

Introduction

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Maine's coast contains treasures of ecology, tradition and natural beauty. Hidden among the fragile reeds of its salt marshes are innumerable crossroads. From the ferry crossings that tied together a narrow, rough highway in the seventeenth century, to the biological intersection between spawning and adulthood for every catadromous and anadromous fish, to the point where the continent, river, ocean and sky all touch and intermingle, to the myriad of other symbolic and physical meeting points, countless worlds interlock in a Maine estuary. The Wells National Estuarine Research Reserve is home to two such estuaries.

ESTUARINE TYPE CHARACTERIZATION

Both the Webhannet and Little River estuaries were formed in the shelter of barrier beach spits and for this reason are termed “back-barrier marshes.” Although they are among the largest salt marshes in Maine, they are considered small when viewed in a national or international context. They are dominated by strong tidal currents due to the large tidal range in the Gulf of Maine. The Webhannet Estuary generally contains well mixed, marine-salinity water, due to a small watershed, small freshwater inflow and a shallow basin which drains almost completely during low tide. The Little River is likewise tide-dominated, but a much larger drainage area

funnels more fresh water inflow into a smaller marsh and channel, generating lower salinities and partial stratification of the water column.

HABITATS

Wells NERR encompasses three broad habitats types—wetlands, upland and beach—each containing a variety of environmental conditions. The diversity, large size and close vicinity of these habitats makes for an ecologically rich area, a setting which has become exceptionally rare along the coast of New England. The impressive diversity of habitats is actively protected and managed by the Reserve.

The wetlands of Wells NERR include salt marsh, red maple swamp, shrub swamp and brackish marsh. The 1,200 acres of salt marsh is the dominant habitat type at the Reserve. Complex plant associations, intricate drainage channels, extensive marsh pools, and regular inundation by tides mark this high energy habitat. This intertidal zone bears the marks of its diverse geologic history, with mud flats, fine to coarse sands, to cobble and boulder beaches. Resident and migrating fish and birds make their diets of the invertebrates that inhabit this area. These marshes formed behind double spit barrier beaches over the past 3,000 to 4,000 years. Early

European settlers valued them as ready-formed, bounteous meadows in an otherwise adverse environment.

Red maple swamp and floodplains are found along the Merriland River, Branch Brook and between Wells NERR campus and the salt marshes. Alder and winterberry holly dominate the understory, while sedges, ferns and wetland herbs form an herbaceous layer. Where freshwater species are able to intrude, a shrub swamp habitat forms, occurring in the upper reaches of the Little River and in areas of stagnant water where flow has been restricted. North of Route 9 is an area where saltwater and freshwater plant species intermingle. Another habitat, brackish marsh, has formed on the north side of Drakes Island Road, where flow historically has been restricted between the open marsh and a tributary channel. This area is currently subject to restoration efforts, where a self-regulating tide gate has been installed.

The uplands include both fields and woodlands. Before European settlement in the middle 1600's, oak-pine forest dominated the area which is now the Reserve. These forests were cleared for timber and fuel, and maintained as fields for farming and defense. Over the past two centuries, farms have been abandoned, making second-growth forest the most common land cover in the region, and threatening species which depend on open and semi-open land cover. About 90 acres of fields are mown to maintain grasslands, with two adjacent fields undergoing early succession with shrubs such as barberry, honeysuckle, bayberry and pasture rose. Abandoned apple trees and hawthorn trees line the edges of these transitional areas. Besides recalling Laudholm Farm's more than three and half centuries of agricultural heritage, these lands provide open and semi-open habitats essential to the grassland-nesting birds and other ani-



Figure 1-1: Wells NERR offers seven miles of hiking and cross-country skiing trails, with several overlooks onto the estuary and ocean.

imals that have become scarce in other parts of the New England coast.

In the northern portion of the Reserve is an oak-pine forest with a significant red maple component and other species intermixed. Heath shrub, in particular blueberry, dominate the understory. Mixed second-growth forest also occurs on site, where formerly cleared areas have been abandoned. Beaches and dunes form the third broad habitat category. Virtually all of the beaches in southern Maine have been extensively built upon. Laudholm Beach is an exception, an undeveloped stretch of vegetated dunes and smooth sand which flanks the entrance to the Little River. This beach consists of a low, partially stabilized foredune near the mouth of the river, stable backdunes and an overwash area. The rest of the beaches at Wells NERR, from Drakes Island Beach just west of Laudholm Beach to the jetties at the Webhannet, and then farther west to Wells and Moody beaches, are rimmed by dense residential development on the former dunefield. Drakes Island Beach and many stretches of Wells and Moody beaches are bordered by seawalls: at high tide there is no useable beach at all, as water inundates the entire sand surface.

