to go after the DER grant - what other funding sources can we bring to bear working with MassDOT / MPO, etc.</td>
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<tr>
<td>5</td>
<td>#5: Assawompsett Dam Replacement March 18th call - no one has ever done any design work on a replacement. Start from scratch effort. Assessment, contributing factors (silt spillover behind dam, etc).</td>
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<td>6</td>
<td>#19: Wetland restoration at Bridge St, Wood St, Wareham St, Vaughn St - March 18th call - Sara and Eric, integrating with GI work and previous wetlands recommendations and studies (Sara’s previous work with Scott). Looking at publicly-owned lands as potential restoration areas. All areas specified are on the Nemasket and so could focus in that watershed.</td>
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<td>#22: Limit pesticides/herbicides/treatment over and around the APC through Integrated Pest Management and better communication with DPW</td>
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<td>#2: Replace railroad bridge over Nemasket</td>
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<td>#16: Country drainage along roadways (swales)</td>
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<td>#9: work with natural systems/green infrastructure to infiltrate water</td>
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<td>#10: Remove vegetation mass from Wareham St Pond</td>
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<td>#18: Install a washing station and educate about invasive transmission</td>
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<td>#23: Work with legislators and environ./transport. Agencies to review legislation and how it works with proposed fixes</td>
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<td>#7: Replace Murdock Street Bridge in Middleboro</td>
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<td>#17: Remove sandbars and MassDOT broken drain (495/44)</td>
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<td>#20: Conduct a freshwater mussel survey</td>
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<td>#24: Look at a regional O&amp;M plan involving utilities/permits with local water supply Con Comm’s and BOH’s</td>
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Notes

- Highlighted blue actions are the top 6 choices for prioritized actions
- Action #3 was grouped with #4 because of their interconnectedness
- Actions #5, #19, and #22 were ranked as seen above after tying

Next Steps/Future Collaborations
- Project components will be clarified and project partners identified to get projects ready for grant applications.
- Herring Commission should be involved in Actions #3/#4.
- New Bedford Water Supply would like to be involved in Actions #25, #26, & #5.
- Action #19 will involve DPW and Con. Comm. from Lakeville and Middleboro.
- Recreation features should be incorporated into Actions #19 & #4.
- DER Culvert Grants and MVP Action Grants may be funding sources for these projects. Culvert Applications are due in 2 weeks.
APC Meeting
April 8, 2020 9:00AM
Remote via Zoom

Designing a Floodwater Management Program
Assawompset Ponds Complex

AGENDA

1. Call to Order
2. Introductions (Who is on?)
3. The SRPEDD Team Scope of Work – January through June 30, 2020
   - **Elements of the Work Program** – where we are in the Work Program
     - involvement of other parties/efforts in a holistic approach to the APC projects/plans
   - **Key Resources** - Project and Documents page where lots of information is posted;
     reports/documents from the 1980’s to present day; has everyone looked at it or been able to access it? Any problems? – **ongoing**
   - **Review of Key Recommendations from past research/reports:**
     - overview of the key recommendations from past reports and studies - **completed**
     - which recommendations do you think are still relevant? - **completed**
   - **Prioritization of Projects**
     - using a voting and selection process involving the entire APC Team, select the top six (6) **priority** projects and assign project team leads to investigate elements of the chosen priority project areas/tasks - **completed**
   - **TODAY’S ACTIVITY** – Project team presents an overview of the elements of the six (6) priority projects selected at the March meeting to the entire APC Team, for discussion. Which projects stand out as feasible to flesh out and pursue in the coming months?
     - Bill will introduce the priority area project research and write-up process, Helen will put the projects up on the screen for all to view.
     - Then, team members from Horsley Witten will discuss the Hydro Study, Dam, and Silt Removal Projects; Manomet and TNC will discuss the Wetlands Restoration Project; SRPEDD will discuss the Culvert Replacement Project, and; Mass Audubon and SRPEDD will discuss the Management Plan Project.
     - This will be followed by questions and discussion.
4. Next Steps
5. Adjourn
Notes by Horsley Witten Group (Jonas Procton, reviewed by Ellie Baker)

- **Attendance**
  - Committee/Stakeholders
    - Dave Demanche, Freetown
    - Althea Brady, Freetown
    - Nancy Yeatts, Lakeville
    - Patricia Cassidy, Middleboro
    - Joseph Osborne, Middleboro
    - Pat Freitas, APC Middleboro Rep.
    - Gary Santos, New Bedford
    - Mike Arruda, Taunton
    - Katie Sousa, Taunton
    - Tom Barron, Herring Commission (Lakeville)
    - Caitlin Rowley, Sen. Michael Rodrigues
  - Project Team
    - Bill Napolitano, SRPEDD
    - Helen Zincavage, SRPEDD
    - Michelle Craddock, MA DER
    - Sara Burns, TNC
    - Danica Warns, Mass Audubon
    - Eric Walberg, Manomet
    - Neil Williams, Manomet
    - Ellie Baker, HW
    - Neal Price, HW
    - Jonas Procton, HW

- **Agenda**
  - Review Key Recommended Projects (One Pagers)
  - Questions/Discussion
  - Next Steps

- **Intro**
  - One pagers were developed for each key recommendation. The one pagers helped highlight how all six key recommendations are linked – for example, the hydro study and modelling will inform elements of the sediment trap and wetland restoration process.
  - SRPEDD prepared a graphic categorizing projects according to what additional information – none, groundwater modelling, or hydrologic & hydraulic (H&H) – is needed to advance each project.

- **Presentations of Key Recommended Projects - One Pagers**
  - **Dam Replacement (HW)**
    - Existing data from the APC study by Neil Fennessey (UMass Dartmouth) and a Nemasket River HEC-RAS model would inform design
    - If the dam is replaced, critical questions include whether the dam elevation should remain the same and whether the fish ladder should be redesigned.
    - Steps: A feasibility study could be performed with the information currently available. Additional groundwater/surface water models and H&H models would be necessary to fully design a dam removal/replacement project. After design, the project would be permitted, constructed, then monitored.
    - Certain funding sources would prefer dam removal over replacement, such
as DER. Dam and Sewall Repair funding was also mentioned as a possibility if replacement is pursued – they would likely rather fund a higher risk dam repair project, but may fund the feasibility study.

- Depending on the project chosen for the dam, there is a wide range of construction cost.
  - Sediment Removal and Trap (HW)
    - This project should be evaluated as part of the larger H&H study for the area. It would be necessary to study the natural geomorphological conditions where sediment is accumulating.
    - Since this project was originally ideated in 1980, the regulatory environment has changed considerably, and dredging an artificial river channel may not be permittable. The sediment trap would essentially be a sediment forebay in the middle of a wetland resource.
    - Collaboration with DMF (Division of Marine Fisheries) is an essential part of this project. It should be determined whether fish could navigate a naturalized channel.
    - The project could also be an opportunity to improve fish passage at the Assawompset Dam area overall.
    - Steps: like the dam project, a feasibility study could occur at present, although an H&H model would be necessary for a more complete design. Sediment Testing is also needed to determine if the sediment is appropriate for release, landfill disposal, or treatment/disposal of contaminants. If appropriate for the site, then design, permitting, construction, monitoring, and maintenance would follow.
    - The permitting process could have a significant degree of overlap with the dam project, so it may be economic in terms of both time and money to permit the two as a single project.
    - The biggest barrier to this project is feasibility.
    - There is a wide range of costs due to uncertainty in feasibility.
  - H&H Study (HW)
    - This project could serve as a necessary precursor or step in several of the other projects. A range of linked models would be created, including a watershed-scale groundwater & surface water model and a smaller-scale H&H model.
    - Projects such as the sediment trap, wetland restoration, and culvert replacement could be based on the smaller-scale H&H model.
    - Assets include the Fennessey study and the existing HEC-RAS model, as well as existing water level data from water suppliers. SNEP Grants/SNEP Network partnership and technical support could be good resources as well.
  - Wetland Restoration (TNC & Manomet)
    - Areas previously discussed for wetland restoration are Vaughn Street and Bridge Street wetlands. Previous studies were largely focused on wetland restoration in relation to sites’ potential for canoe access.
    - Additional sites were proposed due to potential benefits to flood mitigation, water quality, and water access.
    - Steps: Expand existing analysis, prioritize wetland restoration sites, evaluate sites, engineering design and permitting of selected sites, construction and monitoring.
    - Funding could be sourced from the Water Conservation Society, which has a grant application due 4/18/2020 (with a construction completion deadline of November 2022).
    - Cranberry bog restoration could also be incorporated.
    - Manomet prepared a map indicating areas with high restoration potential, cranberry bogs, and undeveloped land currently serving as green infrastructure.
  - Snake River Culvert Replacement (SRPEDD)
- The existing 4'X8' culvert along Snake River (estimated installation 1992) causes problems with both flooding and fish migration. After the existing 4'x8' box culvert was found to cause flooding issues, an additional 2' diameter culvert was installed approximately 30' from the 4'X8' box in 1994, which did not significantly improve flooding and fish passage.
- A larger culvert that meets the Massachusetts Stream Crossing Standards (e.g. width = 1.2X bankfull width) would be installed to replace the undersized culverts.
- Steps: design, permitting, construction
- Assets include established relationships with the agencies involved in a culvert replacement
- Barriers include sourcing funding
  - Assawompset Pond Management Plan (MA Audubon & SRPEDD)
    - A management plan for the Assawompset Pond and Nemasket watersheds would tie together aspects of the other projects.
    - The plan would account for drought, flooding, and climate change impacts.
    - SRPEDD prepared a map of the greater APC region designating land based on owner – the area is largely privately owned.
    - The planning process would need to be inclusive of the various landowners and stakeholders of the area.
    - Steps: stakeholder engagement, data collection, plan development
    - Limited permits would be needed aside form land access permits
    - Question of whether this should proceed or follow H&H study

- Questions/Discussion
  - Dam Replacement/Removal
    - No questions/discussion
  - Sediment Removal
    - The Herring Commission noted that Outback Engineering group is already working on feasibility of sediment removal, and that DMF previously dug a bypass channel to help with fish passage.
    - SRPEDD proposed that after verifying that the sediment in the Nemasket is appropriate for reuse, developing a sediment management plan would give regulatory footing for the permitting process.
    - The Herring Commission noted that the sediment in the Nemasket, rather than the dam, is the biggest factor limiting outflow from the Assawompset Pond.
    - TNC proposed that the wetland restoration project could factor into management of invasive plants at areas of sedimentation; HW proposed that the wetland restoration could serve as mitigation for wetland areas that may be impacted by this (or the dam) project.
    - The Herring Commission and SRPEDD noted that the endangered Red-bellied Cooter Turtle is present in the Nemasket, which is relevant for the sediment removal. An endangered species management plan has previously been prepared.
    - It was proposed that students at local schools/universities could be involved in field sampling/data collection/analysis. HW stated that initial data collection (non-permitting samples) could involve students, while permitting sample would require certified lab analysis.
  - Hydro Studies
    - No questions or discussion
  - Wetlands Restoration
    - TNC proposed that funding from the Wildlife Conservation Society (WCS) could be proposed quickly, given the upcoming 4/18 deadline. Funding would need to be matched 1:1, could account for new wetland restoration design work or tie into future projects, and needs a construction component.
- MA Audubon proposed the SNEP program as an additional funding source, and explained that the upcoming SNEP partnership program application (due 4/15) would partner towns/agencies with pre-approved consultants to assist with projects.
  - Snake River Culvert
    - SRPEDD noted that culvert replacements offer benefits to both flood protection and fish passage (Long Pond has significant herring interaction). The project could begin to be scoped.
  - APC Management Plan
    - Lakeville noted that there are up to 250,000 users of the APC water supply, and the 180,000 number may be an old estimate

- Next Steps
  - Pursue grants (WCS, SNEP, MVP Action Grant, etc.)
  - Prioritize wetland restoration sites, site selection
  - Begin sediment testing/sediment management plan for sediment removal project
    - Outback Engineering to be contacted
  - Begin Snake River Culvert grant process
  - Dam feasibility study
  - Prepare projects for implementation
AGENDA

1. Call to Order

2. Introductions (Who is on?)

3. **Key Resources** - Project and Documents page where lots of information is posted; reports/documents from the 1980’s to present day; project summaries and updates; has everyone looked at it or been able to access it? Any problems?

4. **TODAY’S ACTIVITY – This is strictly an informal working meeting.**
   Project team will present an overview of the progress made to date on the six (6) priority projects selected at the March meeting, and presented in write-ups at the April meeting.
   - Team members will provide summary updates on the Hydro Study (Horsley Witten), Culvert (SRPEDD), and Silt Removal Projects (Horsley Witten, SRPEDD); (10 min.)

   This will be followed by a more in-depth discussion of projects that are currently under consideration for, or will soon be seeking direct technical assistance/funding. These presentations will be followed by a brief discussion/question and answer period.
   - Team members from Manomet and TNC will discuss the Wetlands Restoration Project; (20 min., 10 min. discussion);
   - Horsley Witten and SRPEDD will discuss the Dam Repair/Replacement Project, and; (20 min., 10 min. discussion);
   - Mass Audubon and SRPEDD will discuss the Management Plan Project; (20 min., 10 min. discussion).

5. Next Steps

6. Adjourn
Assawompsett Ponds Complex Committee Meeting
May 13, 2020, Zoom Conference Call
Facilitated by Bill Napolitano, SRPEDD

Notes by Horsley Witten Group (Jonas Procton, reviewed by Ellie Baker)

- Attendance
  - Committee/Stakeholders
    - Althea Brady, Freetown
    - Nancy Yeatts, Lakeville
    - Patty Kellogg, DEP
    - Mike Schroeder, Lakeville Open Space
    - Patricia Cassidy, Middleboro
    - Joseph Osborne, Middleboro
    - Ymane Galotti, New Bedford
    - Gary Santos, New Bedford
    - Karen Almeida, Office of State Senator Michael J. Rodrigues
    - Katie Sousa, Taunton
    - Tom Barron, Herring Commission (Lakeville)
    - Ron Burgess, Herring Commission
    - Caitlin Rowley, Sen. Michael Rodrigues
  - Project Team
    - Bill Napolitano, SRPEDD
    - Helen Zincavage, SRPEDD
    - Michelle Craddock, MA DER
    - Sara Burns, TNC
    - Danica Warns, Mass Audubon
    - Eric Walberg, Manomet
    - Ellie Baker, HW
    - Neal Price, HW
    - Jonas Procton, HW

- Agenda
  - Overview of Projects
  - Project Updates/Overviews
    - H&H Study (HW)
      - Applied for a grant with Southeast New England Program (SNEP) of Restore America’s Estuaries
      - H&H study will help inform Sediment Removal, Dam Replacement, Culvert Replacement, and Wetlands Restoration projects
    - Sediment Removal and Trap (HW)
      - HW worked with SRPEDD and Outback Eng. To revise Outback’s Scope with Herring Commission to better work in concert with H&H study. Outback will conduct more surveying to inform modeling as well as trap design.
      - Outback will take sediment quality samples required to assess contaminant risk and delineate wetlands boundaries.
    - Snake River Culvert Replacement (SRPEDD)
      - SRPEDD has been in contact with MA DOT District 5, who is reviewing the project overview
      - MA DOT had no previous plans to replace the culvert
      - SRPEDD is working on applying for an access permit
    - Wetland Restoration (TNC & Manomet)
      - Previously, wetland maps generated by TNC and Manomet focused on areas noted for
potential recreational value

- Additional map generated to incorporate flood control and habitat benefits
  - See “Potential Wetland Soils Landscape” map from Manomet
  - Light pink = lower potential value for restoration
  - Dark red = higher potential value for restoration
  - Hatching = high habitat value

