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.

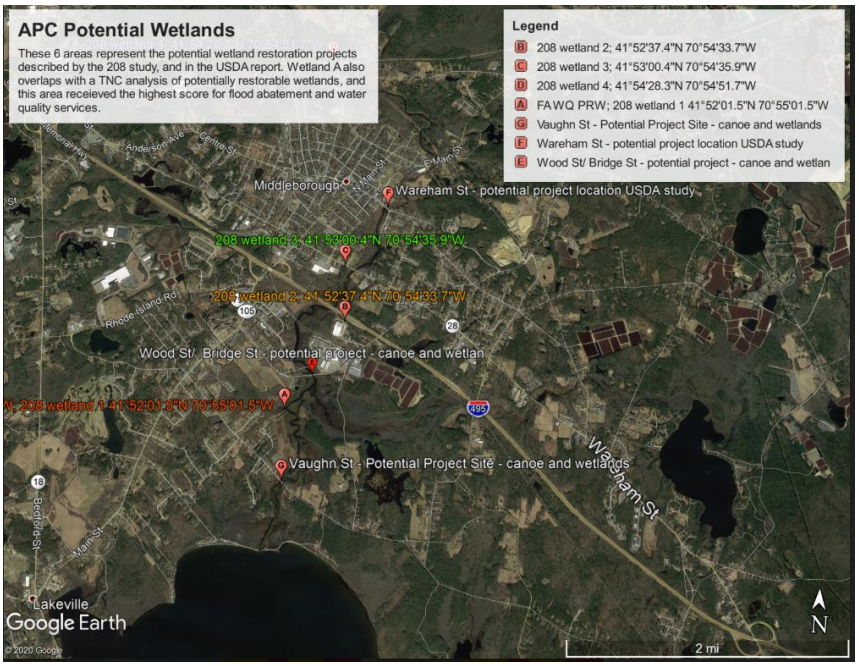
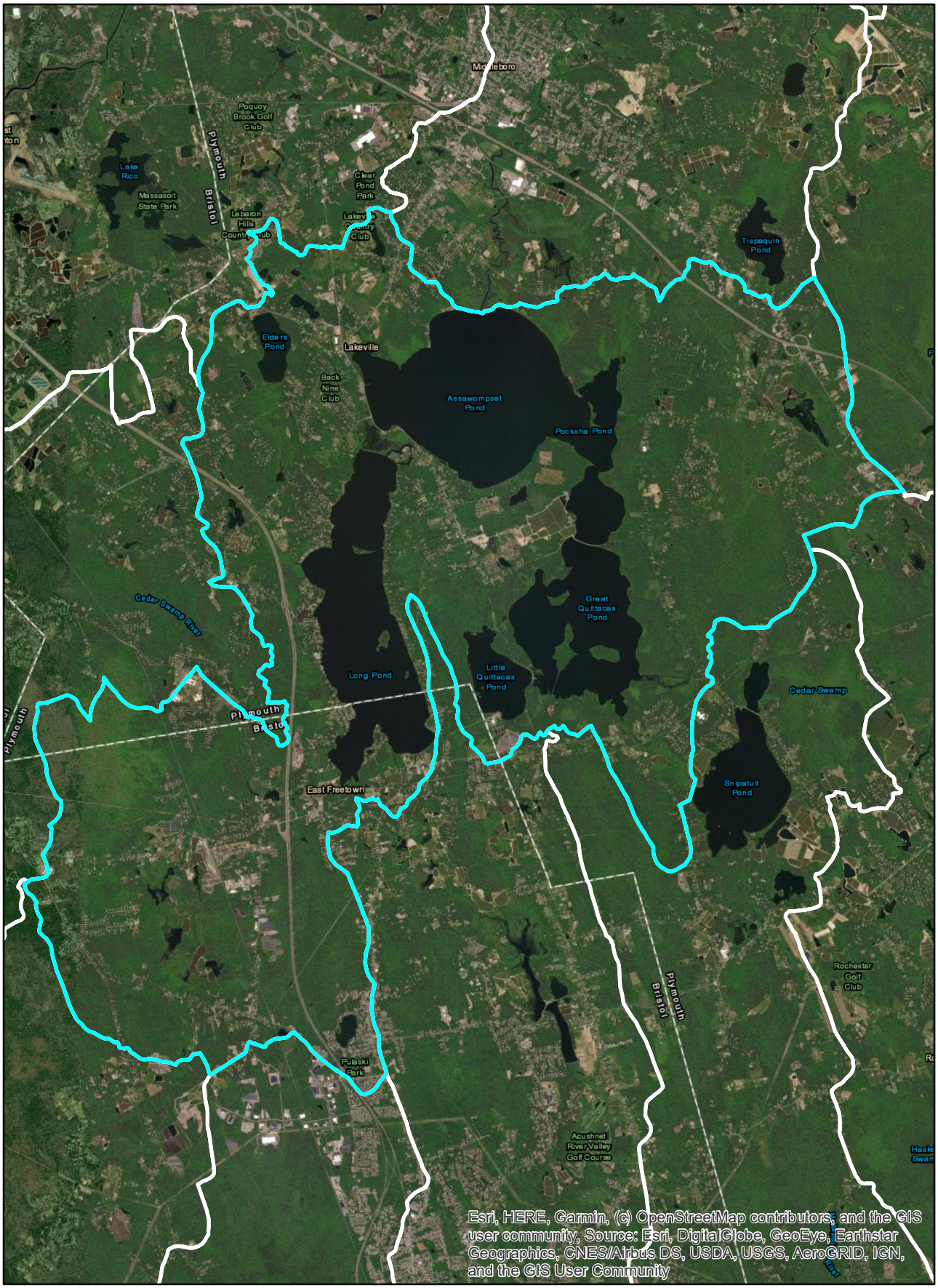


