Chapter 3

Lighthouse on Petit Manan Island
USFWS photo

Refuge and Resource Description

- Part One: The Refuge Landscape
- Part Two: Refuge Island Resources
- Part Three: Refuge Mainland Resources

Part One: The Refuge Landscape

Landscape-level Features

Since our project area spans the entire Maine coast, our description of the Refuge landscape focuses on the coastline, its resources and influences.

Gulf of Maine Ecosystem

This ecosystem is defined by the Gulf of Maine watershed; that is, the geographic area from which all water drains into the Gulf. It is an immense area, extending from eastern Quebec to Cape Cod, Massachusetts, with a land base of 69,115 square miles and a water surface of 33,054 miles. Maine is the only state located entirely within the boundary.

The Gulf of Maine is considered one of the world's most biologically productive environments. Its marine waters and shoreline habitats host about 2,000 species of plants and animals. The strategic location of underwater geologic features, such as Brown's Bank, allow nutrient- rich water from the deep ocean to flow upward over their edges, capturing phytoplankton in sunlit, shallow waters. Phytoplankton flourish here and are the basis of the gulf's food web. The riverine and upland habitats in the ecosystem also play an important role in the health and quality of the water flowing in the gulf. Many northern species (e.g. Atlantic puffin and razorbills) find their southern limit in the Gulf of Maine, while the gulf represents the northern extreme for several southern species such as laughing gulls and roseate terns (Conkling 1995).

Physical Characteristics of Coastal Maine

Maine has more miles of coastline than any other state in the continental United States. A straight line measures the Maine coast as being less than 250 miles from border to border. Actually, there are 7,039 miles of coastline when the shores of its many bays and headlands are considered (Conkling 1999). Elevations range up to 178 feet above mean sea level. Topography along the Maine coast is a mix of gradual slopes to rocky shorelines and abrupt cliffs as high as 100 feet to the oceans below. Approximately 4,617 islands and major ledges lie along the coast (Conkling 1999).

Geology

The Maine coast has a long and complicated geologic history. The bedrock of the region was formed largely through igneous, volcanic and metamorphic processes during Paleozoic times. It has been affected by a variety of geologic events, including mountain building, erosion, sedimentation and glaciation (Griffith 1976).

The indented character of the Maine coast is typical of shorelines of recent submergence. Before Pleistocene glaciation, the Maine shoreline was several hundred miles further south. The mile-high sheet of ice (7 million

tons/acre) that subsequently formed across the state warped the crust downward along a tectonically weak zone running northeast-southwest that corresponds with the present configuration of the coastline. Later, enormous volumes of water released by glacial meltwaters contributed to a worldwide rise in sea level that inundated what had been coastal lowlands.

Geologically, the Maine coast can be divided into five distinct sections (Conkling 1995). The section from Kittery to Cape Elizabeth represents the northern end of the crystalline rocks characteristic of the Atlantic coast north of Cape Cod. Topographic relief is characteristically slight, and the shoreline straight. Maine's most famous beaches and thousands of acres of salt marsh are characteristic, but relatively few islands are located in this section of the coast.

The coast from Cape Elizabeth to the Penobscot River, including Casco, Sheepscot, Boothbay, John's, Muscongus, and Western Penobscot bays, is characterized by long, narrow arms of the sea which extend far into the coastal lowlands. Islands in this section of the coast are also generally long and narrow, trending just east of north, corresponding to the general trend of the bedrock: quartzites, slates, schists, and granite. The deep, elongated bays in this section represent old stream and river drainage systems that were carved out in the folds of the strata, then scoured by glaciers and later filled by rising seas.

The coast fom Vinalhaven to Jonesport is primarily the realm of white and pink granites. This section includes the broad and wide East Penobscot, Jericho, Blue Hill, Frenchman's, Pleasant, and Eastern and Western Bays. There are more islands in this section than in any other; most are forested with spruce. In contrast to the long, narrow islands to the west, islands in this section, whether large or small, are mostly rounded and dome-like, owing to the manner in which the once liquid granite was emplaced and cooled amid overlying rocks. This section also includes the highest coastal mountains, and the only fjord-like feature (Somes Sound) on the U.S. Atlantic coast. To many, this section is the most spectacular scenic area on the coast.

East of the Roque Island archipelago, the bays broaden and shorten as more ancient volcanic rocks and volcanic breccia (consolidated debris from volcanic eruptions) dominate the landscape. East of Cape Wash, bays and islands disappear altogether until Cobscook Bay. Huge tides (20 feet at West Quoddy Head), increased fog, and rugged gray and dark-green cliffs, sea stacks, fewer people, and rare seabirds at the southern end of their breeding range characterize this section "way Downeast."