- Project team helped select areas to focus on
  - NW Quadrant (West of Assawompset Pond)
    - Staple Shore Road
      - Floods frequently
      - Wetland is disconnected from pond by road
  - SW Quadrant (around Long Pond)
    - Snake River Culvert area (between Assawompset and Long Ponds)
      - In 2010 flood, herring were able to swim across the road
    - West side of Long Pond
      - Home frequently flood
      - Loss of living facilities in last major flood
  - Center Area (between all ponds)
    - Wetland south of Route 18, near culvert
  - SW leg of watershed
    - Southern portion of Long Pond
      - Potential “release point”
    - Audubon Sanctuary
      - Potential “release point”
  - NE Quadrant (east of Assawompset Pond)
    - East of island in Assawompset
    - Owl swamp (NE corner of Assawompset)
  - SE Quadrant (East of Great Quittacas)
    - SE corner of Great Quittacas
  - Nemasket River
    - Freitas Farm Property (near Fall Brook)
  - Cranberry bogs
    - Bogs in Freitas Property
    - Bogs east of APC complex near watershed boundary
    - Cowan Bogs off Cowan Drive in Middleborough
  - Dam Replacement (HW)
    - In general, there are three different actions to take with dams
      - Remove entirely
      - Renovate in existing state
      - Replace
    - Questions to ask: how is the dam currently functioning? Why replace it? Is there leakage? How is it managed?
    - Discussion
      - The dam is usually left open, except for during droughts and some summers
        - The dam has been open since 2016, the time of the last drought/last significant drainage
      - Priorities include allowing better drainage of pond, operability, fish passage, and water quality. Sediment control is also a factor in design
      - Operation is currently unsafe
        - Aluminum rather than wood would be a safer material for the boards, since aluminum is lighter and would not absorb water
        - Dam safety is most likely assessed by Taunton
      - The dam generally does not leak
        - There are holes in the wooden boards for ease of removal that allow
some leakage, but no major leakage occurs

- **Ownership**
  - Taunton owns the dam but it is located in Lakeville and Middleborough
  - Taunton and New Bedford are involved in operations
  - Lakeville, Middleborough, Freetown, and Rochester all abut the APC
  - Taunton access the dam through Lakeville, New Bedford through Middleborough
  - There exists a map that clearly shows land ownership around the dam, ask SRPEDD

- **Related project: Scituate Dam Repair**
  - Project involves raising dam by 1.5 feet to increase storage, lowering and automating the spillway gate, and improving fish passage
  - Project has been ongoing since 2013 and is nearing construction
  - Total cost will reach approximately $1.8M

- **Next steps: put together an approximate project timeline and permit pathway for Assawompset Pond Dam**
  - Assawompset Pond Management Plan (MA Audubon & SRPEDD)
    - EPA Watershed Management Plan used as a template

- **Grant Status**
  - MVP Action Grant currently being written, is due June 11
  - Grant is being written under the umbrella of Lakeville
  - Rochester, Lakeville, Freetown, Middleborough, and New Bedford all included a Management Plan in the MVP Planning phase
  - Taunton completing MVP Planning phase now

- **Draft outline**
  - **Scope: Assawompset Pond and Nemasket River Watersheds**
  - **Inventory of Watershed**
  - **Water Quality**
  - **Water Supply**
  - **Floodwater Management**
  - **Habitat Enhancement**
  - **Recreation Access**
  - **Pulling it all Together**
    - Best Practices
    - Next Steps
    - Timeline for Implementation

- **Discussion**
  - New Bedford will be in touch with project team with a question related to funding/roles/involvement of the abutting towns versus the cities
  - Lakeville asked at what point the Management Plan would be shared with the public. SRPEDD/Audubon answered that it will be announced at a public meeting at the conclusion of this project, and public meetings will then be organized to develop the Plan
  - Audubon asked if any species/habitat was of special concern beyond herring? It was clarified that all species/habitat improvements are encapsulated by “Habitat Enhancement;” no additional species were noted.
  - TNC suggested that Ecosystem Management/Ecosystem Resilience could be added as a main issue
  - HW suggested that a section be added to state which parties/municipalities are involved and what roles each group will perform, including developing and implementing the Plan. Lakeville noted the importance of the regional context of the project, especially in regard to funding.

- **Next Steps**
  - Send any additional thoughts to SRPEDD
  - Should hear back from SNEP Grant for H&H study soon
**APC Meeting**

*June 10, 2020 9:00AM*

*Remote via Zoom*

*Designing a Floodwater Management Program*

*Assawompset Ponds Complex*

**AGENDA**

1. **Call to Order**
2. **Introductions (Who is on?)**
3. **Key Resources** - Project and Documents page; has everyone looked at it or been able to access it? Any problems?
4. **TODAY’S ACTIVITY**
   - Team members will provide summary updates on the state of all proposed follow-up projects and working toward solutions to the issues raised during this phase of our collective APC work:
     - H & H Study
     - Herring Commission Survey Work/Silt Mitigation
     - Wetlands Restoration
     - Management Plan Proposal
     - Dam Repair
     - Long Pond River Culvert Work
   Potential complementary work items:
     - WMOST study for the Assawompset Ponds and Upper Nemasket Watersheds (EPA)
     - Future of Dams Public Workshops for the Nemasket River (from the Assawompset Pond to Wareham Street)
5. **Next Steps:**
   - Briefing for Sen. Rodrigues?
   - Format of our Public Meeting?
   - Preparation of final documentation for DER; other DER requests?
   - Last minute needs for the MVP Action Grant application?
   - Schedule/need for future meetings?
6. **Adjourn** [no meeting notes to include – project wrap up]
Appendix B.

Materials Used and Developed in Previous Recommendation Prioritization (Task 2)
List of Previous Studies Reviewed for Recommendations

- 1980 Nemasket River RC&D Measure
- 1982 Nemasket river Resource Conservation & development Measure
- 1984 Nemasket River Dredge Application RC&D Measure
- 2001 USDA Lakeville General Soils for Open Space Committee
- 2002 Assawompset Pond Complex Management Plan (Betty’s Neck)
- 2010 Ponds Public Meeting Presentation Pond Levels & Nemasket Flow Studies Park I
- 2010 UMass Dartmouth APC Pond Level Analysis 1985 to 2010
- 2011 Ponds Public Meeting Presentation Pond Levels and Nemasket Flow Studies Part II
- 2012 USDA Lakeville General Soils for Open Space Committee
- 2013 Lakeville MS4 Area Map
- 2013 Taunton Water Department Switch to NADV 88
- 2013 Culverts Dams the Ponds Flood Haz
- 2013 Culverts Crossings with Severe Constriction or Damage
- 2015 Lakeville FEMA FIRM Panels Revised
- 2017 Lakeville Pre-Disaster Mitigation Dams Outfalls and Crossings
- 2017 Lakeville Pre-Disaster Mitigation FEMA Flood Hazards
- 2017 Lakeville Pre-Disaster Mitigation Matrix
- 2019 CRB Workshop Risk Matrix – Freetown
- 2019 CRB Workshop Risk Matrix – Lakeville
- 2019 CRB Workshop Risk Matrix – Rochester
- 2019 Restoration Projects Compilation Map APC
- 2019 SNEP Database Excerpt
- HW TNC 208 Report Appendix A Watershed Plans
- Taunton River Watershed Dams Survey
- 2019 Nemasket River Documentary

Next Pages include:
1. Initial Full Set of Preliminary Recommendations from Previous Studies
## Flood Management Recommendations

<table>
<thead>
<tr>
<th>ID #</th>
<th>Primary Source (Document / Study)</th>
<th>Recommendation</th>
<th>Recommendation Repeated in...</th>
<th>Category</th>
<th>Antecedent Action Required?</th>
<th>Preliminary Design Work?</th>
<th>Cobenefits?</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1980 Nemasket River RCD</td>
<td>Remove aquatic growth, dredge sediment accumulation, and reduce runoff from the &quot;town barn&quot; area</td>
<td></td>
<td>Channel Improvement</td>
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<td>Habitat Restoration</td>
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<td>2</td>
<td>1980 Nemasket River RCD</td>
<td>Create a basin / sediment trap in the Nemasket River to accumulate sand washed over the outlet structure of the pond. Trap / basin would be installed 200 ft downstream from the dam by enlarging the existing pool below the dam and installing a pressure treated wood water control structure (2 ft height, notch to concentrate water during low flow periods, clear trap annually)</td>
<td>1982 Nemasket River RCD Measure Plan; 1984 Dredge Application</td>
<td>Channel Improvement</td>
<td></td>
<td>Habitat Restoration</td>
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<tr>
<td>3</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Remove approx. 1,900 cubic yards of deposited sand from the Nemasket River channel in the first 500 ft downstream of the Assawompset Dam (&amp; clear existing spoil pile)</td>
<td>1984 Dredge Application</td>
<td>Channel Improvement</td>
<td></td>
<td>Habitat Restoration</td>
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<tr>
<td>4</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Remove one-acre bed of wild rice root mass / much in the lower end of Wareham Street Pond through excavation (6,000 cubic yards).</td>
<td>1984 Dredge Application</td>
<td>Channel Improvement</td>
<td>temporary water control structure and pond draining</td>
<td>Habitat Restoration</td>
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### Sediment and Vegetation Control

