

Selected Inventory of Potential Wetland Restoration Sites in the Buzzards Bay Watershed

Phase II: Northern & Eastern Areas



March 2005

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in the Buzzards Bay Watershed
Phase II: Northern & Eastern Areas

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About This Selected Inventory

Study Purpose

This study was undertaken by the Buzzards Bay Project National Estuary Program (BBP) to identify potential wetland restoration opportunities in the northern and eastern portions of the Buzzards Bay Watershed. Of particular interest were both freshwater and saltwater wetlands that had been filled due to construction and agricultural related activities on public lands, private conservation areas, and abandoned cranberry bogs.

In March 2004, the *Selected Inventory of Potential Wetland Restoration Sites in the Buzzards Bay Watershed, Phase I: Southern Area* was published. It is hoped that this Phase II atlas will provide similar help to those government officials and local nongovernmental organizations looking for restoration projects as part of wetland mitigation efforts. This Selected Inventory has been produced as part of a series of atlases created by the BBP, including the *Atlas of Tidally Restricted Salt Marshes in the Buzzards Bay Watershed* and the *Atlas of Stormwater Discharges in the Buzzards Bay Watershed*. Future efforts will be made to produce an *Atlas of Potential Restoration Sites for Anadromous/Catadromous Fish Runs in the Buzzards Bay Watershed*.

Although the BBP made considerable efforts to locate all wetland fill sites in the targeted parcels, we recognize that some sites may have been overlooked, and our list should not be considered definitive.

Information in the Inventory

The study area for this project encompassed the portion of the Buzzards Bay watershed in the southeastern Massachusetts towns of Bourne, Carver, Falmouth, Marion, Mattapoisett, Middleborough, Plymouth, Rochester and Wareham. Determining potential wetland restoration sites is a fairly complex task. Therefore, in order to establish a realistic set of achievable restoration sites, this project focused only on the following restoration opportunities:

- Public lands owned by the Commonwealth of Massachusetts - predominantly land managed by the Department of Fish and Game (formerly the Division of Fisheries, Wildlife, and Environmental Law Enforcement) and the Division of Conservation and Recreation (formerly the Department of Environmental Management),
- Municipally owned land (both conservation land and non-assigned town land),
- Local land trust properties, and
- Privately owned abandoned cranberry bogs.

The inventory of potential wetland restoration sites in this report contains the following information:

- Maps showing locations of potential wetland restoration sites within the study area,
- An aerial photo of each restoration site with the extent of potential restoration area shown,
- Type of disturbance (alteration),
- Approximate amount of fill to be removed for restoration, and
- Property owner.

How to Use the Information in the Inventory

For restoration sites of interest, the landowner should be contacted for a site visit. Since many of the sites have an existing use, coordination with the particular landowner is essential. While the amount of fill to be removed from the filled sites is given in the atlas, this information can only be viewed as a rough estimate. Furthermore, a more detailed look at each site may find more opportunities for restoration.

What has been included in this atlas is the essential information for each site in order to save time for those seeking wetland restoration opportunities. The type of wetland alteration was included to give some idea concerning the level of environmental improvement as well as the cost of restoration. The depth of fill was included as it directly related to the cost of establishing pre-disturbance elevations to the site. Where possible, information on the type of fill was included as it too related to cost of removal.

Distribution of the Inventory

Distribution of the "Selected Inventory" will include single copies provided to the Conservation Commission and municipal executive (mayor, town manager, selectmen) of each community. Additional copies will be provided to the Massachusetts Office of Coastal Zone Management, MassHighways, Army Corp of Engineers, NOAA, The Coalition for Buzzards Bay, Buzzards Bay Action Committee, and area land trusts.

A copy of the Atlas and the GIS coverages of potential wetland restoration sites developed during this project have been posted on the BBP web site, www.buzzardsbay.org.

Methods

Initial Site Selection

The area investigated for potential restoration sites included land in the Buzzards Bay watershed that is located within the following towns: Bourne, Carver, Falmouth, Marion, Mattapoisett, Middleborough, Plymouth, Rochester, and Wareham (Figure 1). The BBP's parcel GIS database was used to locate properties owned by the Commonwealth of Massachusetts, municipally owned land, privately owned abandoned cranberry bogs¹ and local land trust properties.

