



Waquoit Bay as viewed from WBNERR headquarters. (See Appendix G for Photo information.)

## SECTION 3. WAQUOIT BAY NATIONAL ESTUARINE RESEARCH RESERVE

### 3.1. INTRODUCTION

Waquoit Bay is an 825 acre shallow coastal embayment in the towns of Falmouth and Mashpee. It is protected from the waters of Vineyard Sound by large barrier beaches backed by salt marshes and upland forests (Geist 1996). The bay connects to its larger watershed through both surficial waters (e.g., Childs and Quashnet rivers, Abigail's Brook) and groundwater flow.

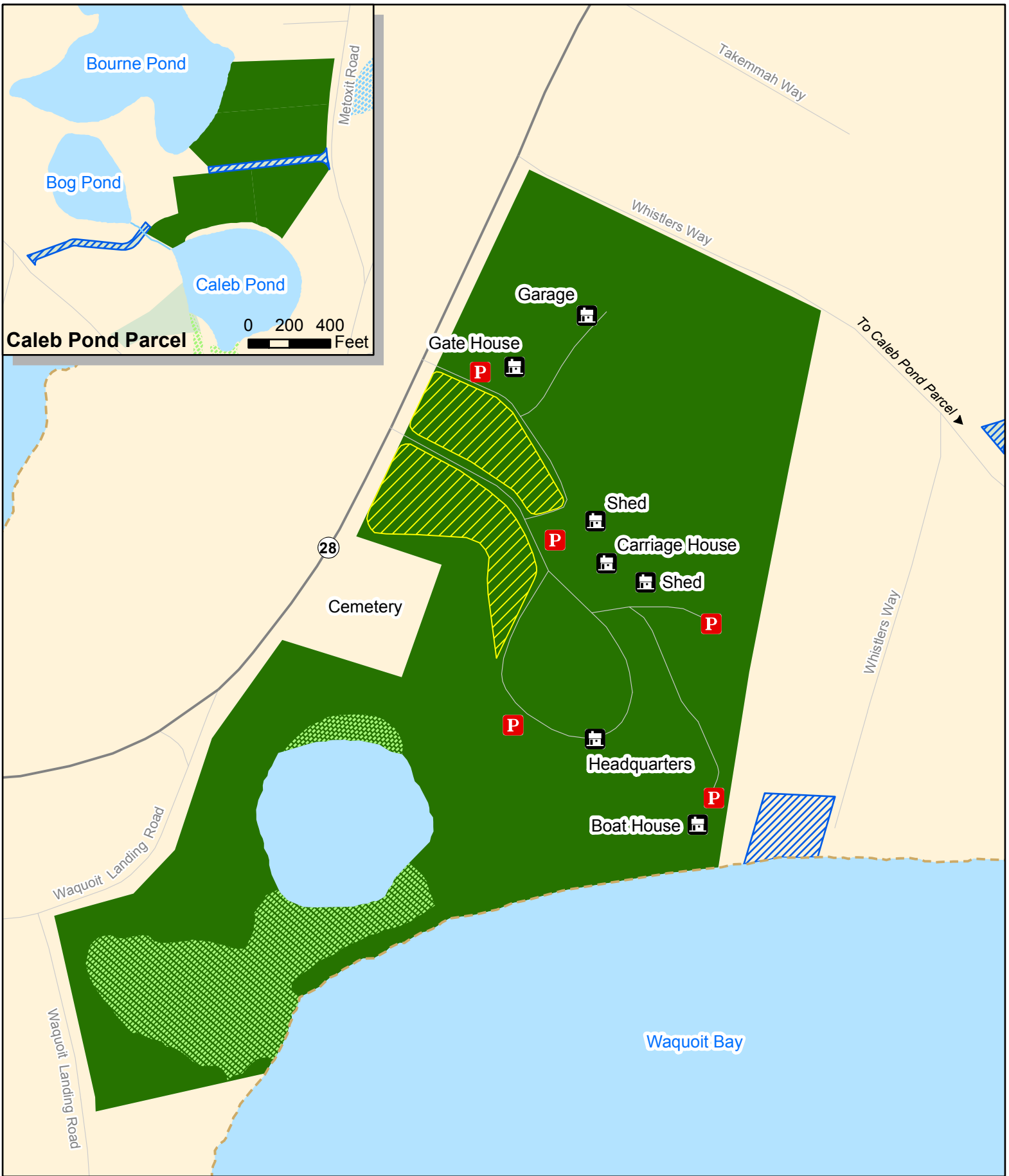
The term "Waquoit Bay National Estuarine Research Reserve" (WBNERR) is often used interchangeably to refer to two different concepts. First, it is used to refer to the collection of DCR properties located on Waquoit Bay and throughout its watershed that collectively form one of 28 National Estuarine Research Reserves (i.e., the Reserve). Each of these areas is protected for long-term research, water quality monitoring, education, and coastal stewardship. Second, the term references a specific property, where the Reserve's headquarters is located, on Route 28 in the Falmouth village of Waquoit. (Figure 3.1) The headquarters area, also referred to as the "campus," includes the Reserve's administrative, operations, and visitor facilities. This section addresses only the WBNERR headquarters

area and the nearby Caleb Pond parcels. (Figure 3.1) Information on the entire Reserve may be found in WBNERR (2014).

The WBNERR headquarters is located on the grounds and in the buildings of the former Sargent Estate, which is situated on a bluff overlooking the bay. (See Section 3.3 Cultural Resources for additional information.) The estate was acquired in 1987 to serve as the Reserve's visitor center and headquarters. The Reserve itself was formally designated the following year.

Today, the WBNERR headquarters is perhaps best known to the public as an information, education, and research center. From an agency perspective, it is also the administrative and operations facility for both the National Estuarine Research Reserve and the individual DCR properties that comprise the Reserve.

WBNERR's physical, political, and regulatory attributes are summarized in Table 3.1.1. This table, and all others in this section, include combined information on WBNERR and its associated properties.



**WBNER**

Figure 3.1.

0 100 200 Feet

Geographic information provided by MassGIS and DCR GIS.