<table>
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<tr>
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<tr>
<td>5</td>
<td>2013 Impaired Crossings</td>
<td>Culvert on Crooked Lane and Bates Brook - Severe Stream Constriction</td>
<td>2017 Pre-Disaster Mitigation Matrix Lakeville</td>
<td>Infrastructure Improvement</td>
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<td>6</td>
<td>2013 Impaired Crossings</td>
<td>Culvert on Old Main Street and Bates Brook - Poor or Damaged Condition</td>
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<td>7</td>
<td>2013 Impaired Crossings</td>
<td>Culvert on Main Street (105) and Bates Brook - Severe Stream Constriction</td>
<td>2017 Pre-Disaster Mitigation Matrix Lakeville; 2019 Lakeville MVP</td>
<td>Infrastructure Improvement</td>
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<td>8</td>
<td>2019 Lakeville MVP</td>
<td>Design replacement for the Snake River (Long Pond River) culvert</td>
<td>Yes</td>
<td>Infrastructure Improvement</td>
<td>Yes</td>
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<td>9</td>
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<td>Culvert on Freetown Street and Cedar Swamp River - Severe Stream Constriction</td>
<td>Yes</td>
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<td>Culvert on Harding Street (Route 44) and Poquoy Brook - Poor or Damaged Condition</td>
<td>Yes</td>
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<td>Culvert on Southworth Street and Unnamed Stream - Severe Stream Constriction</td>
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<td>Culvert on Bedford Street and Unnamed Stream - Poor or Damaged Condition</td>
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<td>Culvert on Pierce Avenue and Unnamed Stream - Poor or Damaged Condition</td>
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<td>14</td>
<td>2019 Lakeville MVP</td>
<td>Explore Elevating Bedford Street</td>
<td>No</td>
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<td>15</td>
<td>2019 Freetown MVP</td>
<td>Townwide assessment of all culverts</td>
<td>No</td>
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<td>Yes</td>
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<td>16</td>
<td>2019 Freetown MVP</td>
<td>Explore funding for town to buy private roads and bring them to compliance</td>
<td>No</td>
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<td>Yes</td>
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<td>17</td>
<td>2019 Freetown MVP</td>
<td>Assess elevation and adding culvert - Fall Brook at Chase Rd flume</td>
<td>No</td>
<td>Infrastructure Improvement</td>
<td>Yes</td>
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<td>18</td>
<td>2019 Freetown MVP</td>
<td>Beach Bluff Road Access</td>
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<td>Infrastructure Improvement</td>
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<td>19</td>
<td>2019 Freetown MVP</td>
<td>Study blockage issues and upgrade culvert - Fall Brook @ Chipaway Rd</td>
<td>No</td>
<td>Infrastructure Improvement</td>
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<td>20</td>
<td>2019 Freetown MVP</td>
<td>Upgrade Terry Brook Dam for pond elevation and to address impact of storm event</td>
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<td>21</td>
<td>2019 Freetown MVP</td>
<td>Squam Brook - work with APC to come up with a solution for all involved to address impact of blocking off</td>
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<td>Infrastructure Improvement</td>
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<td>22</td>
<td>2019 Rochester MVP</td>
<td>Address issues at the Snipatuit Causeway</td>
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<td>Infrastructure Improvement</td>
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<td>23</td>
<td>1980 Nemasket River RCD</td>
<td>Former Pratt Farm site potential for constructing a dam to impound water for purposes such as low-flow augmentation</td>
<td></td>
<td>Grey Infrastructure</td>
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<td>24</td>
<td>2002 APC Management Plan</td>
<td>Creation of an emergency boat launch ramp along Route 105 across from Parkhurst Road</td>
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<td>Infrastructure Improvement</td>
<td></td>
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<td>25</td>
<td>2017 Pre-Disaster Mitigation Matrix Lakeville</td>
<td>Maintain drainage facilities by retaining or increasing the town's MassDOT inspection schedule and extending the order of conditions so that it does not lapse</td>
<td>Stormwater Retention / Detention</td>
<td>Stormwater Retention / Detention</td>
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<td>26</td>
<td>2019 Lakeville MVP</td>
<td>Aquire land for flood storage and explore feasibility of buy-outs / managed retreat in Clark Shores and along Freetown Street and Highland Road, and in the repetitive loss properties on Shore Ave</td>
<td>Stormwater Retention / Detention</td>
<td>Stormwater Retention / Detention</td>
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<tr>
<td>27</td>
<td>2019 Lakeville MVP</td>
<td>Improve drainage on Freetown Street, County Road, Old Powderer House Road, and Heritage Hill Dr by increasing infiltration, and possibly acquiring property for flood storage</td>
<td>Stormwater Retention / Detention</td>
<td>Stormwater Retention / Detention</td>
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<tr>
<td>28</td>
<td>2002 APC Management Plan</td>
<td>Conduct forest management activities to promote water recharge</td>
<td>Water Level</td>
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<td>29</td>
<td>2002 APC Management Plan</td>
<td>Acquire and protect undeveloped lands that contribute to recharge of Assawompsett Pond Complex</td>
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<td>Water Level</td>
<td></td>
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<td>30</td>
<td>2019 Lakeville MVP</td>
<td>Look for drainage options due to site constraints at Freetown Street ledge near school</td>
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<td>Stormwater Retention / Reduce Flood Impacts</td>
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<td>31</td>
<td>1980 Nemasket River RCD</td>
<td>Convert abandoned cranberry bogs on Stony Brook into water storage areas</td>
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<td>Water Storage</td>
<td></td>
<td>Preliminary engineering and discussions with private landowners</td>
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<td>32</td>
<td>1980 Nemasket River RCD</td>
<td>Fall Brook upstream of the Nemasket - Merle Washburn III Memorial Conservation Area as a potential site for water storage to augment low-flow conditions in the Nemasket during summer</td>
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<td>Water Storage</td>
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<td>33</td>
<td>1980 Nemasket River RCD</td>
<td>Utilize abandoned bogs and dam to provide additional water storage along Fall Brook near Cherry Street and Route 25</td>
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<td>Water Storage</td>
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<td>34</td>
<td>1980 Nemasket River RCD</td>
<td>Upstream side of the old Fall Brook Furnace offers potential for creating a dam to provide additional water storage</td>
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<td>Water Storage</td>
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<td>35</td>
<td>2019 Lakeville MVP</td>
<td>No access to Riverside and Commercial Drive during emergency</td>
<td></td>
<td>Stormwater Retention / Reduce Flood Impacts</td>
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<td>36</td>
<td>2013 Impaired Crossings</td>
<td>Draft an APC Management Plan with recommendations for land conservation, recreation, water quality, habitat management, hazardous materials management</td>
<td>2017 Pre-Disaster Mitigation Matrix Lakeville; 2019 Lakeville MVP; 2019 Freetown MVP</td>
<td>Ponds Management</td>
<td></td>
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<tr>
<td>37</td>
<td>2013 Impaired Crossings</td>
<td>Ensure that the management plan helps to coordinate the operation of the Assawompset Pond Dam and water supply system, the Nemasket Park Dam, and the Middleborough East Grove Street water supply well</td>
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<td>Ponds Management</td>
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<td>38</td>
<td>2013 Impaired Crossings</td>
<td>Ensure that the management plan develops strategies to mitigate Nemasket river flow restrictions - develop the Nemasket River Dam / Sediment Plan veg. removal, dam removal, floodplain reclamation</td>
<td>2019 Lakeville MVP</td>
<td>Channel Improvement</td>
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<td>39</td>
<td>2013 Impaired Crossings</td>
<td>Ensure that the management plan anticipates the widest range of climate change scenarios</td>
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<td>Climate Change</td>
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<td>40</td>
<td>2017 Pre-Disaster Mitigation Matrix Lakeville</td>
<td>Educate residents and adopt a Wetland Protection Bylaw</td>
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<td>Stormwater Retention / Reduce Flood Impacts</td>
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<td>41</td>
<td>2019 Lakeville MVP</td>
<td>Improve process and protocol between LEPCs of ponds - users and host communities</td>
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<td>Ponds Management</td>
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<td>42</td>
<td>2019 Lakeville MVP</td>
<td>Work with shorefront community associations to look at vulnerabilities</td>
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<td>Community Outreach</td>
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<td>43</td>
<td>2017 Pre-Disaster Mitigation Matrix Lakeville</td>
<td>Ensure that the Master Plan addresses flooding issues and acquisition of sensitive areas</td>
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<td>Stormwater Retention / Reduce Flood Impacts</td>
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<td>44</td>
<td>2017 Pre-Disaster Mitigation Matrix Lakeville</td>
<td>Study and educate residents on the Green Infrastructure Network Maps and Assets to realize flood control, improved water quality, and habitat retention ecosystem services</td>
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<td>Stormwater Retention / Reduce Flood Impacts</td>
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<td>45</td>
<td>2019 Rochester MVP</td>
<td>Develop a stormwater management plan (consider LID)</td>
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<td>Stormwater Retention / Reduce Flood Impacts</td>
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<td>46</td>
<td>2010 Pond Level / Nemasket Flow Study (2010 &amp; 2011 presentations, 2010 Fennessy Study)</td>
<td>Interim pond level recommendations - approach taken to study pond levels was based on basic statistical methods - need a long-term, scientifically-based hydrologic model of the APC &amp; Nemasket River to create a Decision Support System to guide operations</td>
<td></td>
<td>Water Level</td>
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<td>47</td>
<td>2013 Impaired Crossings</td>
<td>Consider the firm yield (daily water withdrawal rate that can be reliably maintained during a prolonged drought) as an essential first step in DSS development</td>
<td></td>
<td>Water Level</td>
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<td>48</td>
<td>2013 Impaired Crossings</td>
<td>Hydologic study with three main objectives: computer-based model of the ponds and watershed to establish firm yield and reservoir management rules; computer-based model of the Nemasket River above the fish ladder and the Nemasket Park Dam to determine its conveyance capacity and devise rules for the Middleborough dam; use the DSS to develop a comprehensive resource management plan for the APC and Nemasket</td>
<td></td>
<td>Water Level</td>
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<tr>
<td>1</td>
<td>2002 APC Management Plan</td>
<td>Conduct forestry practices to manage a diverse forest of indigenous species that promotes variability in stand and vegetative species composition</td>
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<td>Biodiversity Protection</td>
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<td>2</td>
<td>2002 APC Management Plan</td>
<td>When implementing forestry practices, leave snags and downed logs</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>3</td>
<td>2002 APC Management Plan</td>
<td>Employ appropriate management where priority habitat for rare species has been identified</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>4</td>
<td>2002 APC Management Plan</td>
<td>When conducting forest management near vernal pools, employ timber harvesting guidelines (restrict forestry activities during breeding season)</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>5</td>
<td>2002 APC Management Plan</td>
<td>Prevent / manage exotic or invasive species populations, particularly aquatic weeds known to occur in Long Pond</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>6</td>
<td>2002 APC Management Plan</td>
<td>Consider species reintroduction or habitat enhancement measures when species' requirements and causes of exirpation are sufficiently understood (e.g. introduction of floating loon nests)</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>7</td>
<td>2002 APC Management Plan</td>
<td>Manage nuisance wildlife populations and the presence of their preferred habitat, particularly with regard to those species when they have the potential to degrade water quality, such as beaver, gulls and Canada geese</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>8</td>
<td>2002 APC Management Plan</td>
<td>Conduct haying activities after ground nesting birds have fledged</td>
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<td>Biodiversity Protection</td>
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<tr>
<td>9</td>
<td>2002 APC Management Plan</td>
<td>Work with NHESP to further investigate rare species occurrence to supplement past observations</td>
<td></td>
<td>Biodiversity Protection</td>
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<td>10</td>
<td>2002 APC Management Plan</td>
<td>Maintain mapping/inventory of known invasive species locations within the APC.</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>11</td>
<td>2002 APC Management Plan</td>
<td>Develop guides to assist field personnel and volunteers in identifying invasive species</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>12</td>
<td>2002 APC Management Plan</td>
<td>Prioritize invasive control measures and schedule implementation of control measures</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>13</td>
<td>2002 APC Management Plan</td>
<td>Monitor for spread of invasive bivalves (zebra mussel and Asian clam)</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>14</td>
<td>2013 Impaired Crossings</td>
<td>Ensure that the management plan anticipates needs of fisheries and other natural resources</td>
<td></td>
<td>Biodiversity Protection</td>
<td></td>
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<tr>
<td>15</td>
<td>2019 Lakeville MVP</td>
<td>Understand impacts on herring populations</td>
<td></td>
<td>Biodiversity Protection</td>
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<tr>
<td>16</td>
<td>2002 APC Management Plan</td>
<td>Manage fisheries to ensure the protection of water supply resources</td>
<td></td>
<td>Fisheries Management</td>
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<tr>
<td>17</td>
<td>2002 APC Management Plan</td>
<td>Manage fisheries and fish habitat to ensure healthy sustainable and diverse animal populations</td>
<td></td>
<td>Fisheries Management</td>
<td></td>
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<tr>
<td>18</td>
<td>2002 APC Management Plan</td>
<td>Employ sustainable forest management practices</td>
<td></td>
<td>Forestry Practices</td>
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<tr>
<td>19</td>
<td>2002 APC Management Plan</td>
<td>Develop a forest management plan that achieves diversity in species and structure by increasing early and late seral forest habitats</td>
<td></td>
<td>Forestry Practices</td>
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<tr>
<td>20</td>
<td>2002 APC Management Plan</td>
<td>Employ an active management strategy using a combination of even-aged and uneven-aged silviculture</td>
<td></td>
<td>Forestry Practices</td>
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<tr>
<td>21</td>
<td>2002 APC Management Plan</td>
<td>Mimic natural disturbance patterns into managed forests by extending conventional rotational lengths, increasing stand size, retaining clusters of mature trees, and fostering species and size heterogeneity</td>
<td>Forestry Practices</td>
<td>General Guidelines for Water Supply Protection</td>
<td></td>
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<tr>
<td>22</td>
<td>2002 APC Management Plan</td>
<td>Employ appropriate management for priority neutral communities and employ selective cutting techniques in forested wetlands and riparian buffers</td>
<td>Forestry Practices</td>
<td>General Guidelines for Water Supply Protection</td>
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<tr>
<td>23</td>
<td>1980 Nemasket River RCD</td>
<td>Improve wildlife habitat at ConCom land across from the State Hospital, esp on tree-covered hummocks</td>
<td>Habitat Restoration</td>
<td>General Guidelines for Water Supply Protection</td>
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<tr>
<td>24</td>
<td>1980 Nemasket River RCD</td>
<td>Acquisition of a perpetual easement and construction of a fish ladder would aid fisheries migration to Tispaquin Pond</td>
<td>Habitat Restoration</td>
<td>General Guidelines for Water Supply Protection</td>
<td></td>
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<tr>
<td>25</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Install a concrete fishway on the upstream side of the existing box culvert on Fall Brook at Route 28</td>
<td>Habitat Restoration</td>
<td>Temporary water control / draining</td>
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<tr>
<td>26</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Install a concrete fishway around the dam on Fall Brook at Reynolds Sawmill (Wareham Street)</td>
<td>Habitat Restoration</td>
<td>General Guidelines for Water Supply Protection</td>
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<tr>
<td>27</td>
<td>2002 APC Management Plan</td>
<td>Natural resource inventory should be performed to supplement past survey efforts in the vicinity of the APC to assess the on-site species and communities supported in the assemblage of protected lands</td>
<td>Habitat Restoration</td>
<td>General Guidelines for Water Supply Protection</td>
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<tr>
<td>28</td>
<td>Taunton River Watershed Connectivity Assessment</td>
<td>Ensure that any new dam design for Assawompsett Dam allows for fish passage</td>
<td>Habitat Restoration</td>
<td>General Guidelines for Water Supply Protection</td>
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<tr>
<td>29</td>
<td>Taunton River Watershed Connectivity Assessment</td>
<td>Study the effectiveness of fish passage at the connection between Pocksha and Great Quittacas Ponds</td>
<td></td>
<td>Habitat Restoration</td>
<td></td>
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<tr>
<td>30</td>
<td>Taunton River Watershed Connectivity Assessment</td>
<td>Culvert at Route 18 that accommodates the connector stream between Assawompsett and Long Pond - effectiveness of culverts in passing fish should be assessed</td>
<td></td>
<td>Habitat Restoration</td>
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<tr>
<td>31</td>
<td>2002 APC Management Plan</td>
<td>Manage public access to the land in keeping with DEM's Mass Wildlands Program for Backcountry Areas (304 CMR 7.03(3))</td>
<td></td>
<td>Land Management and Preservation</td>
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<tr>
<td>32</td>
<td>2002 APC Management Plan</td>
<td>Hire an Environmental Park Ranger (cost share between New Bedford, Taunton, Lakeville and Middleborough) for monitoring, visitor contact, developing information for the public, performing admin duties on behalf of the APC management team</td>
<td></td>
<td>Land Management and Preservation</td>
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<tr>
<td>33</td>
<td>2002 APC Management Plan</td>
<td>Encourage the establishment of a volunteer friends group to assist in monitoring activities and to develop educational or recreational programming</td>
<td></td>
<td>Land Management and Preservation</td>
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<tr>
<td>34</td>
<td>2002 APC Management Plan</td>
<td>Pursue land acquisition efforts that connect large preservation holdings (Great Cedar Swamp, Fall River-Freetown Bioreserve, APC, etc)</td>
<td></td>
<td>Land Management and Preservation</td>
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<tr>
<td>35</td>
<td>2002 APC Management Plan</td>
<td>Restrict public access from filtration plant, dams, and other structures fundamental to the reservoirs and its treatment and delivery systems</td>
<td></td>
<td>Water Quality</td>
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<td>36</td>
<td>2002 APC Management Plan</td>
<td>Restrict forestry and wildlife management activities within 200 ft of tributary streams to protect stream buffers and reservoir water quality</td>
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<td>Water Quality</td>
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<tr>
<td>37</td>
<td>2002 APC Management Plan</td>
<td>Implement forestry best management practices</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>38</td>
<td>2002 APC Management Plan</td>
<td>Manage wildlife populations to protect water quality (reduce source of nutrients to drinking water supply)</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>39</td>
<td>2002 APC Management Plan</td>
<td>Monitor water quality to identify early any degradation and its source</td>
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<td>Water Quality</td>
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<tr>
<td>40</td>
<td>2002 APC Management Plan</td>
<td>Monitor weed growth within APC waterbodies</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>41</td>
<td>2002 APC Management Plan</td>
<td>Limit public access near shorelines of terminal reservoirs</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>42</td>
<td>2002 APC Management Plan</td>
<td>Develop routine communication with Lakeville Board of Health to address substandard septic treatment for properties adjacent to Long Pond</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>43</td>
<td>2002 APC Management Plan</td>
<td>Manage wildlife habitats to protect water supply</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>44</td>
<td>2002 APC Management Plan</td>
<td>Review baseline and ongoing water quality data collected by New Bedford and Taunton water departments; suggest modifications to the water quality monitoring programs as needed (adjusting locations of sampling sites, particularly adding sampling in the vicinity of Fall Brook discharging into Long Pond)</td>
<td></td>
<td>Water Quality</td>
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<td>45</td>
<td>2002 APC Management Plan</td>
<td>Clean up a tire dump adjacent to Fall Brook</td>
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<td>Water Quality</td>
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<tr>
<td>46</td>
<td>2017 Pre-Disaster Mitigation Matrix Lakeville</td>
<td>Study, educate and enact the recommendations from the Nemasket River 208 Plan</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>47</td>
<td>2019 Rochester MVP</td>
<td>Assess impact to water supply of the unlined former dump over the Snip aquifer</td>
<td></td>
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<tr>
<td>48</td>
<td>2019 Rochester MVP</td>
<td>Assess water quality of ponds - what data is there and what is known?</td>
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<td>Water Quality</td>
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<tr>
<td>49</td>
<td>2019 Lakeville MVP</td>
<td>Increase collaboration with Taunton and New Bedford to protect surrounding land for increased water quality</td>
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<td>Water Quality</td>
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<tr>
<td>50</td>
<td>2019 Lakeville MVP</td>
<td>Septic systems education - create a do's and don't's list for herbicides, pesticides, water mgmt on private property</td>
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<td>Water Quality</td>
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<tr>
<td>51</td>
<td>2019 Lakeville MVP</td>
<td>Pursue water quality testing and impact study from Cranberry bogs - Ocean Spray and others</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>52</td>
<td>2019 Lakeville MVP</td>
<td>Focus on removing invasive species, especially at the boat ramp and Long Pond which is a point of entry for these species, have a comprehensive study - milfoil management</td>
<td>2019 Freetown MVP</td>
<td>Water Quality</td>
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<tr>
<td>53</td>
<td>2019 Freetown MVP</td>
<td>Education for lakefront homes regarding septic breakout and what to do at Heaven Heights (Long Pond)</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>54</td>
<td>208 Report Map</td>
<td>Install permeable reactive barriers in four locations along the western shore of Long Pond</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>55</td>
<td>208 Report Map</td>
<td>Install permeable reactive barriers in one location west of the Nemasket river</td>
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<td>Water Quality</td>
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<tr>
<td>56</td>
<td>208 Report Map</td>
<td>Install constructed wetlands in three locations along the Nemasket River</td>
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<td>Water Quality</td>
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<tr>
<td>57</td>
<td>208 Report Table</td>
<td>Pursue fertilizer management</td>
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<td>Water Quality</td>
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<tr>
<td>58</td>
<td>208 Report Table</td>
<td>Pursue stormwater mitigation</td>
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<td>Water Quality</td>
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<tr>
<td>59</td>
<td>208 Report Table</td>
<td>Fertigate 70 acres</td>
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<tr>
<td>60</td>
<td>208 Report Table</td>
<td>Encourage Agricultural BMP’s on 725 acres</td>
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<tr>
<td>61</td>
<td>208 Report Table</td>
<td>Encourage Cranberry Bog BMP’s on 500 acres</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>62</td>
<td>208 Report Table</td>
<td>Pursue ecotoilet installation in 102 homes</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>63</td>
<td>208 Report Table</td>
<td>Pursue urine diverting system in Schools / public buildings (100 people)</td>
<td></td>
<td>Water Quality</td>
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<tr>
<td>64</td>
<td>208 Report Table</td>
<td>Pursue wastewater treatment for 105 homes</td>
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<td>Water Quality</td>
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<tr>
<td>65</td>
<td>2002 APC Management Plan</td>
<td>Encourage educational institutions to develop water quality monitoring programs with dual benefit of presenting a living classroom opportunity</td>
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<td>Water Quality</td>
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<tr>
<td>66</td>
<td>2019 Lakeville MVP</td>
<td>Better removal of silt and sediment from state and local roads, creating drainage outlets where feasible, assessing areas where treatments are needed, and with a nature based stormwater management plan</td>
<td></td>
<td>Water Quality</td>
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## Recreation Recommendations