Soils and Hydrology

Soils were mainly deposited as the last glacier retreated some 13 to 15,000 years ago, leaving a soil cover mixture of sand, gravel, silt, and clay (Conkling 1995). Hydrology consists of bedrock aquifers underlying the

mainland portion of the state. "Sole source aquifer" is a designation given for every island off the coast and both tidal and non-tidal surface waters (Conkling 1995). Tidal waters include ponds, salt marshes, creeks, coves, and mud flats. The mean tidal range within the region tends to increase as one moves northeast along the coast. It ranges from 8.8 feet in Muscongus Bay to 10.2 feet at Southwest Harbor on Mount Desert Island (TRIGOM - PARC, 1974).

The non-tidal waters include marshes, bogs, ponds, creeks, artificial impoundments, and seasonally flooded forests. Non-tidal waters are mainly fed from annual precipitation or natural springs.

Climate

Maine's weather is highly variable, and may vary on any given day from place to place. Large ranges in temperature are common, both daily and annually. In general, summers are cool and relatively dry, and winters are cold and wet. Maine has four distinct seasons. The climate of coastal Maine is strongly affected by maritime influences. In general, average coastal temperatures are cooler in the summer and warmer in the winter than in the interior of the state. The average annual temperature varies along the coast. For example, in southern Maine, the average temperature is 45 degrees, along the mid-coast, it is 44 degrees, and in the north, the average temperature is 40 degrees. The coastal region has the longest growing season in the state, averaging from 140 to 160 days per year.

The average annual precipitation in Maine is 42 inches. Along the coast, summer thunderstorm activity is suppressed somewhat by the cooling effect of the ocean, while winter precipitation is increased by the occurrence of coastal storms blowing from the northeast, or "nor'easters." They often bring with them strong winds and heavy precipitation occurring either as snow, rain, or freezing rain. The result is greater precipitation in winter than in summer. Winter precipitation falls mainly as rain or wet snow along the coast, which is also subject to occasional ice storms that cover every exposed surface with a sheet of ice. At times, nor'easters produce unusually high wind-driven tides that can seriously affect coastal beaches and settlements. Fog is particularly frequent in downeast Maine, generally diminishing in frequency and duration in an inland direction and to the south.

The Gulf of Maine is the southern limit of the Atlantic puffin's range
USFWS photo

On a yearly basis, the wind direction is generally from the west. In winter, winds typically originate from the northwest or north, and in

summer, from the southwest or south. In spring and summer, the sea breeze is an important factor along the coast. Cool breezes off the ocean tend to retard spring plant growth and moderate summer temperatures. In winter, sea breezes moderate temperatures on land.

Air Quality

Both State and Federal agencies monitor air quality in response to State and Federal requirements to determine whether the air we breathe is maintaining ambient air quality standards designed to protect the health and welfare of the public. In addition to human health, good air quality is essential to sustaining healthy ecosystems. Healthy and productive vegetation, wildlife, water, and soils, and the protection of visibility, and geological, archeological, historical, and cultural resources are all values associated with clean air.

According to the State of Maine DEP, the state exceeds acceptable levels for particulates, sulfur dioxide, and carbon monoxide (ME DEP; www.state.me.us/DEP/pubs/environment 2002). The primary concern is ground ozone levels in southern counties. A particular health hazard with ozone is the fact it aggravates asthma and other chronic lung diseases. The precursors to ozone are emitted in automobile exhaust, gasoline, and oil storage and transfer, and from common use of paint solvents, degreasing agents, cleaning fluids and similar materials. Unfortunately, some of these compounds are generated in western regions of the country and are carried to Maine by prevailing wind patterns, so efforts to reduce levels are challenging.

Ozone formation is temperature dependent and is more likely to form in the warmer summer temperatures. In 1989, there were 12 days when Maine exceeded the Federal standards for acceptable 8-hour ozone level days. This has been declining, and in 2001, there were 7 days in which the 8-hour levels were exceeded.

Air toxics are another serious concern in Maine. Benzene concentrations are used as an indicator for other hazardous air pollutants. One of the primary sources for these chemicals is car exhaust and evaporation of gasoline during refueling. Over the past 8 years, benzene concentrations were highest in 1994 at 0.9 ppb, decreased to 0.4 ppb in 2000, but then increased to 0.7 in 2001 (ME DEP; www.state.me.us/DEP/pubs/environment 2002).

We do not have air quality monitoring stations on the Refuge, so we have limited local information. Instead, we look to air quality monitoring conducted on Moosehorn Refuge, located in Baring Maine. In 1978, Congress designated the 7,000 acre Moosehorn Refuge Wilderness Area a Class 1 air quality area. Class 1 areas receive the highest levels of protection under the Clean Air Act. Our National Air Quality Program has an

established air quality monitoring station to measure compliance with Federal standards.