HISTORICAL AND CULTURAL SETTING

Henry Boade settled on and farmed the highest point along the coast of the newly established town of Wells in 1642, enjoying a sweeping view of Wells embayment and ready-made pasture in the form of salt marshes. From these earliest days, the principal road in the territory of Maine ran through the property, along the hard sand beach to a ferry crossing at the Little River mouth. The route's importance is known today from the rebuke suffered by the town of Wells at the pen of the Massachusetts general court in 1658 for "exceedingly badd" condition of the road.

The farm was sold to the Symonds brothers in 1655, with the Boade family retaining a life estate with farming rights. The land was worked for twenty years before the houses were burned and abandoned during King Philip's war. It apparently lay fallow during this dangerous period, until it was sold again in 1717 to the Clark family. Nathaniel Clark resettled the property and re-established the farm which would remain in his family for over a century and

a half. He and his heirs grew the operation into the largest, most productive farm in town. Agriculture typically consisted of oxen, cows, horses, sheep, pigs, grains and hay. All of these early owners actively participated in town government as selectmen (Butler 2005).

In 1881, the Lord family bought the property. George Clement Lord, president of the Boston and Maine Railroad, had a new rail station built at the end of Laudholm Farm Road and enjoyed the property as a summer retreat for himself and his family. Agriculture activity expanded with the addition of registered Guernsey cows in 1892, later becoming an award-winning herd that produced high-value milk and butter. When burning shingles drifted onto the farm from a quarter mile away reducing two barns to ashes, a magnificent "James Way" barn was put up in their place, and this sturdy construction still greets visitors today as they pull into the parking lot. During the 1920's and 1930's, the farm hosted "field days" open to the public, with music, speakers and children's activities (Butler 2005).

The farm continued as a full commercial venture until 1925 when most of the herd was sold. During the Depression, the farm was opened to boarders who enjoyed hay rides and the nearby beaches. In 1968, the Maine Department of Conservation purchased 199 acres of meadow, woodland, marsh and beach, ensuring public access to at least a portion of the holdings which had remained essentially unchanged since its settlement over three centuries earlier. Two years later, hundreds of neighboring acres were folded into the Rachel Carson National Wildlife Refuge, ensuring additional conservation management.

When word spread through town that the farm and remaining lands were going to be sold and developed, members of the community organized to protect and conserve it. The Laudholm Trust was formed by the people of Wells and nearby communities to rally support for the farm. In 1984, the Trust and NOAA provided funding to purchase the farm, helping to establish the 1,600-acre Wells National Estuarine Sanctuary under the 1972 National Estuarine Sanctuary Program. Two years later, it was rededicated as the Wells National Estuarine Research Reserve, the fourteenth in the nation. The last private owners were granted a life estate within the Reserve borders, just as the first

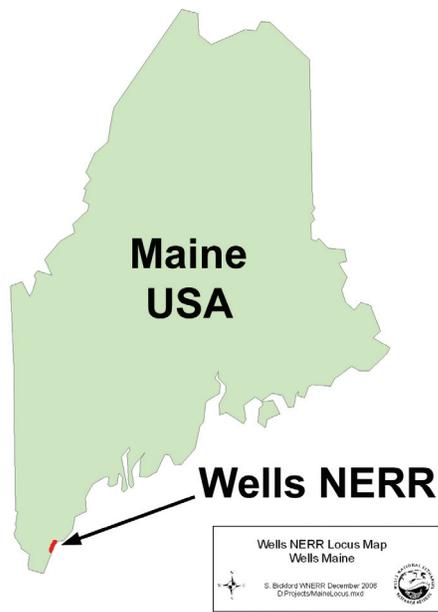


Figure 1-2: Location of Wells NERR.

owners had been three centuries earlier. The public now enjoys access to the farm and beach as so many family members and visitors have in the past (Butler 2005).