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<tr>
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<th>Primary Source (Document / Study)</th>
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<th>Cobenefits?</th>
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<tbody>
<tr>
<td>1</td>
<td>1980 Nemasket River RCD</td>
<td>Develop a campsite at the &quot;Lions Head&quot; site</td>
<td>Recreation</td>
<td>Land acquisition</td>
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<td>2</td>
<td>1980 Nemasket River RCD</td>
<td>Potential rest stop for canoeists at Murdock Street Bridge</td>
<td>Recreation</td>
<td>Land acquisition</td>
<td></td>
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<tr>
<td>3</td>
<td>1980 Nemasket River RCD</td>
<td>Alternative potential rest stop, access ramp, small parking lot at Plymouth Street Bridge (north side)</td>
<td>Recreation</td>
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<td>4</td>
<td>1980 Nemasket River RCD</td>
<td>Enhance passive recreation by purchasing land between Oliver Mill Colonial Park and Spring Street</td>
<td>Recreation</td>
<td></td>
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<tr>
<td>5</td>
<td>1980 Nemasket River RCD</td>
<td>Additional benches, trash receptacle at Con Com land east of Oliver Mill Park / across from the KOA</td>
<td>Recreation</td>
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<td>6</td>
<td>1980 Nemasket River RCD</td>
<td>New nature trail along the north side of the river progressing upstream at Pierce Memorial Playground</td>
<td>Recreation</td>
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<tr>
<td>7</td>
<td>1980 Nemasket River RCD</td>
<td>Additional plantings and benches at Nemasket Park, along with removal of large rocks in channel to ease passage for canoeing</td>
<td>Recreation</td>
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<td>8</td>
<td>1980 Nemasket River RCD</td>
<td>Develop a natural trail and vista platforms along utility easement near town barn and acquire two parcels with unknown ownership</td>
<td>Recreation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Provide a nature trail with interpretive signage and amenities along the Nemasket River between East Grove Street (Route 28) and the Junior High School</td>
<td>Recreation</td>
<td></td>
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<tr>
<td>10</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Improvements to the canoe launch area at Bridge Street - regraded parking and launch ramp, trash cans, plantings, entrance sign, removal of debris</td>
<td>Recreation</td>
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</table>

February 12, 2020
<table>
<thead>
<tr>
<th>ID #</th>
<th>Primary Source (Document / Study)</th>
<th>Recommendation</th>
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<th>Category</th>
<th>Antecedent Action Required?</th>
<th>Preliminary Design Work?</th>
<th>Cobenefits?</th>
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<tbody>
<tr>
<td>11</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Install a canoe access area at Murdock Street via purchase of an acre plot of land, installation of small parking lot, walkway, entrance sign</td>
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<td>Recreation</td>
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<tr>
<td>12</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Install a canoe access area at Wareham Street - formalize informal landing area</td>
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<td>13</td>
<td>1982 Nemasket River RCD Measure Plan</td>
<td>Install a rest area for canoeists at Lion's Head via purchase of a two-acre tract of land with public access only from river</td>
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<td>Recreation</td>
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<tr>
<td>14</td>
<td>2002 APC Management Plan</td>
<td>Phased public access implementation: general access to Betty's Neck, allowing hunting across the remainder of APC property, introducing general access to overall property with appropriate infrastructure</td>
<td></td>
<td>Recreation</td>
<td></td>
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<td>15</td>
<td>2002 APC Management Plan</td>
<td>Develop and informational brochure with a map of the APC with text presenting rules and regulations for public access, and install signage</td>
<td></td>
<td>Recreation</td>
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<td>16</td>
<td>2002 APC Management Plan</td>
<td>Consider the establishment of an environmental center on the Betty's Neck parcel to help support sustained education opportunities to the public</td>
<td></td>
<td>Recreation</td>
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<td>17</td>
<td>2002 APC Management Plan</td>
<td>Identify potential trail connection to Southeastern Mass Bioreserved, and to Myles Standish State Forest</td>
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<td>Recreation</td>
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<td>18</td>
<td>2002 APC Management Plan</td>
<td>Develop inspection forms and a schedule of inspections for monitoring recreation areas</td>
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<td>Recreation</td>
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<td>19</td>
<td>2002 APC Management Plan</td>
<td>Conduct a formal review of the existing trail network and identify potential new trails (in view of erosion potential, minimize impacts to natural resources and wildlife corridors)</td>
<td>Recreation</td>
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<tr>
<td>20</td>
<td>2019 Rochester MVP</td>
<td>Increase flood resilience planning at the Annie Maxim House</td>
<td>Cultural Asset Protection</td>
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Photographs of the CRB Type Issue and Potential Solution Exercise (February Meeting)

<table>
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<tr>
<th>Community Resilience Building Risk Matrix</th>
<th>Top Priority Hazards (tornado, floods, wildfires, earthquake, drought, sea level rise, heat wave, etc.)</th>
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<tbody>
<tr>
<td>Features</td>
<td>Location</td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
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</tbody>
</table>

- **Environmental Features**
  - **1.** Infiltration / Evapotranspiration
  - **2.** Create a late spring, early summer, or fall
  - **3.** Groundwater: tank, storage, pump, etc.
  - **4.** Sub-municipal stormwater / maintenance
  - **5.** Removal of invasive species (5.51) / education / awareness / training
  - **6.** Firewise: Biodiversity / Native Plantings
  - **7.** Neighbors: Easement, Stormwater Management

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<tr>
<td>Societal</td>
<td></td>
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</tbody>
</table>

- **Societal Features**
  - **1.** Located at equestrian trails (Man. Parks that exist within the town of Natick, equestians)
  - **2.** Pesticides: herbicides, insecticides, etc. / a second option: a chemical application for insects / chemical applications
  - **3.** Work with legislators & elected & transportation systems to review legislation & how it was implemented / 0
  - **4.** Look at a regional CT, UN, town/county utilities / parks / town/county
  - **5.** A new comprehensive hydrological study

- **Other Features**
  - **1.** Culverts & Sinks: River, Rte 105
  - **2.** Restroom & bridge over the Natick River
  - **3.** Assessment: Pond Clearing / Neuquon / Rte 5 North (51, 53, 55)
  - **4.** Assessment of the full extent of the dam
  - **5.** Explore elevating Bedford St. infrastructure
  - **6.** Mudbrick St. Bridge in Middleboro
  - **7.** Queens Road: pavements
  - **8.** How can we work with our natural infrastructure
  - **9.** Floodplain recommendations (91-248 Flood Plain Recommendations)
  - **10.** Let’s keep the town in Queen Street again
  - **11.** Make SCR policy/landscape green

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<table>
<thead>
<tr>
<th>Location</th>
<th>Ownership</th>
<th>V or S</th>
<th>Priority</th>
<th>Time</th>
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<td>Short Long Ongoing</td>
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## High/Medium/Low Impact Assessment Score Matrix

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<tbody>
<tr>
<td>1</td>
<td>Replace culverts at Snake River and Route 105</td>
<td>H</td>
<td>L</td>
<td>M</td>
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<td>H</td>
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<tr>
<td>2</td>
<td>Replace railroad bridge over the Nemasket</td>
<td>H</td>
<td>L</td>
<td>M</td>
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<tr>
<td>3</td>
<td>Install Nemasket silt trap</td>
<td>H</td>
<td>M</td>
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<td>M</td>
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<tr>
<td>4</td>
<td>Remove sediment deposition in the first 500ft of the Nemasket</td>
<td>H</td>
<td>M</td>
<td>M</td>
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<td>M</td>
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<tr>
<td>5</td>
<td>Assawompsett Pond Dam replacement</td>
<td>H</td>
<td>L</td>
<td>H</td>
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<td>H</td>
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<tr>
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<tr>
<td>7</td>
<td>Replace Murdock Street Bridge in Middleboro</td>
<td>H</td>
<td>M</td>
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</tr>
<tr>
<td>8</td>
<td>Replace Squam Brook Culvert</td>
<td>M</td>
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<tr>
<td>9</td>
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<td>M</td>
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<td>10</td>
<td>Remove vegetation mass from Wareham St Pond</td>
<td>H</td>
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<tr>
<td>11</td>
<td>Septic system upgrades around the APC</td>
<td>L</td>
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<tr>
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<td>14</td>
<td>Improve forestry management by educating homeowners</td>
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<td>16</td>
<td>Country drainage along roadways (swales, etc)</td>
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<tr>
<td>17</td>
<td>Remove sandbars and MassDOT broken drain (495/44)</td>
<td>M</td>
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<td>L</td>
<td>L</td>
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<tr>
<td>18</td>
<td>Install a washing station and educate about invasive transmission</td>
<td>L</td>
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<tr>
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<td>Conduct a freshwater mussel survey</td>
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<tr>
<td>21</td>
<td>Look at existing MOU’s / maintenance plans that exist and improve or renew action plan if necessary</td>
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<tr>
<td>22</td>
<td>Limit pesticides / herbicides / treatments over and around the APC through integrated Pest Management and better communication with DPH</td>
<td>L</td>
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<td>23</td>
<td>Work with legislators and environmental / transportation agencies to review legislation and how it works with proposed pond fixes</td>
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<tr>
<td>24</td>
<td>Look at a regional O&amp;M plan involving utilities / permits with local water supply Con Comm’s and BOH’s</td>
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<tr>
<td>25</td>
<td>Develop a long-term, scientifically-based hydro model for the APC and Nemasket to support water supply operations, determine firm yield, and support fish passage</td>
<td>M</td>
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<tr>
<td>26</td>
<td>Develop a Management Plan for the APC with best practices for handling the dam, sediment, fisheries, Nemasket flow, floodplain, etc</td>
<td>H</td>
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<td>Floodwater Impact - Water Storage / Movement</td>
<td>Floodwater Impact - Water Quality</td>
<td>Water Supply Intake Protection</td>
<td>Fish Passage</td>
<td>Habitat Restoration</td>
<td>Ponds Level / Water Supply Management</td>
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<tr>
<td>7</td>
<td>Replace railroad bridge over the Nemasket</td>
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<tr>
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<td>Septic system upgrades around the APC / Clark Shoals, Churchill</td>
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<td>22</td>
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Appendix C.

Methods and Outcomes of the Nature-Based Solution Wetland Restoration Analysis (Task 3)
Appendix C:

Materials and Outcomes of the Nature-Based Solution Wetland Restoration Analysis (Task 3)

The goal of Task 3 is to identify nature-based solutions to flooding in the watershed of the Assawompset Ponds Complex. Working with the project steering committee, the project team reviewed previous studies of the APC to develop a prioritized list of management actions. This process resulted in the identification of six action areas as explained on page 6 of this report. The primary nature-based approach identified was “Wetland restoration at Bridge Street, Wood Street, Wareham Street, Vaughn Street” (Figure 1). These four sites were identified in previous studies of the watershed (including the 1982 report titled *Nemasket River Corridor Public Water Based Recreation and Fish and Wildlife Development RC&D Measure Plan*) that emphasized public access to the ponds and river rather than flood control.

In subsequent meetings the steering committee and project team decided to broaden the search area for potential wetlands restoration sites to encompass the entire APC watershed and to emphasize flood control as the top priority in that analysis (Figure 2). Once the search area had been expanded, the project team worked with the steering committee to identify a set of priority subareas based on flood control needs and perceived wetland restoration opportunities (Figure 4). The findings and recommendations contained in Appendix C are based on a watershed-wide geospatial analysis. This analysis significantly expands the number of candidate wetlands restoration sites beyond the four identified in previous studies.

It is important to note that additional field work will be required to select the best restoration sites from the priority areas identified in the geospatial analysis. Factors to be evaluated in the field include current soil, hydrologic and vegetation conditions, proximity to potentially conflicting land uses, and condition of surrounding infrastructure. In addition, a comprehensive hydrologic analysis of the APC watershed is needed to both better characterize the flooding issues in the watershed and to optimize both green and gray infrastructure solutions.
Figure 2: APC Study Area with HUC 12 Watershed Boundary
Geospatial Analysis

Inputs to the geospatial analysis include the following:

- The Potential Wetland Soil Landscape (PWSL1) theme associated with the gSSURGO database,
- Green Infrastructure Analysis for the Taunton River Watershed and the Pine Barrens Ecoregion,
- Federal Emergency Management Agency National Flood Hazard Layer,
- Massachusetts BioMap2,
- National Elevation Data Set.

The following sections provide a brief description of each of the inputs.

- **The Potential Wetland Soil Landscape (PWSL1) theme associated with the gSSURGO database**

The United States Department of Agriculture (USDA) Gridded Soil Survey Geographic (gSSURGO) database is a digital version of the National Cooperative Soil Survey. The potential wetland soil landscapes (PWSL1) theme provides guidance on areas that have a high potential for successful wetlands restoration. According to the publication *Wetland Mapping and the gSSURGO (Gridded Soil Survey Geographic) Database* By Sharon W. Waltman and Lenore Vasilas:

“The gSSURGO database provides new themes in a “Value Added Lookup Table” database, which includes the potential wetland soil landscapes (PWSL1) theme. The PWSL1 theme combines data attributes in the SSURGO database to identify areas that contain hydric soils or have the potential to become hydric soils with minimal effort.

PWSL1 attempts to identify both areas that are considered wetlands under the Farm Bill and Clean Water Act along with areas that may have been wetlands at one time but alteration has made them no longer wetlands, plus areas that were never wetlands but may have the potential (with minimal manipulation) to become wetlands.”

- **Green Infrastructure Analysis for the Taunton River Watershed and the Pine Barrens Ecoregion**

Manomet developed regional green infrastructure analyses for both the Taunton River Watershed and the Pine Barrens Ecoregion of southeastern Massachusetts that are utilized as inputs to the APC project. The green infrastructure analyses are intended to identify a network of lands that provide biodiversity support and climate change resiliency for human communities. Protected and non-protected land is differentiated to clearly depict priority areas for future land conservation efforts. Primary inputs to the green infrastructure analyses includes the Resilient Landscapes project by The Nature Conservancy, the BioMap2 project, buffering of wetlands and riparian areas, and FEMA Flood Zones. The thematic maps that follow include depictions of both the aggregate green infrastructure network and some of the individual components as needed to emphasize particular elements of the analysis.

- **Federal Emergency Management Agency National Flood Hazard Layer**
The Federal Emergency Management Agency (FEMA) Flood Hazard Layer is a digital version of the flood hazard maps associated with FEMA’s National Flood Insurance Program.

- **Massachusetts BioMap2**

The Massachusetts BioMap2 project provides maps of key habitat areas across the state and associated supporting landscapes. The entire BioMap2 network is included in the Manomet green infrastructure analysis, but for the purposes of the APC study it is useful to highlight the wetland core habitat component as it may be possible to augment these areas through future wetlands restoration and thereby further enhance the habitat value that the cores provide. The following excerpt from the *BioMap2 Technical Report – Building a Better BioMap* explains the intent and process of identifying the wetland cores:

Section E: Wetland Core Habitats

Introduction

*BioMap2* Core Habitat includes a statewide assessment of the most intact wetlands in Massachusetts. This analysis identified the least disturbed wetlands - Wetland Cores - those with the most intact buffers and little fragmentation or other stressors associated with development. These wetlands are most likely to support critical wetland functions (i.e. natural hydrologic conditions, diverse plant and animal habitats, etc.) and are most likely to maintain these functions into the future. To identify these high-quality wetlands, *BioMap2* incorporated the University of Massachusetts Conservation Assessment and Prioritization System (CAPS) Index of Ecological Integrity (IEI, see Chapter 2, Section D). The analysis combined individual wetland types (e.g., shrub swamps, forested wetlands, marshes, bogs) into contiguous wetland complexes. To enhance the biodiversity value of selected wetlands as Core Habitat, further analyses were conducted to represent wetlands within the varied ecological settings found in Massachusetts, determined by geology and elevation, as different plant and animal assemblages occur in these unique settings. By mapping the most intact wetlands in each ecological setting, *BioMap2* identifies wetlands that support the broadest spectrum of wetland biodiversity, both currently and into the future, which will help prioritize conservation of wetland diversity in the context of climate change.

- **National Elevation Data Set**

The National Elevation Dataset (NED) is a seamless raster product primarily derived from USGS 10- and 30-meter Digital Elevation Models

**Thematic Maps**

The following thematic maps present several different approaches to identifying areas for wetlands restoration that are likely to have both flood control benefit and habitat value. The results presented here are intermediate in nature and a mix of field work and hydrologic analysis of the APC watershed are needed to complete the restoration site selection process.

- **Figure 3: Potential Wetland Restoration Areas**

Figure 3 depicts potential wetlands restoration areas based on soil type. The percentages shown in the legend are based on the percentage of the individual gSSURGO soil map units that meet the Potential Wetland Soil Landscape (PWSL) criteria, and are an indicator of the prevalence of wet soils. These PWSL areas range from existing, intact wetlands, to areas that have been drained in the past for other uses such as agriculture. Of particular interest are the cranberry bogs in the watershed that could possibly go out of production due to challenging market conditions. The prevalence of wet soils in the PWSL areas indicates that for those areas that have been converted to uses other than wetlands, the likelihood of successful conversion back to wetlands is high.
The Federal Emergency Management Agency (FEMA) Flood Hazard Layer is a digital version of the flood hazard maps associated with FEMA’s National Flood Insurance Program.