The owner, or controlling agency, of the properties that were reviewed for potential restoration sites is given below for each town.



Figure 1. Selected Inventory Study Area

Bourne

- Army Corps of Engineers
- Bourne Cemetery Association
- Bourne Conservation Commission
- Bourne Conservation Trust
- Bourne Housing Authority
- Bourne, Town of
- Bourne Water District
- Buzzards Bay Water District
- Commonwealth of Massachusetts
- Massachusetts Military Reservation (US Government)
- Sandwich, Town of
- Upper Cape Cod Regional Vocational-Technical School

Carver

- Carver Conservation Commission
- Carver, Town of
- Department of Fish and Game
- Department of Conservation and Recreation
- Plymouth Municipal Airport
- Plymouth, Town of

¹ The abandoned cranberry bog data was supplied by MassGIS and is available on their website, www.ma.state.us/mgis/massgis.htm.

Falmouth

- Department of Fish and Game
- Department of Conservation and Recreation
- Falmouth Conservation Commission
- Falmouth, Town of
- Massachusetts Audubon Society
- Massachusetts Bay Transit Authority
- Salt Pond Area Bird Sanctuaries
- The 300 Committee

Marion

- Department of Fish and Game
- Marion Conservation Commission
- Marion Open Space Acquisition Commission
- Marion, Town of
- Massachusetts Land Conservation Trust
- Old Rochester Regional School District
- Sippican Lands Trust

Mattapoisett

- Department of Fish and Game
- Department of Conservation and Recreation
- Fairhaven, Town of
- Mattapoisett Conservation Commission
- Mattapoisett Housing Authority
- Mattapoisett Lands Trust
- Mattapoisett, Town of
- Old Rochester Regional School District

Plymouth

- Boy Scouts of America
- Department of Fish and Game
- Department of Conservation and Recreation
- Massachusetts Land Conservation Trust
- Plymouth Airport Commission
- Plymouth Bourne Conservation Trust
- Plymouth Conservation Commission
- Plymouth Municipal Airport
- Plymouth, Town of
- Plymouth Water Company
- Wildlands Trust of Southeastern Massachusetts
- United States Government

Rochester

- Department of Fish and Game
- Marion Water Department
- Old Colony Regional Vocational-Technical School District
- Rochester Conservation Commission
- Rochester Lands Trust
- The Nature Conservancy
- Wildlands Trust of Southeastern Massachusetts

Wareham

- Army Corps of Engineers
- Boy Scouts of America
- Department of Fish and Game
- New England Forestry Foundation
- Onset Fire District
- The Trustees of Reservations
- Wareham Conservation Commission
- Wareham Fire District
- Wareham, Town of
- Wildlands Trust of Southeastern Massachusetts

The property boundaries for the parcels owned by the above entities were overlain on two MassGIS ortho aerial photograph surveys with 0.5m pixel resolution. One of these photographic surveys was a black and white photography survey from March 1996 and the other was a color photography survey from April 2001. Restoration sites were identified on these properties by locating either areas of filled wetlands, changes in wetland boundaries, or anomalies in the photographs, such as apparent changes in features that might be inconsistent with wetland coverages. The wetland boundary information used for this analysis was based on three sets of information: historic and most recent United States Geographical Survey (USGS) topographic quadrangle maps, and the 1992 DEP Wetland Conservancy Program Maps.

Historic USGS topographic maps dating from the late 1930s to the early 1940s were downloaded from <http://docs.unh.edu/nhtopos/MassachusettsList.htm>. These maps were georeferenced, and then where needed, a wetlands boundary was created from the georeferenced topographic maps. Wetland boundary changes were then evaluated by comparing the most recent USGS topographic wetlands (available from MassGIS) to the historical USGS topographic wetlands (Figures 2 & 3).