N  
W E  
S

**dcr**  
Massachusetts

Building

Parking Area

Major Road

Minor Road

Hydrologic Connection

Town Boundary

Marsh

Salt Marsh

Open Water

Other Protected Open Space

**WBNER**

Fee Interest

Easement

Habitat Management Area

**Table 3.1.1. Physical, political, and regulatory settings of WBNERR and Caleb Pond.**

| Setting                                      | Name or Metric          |
|--|-------------------------|
| <b>Location:</b>                             | Falmouth                |
| <b>Area (acres)<sup>a</sup>:</b>             | 33.37                   |
| <b>Perimeter (miles)<sup>a</sup>:</b>        | 1.80                    |
| <b>Landscape Designation(s)<sup>b</sup>:</b> | Reserve, Parkland       |
| <b>Legislative Districts:</b>                |                         |
| House  | Fifth Barnstable        |
| Senate                                       | Plymouth and Barnstable |
| <b>Regulatory Designations:</b>              | Priority Habitat        |
|  | Waquoit Bay ACEC        |
|  | Outstanding Resource    |
|  | Waters – Waquoit Bay    |
|  | ACEC                    |

a. Calculated using a Geographic Information System (GIS).

b. For a summary of the DCR's landscape designations, see <http://www.mass.gov/eea/docs/dcr/ld-factsheet-final.pdf>.

**Associated Properties.** One additional property, Caleb Pond, is included in this section. (See Figure 3.1 for the location of this property.)

- **Caleb Pond.** This 11.4 acre property is located on the shores of Bourne and Caleb ponds, off Metoxit Road, Falmouth.

WBNERR headquarters and the Caleb Pond property are part of the Waquoit Bay National Estuarine Research Reserve. Other properties in the Reserve include South Cape Beach (Section 4), Washburn Island (Section 5), and Quashnet Woods State Reservation and associated watershed lands (Section 6).

## 3.2. NATURAL RESOURCES

An overview of the ecology of Waquoit Bay was presented in Geist (1996).

### Physical Features

WBNERR is located on the north shore of Waquoit Bay. Elevations range from sea level to approximately 30 feet above sea level at the headquarters and at the Caleb Pond parcels.

## Water Resources

There are three ponds; an unnamed salt pond immediately west of the Reserve's headquarters, and Bourne and Caleb ponds at the Caleb Pond property. (Table 3.2.1) Short tidal creeks connect the unnamed salt pond and Caleb Pond to Waquoit Bay. An additional stream segment passes through the Caleb Pond property.

**Table 3.2.1. Water resources of WBNERR and Caleb Pond.**

| Water Resource                             | Name or Metric |
|--|----------------|
| <b>Watershed:</b>                          | Cape Cod       |
| <b>Aquifer:</b>                            | Cape Cod SSA   |
| Lens                                       | n/a            |
| <b>Rivers and Streams (miles)</b>          | 0.00           |
| <b>Vernal Pools</b>                        |                |
| Certified (#)                              | 0              |
| Potential (#)                              | 0              |
| <b>Wetlands (acres)</b>                    | 2.12           |
| <b>Lakes and Ponds (acres)<sup>a</sup></b> | 1.87           |

a. Includes overlap with adjacent water bodies.

Its proximity to Waquoit Bay makes all low-lying portions of WBNERR susceptible to flooding, storm surge, and anticipated sea level rise. (Table 3.2.2) A Category 1 hurricane would inundate the unnamed salt pond and adjacent marshes, and damage the seaward side of the boat house. A Category 3 storm would inundate the entire boat house.

**Table 3.2.2. Potential impacts of flooding, hurricane inundation, and sea level rise to WBNERR and Caleb Pond.**

| Type of Impact                | Acres | %     |
|-------------------------------|-------|-------|
| <b>Flooding:</b>              |       |       |
| 100-year Storm                | 8.43  | 25.25 |
| 500-year Storm <sup>a</sup>   | 8.56  | 25.64 |
| <b>Hurricane Inundation:</b>  |       |       |
| Category 1 Storm              | 6.17  | 18.48 |
| Category 2 Storm <sup>b</sup> | 7.41  | 22.20 |
| Category 3 Storm <sup>b</sup> | 8.70  | 26.08 |
| Category 4 Storm <sup>b</sup> | 10.54 | 31.59 |
| <b>Sea Level Rise</b>         | 4.19  | 12.57 |

a. Cumulative value; includes 100-year storm impacts.

b. Cumulative value; includes impacts of all lower category storms.

A barrier beach (Fm-6) extends approximately 450 feet along the shore of Waquoit Bay to the south of the unnamed salt pond.



A small barrier beach (Fm-6) on the west side of WBNERR separates a salt marsh from the larger bay. (See Appendix G for Photo information.)

## Rare Species

### State-listed Species

Five state-listed species are known from the WBNERR headquarters area; two are also federally listed. (Table 3.2.3) One candidate for federal listing, the New England Cottontail, is present in the Caleb Pond property. As of this writing, the bushy rockrose has been proposed for delisting under MESA.

**Table 3.2.3. State-listed species of WBNERR and Caleb Pond, as identified by the NHESP.**

| Species <sup>a, b</sup>                   | Type <sup>c</sup> | MESA <sup>d</sup> |
|---|-------------------|-------------------|
| Bushy rockrose                            | P                 | SC                |
| Common tern                               | B                 | SC                |
| Data sensitive rare plant <sup>e, f</sup> | P                 | E                 |
| Eastern box turtle                        | R                 | SC                |
| Roseate tern <sup>e</sup>                 | B                 | E                 |

- Presented alphabetically, by common name.
- Fact sheets are available at: <http://www.mass.gov/eea/agencies/dfw/natural-heritage/species-information-and-conservation/mesa-list/list-of-rare-species-in-massachusetts.html>.
- Types of state-listed species include: B = Bird; P = Plant; and R = Reptile.
- Status of species listed under the Massachusetts Endangered Species Act (MESA): E = Endangered, SC = Special Concern; and T = Threatened.
- This species is also federally endangered.
- The name of this species is not released in accordance with the NHESP's policy of not revealing in site-specific documents the name or location of rare species susceptible to collection.

## Priority Habitat

Priority Habitat at WBNERR (2.52 acres, 7.54%) is restricted to two areas: the headquarters' cultural grasslands and the waters of Waquoit Bay. The latter provides foraging habitat to terns that nest off the property.

## Vegetation

Surveys have largely focused on aquatic plants. Lists of macroalgae and vascular plants common to the bay are provided in Geist (1996). More recently, a multi-year survey identified the aquatic vascular plants of Waquoit Bay and its tributaries. A guide to the common plants of the Sargent Estate was developed as part of WBNERR's interpretive materials.