Massachusetts BioMap2

The Massachusetts BioMap2 project provides maps of key habitat areas across the state and associated supporting landscapes. The entire BioMap2 network is included in the Manomet green infrastructure analysis, but for the purposes of the APC study it is useful to highlight the wetland core habitat component as it may be possible to augment these areas through future wetlands restoration and thereby further enhance the habitat value that the cores provide. The following excerpt from the BioMap2 Technical Report–Building a Better BioMap explains the intent and process of identifying the wetland cores:

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The following thematic maps present several different approaches to identifying areas for wetlands restoration that are likely to have both flood control benefit and habitat value. The results presented here are intermediate in nature and a mix of field work and hydrologic analysis of the APC watershed are needed to complete the restoration site selection process.

Figure 3: APC Potential Wetlands Restoration Areas
• **Figure 4: Priority Search Areas**

The project steering was asked to identify areas in the APC watershed that they feel, based on local knowledge, are good candidate areas for wetlands restoration projects that would have flood control benefits. In a group exercise, the steering committee marked up the potential wetland restoration map. Figure 4 highlights the priority areas that the group identified with black rectangles. The remainder of the thematic maps presented in Appendix C are focused on this portion of the watershed.
Figure 4: Priority Search Areas from Steering Committee

Potential Wetland Restoration Areas

- 80 - 85%
- 86 - 95%
- 96 - 100%
- Open Water

Legend:

- 0 - 0.5 Miles
- 1 - 1.5 Miles
- 2 - 2 Miles

Source: Hill, Matthew, and the GIS Lab community.
• **Figure 5: Elevation and Green Infrastructure**

Figure 5 layers elevation and green infrastructure on the previously introduced potential restoration areas. Restoration sites located at lower elevation in the watershed are likely well positioned to store flood water. The green infrastructure layer shown in the crosshatch is a good indicator of areas of high habitat and biodiversity support. In combination these layers highlight areas of intersection between flood control and habitat/biodiversity support.
Figure 5: APC Potential Wetlands Restoration Area with GI

Potential Wetland Restoration Areas
- 80 - 85%
- 86 - 96%
- 96 - 100%
- Open Water

Elevation
- -3 to 20 feet
- 20 to 44 feet
- 44 to 68 feet

Green Inf Network

Open Water

Potential Wetlands Restoration Areas

Legend:
- 80 - 85%
- 86 - 96%
- 96 - 100%
- Open Water

Elevation
- -3 to 20 feet
- 20 to 44 feet
- 44 to 68 feet

Green Inf Network

Legend:
- 80 - 85%
- 86 - 96%
- 96 - 100%
- Open Water

Elevation
- -3 to 20 feet
- 20 to 44 feet
- 44 to 68 feet

Green Inf Network
Another useful filter in identifying restoration areas with flood control potential is proximity to FEMA flood zones. In Figure 6 the potential wetland restoration areas are depicted in white to make the map easier to read.
Figure 6: FEMA Flood Hazard over Potential Wetland Restoration

Flood Zone Designations

- **A**: 1% Annual Chance of Flooding, no BFE
- **AE**: 1% Annual Chance of Flooding, with BFE
- **AO**: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- **AH**: 1% Annual Chance of 1-3ft Ponding, with BFE
- **VE**: High Risk Coastal Area
- **D**: Possible But Undetermined Hazard
- **X**: 0.2% Annual Chance of Flooding
- **X**: 1% Drainage Area < 1 Sq. Mi.
- **X**: Reduced Flood Risk due to Levee
- **Area Not Included**
- **Area with no DFIRM - Paper FIRMs in Effect**

Potential Restoration Areas

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Potential Restoration Areas include areas that may be eligible for wetland restoration projects. These areas are typically identified based on flood risk, land use, and ecological significance. The map highlights these areas in light blue, indicating where potential restoration efforts could be focused to reduce flood risk and enhance ecological connectivity.
• **Figure 7: Undeveloped and Unprotected Green Infrastructure**

Figure 7 highlights areas where it may be possible to link strategic conservation planning and flood control efforts. The undeveloped and unprotected component of the green infrastructure networks are areas identified as having high conservation value but not currently in a protected status. Protection of wetlands restoration sites in the undeveloped/unprotected areas could provide multiple benefits.
Figure 7: Potential Wetlands Restoration Areas with Undeveloped and Unprotected Green Infrastructure

Potential Wetland Restoration Areas

- Potential Restoration Areas
- Taunton Green Infrastructure: Undeveloped and Unprotected
- Pine Barrens Green Infrastructure: Undeveloped and Unprotected
Figure 8: BioMap2 Wetlands Cores

Figure 8 overlays the BioMap2 wetlands cores with the potential wetlands restoration areas. The cores are ranked as being intact and having high habitat value. Wetlands restoration efforts in close proximity to the cores could serve to buffer these high value areas and increase their long-term viability.
Figure 8: Potential Wetland Restoration Areas with BioMap2 Wetland Cores
Next Steps

As previously noted, a mix of field work and additional hydraulic analysis of the APC watershed are needed to complete the wetland restoration site selection process. The project team is working to identify additional funding for several elements, including the development of a watershed management plan. Based on availability of funding, next steps will include:

1) satellite analysis to explore the sites in terms of: ownership details – public, private, multiple; apparent current land-use and conservation status, proximity to parking lots, other parks to think about access to the site; 2) Field investigations to classify soil type at representative sections of the site, and perform preliminary wetland plant field analysis for the same representative sections. If possible, field work may also elicit notes about changes to existing management, invasive species, and other areas of potential management or construction intervention.

A recently completed study of the Mill River provides a useful synopsis of this process: See [https://drive.google.com/drive/u/0/folders/1BZ0WKoO5zTEYx9N5nkq5KCuDu1AGwdwz](https://drive.google.com/drive/u/0/folders/1BZ0WKoO5zTEYx9N5nkq5KCuDu1AGwdwz) for field data sheets, project recommendations, and basemap imagery of potential sites. For this field work, large municipally owned sites were prioritized for site visits. The Sam Wright Farm in Easton received MVP Action Grant funding for construction of the potentially restorable wetland project at that site.
Appendix D. Priority Project Scoping
NEMASKET SAND TRAP & SEDIMENT REMOVAL

Priority Action Next Steps Summary

Where: The Nemasket River, downstream of the Assawompset Pond Dam.

What’s the problem: The present course of the Nemasket River, for at least 2000 feet downstream of its outlet from Assawompset Pond, was excavated through a peat bog. The original channel of the Nemasket was located approximately 1000 feet east of the present dam.

Due to wave action, sand is routinely eroded from the northwest shore of Assawompset Pond. The sand is carried east to the outlet of the Assawompset Pond dam, where it accumulates at the headwaters of the Nemasket River. This results in the formation of sandbars along the first few hundred feet of the Nemasket. The sandbars partially fill the channel of the Nemasket. According to local sources, the sandbars lead to flooding and reduce the annual alewife run. The accumulation of sandbars has also allowed vegetation (including invasive species) to encroach farther into the excavated Nemasket River channel.

Note that the excavated Nemasket River channel immediately below the dam is likely 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.

Sandbars frequently build up at several points further downstream of the Assawompset Pond Dam - notably, at the junction of the Nemasket River and Fall Brook. Sediment buildup has also been observed on the Nemasket upstream from Wareham Street. Buildup at this location is due to runoff from an earthen boat ramp on the east side of the Nemasket River.
What's the solution: Use results from H&H modeling (see other APC project summary) to evaluate channel hydraulics and sediment transport mechanics. Evaluate channel conditions based on the H&H modeling to determine appropriate geomorphology for the system that supports fish passage and other ecological needs.

If supported by results of H&H modelling, remove accumulated sediment from the first 500 feet of the Nemasket River. Remove the existing spoil pile, which has accumulated from previous sediment clearings.

If supported by results of H&H modeling, construct a sediment trap 200 feet downstream from the Assawompset Pond Dam. The sediment trap will involve enlarging the channel downstream of the dam to create a basin and installing an outlet control structure.

Who: Towns of Lakeville and Middleborough, SRPEDD, Mass DEP, Mass DER, the Middleboro-Lakeville Herring Fisheries Commission, local environmental groups, and environmental/water resource engineers would be involved.

Steps to complete work:

1. Conduct sediment testing above and below the Assawompset Pond dam, and at crucial points in the river in order to develop a Sediment Management Plan (this would be necessary for dredging as well as for both a dam repair and the placement of a silt trap in the river)
2. Conduct a hydrological study of the Nemasket River/Assawompset Pond to determine existing/previous conditions of the Nemasket, and where silt trap and sediment removal would be appropriate (see H&H Model Project Summary)
3. Stakeholder Engagement
4. Determine data needs
5. Collect field data
6. Conceptual engineering silt trap and dredging design
7. 75% design and permitting of silt trap and dredging
8. Final design and bidding
9. Construction
10. Monitoring and O&M

Permits required: Environmental permitting and coordination may include: NOI (Mass DEP, Lakeville, Middleborough), MESA Coordination, Mass DMF review (comment under MEPA and NOI), Mass DEP Ch. 91, ACOE Ch. 404, Water Quality Certification from DEP Ch. 401, Sect. 106 Massachusetts Historical Commission Coordination, Massachusetts Environmental Policy Act

Assets and barriers: Assets include willing partners, support of the Herring Fisheries Commission, legislative awareness. Barriers include uncertainty about the necessity of this project, likely prohibition due to environmental regulation (specific to the sediment basin),
difficulty obtaining environmental grants for dredging operations, and the likelihood the location of the Nemasket River headwaters and Assawompset Pond Dam are ill-suited for preventing sediment accumulation, potential limitations of dredged material disposal if contamination is present.

**When would we see results:** If the project is suitable, 1-3 year following H&H study

**How much (ballpark costs):** $50,000-$100,000 design and $250,000-$1,000,000 construction (depending on contamination)

**Funding sources:** Towns of Lakeville & Middleborough

**Similar Example:**
**Where:** The Assawompset Pond Complex and Nemasket River

**What's the problem:** No hydrological and hydraulic (H&H) models of the Assawompset Pond Complex (APC) or 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.

Several other projects recommended by the APC Management Team require the use of H&H models to properly evaluate project objectives and design parameters. This study is a necessary first step to inform those other projects.

Projects requiring a H&H model include Assawompset Pond Dam removal or replacement, dredging and installing a silt trap at the headwater of the Nemasket River, repairing or replacing the Wareham Street Dam, and replacing undersized culverts throughout the Taunton River Watershed. H&H modelling is also a necessary step in water supply management planning.

**What's the solution:** Develop one or more long-term H&H model(s) of the APC, Nemasket River, and contributing watersheds. These models may include groundwater, surface water, and/or linked modeling approaches. Possible modeling tools may include MODFLOW, HEC-RAS, HSPF, and others. Use the model(s) to establish firm yield and reservoir management operating rules for the APC, and to model the dams along the Nemasket to...
evaluate dam design and operating rules. Design the model to be applicable to scenario-based questions for possible interventions along the Nemasket River.

**Who:** Towns of Lakeville, Middleborough, Freetown, Rochester, Taunton, and New Bedford; APC Management Team; SRPEDD; USGS; local environmental non-profits; civil/environmental/water resource engineers.

**Steps to complete work:**

1. Review existing data
2. Collect new field data from APC, Nemasket River, and contributing watersheds as needed
3. Develop H&H model(s)
4. Identify scenarios of interest
5. Run model(s) and evaluate outcomes of different scenarios

**Permits required:** None

**Assets and barriers:** Assets include existing data collected by Dr. Fennessey and existing data about water surface levels and withdrawals from ponds. Barriers include the complexity of the APC system and anticipated expense of this study.

**When would we see results:** 2-4 years

**How much (ballpark costs):** $200,000-$400,000

**Funding sources:** MVP Action Grant, SRF Loans, SNEP, FEMA HMP Grant?, surrounding municipalities

**Similar Example:** Silver Lake Watershed, Monponsett Ponds.
ASSAWOMPSET POND DAM REPAIR AND REPLACEMENT

Priority Action Next Steps Summary

Where: Assawompset Pond Dam in Lakeville

What’s the problem: The dam was built in 1904 and is in somewhat poor condition. It allows for fish passage via a Denil fish ladder, which has a low but constant capacity for herring runs when pond levels are low. The dam structure itself allows migrating herring passage when pond levels are high. It is owned by the Cities of New Bedford and Taunton. The dam is a granite structure with wooden boards, and it has a 43’x 4’ spillway. Due to the dam’s age and design, it is dangerous to add or remove the wooden boards, making operation of the dam a liability.

The dam was constructed primarily for water supply purposes (currently serving all or portions of 13 cities and towns) and not as a flood control or fish passage structure. Sand has flowed from the pond, over the dam as a result of natural circulation processes, which become exacerbated during heavy storm events, causing siltation, channel clogging, resulting in an adverse impact to the herring fishery. Sedimentation has also caused problems maintaining pond levels adequate for water supply and stream flow, as well as retaining enough storage capacity for heavy storm impacts.

What’s the solution: Pending results of feasibility study and evaluation of water supply and ecological needs, repair and replace the dam in a manner that balances these competing interests and simplifies pond water level management. A reconstructed dam should allow for improved herring passage under variable water level conditions.
Who: The Division of Ecological Restoration (DER), DEP, City of New Bedford, City of Taunton, the Middleboro-Lakeville Herring Fisheries Commission, the APC Management Team, environmental non-profits, and civil engineers.

Steps to complete work:

1. Scope the boundaries of types of data that are currently available, from all sources, that may impact the project feasibility and next steps.
2. Conduct a Feasibility Study for the dam repair and replacement
3. Evaluate dam repair and replacement design options based upon ecological and water supply needs
4. Conduct assessment and field work to determine design specifications
5. Preliminary/conceptual engineering and design
6. 75% design and permitting
7. Final design. Bid package, and bidding
8. Dam construction
9. Monitoring and O&M Plan

Permits required: Environmental permitting and coordination may include: NOI (Mass DEP, Lakeville, Middleborough), MESA Coordination, Mass DMF review (comment under MEPA and NOI), Mass DEP Ch. 91, ACOE Ch. 404, Water Quality Certification from DEP Ch. 401, Sect. 106 Massachusetts Historical Commission Coordination, Massachusetts Environmental Policy Act

Assets and barriers: Assets include willing participants, the APC Management Team Committee, and consistency with local planning, legislative awareness. Barriers include lack of available funding.

When would we see results: approximately three-five years following hydrological study

How much (ballpark costs):

- Initial Phase (field data collection and analysis, engineering, permitting) - $300,000
- Construction Phase - $1,000,000-$3,000,000

Funding sources: USFWS, NOAA, DER, EEA Dam and Seawall Repair or Removal Program, MVP Action Grant, NFWF

Similar Example: Lake Sabbatia, on Bay Street in Taunton; Reservoir Dam, Scituate, MA
Assawompset Pond Complex Floodwater Management Program 2020

WETLANDS RESTORATION
Priority Action Next Steps Summary

Where: The Assawompset Ponds watershed and the upper Nemasket River.

What’s the problem: Urbanization, changing land use patterns, and associated loss of wetlands have resulted in diminishment of flood storage capacity, water quality impacts and habitat destruction. These alterations result in people living and working in low-lying wet areas and have diminished the capacity of wetlands to buffer flooding.

What’s the solution: Targeted wetland restoration could provide multiple benefits including flood mitigation, water quality improvement, improve water access and recreational opportunities, and enhanced support of biodiversity. A regional analysis and prioritization of restoration opportunities is a needed first step. Once the analysis is complete it will be possible to determine linkage to other aspects of APC project planning, develop more detailed implementation plans, and seek funding.

Who: Towns of Lakeville, Middleborough, Freetown, Rochester, Taunton, and New Bedford; APC Management Team; SRPEDD; USGS; local environmental non-profits; civil/environmental/water resource engineers.

Steps to complete work:
- Expansion of existing wetlands restoration analysis from the Nemasket River watershed to the APC watershed.
- Prioritization of potential restoration sites with the project steering committee.
- Integration of priority restoration projects with other aspects of the APC effort.
- On-site assessment of soil, vegetation, and current wetlands. Survey data will be needed for design.
- Engineering and permitting
- Construction, and hopefully some monitoring.