Wells NERR goes beyond providing public access to a historical site with miles of trails through undeveloped woods, fields and beaches (Fig. 1-1). Over four hundred volunteers give their time and often their valuable expertise to the Reserve. Citizens serve as naturalists who lead tours; research assistants who sample water, measure beach erosion, clean beaches, help with marsh restoration and shoreline surveys. Maintenance, library and administrative volunteers perform many essential tasks and form a strong grassroots link between the Reserve and the community that was so instrumental in creating it.

THE NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

The NERR system is a partnership between the National Oceanic and Atmospheric Administration (NOAA) and coastal states established in 1972 by the Coastal Zone Management Act of 1972, as amended. Currently, the network is comprised of 27 sites around the nation. Sites represent different biogeographic regions of the United States, and are protected for the purposes of long-term research, water quality monitoring, education and stewardship. Wells NERR is the northernmost Reserve

on the East Coast. It is located in the southern Gulf of Maine province of the Acadia biogeographic region (Fig. 1-2). Wells NERR is one of two Reserves so located, the other being Great Bay NERR in New Hampshire. In contrast to Great Bay, which contains a large bay significantly inland from the ocean, Wells is comprised of two small watersheds on the open coast.

Reserves work with citizens, elected officials, non-profit organizations and other groups within their communities to address environmental issues such as non-point source pollution, habitat protection and restoration, and invasive species. Much of their stewardship efforts focus on land outside Reserve boundaries because upland activities there have a profound effect on estuarine water quality.

Wells NERR is a partnership between the National Oceanic and Atmospheric Administration and the State of Maine. Administrative oversight is vested in the Reserve Management Authority (RMA), established by the state in 1990 to support and promote the interests of Wells NERR. The RMA is composed of representatives having a property, management, program, or financial interest in the Reserve. RMA members represent the Maine Department of Conservation, the U.S. Fish and Wildlife Service, the Town of Wells, Laudholm Trust, the Maine State Planning Office and NOAA (Fig. 1-3). Wells NERR is unique among NERRs in that it does not receive dedicated state funding.

Wells NERR maintains collaborations with a range of local, state, federal and university partners to accomplish research, education and stewardship objectives. These include the Maine Departments of Inland Fisheries and Wildlife, Marine Resources, Environmental Protection; University of Southern Maine; University of New England; Natural Resources Conservation Service (U.S. Department of Agriculture); Gulf of Maine Council on the Marine Environment; Casco Bay Estuary Partnership; Southern Maine Regional Planning Commission; York County Audubon Society; and numerous land trusts and municipal conservation commissions. Wells NERR also has close ties to the Maine Coastal Program, which was instrumental in creating the Reserve. Another close partner in research and outreach is Maine Sea Grant, for which the Reserve provides an office on campus.