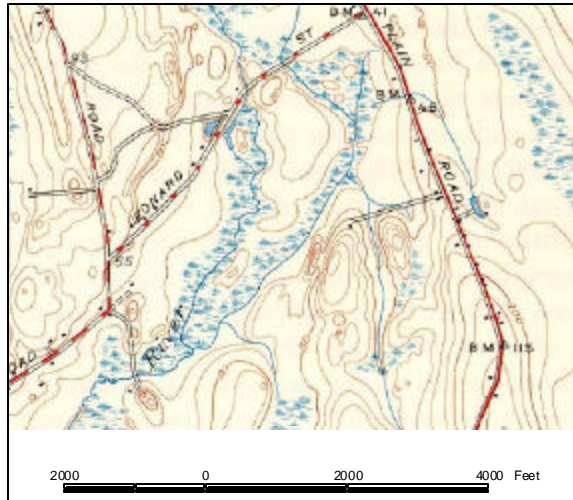


Figure 2: Portion of 1948 New Bedford North Quadrangle.

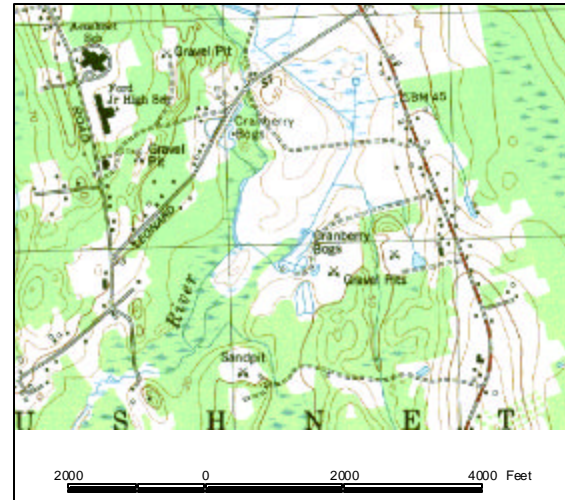


Figure 3: Portion of 1973 New Bedford North Quadrangle.

The wetlands shown on the historic topographical maps and features evident on recent aerial photographs were also compared to the “core” wetlands identified in the 1992 Department of Environmental Protection Wetland Conservancy Program (DEP-WCP) wetland survey (Figure 4).² The wetland boundaries identified by the Conservancy Program were based on evaluating infrared aerial photographs taken during early spring (leaf-off) conditions and are generally considered to delineate the minimum extent of wetlands, and not the regulatory wetland boundary pursuant to the Wetlands Protection Act.

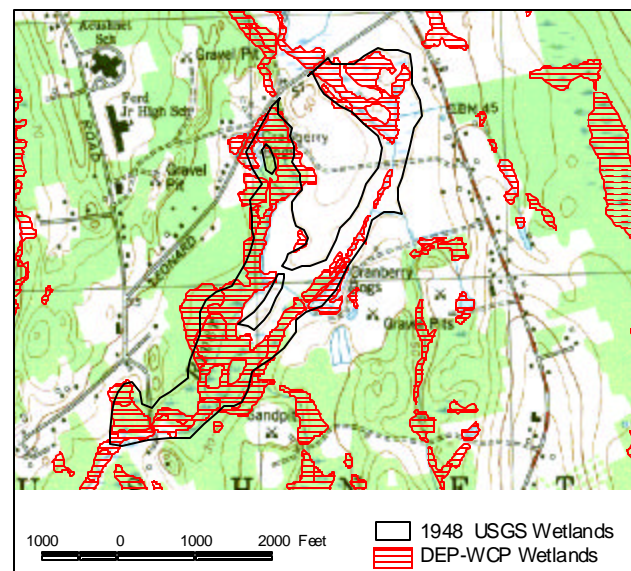


Figure 4: Layering of Data (area depicted in illustrations 2 & 3, with the 1948 USGS and the DEP-WRP wetlands).

² Available from the MassGIS website.

Site Selection Refinement

A list of hundreds of potential wetland restoration sites was developed by overlaying property parcel coverages of targeted properties and wetland boundaries on the aerial photographs as described above. Due to the large number of sites all could not be field investigated, and because it was recognized that many of the filled or altered wetland areas on this list would not be viable restoration sites, a pilot study was done during Phase I of the Atlas. In this study, 20 of the 51 sites identified in the Town of Dartmouth were field investigated to refine the remote selection process. Based on the site visits in the pilot study, the following types of sites were eliminated from consideration for the reasons given.