Figure 1: Location of the Bridge Street, Wood Street, Wareham Street, Vaughn Street potential wetland restoration sites. Also depicted are three priority potential restoration sites in the upper Nemasket River that were identified in a previous TNC study.

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



0 0.5 1 2 3 4 Miles

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

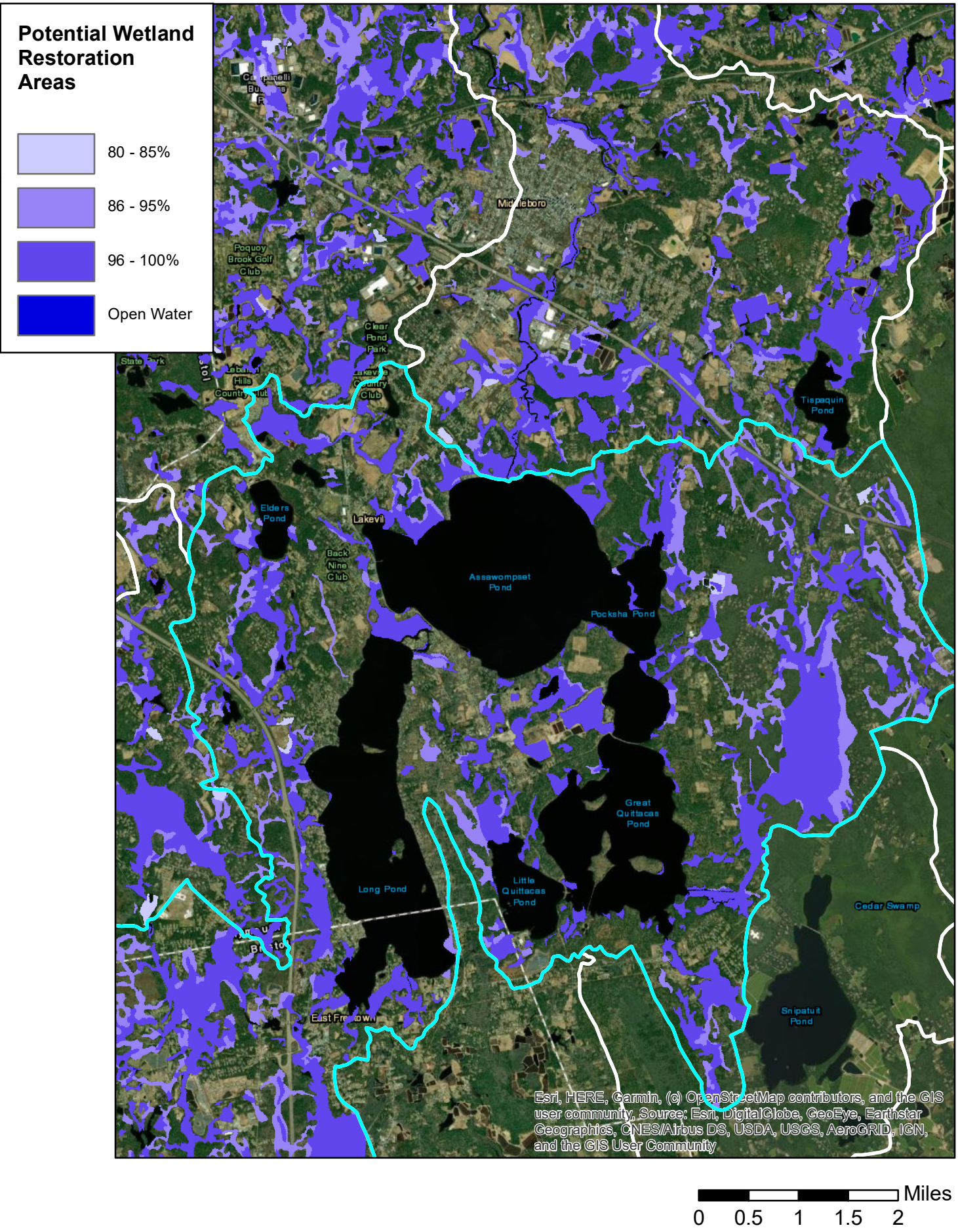
Thematic Maps

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.

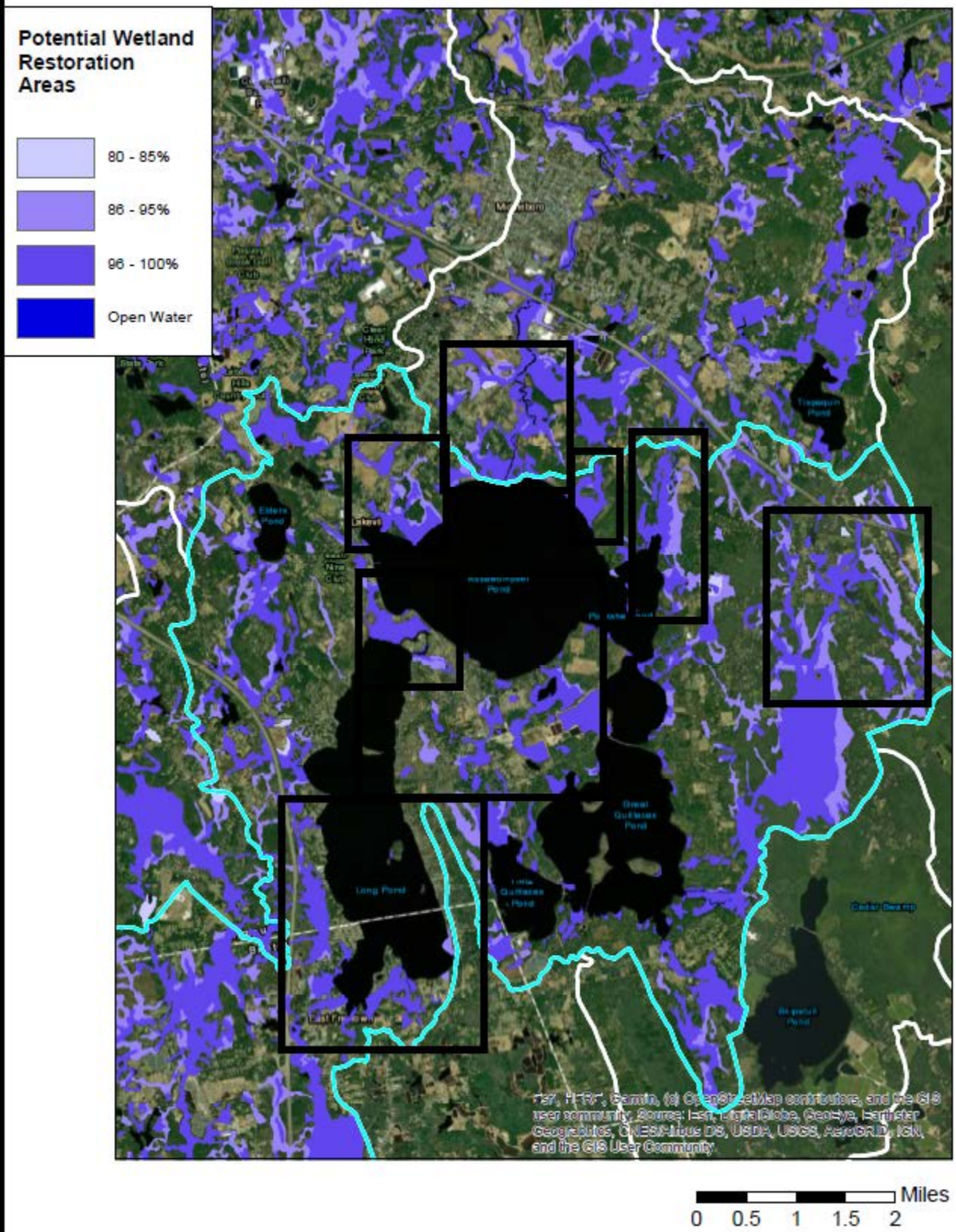
Figure 3: APC Potential Wetlands Restoration Areas