Permits required:
- Conservation commission NOI FOR WPA relevant work
- Depending on size, potential MEPA
- Need to check for endangered species
- If altering River, potential for ACOE

Assets and barriers:
- Climate resilience
- Biodiversity services
- Water quality
- Flood relief
- Enhancing fisheries
- Potential recreation co-benefit

When would we see results: We could request funds for engineering, permitting, and construction to Wildlife Conservation Society (WCS). Application due 4/18, construction completion deadline Nov 2022.

How much (ballpark costs): $175,000

Funding sources:
- WCS
- NFWF
- MVP
- DER Cranberry Priority Projects

Similar Example: The Town of Easton just received MVP action grant funding to restore a wetland identified by TNC through one of the analyses used in the Nemasket watershed.
**Where:** MassDOT owns the culvert where the Snake River (also known as Long Pond River) crosses under Bedford Street (Route 105/18) in Lakeville. The culvert location is shown with the green dot/red triangle in the map, adjacent to Tamarack Park.

**What’s the problem:**

The Snake River culvert is a 4’ x 8’ concrete box culvert that facilitates the flow of water between Long Pond and Assawompset Pond under Bedford Street. The culvert was constructed in 1993 as part of a road safety improvement measure by Mass Highway District 7 (now MassDOT District 5 jurisdiction). The invert of this culvert was determined to be too high for the downstream migration of juvenile herring. To remedy this, Mass Highway added a 2’ diameter culvert, approximately 30” to the north of the larger culvert, in 1994. State dive teams have periodically inspected the larger structure, most recently in September of 2016.

Flooding in this area suggests that the culvert is undersized, creating backwatering that overflows Bedford Street during high rains, and with a design that hinders fish passage. The latter problem has led the Division of Marine Fisheries to designate this stream crossing as a Priority Barrier that inhibits the passage of diadromous River Herring and American Eel species. According to NAACC culvert surveying methodology and bankfull estimates (22.8 ft to 44.1 ft) from USGS StreamStats, the culvert width of 8’ represents a severe constriction to stream flow. Increased development around the pond shore, shallow stream profile, continued presence of aquatic invasives, and lack of stormwater improvements and flood control measures all contribute to the problem. Because the culvert runs the width of the public right of way, a failure could cause Bedford Street to become impassable in this location, flood pond-front communities on Long Pond, make Town Hall inaccessible, and force emergency response personnel (fire and rescue) to use other routes leading to longer emergency response times.
**What’s the solution:** Replace the existing problematic culvert with a new, larger open box or open bottom arched culvert that will allow greater conveyance of water, lessen overtopping during flood events, and allow for fish passage.

**Who:** The Town of Lakeville, MassDOT (especially District 5), SRPEDD, Mass DEP, the Division of Ecological Restoration, the Middleboro-Lakeville Herring Fisheries Commission, environmental non-profits, and civil engineers would have a role. The Town would like to work with MassDOT to replace the culvert, but MassDOT has no immediate or long-term plans to improve Bedford Street. MassDOT has worked with outside partners to facilitate similar repairs in tidally impacted areas.

**Steps to complete work:**

1. File a Notice of Intent (NOI) with the Lakeville Conservation Commission
2. Obtain a MassDOT Access Permit
3. Conduct assessment field work to determine design specifications
4. Engineer culvert design
5. Permitting
6. Culvert removal and construction

**Permits required:** Environmental permitting and coordination, from concept through construction may include: NOI, MassDOT Access Permit, MESA Coordination, Ch. 91, ACOE, WQC from DEP, Sect. 106 Coordination; MEPA

**Assets and barriers:** The data already known about this culvert is an asset. The state dive team inspection results, knowledge of fisheries impacts at the Herring Commission, and monitoring conducted by SRPEDD staff (2001-2003, as part of the Geographic Roadway Runoff Inventory Program and a DEP Source Water Protection Program Grant) will all contribute to expediting initial project design and investigation and have noted problems related to increased presence of aquatic invasive vegetation, channel clogging, and poor water exchange. Inadequate culvert infrastructure has become a priority issue across the state, with guides on the construction of better culvert systems now available. The barriers to culvert replacement projects are mainly associated with funding, phasing the project in sync with funding schedules, and coordinating all of the agencies that have a role in the project.

**When would we see results:** approximately two years

**How much (ballpark costs):**

- Initial Phase (field data collection and analysis, engineering, permitting) - $75,000 - $100,00
- Construction Phase - $200,00 - $500,000
**Funding sources:** USFWS, NOAA, DEP 604(b), DEP Sect. 319,, Mass. Environmental Trust (MET), MVP Action Grant, NFWF

**Similar Examples:** Pearse Road, Swansea; Hill Street, Raynham
Where: The entire Assawompset Pond Complex (APC) and its watershed, including Long, Assawompset, Pocksha, Great Quittacas, and Little Quittacas Ponds, and the Nemasket River.

What’s the problem: The state’s largest natural pond system, the APC provides drinking water for around 250,000 people in the cities of New Bedford and Taunton, and portions of nearby towns. It is a significant habitat area for fish, birds, wetlands, and mammal species. It is a scenic residential and recreation area for surrounding communities. Water quality and flow through the APC and Nemasket is affected by the land use in their combined 44,900-acre watersheds, where land is owned and maintained by many individual households and larger entities (75% of land in private ownership, 18% in municipal ownership, 5% in state ownership, 1% in non-profit land conservation ownership, and less than 1% in federal ownership or ownership unknown).

Recently, excessive flooding has caused significant issues for the APC and surrounding communities, particularly in 2010 when heavy and prolonged rainfall and resultant flooding caused evacuations, property damage, failures of septic systems, and interruption of critical utility and transportation infrastructure. Runoff with excess nutrients degrades water quality and encourages invasive plant overgrowth. The system has also experienced serious drought, most recently in 2016. Climate trends elevate the urgency for considering these issues.

What’s the solution: Develop a comprehensive management plan that targets floodwater mitigation throughout the APC while also equally addressing water supply and quality, preserving critical habitat, maintaining recreational access that does not impede natural function of the land, and improving resilience of the Ponds and surrounding communities.
The plan would consider the APC and Nemasket systems as a whole, and identify known data, missing data points, and best practices for managing infrastructure, sedimentation, fisheries, aquatic invasives, floodplain areas, and water quality, supply, and flow. A coordinated and balanced set of goals and strategies will ensure all stakeholders 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.

Who: All property owners within the APC and its watershed; the Towns of Lakeville, Freetown, Middleborough, and Rochester; water suppliers; state and local regulatory agencies; the Assawompset Ponds Committee; local environmental groups; environmental engineers; and regional planning agencies. All have relevant knowledge for an effective management plan.

Steps to complete work:

- Design an inclusive stakeholder engagement process including identification of communications networks between stakeholder groups.
- Outline the contents of the management plan and determine data needs (ex: water levels and flows, vegetation, wildlife populations, water quality, pollutant levels, land use).
- Collect data by: (1) research existing sources and documents; (2) 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.
- As a specific portion of data collection, determine the additional information that will be necessary for completing a hydrological study.
- Review surrounding communities’ bylaws for opportunities to standardize land use approaches across the region that support management plan goals.
- Draft management plan (including ongoing stakeholder engagement).
- Include a schedule of implementation and benchmarks for tracking success.
- Update plan periodically with new data and updated action recommendations.

Permits required: Perhaps Con Comm Notices of Intent or Access Permits for fieldwork.

Assets and barriers: Assets in plan development include existing data on the APC, the results of the planned hydrologic study, and the regular coordination of the Assawompset Ponds Committee as the nucleus of continued stakeholder cooperation. Barriers include securing funding and coordinating a diversity of stakeholder groups and interests.

When would we see results: Developing a management plan: one to two years. Implementing the plan and seeing improvements is a long-term (decades-long) process.

How much (ballpark costs): $125k

Potential funding sources: MVP Action Grant Funds
Similar Example: Taunton River Watershed Management Plan

Competing Interests: Identify integrated project timeline and prioritize next steps. The Management Plan might compete with the Hydrological Study for this round of MVP Action Grant funding, and it is unlikely both could be completed under one project. The Management Plan may be a necessary first step to lay the foundation for a path forward for completing future studies and taking action.
## April to June Work Program - Next Steps in Advancing Priority Actions During Grant Scope and Beyond

<table>
<thead>
<tr>
<th>Task ID</th>
<th>Task Description</th>
<th>Lead</th>
<th>Deliverable</th>
<th>Future Actions/Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wetlands</td>
<td>TNC, Manomet, HW</td>
<td>GIS analysis and mapping of stormwater retention areas. Create a short-list of high-level priority wetland and non-wetland based restoration sites. Written plan to test broad-based restoration opportunity for other land uses (forests, cranberry bogs, etc).</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>1.1</td>
<td>Expand the priority wetlands methodology to the rest of the ponds watershed area and pull in other tools.</td>
<td>HW Silt, H/H, Dam, Plan</td>
<td>TNC, TNC, Eric, TNC, Ellie HW</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>1.2</td>
<td>Identify case studies for optimizing flood control/sediment management and renaturalization of wetland/riverine areas around dam.</td>
<td>TNC / Manomet</td>
<td>TNC / Manomet</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>1.3</td>
<td>Truth-check broad-based restoration opportunity with Ponds Committee.</td>
<td>HW Silt, H/H</td>
<td>HW Silt, H/H</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>1.4</td>
<td>Identify case studies for optimizing flood control/sediment management and renaturalization of wetland/riverine areas around dam.</td>
<td>TNC / Manomet</td>
<td>TNC / Manomet</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>1.5</td>
<td>Permit Pathway HW Memo</td>
<td>HW Silt, H/H</td>
<td>HW Silt, H/H</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>2</td>
<td>Culvert</td>
<td>SRPEDD, HW</td>
<td>File for a MassDOT Access Permit to allow site access and investigation (get the MassDOT process from Pam/Andrea)</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>2.1</td>
<td>Field investigation of the site</td>
<td>HW Silt, H/H</td>
<td>HW Silt, H/H</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>2.2</td>
<td>Permit Pathway HW</td>
<td>SRPEDD, HW</td>
<td>HW Silt, H/H</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>2.3</td>
<td>Permit Pathway HW</td>
<td>The Pond Commission meeting</td>
<td>HW Silt, H/H</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>2.4</td>
<td>Permit Pathway HW</td>
<td>The Pond Commission meeting</td>
<td>HW Silt, H/H</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>3</td>
<td>Dam Repair or Replacement</td>
<td>HW, SRPEDD, HW</td>
<td>File for a MassDOT Access Permit to allow site access and investigation (get the MassDOT process from Pam/Andrea)</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>3.1</td>
<td>Outline of a feasibility study for dam repair</td>
<td>HW, SRPEDD, HW</td>
<td>HW, SRPEDD, HW</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>3.2</td>
<td>Identify funding source for dam repair</td>
<td>HW, SRPEDD, HW</td>
<td>HW, SRPEDD, HW</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>3.3</td>
<td>Apply for funding for the removal of dam and seawall</td>
<td>HW, SRPEDD, HW</td>
<td>HW, SRPEDD, HW</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>3.4</td>
<td>Apply for funding for dam repair</td>
<td>HW, SRPEDD, HW</td>
<td>HW, SRPEDD, HW</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>4</td>
<td>HH Study</td>
<td>HW, Silt, Plan</td>
<td>Complete the Upper Nemasket River study with SNEP Network funds</td>
<td>Overlapping Priority Projects Future Actions/Funding</td>
</tr>
<tr>
<td>Task ID</td>
<td>Task Description</td>
<td>Lead</td>
<td>Deliverable</td>
<td>Overlapping Priority Projects</td>
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<tr>
<td>---------</td>
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</tr>
<tr>
<td>4.2</td>
<td>Scope the contents of a phased H/H plan - surface water then ground water</td>
<td>HW</td>
<td>Outline</td>
<td></td>
</tr>
<tr>
<td>4.3</td>
<td>Permit Pathway</td>
<td>HW</td>
<td>Memo</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Management Plan</td>
<td>SRPEDD, MassAudubon start - all partners reviewing</td>
<td></td>
<td>All</td>
</tr>
<tr>
<td>5.1</td>
<td>Draft plan outline based on EPA structure</td>
<td>SRPEDD, MassAudubon</td>
<td>Outline and Management Plan purpose statement (extending beyond flood management aspect)</td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>Complete MVP Action Grant or EPA Watershed Management Grant</td>
<td>SRPEDD</td>
<td>Grant Application</td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>Link one-pagers to where they fit in management plan (co-benefit explanation)</td>
<td>All partners in one-pagers</td>
<td>Revised one-pagers</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Silt</td>
<td>HW, SRPEDD, Outback</td>
<td>H/H, Dam</td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>Permit Pathway</td>
<td></td>
<td>Memo</td>
<td></td>
</tr>
<tr>
<td>6.2</td>
<td>Support Outback’s scope of work into initial transects, data collection, and potential conceptual silt trap design.</td>
<td></td>
<td>Review of permit pathway results and their intended scope, which includes conceptual design for silt trap at the moment</td>
<td></td>
</tr>
<tr>
<td>6.3</td>
<td>Identify funding strategy for a sediment management plan</td>
<td>SRPEDD</td>
<td>Potential funding sources</td>
<td>Develop options for dealing with this issue in a larger dam feasibility study or expanded h/h</td>
</tr>
<tr>
<td>7</td>
<td>Administrative</td>
<td>All partners reviewing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>Grant Schedule</td>
<td>SRPEDD</td>
<td>Spreadsheet</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Final Report</td>
<td>SRPEDD</td>
<td>Report</td>
<td></td>
</tr>
<tr>
<td>7.3</td>
<td>Public Meeting - set up virtual platform</td>
<td>All</td>
<td></td>
<td>Determine approach (by May), execute (by end of may), leave open for public comment (beginning of June)</td>
</tr>
</tbody>
</table>
Anticipated Permitting Pathways for Three Priority Projects

Horsley Witten Group, Inc. (HW) compiled an anticipated permitting pathway for the three Priority Projects involving infrastructure construction identified in the Assawompset Ponds Complex Flood Water Mitigation Project 2020 efforts. These Priority Projects are:

- Assawompset Pond Dam Repair and Replacement Project,
- Snake River Culvert Replacement Project, and
- Nemasket River Sand Trap and Sediment Removal Project.

Each of these projects is more fully described in the Final Report to which this document is attached. The permitting pathway for these projects is summarized in the Table below, and each permit is described in more detail on the following pages. The permit pathway includes a list of each of the permits that are expected to be required in order to construct the projects, as well as the agency that issues the permit, the approximate review period that can be expected for the project, and the order in which the permits would be pursued. Some permit applications are typically submitted and reviewed concurrently, and some permit applications must include proof of permit issuance from prior permits processes. The table below identifies the likely order or stage in which each permit application would be submitted along the permit pathway for each project and a general estimate of the overall permitting timeline. We note that permitting occurs during the project design process and the permit requirements and conditions inform the design process for each project as it progresses.