1. Footpaths

Many sites on land trust and other passive recreation properties were existing footpaths. The BBP determined that these were not available for restoration, as the restoration activities would conflict with the existing use (Figure 5).



Figure 5: Footpath on Land Trust Property

2. Vegetative Anomalies

Some anomalies that were viewed in the orthophotographs did not represent actual wetland alterations. The 0.5m resolution orthophotographs available from MassGIS are detailed enough to show a fallen tree as something different from the surrounding area. Site visits revealed that many anomalies found in the orthophotographs were not wetland alterations (Figure 6).

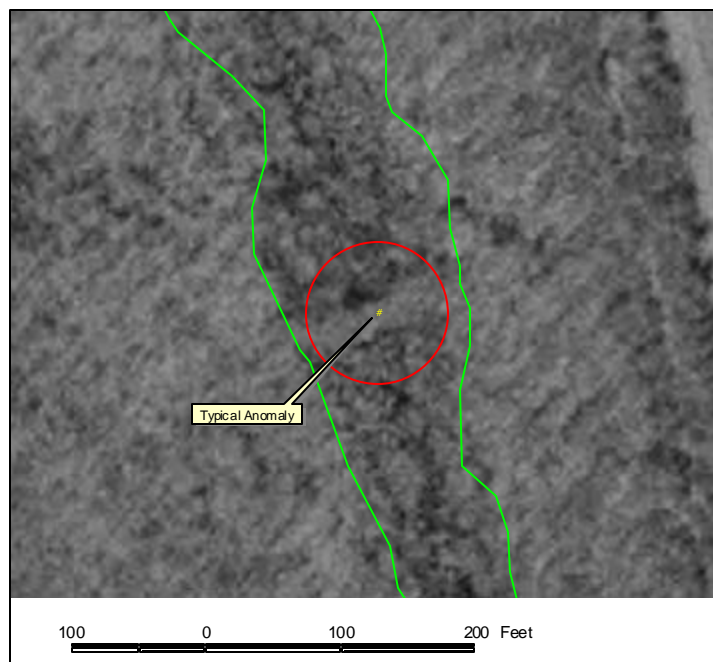


Figure 6: Anomalies in the Orthophotographs

3. Existing Public Facilities

Several sites turned out to be existing public facilities. The BBP determined that many public facilities were not available for restoration, as the restoration activities would conflict with the existing use (Figure 7).

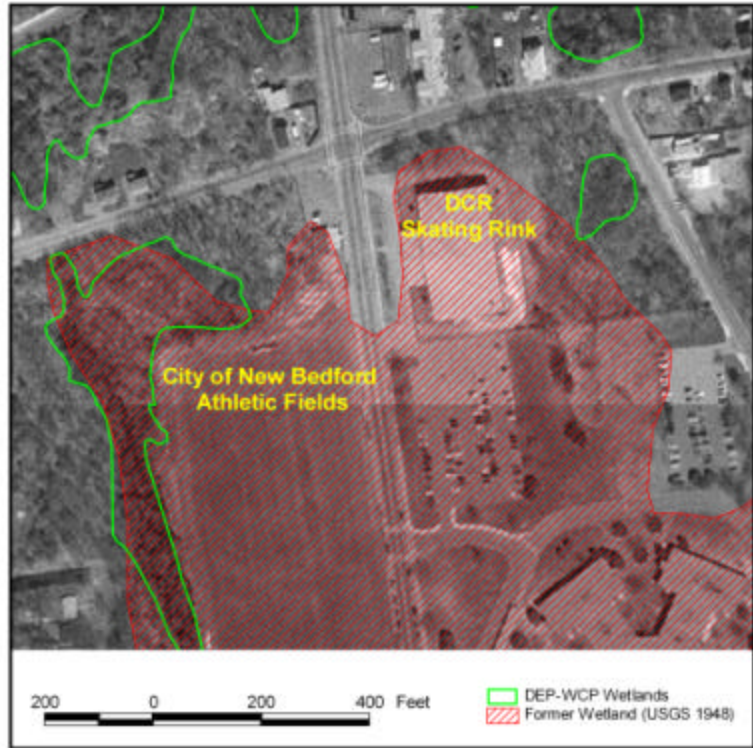


Figure 7: Public Facilities Located in a Former Wetland.