- **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.

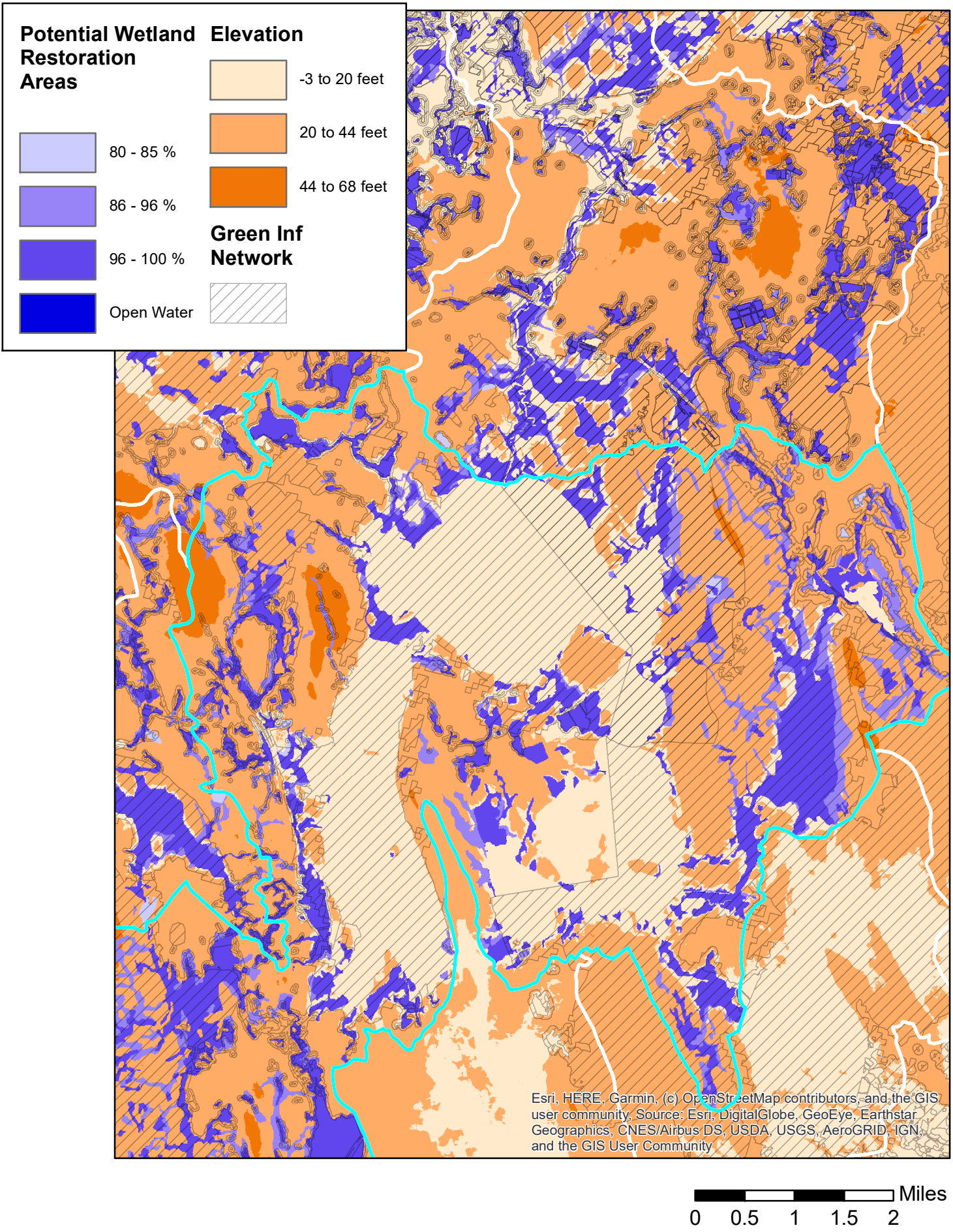
Figure 4: Priority Search Areas from Steering Committee