**Invasive Species.** Four invasive plants are known from the headquarters and Caleb Pond areas. (Table 3.2.4) An unidentified species of bittersweet is present at Caleb Pond; it is potentially invasive.

**Table 3.2.4. Known invasive and likely invasive plants of WBNERR and Caleb Pond.**

| Species <sup>a</sup>      | Status <sup>b</sup> |
|---------------------------|---------------------|
| Japanese barberry         | I                   |
| Multiflora rose           | I                   |
| Norway maple <sup>c</sup> | I                   |
| Oriental bittersweet      | I                   |

- Presented alphabetically, by common name.
- Plants are classified as being either Invasive (I) or Likely Invasive (L) according to MIPAG (2005).
- Recorded only on the Caleb Pond parcel.

One potentially invasive plant, chee reedgrass, has also been observed on WBNERR grounds. This species was not evaluated by MIPAG (2005), but has life history traits consistent with invasive plants.

## Natural Communities

There have been no formal surveys of natural communities. However, some community types have been tentatively identified. (Table 3.2.5) Forest cover types have been classified and mapped for this property and for all others in the Reserve.



**Table 3.2.5. Known natural communities of WBNERR and Caleb Pond.**

| Community Type <sup>a</sup> | System <sup>b</sup> | State Rank <sup>c</sup> | Source <sup>d</sup> |
|-----------------------------|---------------------|-------------------------|---------------------|
| Coastal Salt Pond Marsh     | E                   | S2                      | 1                   |
| Cultural Grassland          | T                   | -                       | 1                   |
| Maritime Beach Strand       | T                   | S3                      | 1                   |

- Classified according to Swain and Kearsley (2011).
- E = Estuarine, P = Palustrine, T = Terrestrial.
- The NHESP ranks communities from most rare (S1) to the most common (S5).
- Information contained in this table was obtained from the following sources:
  - Incidentally observed by RMP Planner during site visits.

### Forests

WBNERR is 63.49% forested. This includes the eastern portion of the headquarters and nearly all of the Caleb Pond property.

### Wildlife

Terrestrial wildlife has not been surveyed; fin fish and invertebrates common to the bay were identified in Geist (1996). The stream through the Caleb Pond parcel serves as a diadromous fish run for American eel.

## **3.3. CULTURAL RESOURCES**

This section describes the known and potential cultural resource areas, including pre-Contact and post-Contact archaeological resources, and historic buildings, structures, and landscapes. An overview of significant events in the history of WBNERR is presented in Table 3.3.1. Cultural resources are identified in Table 3.3.2.

### **Archaeological Resources**

Sites in the vicinity of WBNERR range in age from possibly as early as the Paleo Indian Period (12,900 years ago) to the Contact Period (450 BP) and may be expected to have survived on undeveloped land. In its entirety, WBNERR must be considered highly archeologically sensitive for pre-Contact resources. Four pre-Contact sites are recorded in WBNERR and two archaeological surveys have been conducted within the limits of the parcel.

One known archaeological resource, a well, is located behind the Carriage House.

## **Historic Resources**

The abundance of natural resources that attracted native Mashpee Indians to the area also attracted white settlers soon after their 17<sup>th</sup> century arrival. The area around WBNERR flourished in the 19<sup>th</sup> century as a local manufacturing and seafaring center with a strong agricultural base. In the late 19<sup>th</sup> century the area became a popular location for the construction of summer estates for wealthy urban dwellers. The late 19<sup>th</sup> century Sargent Estate makes up the core of WBNERR. The main house was built between 1880 and 1890 by Ignatius Sargent in the Shingle Style of late Victorian construction and used as a summer “cottage” for family vacations until it was damaged by the 1938 hurricane. Following the 1938 hurricane, the building was boarded up for almost 50 years until it was acquired by the Commonwealth in 1987 for use as the Reserve’s headquarters. All of the historic buildings have been adapted for new uses.

### Historic Landscapes

**Sargent Estate Landscape.** WBNERR’s most significant historic resource is the Sargent Estate landscape. The core of this 1880s estate consists of four buildings built for Ignatius Sargent: the Visitor Center/Main Offices; Gate House; Boat House; and Carriage House. The landscape and buildings are contributing resources to the Waquoit Village National Register District.



The Ignatius Sargent House is the administrative headquarters for the four parks within the Reserve. The accessible entrance to the visitor center is visible in the center of the photo. (See Appendix G for Photo information.)

**Table 3.3.1. Significant events in the history of WBNERR and Caleb Pond.**

| Year(s)   | Events   |
|-----------|--|
| 1974-1978 | The state investigates the feasibility of establishing one or more National Estuarine Sanctuaries (now called National Estuarine Research Reserves) at Waquoit Bay.  |
| 1979      | Waquoit Bay designated as an Area of Critical Environmental Concern.   |
| 1981      | Commonwealth recommends Waquoit Bay for designation as a National Estuary Sanctuary. It is awarded a pre-acquisition grant to further evaluate the site, collect information necessary for a management plan, draft an Environmental Impact Statement, and begin preliminary acquisition activities. |
| 1987      | Federal funding is used to acquire the Sargent Estate to serve as the Reserve's visitor center and headquarters.   |
| 1988      | Formal designation as a National Estuarine Research Reserve.   |
| 1989-1991 | Legislature authorizes over \$1,500,000 for the establishment of WBNERR.   |
| 1994-1999 | \$1,240,000 in federally-funded grants is authorized for exhibits and renovations.   |
| 2008      | Caleb Pond parcel added to the reserve.  |

**Table 3.3.2. Cultural resources of WBNERR and Caleb Pond.**

| Location and Resource            | Type <sup>a</sup> | Date <sup>b</sup> | Condition <sup>c</sup> | Integrity <sup>d</sup> | In Use <sup>e</sup> | Utilities <sup>f</sup> | MHC # <sup>g</sup> | Guidance <sup>h</sup> |
|----------------------------------|-------------------|-------------------|------------------------|------------------------|---------------------|------------------------|--------------------|-----------------------|
| <b>Waquoit Village</b>           | MHCA              | 1750-1900         | -                      | -                      | -                   | -                      | FAL.A              | -                     |
| <b>Waquoit Historic District</b> | NRHD              | 1750-1900         | -                      | -                      | -                   | -                      | FAL.AY             | -                     |
| <b>Reserve Headquarters</b>      |                   |                   |                        |                        |                     |                        |                    |                       |
| Sargent Estate Landscape         | LA                | 1880s             | -                      | M                      | -                   | -                      | -                  | 1                     |
| Ignatius Sargent House           | BU                | 1885              | 3                      | H                      | Y                   | E, H, I, S, T, W       | FAL.242            | 1                     |
| Gate House                       | BU                | 1885              | 2                      | M                      | Y                   | E, H, I, S, T, W       | FAL.795            | 1                     |
| Boat House                       | BU                | 1885              | 3                      | M                      | Y                   | E, H, I, S, T, W       | FAL.796            | 1                     |
| Carriage House                   | BU                | 1885              | 3                      | H                      | Y                   | E, H, I, S, T, W       | FAL.797            | 1                     |
| Well                             | AR                | ca. 1885          | 5                      | M                      | -                   | -                      | -                  | 2                     |