4. Existing Utility Structures and Easements

In areas where there were gas, electric, water, and sewer utility lines, wetlands had been altered to satisfy the needs of the particular utility. The BBP determined that the utility line easements were not available for restoration, as the restoration activities would conflict with the existing use (Figure 8).



Figure 8. Electric Easement

5. Access Roads

Many of the fill sites visited turned out to be access roads. The BBP determined that the access roads were not available for restoration, as the restoration activities would conflict with the existing use (Figure 9).

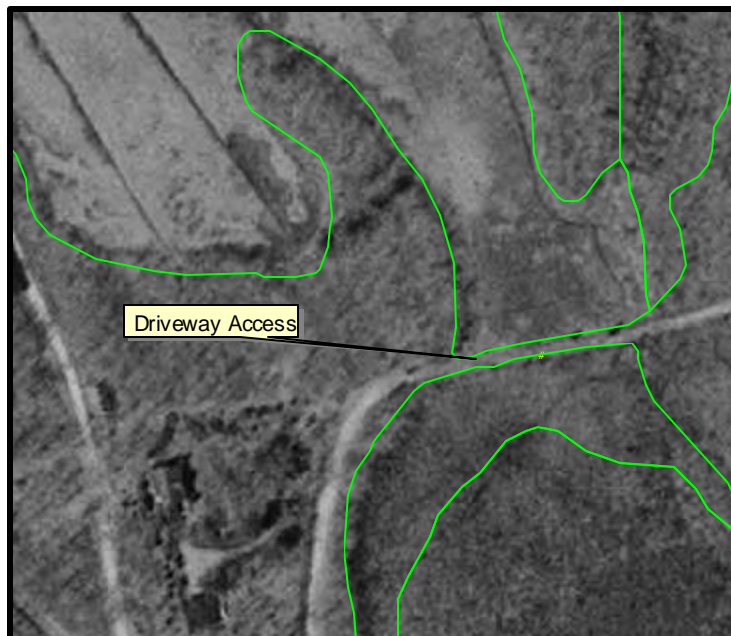


Figure 9: Access Road through Marsh.

6. Apparent Wet Fields

Wet spots in fields may or may not be altered wetlands. Whether the wet spots shown below in figures 10 and 11 or on other orthophotographs were wetlands could only be determined through a site visit.



Figure 10: Wet spot that was actually a dry field.



Figure 11: Wet spot that was a wet field.

7. Old Gravel Pits

Old gravel pits are good wetland creation sites. Many of the municipal gravel pits were excavated to the water table, with some areas having an established wetland. However, these could not be considered potential restoration sites, as they were historically uplands.

The elimination of the seven categories of wetland alterations above reduced the number of sites needing field investigation from 258 to 197. The number of identified sites, before and after being sorted by the “pre-selection criteria,” is summarized by municipality in Table 1.

Table 1: Number of Sites Before and After Preliminary Selection Criteria

Town	Abandoned Cranberry Bogs	Potential Sites Prior to Pre -selection Criteria	Potential Sites After Pre -selection Criteria
Bourne	6	16	14
Carver	13	29	18
Falmouth	1	30	21
Marion	12	45	42
Mattapoisett	2	26	26
Middleborough	4	14	5
Plymouth	10	24	14
Rochester	21	35	26
Wareham	23	39	31

Site Visit Procedure

Of the 197 sites that passed the Pre-selection Criteria, the BBP staff visited most. Not visited were the abandoned cranberry bogs off of public ways, due to private property issues and an inability to access them physically or visually. Based on these field investigations, each site was placed in one of the following three categories:

- Rejected, Not Altered Wetland
- Rejected, Restoration Criteria Not Met
- Potential Restoration Site

Although the sorting process using the various information sources available was able to dramatically reduce the number of sites visited, several locations visited were found to be unaltered wetlands. This was considered normal as there was a different criterion for wetland identification for each data source, and the differences in coverage between the data sources were used to determine which sites to visit. These sites were identified as "Rejected, Not Altered Wetland."

Many times conflicting uses were not apparent until a site visit was made. When the site contained an access road, park, ball field, utility lines, or some other use that was incompatible with a restoration project, the site was labeled as "Rejected, Restoration Criteria Not Met."