- **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



- **Figure 6: Flood Hazard Areas**

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.

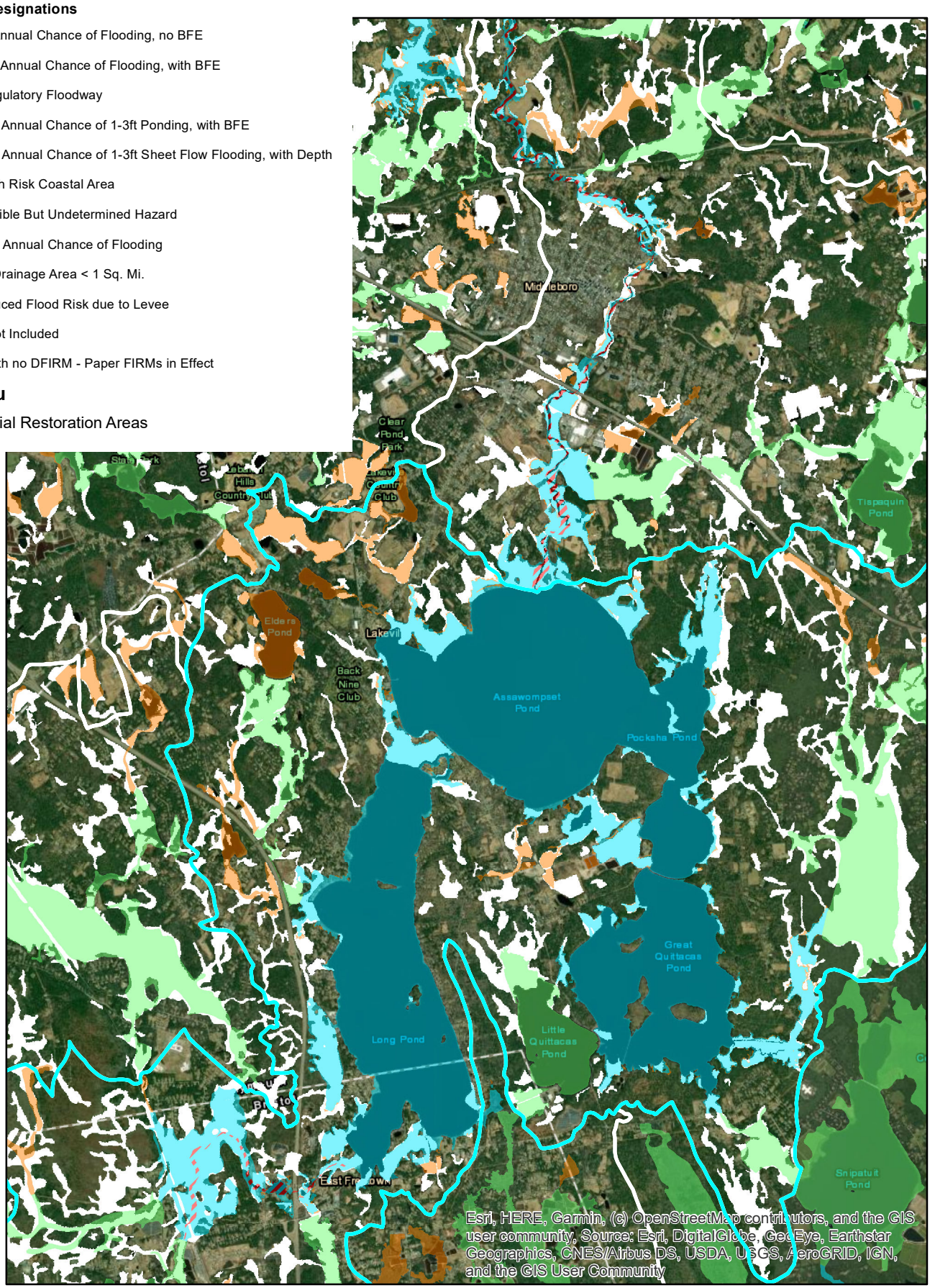
Figure 6: FEMA Flood Hazard over Potential Wetland Restoration