- Resource types include the following: AR = Archaeological; BU = Building; LA = Landscape; MHCA – Massachusetts Historic Commission Area; NRHD = National Register Historic District; OB = Object; and ST = Structure.
- Date of construction provided, when known.
- Building system and equipment condition codes as used in the Massachusetts Capital Asset Management Information System (CAMIS): 1 = Excellent-easily restorable to like new condition; 2 = Good-routine maintenance required; 3 = Adequate-some corrective and preventative maintenance required; 4 = Fair-excessive corrective maintenance and repair required; 5 = Poor-renovation needed; and 6 = Fail.
- Integrity is a relative assessment of the condition of a resource's retention of its historic character-defining features; H = High; L = Low; M = Medium; and U = Unknown.
- Use categories include: N = building is not in use; S = building is used on a seasonal basis; and Y = building is used year-round.
- The following codes are used to identify utilities associated with buildings: E = Electric; H = Heat; I = Internet; S = Septic system; T = Telephone; W = Water; and W(S) = Water is available on a seasonal basis. This information is included for all buildings.
- Massachusetts Historical Commission inventory number.
- The following guidance is offered for the ongoing maintenance of these cultural resources:
  - Refer to Historic Landscapes - Built Features BMP (DCR n.d.g).
  - Refer to Archaeological Features BMP (DCR n.d.k).

The landscape retains integrity in the collection of original structures and the prominence of the estate's original circular drive. Much of the planted landscape has been altered to create educational exhibits, however, many mature trees including maple, birch, and oak, which most likely date from the estate period remain, and the vista from the house to the bay remains cleared. The entry drive is edged with planted trees and although the estate is relatively small, the open, undeveloped naturalistic landscape bordering the approach retains its historic integrity and sense of separation from Route 28. In addition, the low stone wall and entry gates that enclose the estate remain in excellent condition.



The Sargent Estate's circular drive and Carriage House. (See Appendix G for Photo information.)

The estate core is the last remaining example of the late 19<sup>th</sup> century summer estates that once characterized the Waquoit Village area. This intact collection of estate buildings and landscape features is a significant and rare resource within the DCR system, as many former estates acquired by the agency have lost significant structures and landscape elements to deferred maintenance and vandalism. The active reuse of the buildings by the Reserve is a great benefit to the long term preservation of the resource but also carries additional care and responsibility.



The Boat House as viewed from the shore of Waquoit Bay. (See Appendix G for Photo information.)

### Structures

There are no historic structures that are not associated with Sargent Estate landscape.

### Objects

There are no known historic objects.

## **3.4. RECREATION RESOURCES**

WBNERR's main functions are research, education/outreach, administration, and operations. As a result, there is little recreation infrastructure, and few recreational activities take place here. There is no beach access for the general public. The following recreational activities are known to take place:

- Fishing, shellfish
- Geocaching (1 cache as of March 2015)
- Hiking
- Nature study (e.g., bird watching)
- Scenic viewing (view across bay to Washburn Island)

## **3.5. INFRASTRUCTURE**

### **Property Boundary**

The WBNERR headquarters area is situated between Waquoit Bay to the south, Waquoit Landing Road to the west, Route 28 and Whistler's Way to the north, and private residences to the east. None of the boundaries are posted.

The Caleb Pond parcel is bounded by a mixture of private residences, pond shores, and Metoxit Road.

These boundaries are posted. Despite this, encroachment may be occurring along Metoxit Road.

A 0.30 acre easement on 71 Whistler's Way (Figure 3.1) allows access for "bathing and other recreational purposes." An additional easement, on 0.46 acres of Town of Falmouth land, allows access to the Caleb Pond property from between 26 and 80 Whistler's Way.

### Buildings and Structures

Most of WBNERR's buildings are historic; constructed as part of the Sargent Estate. (Table 3.3.2) Non-historic buildings are limited to a newly constructed garage/maintenance building, and two sheds. (Table 3.5.1)



This maintenance garage, built in 2013, is the operational center for the four parks within the Reserve. (See Appendix G for Photo information.)

Recent construction and building renovations have focused on increasing energy efficiency and decreasing greenhouse gas emissions. All buildings

are heated with natural gas. Solar panels provide domestic hot water to the gatehouse. Photovoltaic panels adjacent to the gatehouse and on the roof of the garage feed into the electric grid, offsetting electric costs.

There are four septic systems; one for the Sargent House (i.e., headquarters), carriage house, and boat house, and a combined system for the gatehouse and maintenance garage. There are two tight tanks, one for a sink in the carriage house and the other for the floor drains and shop sink in the maintenance garage. All water is provided by the Town of Falmouth.

### Roads

A network of unpaved driveways, either gravel or gravel covered with crushed seashells, provides access to buildings and parking areas. (Figure 3.1) The conditions of these driveways are summarized in Table 3.5.2.

**Table 3.5.2. Condition and length of driveways at WBNERR.<sup>a</sup>**

| Road Condition | Paved (Miles) | Unpaved (Miles) |
|----------------|---------------|-----------------|
| Good           | 0.04          | 0.44            |
| Fair           | 0.00          | 0.00            |
| Poor           | 0.00          | 0.00            |
| <b>Total</b>   | <b>0.04</b>   | <b>0.44</b>     |

a. Based on field assessment; all distances calculated using GIS.