Sites that were identified as altered wetlands and had opportunities for restoration were labeled as a "Potential Restoration Site." At "Potential Restoration Sites," the BBP personnel would inspect the site and note the type of alteration, the extent of the altered area, and the depth of fill, if fill was the disturbance type. The extent of the fill was denoted on a color or black and white orthophotograph. Any additional information that could be of use was denoted on the orthophotograph margins.

Results

The types of wetlands alterations discovered during the Phase II site visits were fill (31 sites), abandoned cranberry bogs (91 sites), and ditching (11 sites). It should be noted that some sites had more than one alteration type.

Since the type of fill may affect the cost of removal and disposal, the type of fill was noted when it could be determined. Types of fill encountered were gravel, road silt, asphalt, sand, trash, large stones, rocks (smaller stones), and municipal compost.

There were 130 potential restoration sites in the study area and the total area of all sites was 386 acres. Table 2 breaks down the number of restoration sites and acreage by town.

Table 2: Number of Potential Restoration Sites and Acreage Sorted by Town

Town	Number of Restoration Sites	Total Acreage
Bourne	10	25
Carver	14	68
Falmouth	4	3
Marion	30	71
Mattapoissett	10	15
Middleborough	4	10
Plymouth	10	30
Rochester	22	67
Wareham	26	97

Ninety-one of the sites in the Phase II Atlas are abandoned cranberry bogs. This category of alteration accounted for 343 acres, or 90% of the total acreage. All of the abandoned bog sites need a more detailed assessment to determine their restoration potential, including the degree of alteration and most promising restoration technique. Potential restoration techniques might include, but are not limited to: take no action, re-establishment of meandering stream channels, filling existing ditches, removal of dikes, planting of vegetation, removal of water control structures, or establishment of permanent water control structures.

In the majority of cases where sites visits were performed, the bog ditching was determined to be effective in altering the hydrology of the bog. The existing bogs viewed were typically red maple (*Acer rubrum*) dominated wetlands. Some bogs viewed did not exhibit signs of wetland hydrology and may be, or a portion may be, what is considered a "dry bog." Dry bogs are cranberry bogs that rely on an artificially induced hydrology to maintain productive cranberry vines and they revert to upland upon abandonment. In many cases bog restoration may not result in an increase in wetland acreage but a change in wetland type. Many times the presence of uplands (bog dikes) within the bog system have aided wildlife diversity by adding the opportunity for sandy nesting sites within the bog system.

Table 3 on the following pages provides a brief summary of the 130 potential restoration sites. Maps and full data on each site may be found in the appendices.