The following pages provide more details about key requirements of each permit and anticipated regulatory review overlap. We note, however, that every project is unique and results in a unique permitting pathway and timeframe as a result of project and site conditions, as well as other unpredictable outside influences on the schedule. In addition, an alternative permitting pathway has been developed recently to facilitate Ecological Restoration Projects. In this case, a Notice of Intent is submitted to the local Conservation Commission and MA DEP at the end of the permitting process once all of the other permit processes have progressed and all agencies have provided comments. This permitting pathway is a potential option for the Snake River Culvert Replacement project, but does not always yield expediency in acquiring permits. This report presents the more traditional permitting approach, and describes all permits, but the order of operations can be explored at the initial permitting phase for each project to determine if the Ecological Restoration approach may be beneficial.
### Table 1. Summary of Permits Anticipated to be Required for Implementation of Three Priority Projects

<table>
<thead>
<tr>
<th>ORDER/STAGE</th>
<th>PERMIT</th>
<th>AGENCY(^1)</th>
<th>APPROX REVIEW PERIOD</th>
<th>PROJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MA Environmental Policy Act Certificate</td>
<td>MA EEA, MEPA Program</td>
<td>6 months</td>
<td>Assawompset Pond Dam Repair/Replace</td>
</tr>
<tr>
<td></td>
<td>Order of Conditions</td>
<td>Conservation Commissions MA DEP</td>
<td>1-3 months</td>
<td>Snake River Culvert Replacement</td>
</tr>
<tr>
<td>1</td>
<td>MA Endangered Species Act Review</td>
<td>MassWildife, NHESP</td>
<td>3 months</td>
<td>Nemasket Sand Trap &amp; Sediment Removal</td>
</tr>
<tr>
<td>1</td>
<td>Chapter 91 Waterways Permit</td>
<td>MA DEP</td>
<td>6-12 months</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Section 401 Water Quality Certification</td>
<td>MA DEP</td>
<td>6-12 months</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(typically filed with Ch 91)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Section 404 General Permit</td>
<td>Army Corps of Engineers</td>
<td>2-3 months</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Section 106 Historical Review</td>
<td>MA Historical Commission</td>
<td>1 month</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(filed with MEPA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>State Highway Access Permit</td>
<td>MA DOT</td>
<td>25% design: 20 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>75-100% design: 20 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Final Plans, Specs and Estimates: 10 days</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Chapter 85, Section 35 Bridge Review</td>
<td>MA DOT</td>
<td>Variable</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fishway Construction Permit</td>
<td>MA DMF</td>
<td>Variable, 1-2 months</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Dam Safety Permit</td>
<td>MA DCR</td>
<td>2 months</td>
<td></td>
</tr>
</tbody>
</table>

Total Estimated Permit Timeline: 18-24 months 13-14 months 13-14 months

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\(^1\) EEA = Executive Office of Energy and Environmental Affairs; MEPA = Massachusetts Environmental Policy Act; DEP = Department of Environmental Protection; DOT = Department of Transportation; DMF = Division of Marine Fisheries; MassWildlife = Massachusetts Division of Fisheries and Wildlife; NHESP = Natural Heritage and Endangered Species Program; DCR = Department of Conservation and Recreation
Description of Anticipated Permits

MA Environmental Policy Act

The MEPA review process is triggered under a variety of thresholds specified in MA CMR 11.03, including impacts to state-listed endangered, threatened, or special concern species habitat; alteration of wetland areas; alteration of fish run; and dredging. State funding, which is a likely contributor to any of these projects, also triggers MEPA review in conjunction with any other threshold.

The MEPA process includes an Environmental Notification Form (ENF) for initial review, and is sometimes followed by a more detailed Environmental Impact Report (EIR) for more complicated projects. These projects will require an ENF but are less likely to trigger an EIR. The dam repair and silt trap projects are more likely than the culvert replacement to potentially trigger an EIR.

Key Requirements:

- Quantification of impacts to wetland resource areas
- Identification of rare and endangered species habitat
- Impacts to the water supply
- Impacts to historical/archeological resources
- Indication of presence of hazardous waste
- Statement of existing environmental conditions
- Assessment of environmental impact
- List of required permits
- Mitigation measures proposed
- Analysis of project alternatives
- EIR must contain response to ENF comments

Regulatory Overlap:
The ENF also circulates to MA DEP, MA DOT, SRPEDD, Lakeville, Middleborough, Freetown, Rochester, Taunton, New Bedford (city councils/select people, planning departments/boards, conservation commissions, departments of health, public libraries), MA Coastal Zone Management office, MA DMF, MA DCR, MA Historical Commission, Native American tribes and MassWildlife

Permitting Timeline:

- The MEPA review process may take up to 30-37 days before issuance of a MEPA Certificate.
- Following review, comments are filed with the Secretary of EEA within 20-37 days.

Order of Conditions

An Order of Conditions is required for any project that involves the removal, dredging, filling, or altering of wetlands under the Massachusetts Wetlands Protection Action (General Law Chapter 131, Section 40). This project is located in both Middleborough and Lakeville, and neither community has a local wetlands protection bylaw. An Order of Conditions is obtained by submitting a Notice of Intent to the Conservation Commissions in each town in which the project is located and the MA DEP.
Key Requirements:
- Quantification of impacts to buffer zones and resource areas.
- Notation of other applicable environmental standards/requirements, including requirements for projects in rare wetland wildlife habitat or in coastal fisheries.

Key Restrictions:
- Cannot discharge dredged or fill material within 400 feet of the high water mark of a Class A surface water, or in a vernal pool.
- Project shall not impede or obstruct migration of fish unless allowed by DMF, shall not change volume or rate of flow of water in fish run, or impair the capacity of spawning/nursing habitats for fish. Dredging/disposal of dredge material is prohibited March 15th-June 15th.
- No more than 5000 square feet of Bordering Vegetated Wetland may be lost.

Regulatory Overlap:
- A copy of the NOI must also be submitted to MA DEP, Natural Heritage and Endangered Species Program, and MA Department of Marine Fisheries.
- For projects located on the Assawompset Pond, copies of the NOI must also be sent to the Taunton and New Bedford Water Departments.

Permitting Timeline:
- Conservation Commissions are likely to take between 1-3 months to reach a decision.

Massachusetts Endangered Species Act Review

The MA Endangered Species Act Review is triggered by projects within priority habitat zones, and in project areas in which endangered species are known to be present.

Key Requirements:
- Quantification of wetland resource area impacts.
- Geography and assessment of impacts within priority habitats and efforts to avoid impacts.

Key Restrictions:
- Activities cannot occur within 300 feet of a vernal pool.
- Changes in environment cannot be likely to result in stress, lowered reproduction or growth, or decline in local population of Endangered or Threatened species.
- The project cannot prevent, hinder, or stop ecological processes which are important to the survival of Endangered or Threatened species.
- The project cannot isolate populations of Endangered or Threatened species from each other.
- Activities cannot disrupt seasonal or daily movements or migrations of Endangered or Threatened species.
- Activities cannot decrease the long term survival or recovery of local populations of Endangered or Threatened species.

Regulatory Overlap:
- Likely to be triggered during the MEPA review process.

Permitting Timeline:
• Review from MassWildlife will take up to 30 days, followed by a 60 day determination period prior to a response being issued.

Chapter 91 – Waterways Permit

Waterways Permits are generally required for activities involving dredging, filling, or installing structures in regulated waterways, which includes Great Ponds and navigable waters on which public funds have been expended for stream clearance, channel improvement, or any form of flood control or prevention work, either upstream or downstream within the river basin in MA. Chapter 91 has jurisdiction in Assawompset Pond due to its classification as a Great Pond, and any Structural Alteration activities would require Chapter 91 authorization through a Water-Dependent Waterways License. Chapter 91 has jurisdiction in the Nemasket River as a navigable waterway.

Key Requirements:
• Description of any filling or dredging activities planned.
• Description of potential impacts on any docks, piers, boat ramps, private water supply wells, surface water withdrawal points.
• Description of any potential impacts to public access or navigation.
• Grain size analysis and sediment quality testing, for any dredging projects.

Key Restrictions:
• May not adversely impact the width or depth of an existing channel.
• Project shall not disrupt any water-dependent use in operation.
• Structures must meet the standards of State Building Code, 780 CMR.
• No dredging may occur to a mean low water depth greater than 20 feet.
• No dredging may occur between March 15th and June 15th unless otherwise determined by DMF.
• Dredging activities must be a minimum of 25 feet away from any marsh boundaries.

Regulatory Overlap:
• Application must also be sent to the Lakeville and Middleborough Planning Boards.
• Application can be filed jointly with a Chapter 401 Water Quality Certification Application.
• An Applicant may initiate coordinated review under MEPA by specifying so on the ENF filing.

Permitting Timeline:
• After an application is filed, a public notice must be issued (including in at least one local newspaper) and a 30-day public review period occurs.
• Regulatory review up to 276 days (total process can be 6-12 months).

Section 401 Water Quality Certification

Water Quality Certification is required for projects involving dredging at least 100 cubic yards of material or activities disturbing more than 5000 square feet of wetland area.

Key Requirements:
• See Chapter 91 – Waterways Permit
• Discharges to wetland areas must result in 1:1 wetland replication efforts.
• Chemical and physical testing of dredged material. The regulations state that testing must occur if at least 10% of the dredged sediment passes the No. 200 U.S. Standard Series Testing Sieve; in practice, testing is generally required.
• For projects that dredge up to 10,000 cubic yards of material, one core for every 1,000 cubic yards must be collected. For larger projects, a project-specific sampling plan must be developed.

Key Restrictions
• No discharges of dredged material may be released in Outstanding Resource Waters.
• No dredged material may be discharged within 400 feet of the high water mark of a Class A surface water.
• No discharge of dredged material is permitted for the impoundment or detention of stormwater for purposes of controlling sedimentation or other pollutant attenuation. Dredging may be permitted to manage stormwater for flood control if there is no practicable alternative.
• Avoid adverse impacts to wetland areas to the greatest extent practicable.
• Where possible, maintain 25-feet between the edge of vegetated wetlands and the dredging area.
• Dredging may not occur during migration, spawning, or development of finfish, shellfish, crustaceans, or merostomatans.
• Dredged material cannot be transported with free liquid and must minimize fugitive dust.

Regulatory Overlap:
• Can be filed jointly with a Chapter 91 Permit Application or jointly with the Army Corps Section 404 Permit.

Permitting Timeline:
• Chemical analyses of sampled material must be performed within 3 years prior to the submission of the application.

Section 404 General Permit

Sections 404 and 10 General Permits are required for dredging activity in coastal and waterway areas. The Assawompset Dam Restoration may be permitted under Massachusetts General Permit 1: Maintenance. A pre-application consultation with New England Corps is recommended in order to review application needs, anticipated project restrictions, and potential combination of this project with downstream dredging, if that is also being pursued, in order to avoid project segmentation. It is possible that Army Corps may require an Individual Permit.

Key Requirements:
• Vicinity map locating the site of the entire project.
• Site plan showing the project limits and the limits of waterbodies/wetlands.
• Detailed plan showing the proposed activity, as well as the limits of proposed dredging or filling.

Key Restrictions:
• No more than 1000 square feet of permanent impacts to riffle and pool complexes or non-tidal vegetated shallows.
• No more than 5000 square feet of temporary permanent impacts to riffle and pool complexes, or 1000 square feet of temporary impacts in vegetated shallows.
Regulatory Overlap:
- This review typically occurs at the same time as the Chapter 91 and Water Quality Certificate processes, and after the Notice of Intent (application for Order of Conditions).

Permitting Timeline:
- The ACOE review process will take up to 45 days from the time a complete application is submitted, and includes both internal review and a public notification/comment period. If ACOE has questions and requests additional information, this can extend the timeline.

Section 106 Review

Key Requirements:
- A Project Notification Form should include:
  - Descriptions of any demolition, rehabilitation, or new construction activities.
  - Indication of the presence of known historical or archaeological properties/sites.
  - Quantification of resource area impacts.

Key Restrictions:
- The project may not have adverse effects on historical, architectural, archaeological, or cultural characteristics of a property. If a finding of adverse effects is reached, the Historical Commission will provide consultation on project alternatives to protect the historical characteristics.

Regulatory Overlap:
- The MA Historical Commission is typically notified during the onset of the MEPA review process.

Permitting Timeline:
- Review by the Historical Commission will take up to 30 days.
- Maximum of 120 day process if adverse effects are disputed and Historical Commission does not accept adverse effect.

State Highway Access Permit

A Non-Vehicular State Highway Access Permit is required for construction, relocation, or repair of utilities within a state highway layout (SHLO). The Access Permit must be obtained from the MA DOT District 5 Highway Division office in Taunton.

Key Requirements:
- Proposed designs must meet the 13 controlling criteria outlined in the MA Highway Department Project Development and Design Guide
- Traffic Management Plan and Detour Plan
- Tree Cutting or Landscaping Plan
- Vegetative Plan
- Pre-review of the permit application by District 5 Office, requiring:
  - General project information including the town and State Highway in which project work is proposed, description of work to be performed
  - Evidence of EOEEA certification of MEPA compliance
Engineering plans in a form acceptable to the Division of Highways

- Detailed Access Permit Review
  - A series of three submissions at the 25% design, 75% or 100% design, and PS&E phases

Key Restrictions:
- Avoid, minimize, or mitigate transportation-related air pollution (as determined applicable by DOT)

Regulatory Overlap:
- MA DOT will provide comments as part of the MEPA Review process.

Permitting Timeline:
- The Detailed Application Review process is anticipated to take a minimum of 75 days between the three phases of review, although this process may be broken out by the various design phases.
- Access Permit Application should follow certification of compliance with MEPA.
- Permit must be renewed if construction is not complete within 1 year of approval.

Chapter 85, Section 35 Bridge Review

The purpose of this review is to allow MA DOT to evaluate the bridge design for any proposed alteration or construction of a bridge located on a public highway and spanning more than 10 feet to determine the maximum allowable load for the bridge. This review is typically performed by the MA DOT District office.

Fishway Construction Permit

A fishway construction permit is required for the construction or alteration of any fish passage device, such as fish ladders. Any alterations or improvements to the existing fish ladder at the Assawompset Dam associated with dam repair or replacement would require this permit.

Key Requirements:
- Intended time of construction for the fishway.
- An operation and maintenance plan for the fishway.
- A fishway monitoring plan.
- A fish passage suitability statement.

Key Restrictions:
- Dredging activities prohibited between March 15th – June 15th

Regulatory Overlap:
- n/a

Permitting Timeline:
The permitting timeline is not clearly defined, but application should occur prior to Ch. 91, Ch. 401, and NOI applications if variances from allowed construction/dredging time periods are sought.

**Dam Safety Permit Application**

A Dam Safety Permit is required for any dam-related work, including dam repairs, improvements, or removals. This dam is categorized as a Low Hazard dam.

**Key Requirements:**
- Preliminary report, including early site investigation information, preliminary designs.
- Final design report, including hydrologic, hydraulic, and structural considerations, as well as construction schedule, filling schedule, and operation and maintenance plan.
- Construction documents, including plans and specifications.
- Dam design:
  - Spillway must be able to pass the 100-year (for Low Hazard) or 500-year (for Significant Hazard) flood. Emergency spillway must pass the 25-year or 50-year flood.
  - A gate or conduit must be provided to drain the reservoir. Minimum drain time must be computed. Water conveyance velocity shall prevent damage to the interior surface. Seepage protection must be provided. Trash rack must be installed at intake.
  - Dam must be designed to prevent instability due to seepage, uplift, or loss of material.
  - Must provide structural and slope stability analysis.

**Regulatory Overlap:**
- Dam owner must notify the Dam Safety Commissioner, the Conservation Commissions, and the Division of Fish and Wildlife 21 days prior to construction or drawdown occurs.

**Permitting Timeline:**
- Permit is issued within 60 days from the submission of the final design report.
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
Appendix E. Public Engagement Materials
PRESS RELEASE - FOR IMMEDIATE RELEASE

Contact: Bill Napolitano (bnap@srpedd.org) or Helen Zincavage (hzincavage@srpedd.org) for more information.

Getting to Solutions for Floodwater Management around the Assawompset Ponds Complex

The Assawompset Ponds Committee - a group of representatives from local communities surrounding the ponds, water supply entities, and state agencies - is studying the most promising methods for improving the ecological functions of the Assawompset Ponds Complex in order to alleviate floodwater impacts.

Funded by a grant from the Division of Ecological Restoration, the Ponds Committee is working with a team of specialists with multi-disciplinary perspectives and historical knowledge of issues in the Ponds, including the Southeastern Regional Planning and Economic Development District, Mass Audubon, Manomet Inc, Horsley Witten Group, and The Nature Conservancy. The project team synthesized recommendations from four decades' worth of previous studies, which the Ponds Committee then reviewed to determine their continued relevance and prioritize the projects that, once completed, would have the most significant positive outcomes for retaining and channeling floodwaters. Where historical studies abound, the goal of this current work was to elevate the most important floodwater management projects to the point of readiness for funding and to achieve project realization and installation.

Some of the priority solutions that came out of this work are engineered infrastructure projects (such as replacing undersized culverts), while others are nature based solutions that enhance the ability of natural systems to do their own important work in storing and diverting floodwater (such wetland restoration). In the final stages of the project, the team pursued the top six priority projects, outlining the process for implementation. As part of the effort aimed at next steps, the project team secured grant funding from the Southeast New England Network to perform a hydrological and hydraulic study of the APC’s outlet in the Upper Nemasket River, which will create a model to test potential restoration and floodwater mitigation projects.