**Table 3.5.1. Non-historic buildings of WBNERR and Caleb Pond.**

| Location and Infrastructure | Date <sup>a</sup> | Condition <sup>b</sup> | In Use <sup>c</sup> | Utilities <sup>d</sup> |
|-----------------------------|-------------------|------------------------|---------------------|------------------------|
| <b>Reserve Headquarters</b> |                   |                        |                     |                        |
| Garage/maintenance building | 2013              | 1                      | Y                   | E, H, I, S, T, W       |
| Shed                        | -                 | 3                      | Y                   | -                      |
| Shed, "Andy's Place"        | -                 | 2                      | Y                   | E                      |

- a. Building system and equipment condition codes as used in the Massachusetts Capital Asset Management Information System (CAMIS): 1 = Excellent-easily restorable to like new condition; 2 = Good-routine maintenance required; 3 = Adequate-some corrective and preventative maintenance required; 4 = Fair-excessive corrective maintenance and repair required; 5 = Poor-renovation needed; and 6 = Fail.
- b. Date of construction provided, when known.
- c. Use categories include: N = building is not in use; S = building is used on a seasonal basis; and Y = building is used year-round.
- d. The following codes are used to identify utilities associated with buildings: E = Electric, H = Heat; I = Internet; S = Septic system; T = Telephone; W = Water; and W(S) = Water is available on a seasonal basis. This information is included for all buildings.



## Parking

Parking is limited, with only 41 public spaces. (Table 3.5.3; Figure 3.1). Accessible parking lot is provided in a two-car lot adjacent to the Sargent House. This lot is gravel, with a covering of crushed seashell. It lacks proper signs and an access aisle.

**Table 3.5.3. Number of public parking spaces, by location and type, at WBNERR.**

| Location                                | HP       | Other     | Total     |
|---|----------|-----------|-----------|
| Main Lot <sup>a</sup>                   | 0        | 20        | 20        |
| Boat House <sup>a</sup>                 | 0        | 2         | 2         |
| Carriage House – West Side <sup>a</sup> | 0        | 5         | 5         |
| Off-Loop <sup>a</sup>                   | 0        | 4         | 4         |
| Sargent House                           | 2        | 0         | 2         |
| Gate House <sup>a</sup>                 | 0        | 8         | 8         |
| <b>Total</b>                            | <b>2</b> | <b>39</b> | <b>41</b> |

a. Number of spaces is based on the number of potential 9-foot-wide spaces.

During the summer, parking spaces adjacent to the gatehouse are used by visiting researchers staying in that building. Employees park in the main lot, adjacent to the boat house, to the south of the carriage house, and in a lot adjacent to the new garage. Only the last of these lots is paved.



WBNERR's only designated HP parking is located adjacent to the Sargent House's ramp, on soft soil. (See Appendix G for Photo information.)

## Trails

A small formal trail system loops through the property. It is largely located among the forested portion of the property. This trail incorporates portions of the driveway, walkways, and lawns, as well as more traditional single-track. The numbers of miles of trails, by condition, are presented in table 3.5.4.

**Table 3.5.4. Condition and length of official trails at WBNERR.**

| Trail Condition | Length (Miles) |
|-----------------|----------------|
| Good            | 0.46           |
| Fair            | 0.09           |
| Poor            | 0.00           |
| <b>Total</b>    | <b>0.55</b>    |

Paved walkways extend from the carriage house to the main building. However, the paved sections are discontinuous, with no pavement at the two locations where the walkways cross the driveway.

## Kiosks and Signs

An illuminated main identification sign is located at the park's entrance. It is set amidst a wooden trellis bearing metal silhouettes of fish. A three-sided kiosk is located along the path between the carriage house and the main building. The first side bears an interpretive panel on the Sargent Estate; the second side has a panel that identifies the four DCR properties in the National Estuarine Research Reserve, and the third side has a lockable bulletin board for meeting and program notices.



WBNERR's three-sided kiosk is centrally located along the main pathway between the parking lot, carriage house, and the Sargent House. (See Appendix G for Photo information.)

## Iron Ranger

There is no iron ranger. The Waquoit Bay Reserve Foundation (WBRF) has a donation box in the visitor center in the headquarters building.

## Memorials and Markers

A six foot diameter compass rosette, made of stones and bricks, is set in the lawn behind the main building. A National Oceanic and Atmospheric Administration National Geodetic Survey marker is located at the center of the rosette.

### 3.6. INTERPRETATION

The National Estuarine Research Reserve System's mission is to "practice and promote stewardship of coasts and estuaries through innovative research, *education, and training* using a place-based system of protected areas" (NOAA 2011). Emphasis is placed on increasing environmental literacy through education and training. As a result, extensive formal and informal interpretive and educational programs are offered throughout the Reserve, including:

- Coastal Training Program (CTP; for coastal decision makers)
- K-12 Estuarine Education Program (KEEP; for teachers)
- Teachers on the Estuary (TOTE; for teachers)
- Summer Science School (five different week-long educational experiences for grades 2-12)
- Let's Go N'Seine
- Discovery Day
- Waquoit Bay Estate Tour
- Guided Osprey Watching
- Evenings on the Bluff
- Junior Ranger Program, including Fish Prints, Forest Food Webs, All About Waters, and Science at the Shore
- Research at the Reserve seminar series

Additional information on programming at WBNERR and throughout the Reserve is provided in WBNERR (2014).

The ground floor of the headquarters includes a multi-use room for presentations and a visitor center. The latter includes several professionally developed and prepared static displays covering watershed-related topics (e.g., septic systems and nutrients).



Interpretive displays in the visitor center; emphasis is on watershed protection. (See Appendix G for Photo information.)

A self-guided nature trail runs throughout the developed portion of the property. It includes the following nine interpretive displays; all relate to features on the WBNERR landscape, many involve demonstration projects:

- It takes a Watershed to Protect a Bay
- Energy Efficiency
- Lawn Care
- Composting (demonstration project)
- Gardens (demonstration project)
- Green Your Ride
- Taming Stormwater (demonstration project)
- Ecological Landscaping (demonstration project)
- Powered by the Sun (demonstration project)



Many interpretive displays, such as this rain garden, include both signs and practical demonstration projects so that visitor's may apply these lessons to their own backyards. (See Appendix G for Photo information.)

### 3.7. MANAGEMENT RESOURCES

#### Staffing

##### DCR Personnel

All WBNERR staff members are DCR employees whose positions are funded through a combination of state and federal funds. (Table 3.7.1) Many of these positions are unique to this park. All staff members are based at WBNERR, but their responsibilities are Reserve-wide.