Table 3: Summary Table of Potential Wetland Restoration Sites

Site Number	Wetland Type	Alteration Type	Altered Area (acres)	2003 NHESP Endangered Species Habitat	DEP Aquifer Area	DEP Zone II	Notes
Town of Bourne – Appendix 1							
BOUR-1	freshwater	fill	0.19	yes			
BOUR-3	freshwater	fill	0.15	yes			
BOUR-9	unknown	fill	1.3				Needs elevations checked
BOUR-10	unknown	abandoned bog	8.4	yes			Site of historic herring run
BOUR-11	unknown	abandoned bog	2.5	yes			Site of historic herring run
BOUR-12	saltwater	fill	0.04	yes			Site of historic herring run
BOUR-13	saltwater	abandoned bog	4.1	yes			Site of historic herring run
BOUR-14	freshwater	abandoned bog	2.7	yes	high yield		
BOUR-15	freshwater	abandoned bog	4.2	yes	high yield	yes	
BOUR-16	freshwater	abandoned bog	1.6	yes	med. yield	yes	
Town of Carver – Appendix 2							
CARV-2	freshwater	abandoned bog	5.2		med. yield		
CARV-6	freshwater	abandoned bog	1.3		med. yield		
CARV-8	freshwater	abandoned bog	0.5		med. yield		Good access
CARV-10	freshwater	abandoned bog	2.3	yes	high yield		
CARV-12	freshwater	abandoned bog	1.7		high yield		
CARV-13	freshwater	abandoned bog	0.9	yes	high yield		
CARV-14	freshwater	abandoned bog	7.8		high yield		
CARV-15	freshwater	abandoned bog	1.7		high yield		
CARV-16	freshwater	abandoned bog	3		high yield		
CARV-19	freshwater	abandoned bog	3		med. yield		
CARV-20	freshwater	abandoned bog	1.4		med. yield		
CARV-22	freshwater	abandoned bog	4.8	yes	med. yield		
CARV-23	freshwater	abandoned bog	24.5		med. yield		
CARV-29	freshwater	abandoned bog	3.4		med. yield		
Town of Falmouth – Appendix 3							
FALM-1	saltwater	fill	0.3				
FALM-9	freshwater	ditching	1				<i>Phragmites</i> present
FALM-27	unknown	ditching	1.1				Needs elevations checked
FALM-28	saltwater	fill	0.5				
Town of Marion – Appendix 4							
MARI-2	freshwater	fill	0.8	yes			<i>Phragmites</i> present
MARI-4	freshwater	fill	0.2				
MARI-5	freshwater	ditching	1				Next to Holmes Brook
MARI-6	freshwater	ditching	0.4				Next to Holmes Brook
MARI-7	freshwater	fill	1.5				
MARI-8	freshwater	fill	2.8				
MARI-9	freshwater	abandoned bog	7.8				Possible spot. turtle habitat
MARI-10	freshwater	abandoned bog	14.8				Spotted turtles observed
MARI-11	freshwater	fill	0.2				
MARI-12	freshwater	fill	0.3				Access a problem
MARI-13	freshwater	fill	0.1	yes			
MARI-15	freshwater	ditching	1				
MARI-17	freshwater	fill & ditching	0.2				
MARI-20	freshwater	abandoned bog	1				Spotted turtles observed
MARI-21	freshwater	abandoned bog	2.4				Spotted turtles observed
MARI-22	freshwater	ditching	0.1				
MARI-23	freshwater	abandoned bog	5.1		high yield	yes	
MARI-26	saltwater	fill	0.5	yes			
MARI-27	unknown	abandoned bog	1.8	yes			Needs elevations checked

Site Number	Wetland Type	Alteration Type	Altered Area (acres)	2003 NHESP Endangered Species Habitat	DEP Aquifer Area	DEP Zone II	Notes
MARI-28	freshwater	abandoned bog	2.7				
MARI-29	freshwater	ditching	0.7				
MARI-31	freshwater	ditching	0.5	yes			Access a problem
MARI-33	freshwater	ditching	4.5	yes			
MARI-35	freshwater	abandoned bog	1.5	yes			
MARI-36	freshwater	ditching	11				
MARI-42	freshwater	fill	0.5				
MARI-46	freshwater	abandoned bog	2.3		med. yield		
MARI-50	freshwater	abandoned bog	0.7				
MARI-51	freshwater	abandoned bog	2.1	yes			
MARI-52	freshwater	Abandoned bog	2.5	yes			
Town of Mattapoisett – Appendix 5							
MATT-2	freshwater	fill	1.1	yes			
MATT-3	freshwater	fill	3.6	yes			Easy access
MATT-6	saltwater	fill	0.4	yes			
MATT-8	saltwater	fill	0.1				Easy access
MATT-9	freshwater	fill	0.2				
MATT-13	freshwater	fill	0.2	yes		yes	
MATT-17	freshwater	fill	0.3				
MATT-24	freshwater	abandoned bog	6.6	yes			
MATT-25	freshwater	abandoned bog	1.9				Easy access
MATT-26	freshwater	fill	0.2				Easy access
Town of Middleborough – Appendix 6							
MIDD-9	freshwater	abandoned bog	5.5				Easy access
MIDD-11	freshwater	abandoned bog	2.6		med. yield		
MIDD-12	freshwater	aband. bog & fill	0.9		med. yield		
MIDD-13	freshwater	aband. bog & fill	1.2		med. yield		
Town of Plymouth – Appendix 7							
PLYM -1	freshwater	abandoned bog	1.5		high yield	yes	
PLYM -2	freshwater	abandoned bog	2.6		med. yield		
PLYM -5	freshwater	abandoned bog	3	yes	high yield	yes	
PLYM -9	freshwater	abandoned bog	12.2	yes	high yield		
PLYM -10	freshwater	abandoned bog	1.1	yes	high yield		
PLYM -11	freshwater	abandoned bog	0.6	yes	high yield		
PLYM -12	freshwater	abandoned bog	2	yes	high yield		
PLYM -18	freshwater	abandoned bog	2		high yield		NHESP potential vernal pool
PLYM -25	freshwater	abandoned bog	4.1		high yield	yes	
PLYM -26	freshwater	abandoned bog	2.5	yes	high yield		
Town of Rochester – Appendix 8							
ROCH-3	freshwater	abandoned bog	2.7			yes	
ROCH-4	freshwater	abandoned bog	7.8		high yield	yes	
ROCH-8	freshwater	fill	0.1		med. yield		
ROCH-10	freshwater	abandoned bog	1				
ROCH-12	freshwater	abandoned bog	11				
ROCH-13	freshwater	abandoned bog	1.3				
ROCH-14	freshwater	abandoned bog	2.7				
ROCH-15	freshwater	abandoned bog	2.3				Easy access
ROCH-17	freshwater	abandoned bog	1.8		med. yield		
ROCH-18	freshwater	abandoned bog	0.2		med. yield		
ROCH-19	freshwater	abandoned bog	2.7		med. yield		
ROCH-21	freshwater	abandoned bog	0.7		med. yield		
ROCH-23	freshwater	abandoned bog	2.3		med. yield		