Most of the air pollutants affecting Moosehorn Refuge would likely also occur at the Refuge (Porter, pers com, 2002). Pollution sources include power plants, industry (such as pulp mills), and automobiles. Pollutant haze often reduces visibility in the wilderness area. Occasionally, smoke plumes from nearby industry drift into the area. The area receives acid rain (and acid snow, fog, and dryfall), with a pH of about 4.6. Acid rain is the broad term used to describe several ways that a weak solution of inorganic acids, such as nitric and sulfuric acid falls out of the atmosphere as rain, snow, mist or fog. Sulfur dioxide and oxides of nitrogen are the primary causes of acid rain. Most of this comes from electic-power generation that relies on burning fossil fuels, such as coal. Acidification in surface water is an increasing concern.

In addition, it is likely that mercury deposition from the atmosphere and bioaccumulation is occurring in the area at a rate similar to that demonstrated in Acadia National Park and the Penobscot River valley. Mercury becomes airborne through burning coal, oil, wood, or natural gas, incinerating mercury-containing garbage, and through industrial processes that use

Short-billed dowitchers
Photo by Craig Snapp

mercury. Contaminant research has documented increasing concentrations of mercury in various species of wildlife as you move eastward across the country, with the highest documented levels recorded in Maine (Evers pers. comm.). Mercury bioaccumulation in fish has prompted the State of Maine to advise certain at-risk persons not to eat fish from lakes and ponds in the state.

The monitoring at Moosehorn Refuge includes documenting the cumulative effects of these air pollutants and their injury to vegetation, wildlife, soils, water quality, visibility, odor, and cultural and archeological resources. Surveys in the wilderness area in 1998 to 2001 documented symptoms of ozone injury, such as stippling and chlorosis, on several plant species. Vegetation such as black cherry, milkweed, and wild grape are all readily subject to such injury.

Acadia National Park also has two air quality monitoring sites at McFarland Hill and Cadillac Mountain. Pollutants monitored include: ozone, nitrogen oxides, fine particulates, visibility, mercury, acid deposition, UV-b radiation, precipitation and other meteorological parameters. In 2001, the park recorded 10 days when the air was unhealthy to breathe due to ground-level ozone levels. Park studies have shown numerous plant species harmed by ozone exposure including black cherry, quaking aspen, and decreased growth rates in eastern white pine.

The estimated annual average visibility at the park is 110 miles. Air pollution reduces visibility during the summer months to approximately 33 miles, dropping to only a few miles on the haziest summer days. Sulfur dioxide and nitrogen oxide are affecting surface waters of the park. Its rocky soils give streams and lakes little protection from acid rain. The average pH of precipitation measured has ranged from 4.4 to 4.6. This value is ten times the acidity of natural rainfall. Park staff have measured acid fog with a pH of 3.0, comparable to grapefruit juice. Fish with high levels of mercury have been documented in its lakes since the early 1990's. Mercury concentrations in some species of warm water fish, such as bass, perch, and pickerel, are among the highest ever recorded in the U.S. (www.npca.org)

Water Quality

Assessments of estuarine, riverine, lakes, and coastal water quality is done primarily by two state agencies: the Department of Marine Resources (DMR) and the Department of Environmental Protection (DEP). The DMR conducts an extensive program to monitor pathogen indicators and phytotoxins. The purpose of this program is to manage the risk of human illness due to consumption of contaminated fish or shellfish. The DEP's Marine Environmental Monitoring Program monitors and researches other water quality issues within the 7, 039 miles of shoreline and near-coastal waters. Three other coastal projects also collect water quality information

on a site-specific or project-specific basis. The Casco Bay Estuary Project has supported several monitoring projects within Casco Bay. Maine's Shore Stewards Program supports a diverse array of volunteer monitoring groups that operate in specific embayments and estuaries. The Gulf of Maine Council's Gulfwatch Project surveys toxic contamination in coastal waters from Cape Cod to Yarmouth, Nova Scotia.

Both point and nonpoint source pollution affect the quality of Maine's waters. Point source pollution occurs from a single discharge point; nonpoint pollution sources are those that can come from numerous sources in the watershed, typically as runoff from the land. Point source pollution include sewer overflows, sewage pipes leading directly to the water, and industrial discharges from paper mills and other manufacturers. Nonpoint source pollution includes nutrients, bacteria, sediment, oil, and heavy metals that are transported to water bodies from different sources by runoff from storms. This threat is much harder to manage and control, and is exacerbated by development and increased impervious and polluted surfaces.

No water quality monitoring is occurring on the Refuge, so we are unsure how directly our waters are affected by these pollutants.