A variety of seasonal employees supplement the permanent staff. These employees may be assigned to work at any of the four properties in the Reserve. However, some are primarily associated with South Cape Beach and others are primarily associated with Washburn Island. Because of this, seasonal staffing information is presented in Sections 4 and 5.

##### Partnerships and Volunteers

The WBRF was established to support the Reserve through fundraising and volunteerism. They organize the science summer school, manage grants, and raise funds. Their activities cover all four parks within the Reserve.

##### Public Safety

The Falmouth Fire and Police departments provide fire response, emergency services, and law enforcement.

#### Funding

##### Conservation Trust Fund

There are no funds in the Conservation Trust Fund dedicated to WBNERR.

##### Retained Revenue

There are no retained revenues.

##### Other Revenues

Funding for WBNERR and the other three properties that constitute the Reserve is unique in the DCR system, as it originates from both the Commonwealth and NOAA. Federal funds are provided in the form of grants to the Commonwealth.

**Table 3.7.1. Mass Parks personnel assigned to WBNERR; current and past.**

| Job Title                                   | Number of Positions<br>2014 | Number of Positions<br>2005 |
|---|-----------------------------|-----------------------------|
| <i><b>Year-round Personnel</b></i>          |                             |                             |
| Administrative Assistant II                 | 1                           | 1                           |
| -Fiscal Administrative Assistant            |                             |                             |
| Environmental Analyst II                    | 1                           | 1                           |
| -Research Coordinator                       |                             |                             |
| Environmental Analyst II <sup>a</sup>       | 1                           | 1                           |
| -Stewardship Coordinator                    |                             |                             |
| Forest and Park Supervisor II               | 1                           | 1                           |
| Laboratory Technician II <sup>b</sup>       | 1                           | 0                           |
| -GIS/Research Technician                    |                             |                             |
| Program Coordinator I <sup>a</sup>          | 0                           | 1                           |
| -Community Educator                         |                             |                             |
| Program Coordinator I <sup>a</sup>          | 1                           | 1                           |
| -CTP Coordinator                            |                             |                             |
| Program Coordinator I                       | 1                           | 1                           |
| -Education Coordinator                      |                             |                             |
| Program Coordinator I <sup>a</sup>          | 1                           | 0                           |
| -School & Interpretive Program Coordinator  |                             |                             |
| Program Coordinator I <sup>a</sup>          | 1                           | 0                           |
| -Volunteer & Events Coordinator             |                             |                             |
| Program Coordinator I <sup>a</sup>          | 0                           | 1                           |
| -Volunteer & Interpretive Coordinator       |                             |                             |
| Recreation Facilities Repairer <sup>c</sup> | 1                           | 1                           |
| Reserve Manager                             | 1                           | 1                           |
| Skilled Laborer II <sup>c</sup>             | 1                           | 1                           |
| Technology & GIS Coordinator <sup>a</sup>   | 0                           | 1                           |
| <i><b>Seasonal Personnel</b></i>            |                             |                             |
| Forest and Park Supervisor I (Short-term)   | 1                           | 0                           |
| Park Interpreter (Long-term)                | 1                           | 1                           |
| Park Interpreter (Short-term)               | 1                           | 0                           |

a. Federally funded.

b. Combined position funded through a combination of federal funds and grants in 2014.

c. These positions exist, but are unfilled in 2015.

Typically a “Consolidated Funding” grant is awarded to partially support staff, programming, and operations. Additional grants may be awarded to support specific activities, such as land acquisition, facility and exhibit upgrades, and technology upgrades. In federal FY 2014, there was \$593,000 in Consolidated Funding and no land acquisition funds. A \$216,112 grant was awarded to WBNERR by NOAA, for the purpose of reducing the Reserve’s carbon footprint.

The WBRF may “solicit, receive, distribute, and administer grants and donations for funding of research, monitoring, stewardship, education, interpretive, cultural, and recreational programs, activities, supplies, and equipment related to” the entire Reserve. They may also operate on-site concessions.

There are two ways that the WBRF generates revenue at WBNERR; both involve donations. Visitors staying overnight in the gatehouse (e.g., visiting researchers) are asked to consider making a voluntary contribution of \$20 per night to WBRF; these revenues are used to maintain and clean the gatehouse. Second, contributions placed in the headquarters’ donation box also go to the WBRF. These donations are combined with revenues generated off-site (e.g., membership fees) to fund such items and activities as supplies for volunteers and the visitor center (e.g., display cases), and thank you cookouts for volunteers.

### 3.8. MANAGEMENT PRACTICES

Management of DCR properties is guided by a variety of regulations, policies, BMPs (e.g., Table 3.3.2), legal agreements, and institutional knowledge. In addition, WBNERR’s inclusion in the National Estuarine Research Reserve System carries with it a variety of federal and NOAA requirements. This section describes those practices unique to the management of WBNERR. Emphasis is placed on state and DCR practices; additional requirements are identified in WBNERR (2014).

Legal agreements unique to WBNERR are listed in Table 3.8.1.

**Table 3.8.1. Key legal agreements for WBNERR.**

| Party and Subject of Agreement  | Type <sup>a</sup> | Expiration Date <sup>b</sup> |
|---|-------------------|------------------------------|
| <b>National Oceanic and Atmospheric Administration</b><br>State and federal roles in management of WBNERR | U                 | None                         |
| <b>Waquoit Bay Reserve Foundation</b><br>Support for mission of WBNERR                                    | A                 | 2018                         |

- Agreement types include: A=Memorandum of Agreement; E=Easement; L=Lease; and U=Memorandum of Understanding.
- Year that agreement expires. Permanent agreements are indicated by an expiration date of “None.”