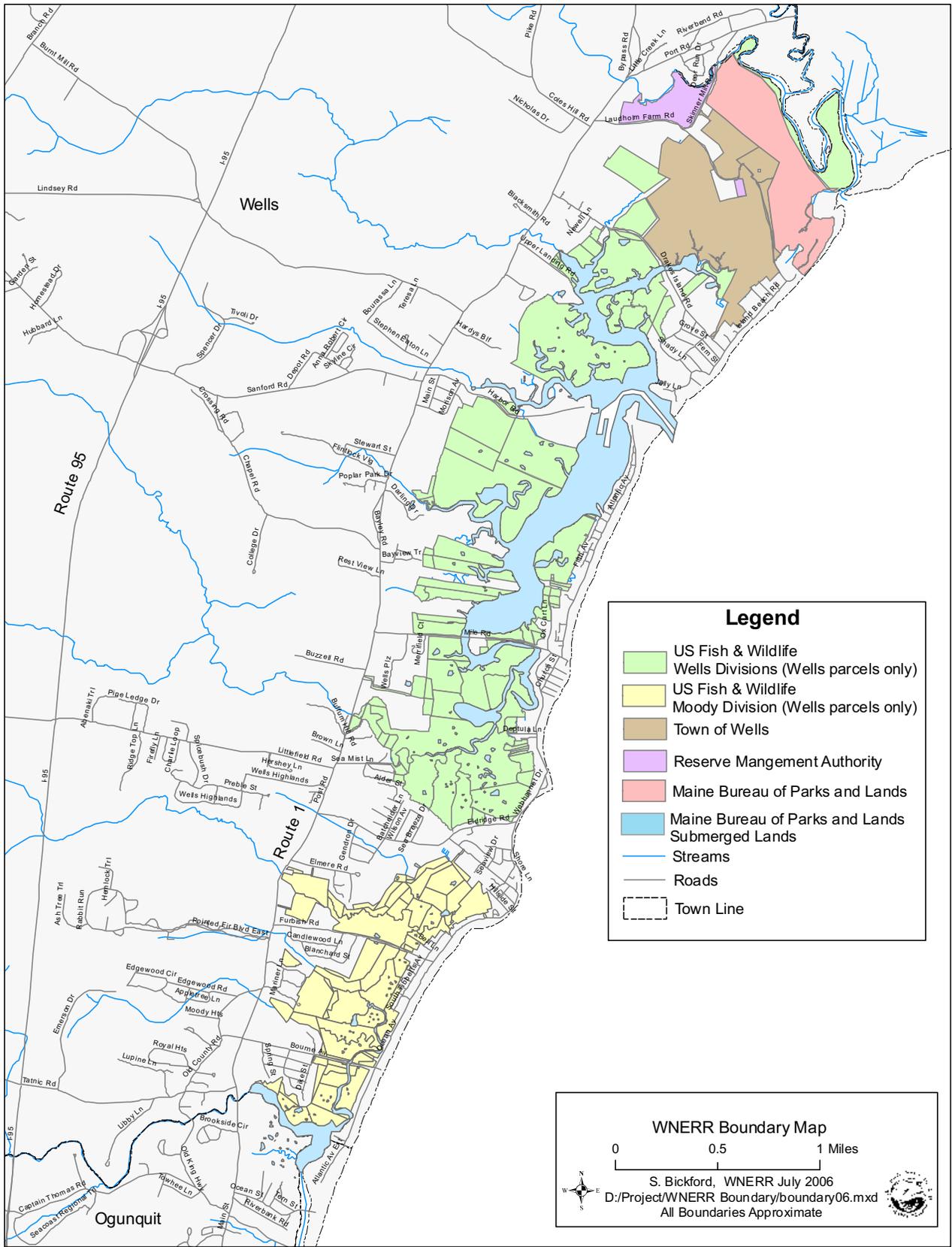


Figure 1-3: Wells NERR boundaries and land ownership. Map Sue Bickford.

ECOLOGICAL SIGNIFICANCE AND DESIGNATIONS OF RESERVE

NOAA has identified 11 distinct biogeographic regions and 29 subregions in the U.S., each of which contains several types of estuarine ecosystems (15 C.F.R. Part 921, Appendix I and II). The Reserve System is designed to include sites representing all 29 biogeographic subregions, with additional sites representing different types of estuaries. The Reserve System currently represents 18 of those sub-regions (Fig. 1-4). The Wells Reserve is the only NERR in Maine and one of two NERRs located in the Acadian Biogeographic Region and the Southern Gulf of Maine Subregion.

MANAGEMENT PRIORITIES

The NERRs form a network of protected areas to promote informed management of the Nation's estuaries and coastal habitats. Federal regulations establish five specific goals for the system:

- ◇ Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources;
- ◇ Address coastal management issues identified as significant through coordinated estuarine research within the System;
- ◇ Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation;
- ◇ Promote Federal, state, public and private use of one or more Reserves within the System when such entities conduct estuarine research; and
- ◇ Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

Reserve System Research Funding Priorities

Federal regulations, 15 C.F.R. Part 921.50 (a), specify the purposes for which research funds are to be used:

- ◇ Support management-related research that will enhance scientific understanding of the Reserve ecosystem,

- ◇ Provide information needed by reserve managers and coastal ecosystem policy-makers, and
- ◇ Improve public awareness and understanding of estuarine ecosystems and estuarine management issues.

The reserve system is focusing on the following research areas to support the priorities above:

- ◇ Eutrophication, effects of non-point source pollution and / or nutrient dynamics;
- ◇ Habitat conservation and / or restoration;
- ◇ Biodiversity and / or the effects of invasive species;
- ◇ Mechanisms for sustaining resources within estuarine ecosystems; or
- ◇ Economic, sociological, and / or anthropological research applicable to estuarine ecosystem management

The Wells NERR approach to implementing the above national goals are embodied in its vision and mission statements.