Site Number	Wetland Type	Alteration Type	Altered Area (acres)	2003 NHESP Endangered Species Habitat	DEP Aquifer Area	DEP Zone II	Notes
ROCH-26	freshwater	abandoned bog	2.5				NHESP certified vernal pools
ROCH-28	freshwater	abandoned bog	12				
ROCH-29	freshwater	abandoned bog	3.2				NHESP potential vernal pool
ROCH-32	freshwater	abandoned bog	2.1				
ROCH-33	freshwater	abandoned bog	2.3		med. yield		
ROCH-35	freshwater	abandoned bog	3.1		high yield		
ROCH-36	freshwater	abandoned bog	1.6		high yield		
ROCH-37	freshwater	abandoned bog	3.2		med. yield		
ROCH-39	freshwater	abandoned bog	0.8				Easy access
Town of Wareham – Appendix 9							
WARE-1	freshwater	abandoned bog	14				
WARE-3	freshwater	abandoned bog	5.4		med. yield		
WARE-4	freshwater	abandoned bog	4	yes			
WARE-5	freshwater	abandoned bog	1.3		med. yield		
WARE-6	freshwater	abandoned bog	4.5	yes	med. yield		
WARE-8	freshwater	abandoned bog	2.9		med. yield		
WARE-10	freshwater	abandoned bog	9				NHESP potential vernal pool
WARE-12	freshwater	abandoned bog	5.9		med. yield		
WARE-15	freshwater	abandoned bog	6.45	yes			
WARE-17	freshwater	abandoned bog	1.7	yes	high yield	yes	
WARE-18	freshwater	abandoned bog	9.3		high yield	yes	
WARE-19	freshwater	abandoned bog	2				Easy access
WARE-20	freshwater	abandoned bog	2		med. yield		
WARE-21	saltwater	abandoned bog	1.2				Same owner for WARE-22
WARE-22	saltwater	abandoned bog	1.5				Same owner for WARE-21
WARE-23	saltwater	fill	0.2				Tidal restriction
WARE-24	saltwater	fill	0.2				Tidal restriction
WARE-25	saltwater	abandoned bog	1.8				Do with WARE-23 & 24
WARE-26	saltwater	fill	<0.1				Tidal restriction
WARE-28	unknown	abandoned bog	2.4				Do with WARE-23 & 24
WARE-31	freshwater	abandoned bog	1.5				
WARE-34	freshwater	abandoned bog	13.7		high yield	yes	NHESP potential vernal pool
WARE-35	freshwater	abandoned bog	1.2		high yield	yes	
WARE-37	freshwater	abandoned bog	3.5	yes	high yield	yes	
WARE-38	freshwater	abandoned bog	0.7	yes	high yield	yes	
WARE-39	freshwater	abandoned bog	1.2	yes	med. yield		

Locus Map of Potential Restoration Sites