Key management and guidance documents are identified below. (Table 3.8.2)

**Table 3.8.2. Key management and guidance documents for WBNERR.**

| Author and Document   | Year              |
|---|-------------------|
| <b>Gannett Fleming, Inc.</b><br>Environmental Audit Report: Waquoit Bay National Estuarine Research Reserve, Falmouth, MA.  | 1998 <sup>b</sup> |
| <b>Massachusetts Natural Heritage and Endangered Species Program and Massachusetts Department of Natural Resources Conservation (sic).</b><br>Habitat management for a federally-listed plant..., Falmouth. | 2009              |
| <b>Louis Berger Group, Inc.</b><br>Waquoit Bay stream restoration master plan; Falmouth and Mashpee, Massachusetts.   | 2010              |
| <b>Waquoit Bay National Estuarine Research Reserve</b><br>Emergency operations plan for the Waquoit Bay National Estuarine Research Reserve.  | 2012              |
| <b>Whiddon, A. J.</b><br>Prescribed Fire Plan. Administrative Unit(s): Waquoit Bay National Estuarine Research Reserve.   | 2012 <sup>a</sup> |
| <b>Waquoit Bay National Estuarine Research Reserve.</b><br>Hurricane preparedness and response plan for the Waquoit Bay National Estuarine Research Reserve. 2013.  | 2013              |
| <b>Waquoit Bay National Estuarine Research Reserve.</b><br>Waquoit Bay National Estuarine Research Reserve; Management Plan; 2013-2017.   | 2014              |



The 2014 Management Plan (WBNERR 2014) covers all properties in the Reserve, and addresses Reserve research, education programs, and staffing in detail. It does so from the perspective of the National Estuarine Research Reserve System. This plan is updated every five years, per NOAA requirements.

### Advisory Committees

The following three committees provide input on matters of policy and operations at WBNERR:

- Waquoit Bay National Estuarine Research Reserve Advisory Committee
- CTP Advisory Committee
- KEEP Advisory Committee

### Research Activities

The Reserve has a formal registration procedure for research activities; it is administered by the Research Coordinator. Visiting researchers must submit a Research Registration Form in order to obtain temporary housing in the gatehouse, or to use classroom or lab space. Researchers must submit a formal Field Safety Plan prior to beginning their studies. Moorings are available for research vessels on a first-come first-served basis. The Reserve has general research permits from the towns of Falmouth and Mashpee that cover common activities; less common activities may require project-specific filings under the Wetlands Protection Act.

### Annual Maintenance

Ongoing management practices typically follow a regular schedule. Common activities, and the desired frequency with which they occur, are identified in Table 3.8.3.

**Table 3.8.3. Annual cycle of management activities at WBNERR.**

| Activity                                 | Spring <sup>a</sup> | Summer <sup>a</sup> | Fall <sup>a</sup> | Winter <sup>a</sup> |
|--|---------------------|---------------------|-------------------|---------------------|
| Cleaning - Bathroom(s)                   | AN                  | E3/AN               | E3/AN             | E3/AN               |
| Cleaning-Visitor Center                  | D1/AN               | D1/AN               | D1/AN             | D1/AN               |
| Cleaning - Walkways                      | AN                  | AN                  | AN                | D1/AN               |
| Litter removal - Trails                  | AN                  | AN                  | AN                | AN                  |
| Maintenance - Picnic sites, fences, etc. | AN                  | AN                  | AN                | N/A                 |
| Mowing and trimming                      | E7/AN               | E7/AN               | E7/AN             | N/A                 |
| Mulching and fertilizing                 | AN                  | AN                  | AN                | N/A                 |
| Pruning - Trees and shrubs               | AN                  | AN                  | AN                | AN                  |
| Trash - Empty - Barrels                  | N/A                 | AN                  | N/A               | N/A                 |
| Trash-Empty-Bathroom                     | E7/AN               | E7/AN               | E7/AN             | E7/AN               |
| Weeding - Flower beds and grassy areas   | N/A                 | N/A                 | N/A               | N/A                 |
| Weeding - Paved areas                    | N/A                 | N/A                 | N/A               | N/A                 |

a. Frequency codes are: A1 = Once annually; AN = As needed; D = Daily, # times; E = Every # days; N/A = Not applicable.

## Natural Resources

### Water Resources

There are five rain gardens. They serve the dual functions of managing storm water and educating the public about storm water management.

Wastewater accumulated in the carriage house and garage's tight tanks is transported off-site for treatment and disposal. The carriage house's tank has not needed pumping in the past 14 years, and the maintenance farage's tank is too new to have identified the frequency of pumping.

No fertilizers other than compost are used at WBNERR, and reducing fertilizer use in the watershed is a major focus of the Reserve's education programs.

There is no barrier beach management plan for the park.

### Rare Species

The headquarters' cultural grasslands are managed to promote a population of a rare plant. Portions of these grasslands have been designated "no mow" areas from June to December. These areas are

identified with post and rope symbolic fencing, and a sign.

From 2009–2012, autumn olive, yucca, wisteria, and bayberry encroaching on rare plant habitat were removed from the site. Additional management, including prescribed burns (Whiddon 2012a) is implemented as needed.



Prescribed burning is periodically used to maintain appropriate vegetative conditions in the rare species management area. (See Appendix G for photo information.)

### Invasive Species

Invasive plants are actively managed in critical resource areas as staffing and funding allow.

### Vegetation

The timing and location of mowing has been adjusted in response to rare plant management needs. (See Rare Species, above.) Lawns outside the rare plant management area are cut in accordance with the annual work cycle. (Table 3.8.3)

Compost is generated on-site and used to fertilize lawns and flower beds.

### **Cultural Resources**

The entire headquarters area is within the Waquoit Village National Register Historic District. If federal funds, such as NOAA grants, are used to change the property, the Advisory Council on Historic Preservation must be allowed to comment on the project.

### **Recreation Resources**

There are no recreation resources to manage.

## **Infrastructure**

### Buildings

Visiting researchers may use on-site housing, and laboratory and classroom space. Access to these facilities requires submission of a Research Registration Form.

### Roads

The use of broken seashells as the driveway surface requires that snow plows be raised above the driveway surface. The driveway and parking lots are sanded when plowed.

### Parking Areas

The use of broken seashells as the surface of the main lot and off-loop lot requires that snow plows be raised above the lot surface.

### Trails

Trails are maintained by the Stewardship Coordinator with the assistance of volunteers.

### Kiosks and Signs

Park employees are responsible for updating the content of kiosk's bulletin board and an additional bulletin board on the headquarters' porch.

## **3.9. RECOMMENDATIONS**

### **Introduction**

This section provides recommendations for the near- and long-term management of WBNERR. Applied Land Stewardship Zoning recommendations provide general guidance for managing WBNERR. Future activities and projects should be checked against the zoning map (Figure 3.2) for consistency. Management recommendations for WBNERR are all high-priority, and should be addressed as soon as resources become available.

### **Applied Land Stewardship Zoning (Figure 3.2)**

The following Land Stewardship Zoning is recommended for Waquoit Bay National Estuarine Research Reserve.

### Zone 1

Two sections of WBNERR have been designated Zone 1.

- The barrier beach, salt pond marsh, and coastal bank.
- The rare species management area.