Wells NERR Vision:

Healthy estuaries and coastal watersheds where coastal communities and ecosystems thrive.

Wells NERR Mission:

The Wells National Estuarine Research Reserve is dedicated to protecting and restoring coastal ecosystems of the Gulf of Maine through integrated research, stewardship, environmental learning, and community partnerships.

In support of the above, the following strategic goals have been developed for Wells NERR.

- ◇ Enhance the public's ability and willingness to appreciate and understand natural environments, make informed decisions, and take responsible actions to sustain coastal communities and ecosystems.
- ◇ Increase understanding of coastal ecosystems through Reserve science, and ensure the results of research are made available to address coastal management issues.

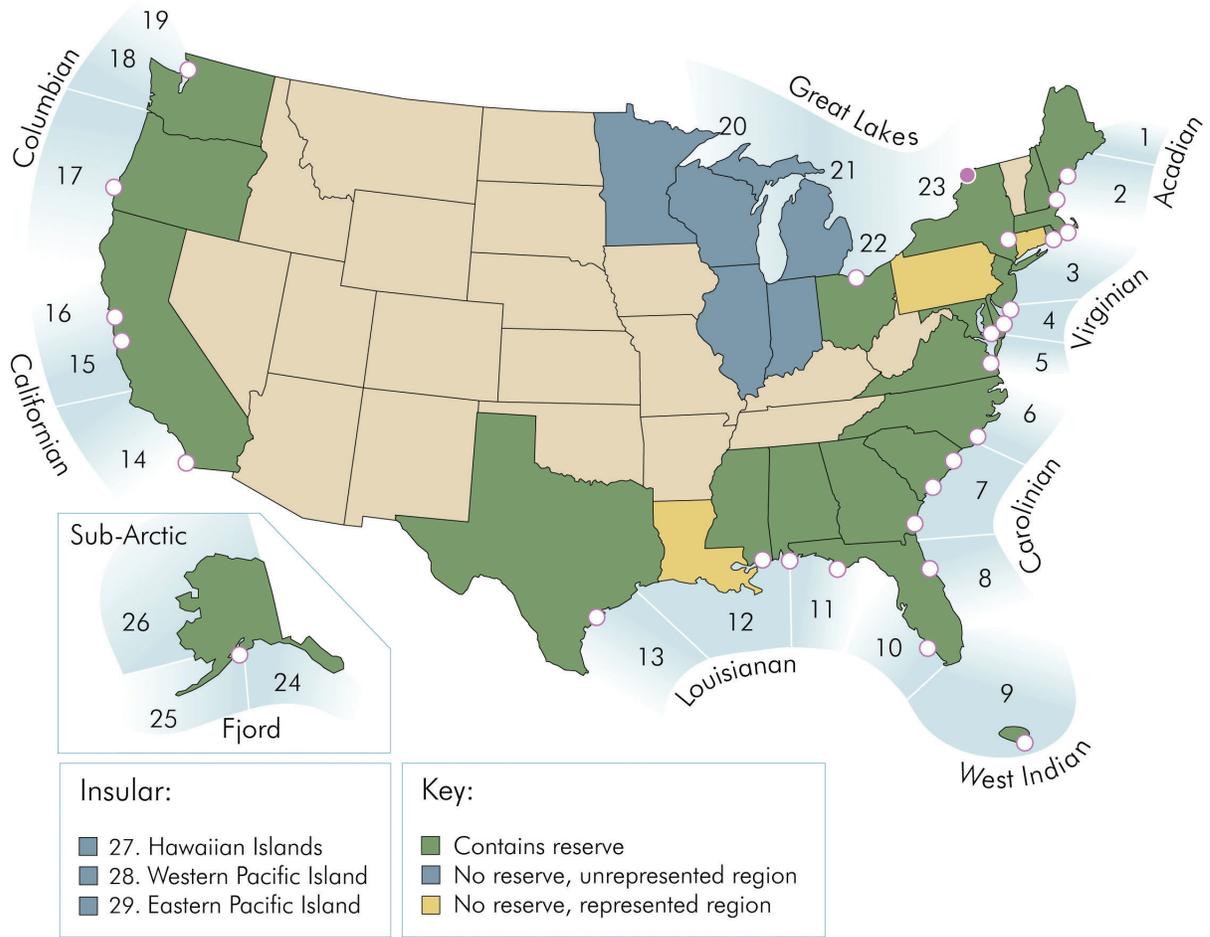


Figure 1-4: Biogeographic regions and locations of National Estuarine Research Reserves.