The Ponds Committee and the project team are hosting a virtual public meeting to share and discuss project outcomes thus far, and to gather additional insights from residents and stakeholders of the Ponds communities for the next steps in project implementation. Please join
us for this important conversation! As further opportunity for input, the presentation will be recorded and posted at www.srpedd.org/environment, accompanied by a fillable form for written comment submission, available through July 8, 2020. We also anticipate additional virtual public meetings on potential waterway enhancement and restoration activities in upcoming months, dates forthcoming.

Wednesday, June 24, 2020 from 6:00pm to 7:30pm

Register for the event by going to: https://forms.gle/n7VeZG5mmJ4FkPYF8

For those without access to a computer, please call our project hotline at 508-812-0636. Leave your name and number, and we will follow up with instructions for accessing the meeting by phone.

###
Planning for Floodwater Management
In the Assawompset Ponds Complex and Nemasket River
Agenda – June 24, 2020

6:00pm: Welcome & introductions

6:05pm: Project overview
   • Grant purpose
   • Process
   • Solution set: grey vs. green

6:20pm: Priority actions
   • Wetland Restoration
   • Dam removal / repair
   • H&H study
   • Culvert replacement
   • Silt removal
   • Management plan

7:00pm: Where are we now and where are we headed?

7:10pm: Q&A and discussion
Meet the project team
Project Overview

Purpose and Process
Project Background

• Funding was secured in the FY2020 state budget and managed by the Massachusetts Division of Ecological Restoration (DER).

• **DER is requesting responses from organizations to work with communities and core-stakeholders to advance high priority flood mitigation actions in and around the Assawompset Pond Complex.** This grant opportunity will provide funding for one selected team to advance the evaluation, planning, and prioritization of tasks related to flooding in the Assawompset Pond Complex (APC).
To set the stage for the implementation of priority actions that advance floodwater management in the APC and Nemasket River systems.

- We sought a floodwater management framework that wove together
  - The threads of previous recommendation with
  - A program for prioritizing actions, in order to achieve
  - A basis for further funding and implementation of the highest priority mitigation actions.
Critical Assumption #1:
Climate change is anticipated to exacerbate flooding issues that are already occurring around the APC and the Nemasket River.

Taunton Basin predictions for a high emissions scenario (Resilient MA)

- An additional 2.56 inches of rain annually by 2050, with almost all of this increase concentrated in the winter and spring seasons.
- An additional 2 days of extreme weather events by 2050, again, seasonally concentrated.

These changes pose a threat to APC communities given the Nemasket River's current limited ability to transport excess water.
Many studies of the APC had been completed since the 1980’s, containing a great deal of historical knowledge about the floodwater problems in the APC, alongside recent experiences of floodwater events captured by local MVP planning efforts.

The crux of the project team’s approach to this work was to synthesize this wealth of previous studies into a program of priority actions for achieving meaningful floodwater mitigation impacts on the ground, with an emphasis on nature-based solutions.
Critical Assumption #3:

A holistic approach to floodwater management includes combining the potential positive effects of both "green" and "grey" infrastructure approaches.
The Solution Set

"Grey" infrastructure

- Focus on engineered solutions (dams, pipes, sediment traps)
- Stormwater piped away from source to be treated
- Aging infrastructure not built to withstand increased precipitation
- Water quality impairments

"Green" Infrastructure

- Innovative development that works with nature
- Stormwater captured and treated as close to source as possible
- Treats water as a resource
- Save on maintenance costs
Nature based solutions
Protect, restore, and/or manage an existing ecological system or mimic natural processes, to protect public health and clean water, increase natural hazard resilience, and sequester carbon.

**Protect** natural green infrastructure already providing services

**Manage** existing natural processes through low impact development

**Restore** damaged or destroyed ecosystems
You get what you zone for

Communities often unintentionally discourage NBS/LID by...

• Requiring large lots, strict dimensional requirements
• Requiring wide, curbed roads
• Requiring non-native species
• Not prioritizing preservation of natural features

Learn more at massaudubon.org/bylawreview
Grant Process – Task 1

- Convene the Assawompset Ponds Complex Management Team as the Project Steering Committee
- The existing Assawompset Ponds Complex Management Team served as the Project Steering Committee.
  - Long-standing body with representatives from each community, herring fishery stakeholders, state agencies, and water supply entities.
  - Expanded to include the MVP Core Team Leaders from pondside communities. SRPEDD also intermittently engaged MassDOT and USGS
Grant Process – Task 2

Previous Recommendations Synthesis and Project Prioritization

- Review previous recommendations related to floodwater management around the APC and Nemasket River, 1980 to present

- In total, there were 140 recommendations recorded, with 48 related to floodwater management specifically. With these 48 as a reference point, 26 actions were identified as a high priority for additional consideration. Finally, the Steering Committee determined their top 6 priority actions.
Grant Process – Task 3

- Analyze the APC flooding issues pursued to date and suggest additional or alternative mitigation measures that integrate nature-based solutions, green infrastructure solutions, and improved interjurisdictional coordination.
Grant Process – Task 4

Provide further details for implementing the top one to three priority action items

• Potentially including: estimated planning level cost estimates and feasibility assessment for permitting and implementation.

• Prepare these projects for follow-on funding proposals to carry forward the design and permitting, and ultimately the implementation.

• Instead of the top one to three, we made progress on the top 6 priority actions
The project team quickly understood flooding to be one challenge across a number of management areas that stakeholders and communities in the region are working to address.

Problematic flooding is interwoven with water quality, habitat, fish passage, sedimentation, recreation, and drinking water supply level maintenance issues.

The project team retained its purpose-driven focus on floodwater management in the APC, but also pursued actionable strategies that could elevate co-benefits and improve outcomes for other issue areas.
Prioritization Outcomes - Top 6 Projects

1. Remove Sediment Deposition in the first 500 ft of the Nemasket River and install Silt Trap
2. Develop a long-term, scientifically-based hydro model for the APC and Nemasket to support water supply operations, determine firm yield, and support fish passage
3. Develop a Management Plan for the APC with best practices for handling the dam, sediment, fisheries, Nemasket flow, aquatic invasives management, floodplain, water quality and supply, etc.
4. Replace undersized culverts at the snake River and Route 105
5. Assawompset Dam Replacement
6. Wetland restoration at Bridget Street, Wood Street, Wareham Street, Vaughn Street
Priority Actions

The Top Six Project Contenders
Hydrological and Hydraulic Study

**PROBLEM:** No watershed-scale hydrologic models for the APC currently exist, and there is only limited prior hydrological and hydraulic (H&H) modeling of the Nemasket River (FEMA).

- Several other priority projects require the use of watershed and/or H&H models to properly evaluate project objectives and design parameters.

**SOLUTION:** Develop a large-scale watershed model of the APC, and a more focused H&H model of the Upper Nemasket River corridor.

- Large-scale watershed modeling may include groundwater, surface water, and/or linked modeling approaches.
- Upper Nemasket H&H model will be a river-corridor model using the USACE HEC-RAS software.
NEXT STEPS - Phase 1 Upper Nemasket

1. Review existing data
2. Collect new field data from APC, Nemasket River, and contributing watersheds as needed
3. Develop H&H model, designed to be applicable to scenario-based questions for possible interventions along the Nemasket River
4. Identify scenarios of interest
5. Run model(s) and evaluate outcomes of different scenarios
6. Determine next component of system to study (ground water, other surface bodies, etc)

ESTIMATED PROJECT COST Phase 1: $125,000
Watershed-Scale Study

NEXT STEPS – Phase 2 APC Watershed
1. Longer-term planning horizon
2. Study scale, methodology, and timing not yet addressed
3. Potential funding not yet identified
4. Develop model design to establish firm yield and reservoir management operating rules for the APC, and to evaluate dam design and operating rules.

ESTIMATED PROJECT COST Phase 2: $200,000-$400,000
Nemasket Sedimentation

**PROBLEM:** The present course of the Nemasket River, for at least 2,000' downstream of its outlet from Assawompset Pond, was excavated through a peat bog.

- Original Nemasket channel was located approximately 1000' east of the present dam.
- Wave action erodes the shore of the Pond and sand is carried to the outlet of the dam, where it accumulates at the headwaters of the Nemasket.

**SOLUTION:** Use results from H&H modeling and field surveys to evaluate channel hydraulics and sediment transport mechanics.
Nemasket Sedimentation

NEXT STEPS

1. Conduct channel surveys and sediment testing above and below the Assawompset Pond dam, and at crucial points in the river

2. Integrate field survey data into the development of potential solution alternatives for addressing sedimentation
   • Gray-style dredging and silt trap install
   • Green-style floodplain /channel restoration alternatives

3. Stakeholder Engagement and selection of approach

4. Conceptual engineering

5. 75% design and permitting

6. Final design and bidding

7. Monitoring and O&M

Estimated Project Cost: as yet unknown
APC & Nemasket River Management Plan

PROBLEM

- Combined 44,900-acre watershed with mixed ownership
- Excessive flooding experienced by surrounding communities
- Water supply for 250,000 people
- Water quality degradation, invasive plant growth, restricted fish passage

SOLUTION

- Comprehensive community-led planning
- Management plan that balances floodwater mitigation with water supply/quality, habitat, and recreational needs

Draft Plan Outline:
- I. Natural Resource and Climate Change Inventory
- II. Community and Stakeholder Overview
- III. Water Quality
- IV. Water Supply Levels
- V. Floodwater Management
- VI. Habitat Enhancement
- VII. Managing Development / Ecosystem Resilience
- VIII. Recreational Access
- IX. A Culture of Watershed Protection
- X. Integrated Implementation Schedule

Topical Chapter (III-IX) Sub-Sections:
- I. Problem Statements (current and climate conditions)
- II. Goal Targets (current and climate conditions)
- III. Intended Actions (current and climate conditions); icons for NBS, level of community support, overlap with other environmental co-benefits
- IV. Benchmarks of Success (current and climate conditions)
- V. Implementation Timeline
- VI. Overlapping or Competing interests
APC Management Plan

NEXT STEPS
1. MVP Action Grant proposal submitted
2. Inclusive community engagement process for planning
3. Research, data collection, and analysis
4. Land use and regulation review
5. Draft watershed management and climate action plan
6. Periodic updates and tracking success

ESTIMATED PROJECT COST: $125,000
Snake River Culvert Replacement

**PROBLEM**
- MassDOT-owned culvert under Bedford St.
- Undersized design
- Overflows flood Bedford St.
- Blocks fish passage
- Failure could cut off access to town hall and emergency response

**SOLUTION**
- Replace with larger design appropriate for water flows
Snake River Culvert Replacement

**NEXT STEPS**
1. File a Notice of Intent (NOI) with the Lakeville Conservation Commission
2. Obtain a MassDOT Access Permit
3. Conduct assessment field work to determine design specifications
4. Engineer culvert design
5. Permitting
6. Culvert removal and construction

**ESTIMATED PROJECT COST:** $275,000-600,000
Assawompset Pond
Dam Repair

**PROBLEM:** The dam, built in 1904, is in somewhat poor condition.

- Dangerous to add or remove the wooden boards, making operation of the dam a liability.
- Constructed primarily for water supply purposes and not as a flood control or fish passage structure.

**SOLUTION:** Repair / replace the dam

- Pending results of feasibility study and evaluation of water supply and ecological needs.
- Balance competing interests and simplify pond water level management.
NEXT STEPS

1. Conduct a Feasibility Study for the dam repair and replacement
2. Evaluate dam repair and replacement design options based upon ecological and water supply needs
3. Conduct assessment and field work to determine design specifications
4. Preliminary/conceptual engineering and design
5. 75% design and permitting
6. Final design. Bid package, and bidding
7. Dam construction
8. Monitoring and O&M Plan

Estimated Project Cost: $1-3 MIL
Wetlands Restoration

PROBLEM
• Urbanization and changing land use result in lost wetland habitat
• Reduced flood storage capacity
• Habitat and water quality impacts
• Increased flooding in neighboring areas

SOLUTION
• Targeted wetland restoration for improved flood storage, water quality, recreational access, and habitat
• Regional analysis and prioritization
**NEXT STEPS**

1. Wetlands restoration analysis for Nemasket and APC watersheds
2. Prioritization of potential restoration sites with the project steering committee and integration with other aspects of the APC effort
3. On-site assessment of soil, vegetation, and current wetlands
4. Engineering, design, and permitting
5. Construction and monitoring

**ESTIMATED PROJECT COST:** $500,000
## Where Are We Now?

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>CURRENT ACTIVITY</th>
<th>NEXT STEPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedimentation</td>
<td>Outback Engineering surveying / sediment sampling commenced. Grant received for Nemasket River Public Engagement.</td>
<td>Review silt trap and dredging options among other possible alternatives.</td>
</tr>
<tr>
<td>H&amp;H Study</td>
<td>Received a grant for an initial study phase of upper Nemasket surface water flows.</td>
<td>Scenario testing based on H&amp;H model. Next phases (groundwater).</td>
</tr>
<tr>
<td>APC &amp; Nemasket Watershed Mgmt Plan</td>
<td>Applied for an MVP Action Grant to fund preparation of the plan.</td>
<td>Await funding response – plan for backup funding source.</td>
</tr>
<tr>
<td>Assawompset Dam Repair</td>
<td>Investigated potential funding sources and dam hazard level. Permit pathway complete.</td>
<td>Use results of field work and H&amp;H model to inform feasibility study.</td>
</tr>
<tr>
<td>Wetlands Restoration</td>
<td>Initiated riverside sites, and expanded search within watershed.</td>
<td>Prioritize sites for acquisition / management.</td>
</tr>
</tbody>
</table>
How Would You Prioritize These Actions?

APC Floodwater Management Plan Meeting 6 24

Thank you for attending the APC Floodwater Management Plan Public Meeting! We want to understand how the six priority actions that the Steering Committee identified during the project align with the priorities of the community at large. We would greatly appreciate it if you could fill out the following form.

A guidance document presents high-medium-low impact rankings as estimated by the Project Team for reference, if helpful. It is accessible by copy/pasting this address into a web browser:

https://drive.google.com/file/d/1mirq1PgMxeerQRV48EGdCwwgkf6hbiuc7/view?usp=sharing

Please select your top six priorities from the actions related to floodwater level / quality below by placing six checkmarks, one on each of your priorities.

https://forms.gle/WiBDuksJau9WbYCE7
Future Public Engagement

Keep Coming to Meetings!

Two Upcoming Processes:
1. {Definite} Nemasket River Community Outreach Project – goal is to explore, as a community, potential alternatives for fixes along the Nemasket from the APC to Wareham Street.
2. {Potential} APC/Nemasket Watershed Management and Climate Action Plan – anticipating 6 public meetings on the topics of:
   • water supply
   • water quality
   • recreational access
   • habitat enhancement
   • floodwater management
   • creating a culture of watershed protection and celebration.
Thank you!

Questions? Comments?

Submit written comments to...
APC Floodwater Management Plan Meeting 6

Thank you for attending the APC Floodwater Management Plan Public Meeting! We want to understand how the six priority actions that the Steering Committee identified during the project align with the priorities of the community at large. We would greatly appreciate it if you could fill out the following form.

A guidance document presents high-medium-low impact rankings as estimated by the Project Team for reference, if helpful. It is accessible by copy/pasting this address into a web browser:

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Please select your top six priorities from the actions related to floodwater level / quality below by placing six checkmarks, one on each of your priorities.

- Replace culverts at Snake River and Route 105
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- Elevate Bedford Street
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- Replace Squam Brook Culvert
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- Improve forestry management by educating homeowners
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- Country drainage along roadways (swales, etc)
- Remove sandbards and MassDOT broken drain (495/44)
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- Look at a regional O&M plan involving utilities / permits with local water supply Con Comms and BOH
Develop a long-term, scientifically-based hydro model for the APC and Nemasket to support water supply operations, determine firm yield, and support fish passage

Develop a Management Plan for the APC with best practices for handling the dam, sediment, fisheries, Nemasket flow, floodplain, etc

We'd appreciate any other comments, questions, or feedback that you have on the ideas presented for the APC and Nemasket

Thank you so much for enabling continuing public information/participation via Zoom.

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Is the idea to replace the dam or to modify the existing dam

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Google Forms
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