### Zone 2

Three areas have been designated Zone 2.

- Forested uplands surrounding the salt pond.
- The forest area north and east of WBNERR's buildings and lawns.
- Caleb Pond parcel.

### Zone 3

Areas designated Zone 3 include:

- All existing buildings, driveways, walkways, and parking areas.
- Sections of maintained lawn that is not rare plant habitat.

### Significant Feature Overlay

There are no Significant Feature Overlays.

### **Management Recommendations**

Six priority management recommendations were developed for Waquoit Bay National Estuarine Research Reserve. (Table 3.9.1) For a recommendation to be considered priority it must address one or more of the following criteria:

- Regulatory compliance or compliance with legal agreements.
- Threats to the health and safety of park visitors and employees.
- The imminent loss of a natural, cultural, or recreation resource.

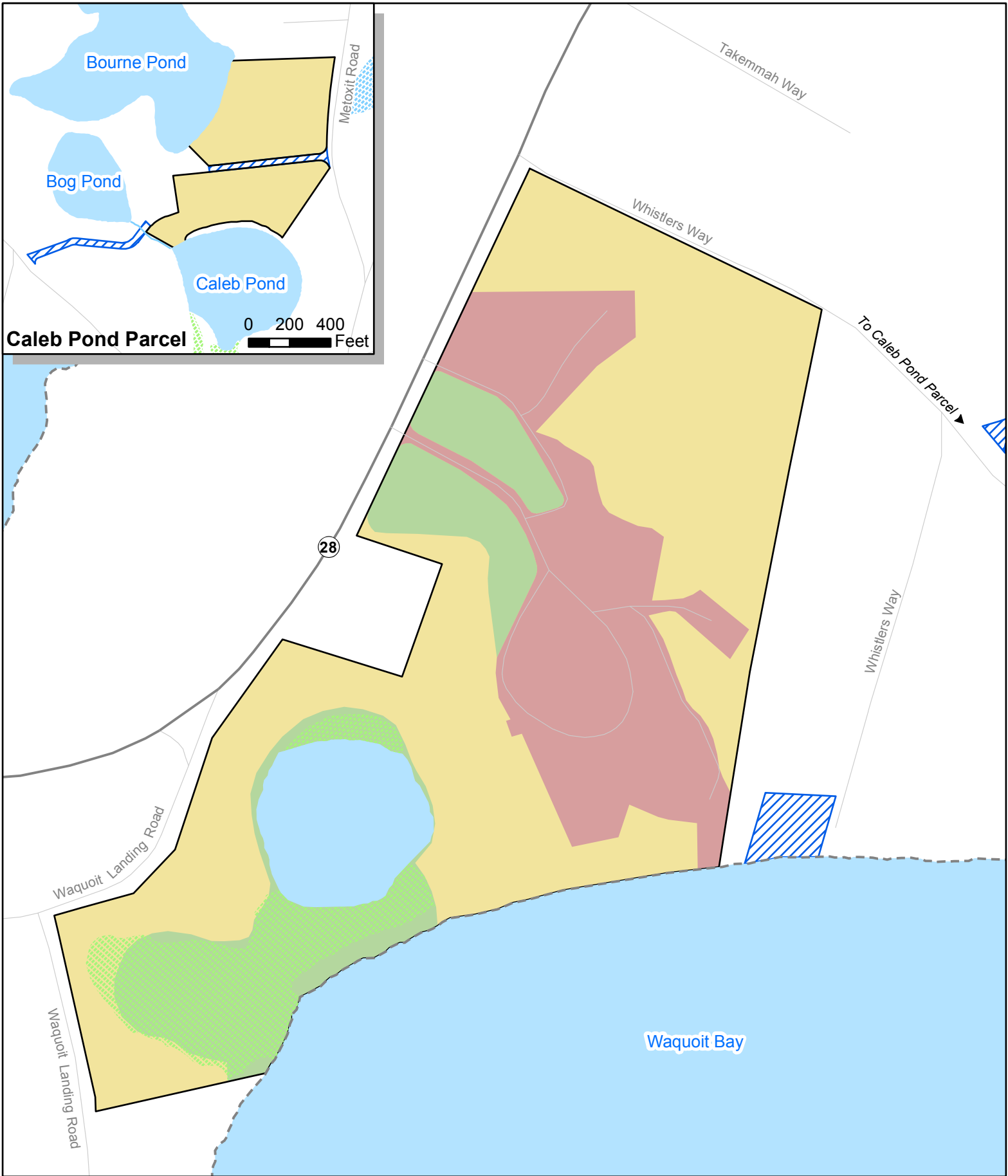
Additional maintenance and management needs observed during the preparation of this RMP, but not meeting one or more of the above criteria, are not included in this plan.

The following recommendations are of equal priority.

**Table 3.9.1. Priority recommendations for WBNERR and Caleb Pond.**

| <b>Recommendation</b>   | <b>Implementation<sup>a</sup></b> |
|---|-----------------------------------|
| Prepare a barrier beach management plan.  | P, R                              |
| Continue ongoing rare plant monitoring and management activities.   | R                                 |
| Minimize any further impact on the historic landscape by retaining trees, keeping the view from the main house/visitor's center to the bay cleared, and limiting the introduction of new features in areas that retain the integrity of the historic landscape. | R, V                              |
| Investigate potential encroachment along Metoxit Road and resolve with abutters, if warranted.  | L, R                              |
| Provide at least two accessible spaces, access aisles, and proper pavement markings and signs; at least one must be van accessible.   | C, E, U                           |
| Fill vacant park operations positions.  | O, R                              |

- a. The following codes identify the party or parties responsible for implementing the recommendations: B = Bureau of Ranger Services; C = Contractor; E = Division of Engineering; F = Bureau of Forest Fire Control and Forestry; L = Legal Services; O = Other; P = Bureau of Planning, Design & Resource Protection; R = Regional and district staff; U = Universal Access Program; V = Volunteer or partner; and X = Office of External Affairs and Partnerships.



- Major Road
  - Minor Road
  - Hydrologic Connection
  - Town Boundary
  - Marsh
  - Salt Marsh
  - Open Water
- Land Stewardship Zoning
- Zone 1
  - Zone 2
  - Zone 3
  - Easement

**WBNERR**

Figure 3.2. Recommended Land Stewardship Zoning

0 100 200 Feet

Geographic information provided by MassGIS and DCR GIS.