- ◇ Protect, manage, and restore the natural functions and diversity of coastal habitats for the benefit of communities and ecosystems.
- ◇ Serve as a model site and resource for exemplary coastal stewardship that fosters an understanding of the connections among land, water, and people.
- ◇ Foster a collaborative and collegial environment that values and recognizes personal contributions that enrich both the individual and the organization.
- ◇ Strengthen the organization’s financial foundation to build capacity and enrich programs.

Strategic Objectives for Research Program:

- ◇ Objective 1: Investigate coastal food webs and habitats, their underlying physical and biological processes, and their response to natural changes and human activities.

- ◇ Objective 2: Provide visiting investigators and staff with opportunities to conduct independent or collaborative research at the Reserve and in the Gulf of Maine region.
- ◇ Objective 3: Promote the development and implementation of regionally coordinated ecological monitoring of coastal habitats, and continue to maintain and expand the System Wide Monitoring Program (SWMP).

RESERVE PROTECTION EFFORTS

Wells Reserve lands are owned by four distinct entities (acreage data from Wells NERR GIS): Maine Department of Conservation (146 acres); U.S. Fish and Wildlife Service/Rachel Carson National Wildlife Refuge (1,428 acres); Town of Wells (240 acres); and Reserve Management Authority (40 acres). Wells NERR also includes 386 acres of submerged lands owned by the Department of Conservation. Submerged lands within

the Wells Harbor Federal Navigational Channel are excluded from the Wells Reserve (Fig. 1-3).

Management of state, town, and RMA-owned lands is carried out by the Reserve Management Authority using recommendations made by the Stewardship Advisory Committee. Federal lands are managed by the U.S. Fish and Wildlife Service.

The Wells Reserve has created four management zones: Public and Administrative, Active Management, Conservation, and Protected. These management zones are used to control the types and levels of access and activities at the Reserve. They allow research, education, resource management, and public enjoyment while providing adequate protection to sensitive areas.

An extensive trail system allows visitor visual access to the full range of habitats that make up the Reserve. These trails provide opportunities to view and learn about wildlife and their habitats even when visitors are near or within habitats receiving protection or intensive management.

Public and Administrative Zone

This zone includes a campus of buildings, pathways, parking lots, and other infrastructure to accommodate employees, visiting researchers and educators, and the public. This area is the most intensively used on the Reserve property and supports large and small events and activities. It includes the Visitor Center, barn, auditorium, Maine Coastal Ecology Center, parking area, entrance road, and the landscaped grounds that immediately surround these facilities. A second area within the public and administrative zone contains the buildings and immediate surroundings of the Alheim Property, which includes housing for visiting researchers. Stewardship in the public and administrative zone relates primarily to building upkeep and grounds maintenance. Management activities within the zone include mowing and snow removal.

Active Management Zone

This zone consists of 90 acres of fields and shrublands. These include the grounds surrounding the Visitor Center and six fields that have a long agricultural his-

tory. Shrubs along the perimeter of these fields form an edge habitat valuable to wildlife. Stewardship within this zone is guided by the Reserve's open-field management plan. Management activities within the zone include prescribed burns, mowing, brush hogging, and periodic tree cutting. These activities are timed to avoid adverse impacts on wildlife. The Reserve's open-field management plan sets these goals for managing fields and shrublands:

- ◇ Maintain the fields for their visual appeal, historical value, and ecological significance;
- ◇ Provide habitat for a range of grassland-nesting birds and other wildlife that use open fields for feeding, nesting, roosting, and hunting;
- ◇ Control and curtail the spread of non-native species.
- ◇ Encourage the growth of native grasses and rare plants that need full sunlight to thrive;
- ◇ Regenerate desirable shrub species like alders to provide edge habitats for birds and mammals;
- ◇ Provide educational opportunities for the public on topics of natural succession, habitat change, and land-use history.