Flood Zone Designations

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- AH: 1% Annual Chance of 1-3ft Ponding, with BFE
- AO: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- 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

pwsl1pomu

- Potential Restoration Areas

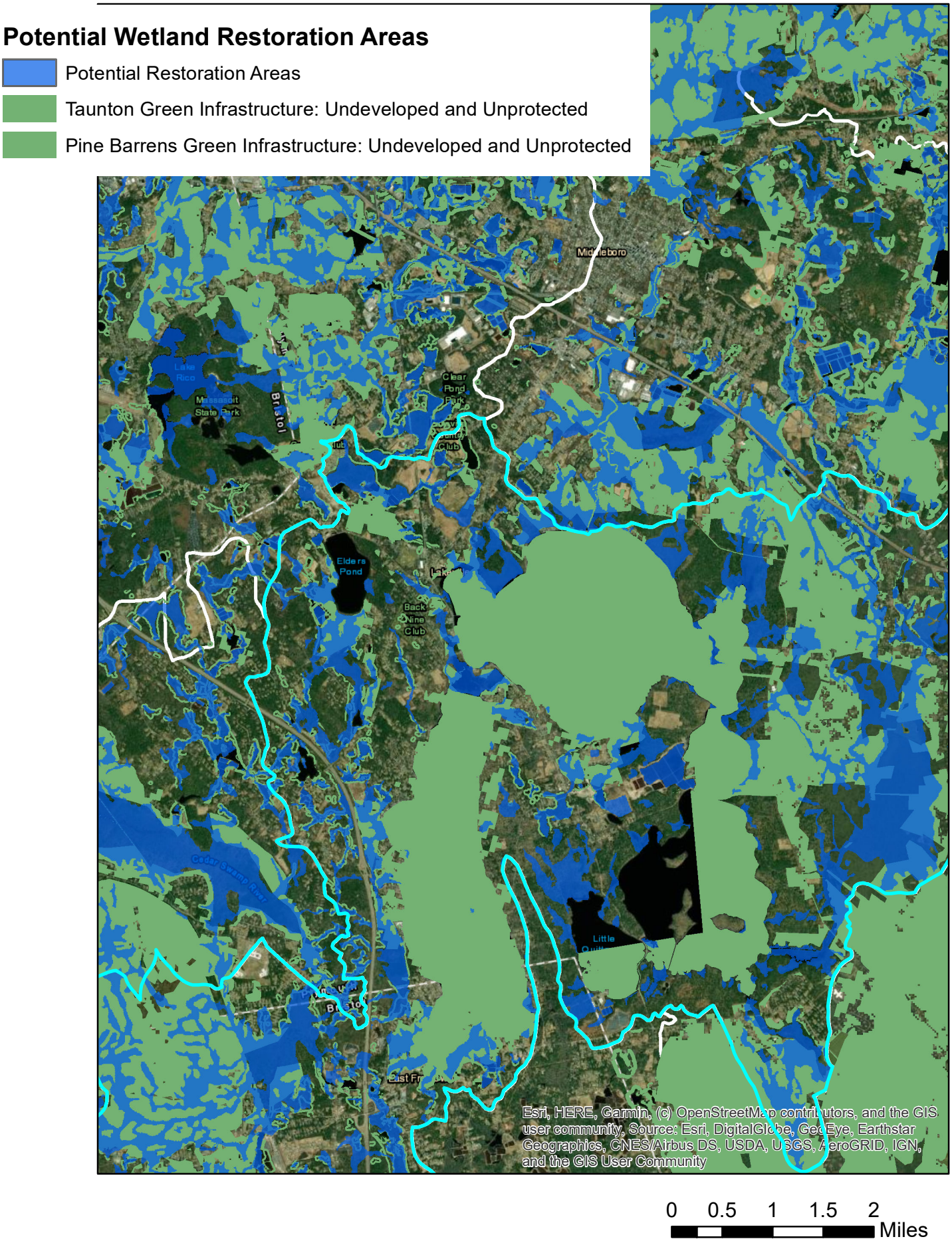


0 0.5 1 1.5 2 Miles

- **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.

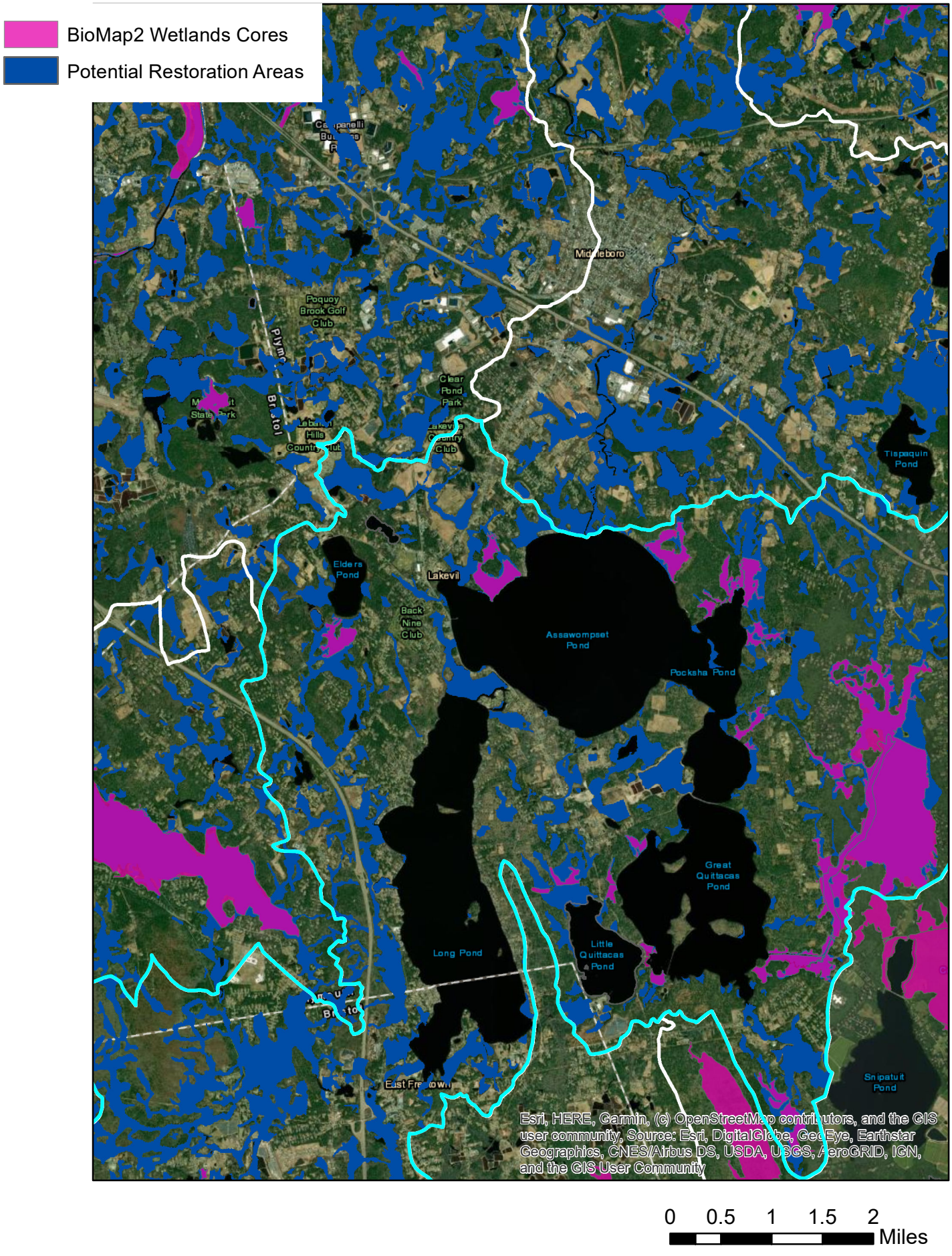
Figure 7: Potential Wetlands Restoration Areas with Undeveloped and Unprotected Green Infrastructure



- **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) 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.