Conservation Zone

This zone comprises most of the Reserve's forests and shrublands. Stewardship and resource management within this zone is intended to maintain relatively undisturbed, natural habitats. It focuses on minimizing disturbance to plants and wildlife, while ensuring public safety. Management activities within the zone include tree and shrub cutting and trail maintenance.

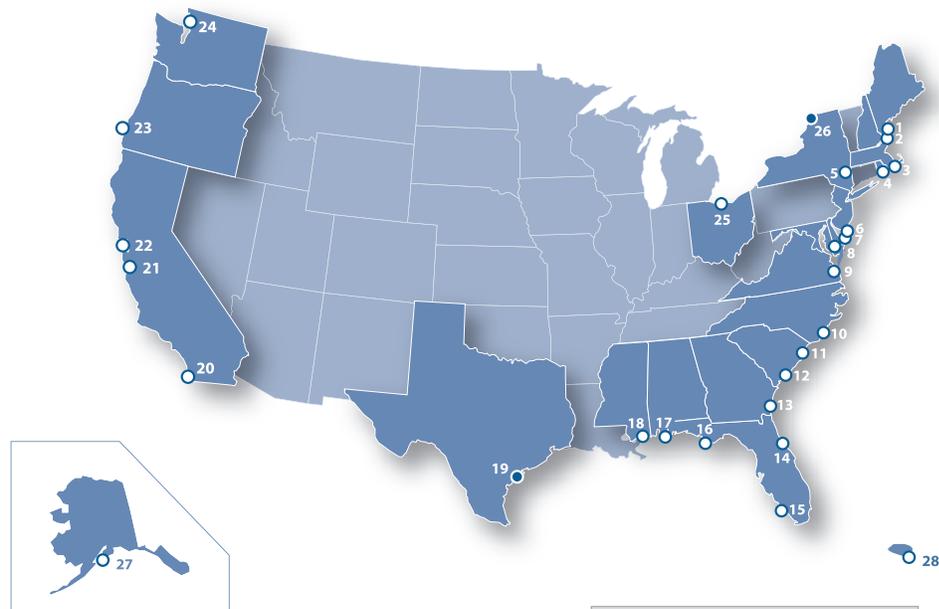
Protected Zone

This zone includes areas deemed in need of greatest protection because they support sensitive species (state or federal rare, threatened, or endangered species) or sensitive habitats. Sensitive habitats within the Reserve include dune systems, salt marshes, freshwater wetlands (including streams, vernal pools, forested wetlands, and wet meadows), and tidal waterways. Stewardship within this zone requires that areas are closed except by permit for specific interpretive education programs, research projects, or stewardship and management activities.

REFERENCES

Butler, Joyce. 2005. Laudholm: the history of a celebrated Maine saltwater farm. Wells National Estuarine Research Reserve and Laudholm Trust. Wells, Maine. 28 pp.

estuarine research reserves



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| 1. Wells Reserve, Maine | 15. Rookery Bay Reserve, Florida |
| 2. Great Bay Reserve, New Hampshire | 16. Apalachicola Reserve, Florida |
| 3. Waquoit Bay Reserve, Massachusetts | 17. Weeks Bay Reserve, Alabama |
| 4. Narragansett Bay Reserve, Rhode Island | 18. Grand Bay Reserve, Mississippi |
| 5. Hudson River Reserve, New York | 19. Proposed Reserve—Texas |
| 6. Jacques Cousteau Reserve, New Jersey | 20. Tijuana River Reserve, California |
| 7. Delaware Reserve | 21. Elkhorn Slough Reserve, California |
| 8. Chesapeake Bay Reserve, Maryland | 22. San Francisco Bay, California |
| 9. Chesapeake Bay Reserve, Virginia | 23. South Slough Reserve, Oregon |
| 10. North Carolina Reserve | 24. Padilla Bay Reserve, Washington |
| 11. North Inlet-Winyah Bay Reserve, South Carolina | 25. Old Woman Creek, Ohio |
| 12. ACE Basin Reserve, South Carolina | 26. Proposed Reserve—St. Lawrence River |
| 13. Sapelo Island, Georgia | 27. Kachemak Bay Reserve, Alaska |
| 14. Guana Tolomato Matanzas Reserve, Florida | 28. Jobos Bay Reserve, Puerto Rico |

● designated ○ proposed

Fig. 1-5: The National Estuarine Research Reserve System.