Estuaries

An indicator of the water quality in Maine's estuaries used by ME DEP is the amount of area closed to shellfish harvesting in a given year. As of June 2001, 156,758 acres of flats and waters were closed to shellfishing, a slight decrease from the 166,555 acres closed in October 2000 (ME Development Foundation, January 2002; www.smart growth.org). Sewage discharges from malfunctioning septic systems, straight discharge pipes, and non-point source pollution are responsible for closing the shellfishing areas (ME DEP; www.state.me.us/DEP/pubs/environment (2002.pdf).

Rivers, Streams and Brooks

An indicator of the water quality in Maine's rivers, streams and brooks used by ME DEP is the number of miles that were not able to support one or more of their designated uses, including fishing, aquatic life, and swimming, and were not in attainment of water quality standards in sections 305(b) of the Federal Water Pollution Control Act. In 2000, 749 miles of the estimated 31,752 total miles of rivers, stream, and brooks, were estimated to not fully support one or more of their designated uses. Of those, 427 miles of river did not support fishing, 331 miles were unfit to support aquatic life, and 176 miles could not support swimming. Several rivers were unable to support more than one type of use (ME Development Foundation, January 2002; www.smartgrowth.org). Fortunately, since 1994, sewage effluent discharged into Maine rivers has decreased by 20%.

Lakes

There are 5,788 lakes in Maine, and 2,314 are deemed significant by ME DEP. Using suitability for swimming as an indicator, only 3.8% of the significant lakes were deemed unsuitable for swimming in 2000, according to ME DEP. This is an improvement over 1998 figures, when 5.3% of significant lakes were not swimmable. More detailed water quality monitoring has occurred in 224 Maine lakes for the last eight years. Data shows that 67% of those lakes have a stable water quality; an additional 25% are improving; and 8% are declining.

Groundwater

Groundwater is Maine's primary source of drinking water and protecting its quality is critically important to the health of Maine's citizens. Groundwater is defined as water contained in open spaces in the soil, sand, and gravel within rock fractures. The water comes from rain or melting snow that seeps into the ground and is stored in geologic structures. In most cases, groundwater is polluted through non-point sources, namely contaminated snowmelt or rain. While these waters are filtered through the soils before reaching the aquifer, it is often not enough to remove contaminants such as salt, oil, gas, and lead from roads, pesticides and fertilizers from home gardens and landscaping, effluent from septic systems, and substances disposed of on the ground by homeowners. Point sources, such as those from development near primary aquifers, or petroleum leaks at gas stations and homes, are also important threats. In 1994, 54 public and private wells were replaced due to petroleum contamination of their water source. Since that peak, the number has declined, with only 35 wells needing replacement in 1999 due to contamination (ME Development Foundation, January 2002; www.smartgrowth.org)

Socio-economic Characteristics of Coastal Maine

It is said that Maine's seacoast is the backbone of the State's economy. This is not surprising as coastal Maine's southern and mid-coast regions are growing at almost twice the rate than the state as a whole during 1990-1996. The majority of the State's residents live in coastal counties. It is the natural beauty and rich resources of the shore and ocean that draw people to the coast.

Demographics

The population of Maine is estimated at 1,274,923 with an average density of 41.3 persons/ square mile (U.S. Census, 2000; http://quickfacts.census.gov/qfd/states/23000.html). The top three counties with highest population densities are: Cumberland (318 persons/square mile), Androscoggin (221 persons/square mile), and York (188 persons/square mile). All are located in southern and mid-coast Maine. The eight coastal Maine counties and their populations are depicted in Table 3-1.

Table 3-1 Populations of Eight Coastal Maine Counties (U.S.Census 2000)

Coastal Maine Counties	Population
Cumberland County	265,612
Hancock County	51,791
Knox County	39,618
Lincoln County	33,616
Waldo County	36,280
Washington County	33,941
Sagadahoc County	35,214
York County	186,742

A Brookings Institution report in July 2001 listed Portland as the 9th fastest growing metropolitan area in the nation. Between 1982 and 1997, its population increased by 17%. Between 1990 and 2000 the state population increased by only 3.8%. Other populated cities and towns along the coast are Kittery, York, Wells, Kennebunkport, Biddeford, Saco, Yarmouth, Freeport, Brunswick, Bath, Boothbay Harbor, Damariscotta, Rockland, Camden, Belfast, Bucksport, Ellsworth, Bar Harbor, Machias, and Calais.

The State Planning Office estimates that between 1970 and 1990, land development in Maine occurred at four times the rate that the population increased. People are moving away from villages and city centers into the countryside. This situation creates sprawl, which is characterized by low-density development that is center-less and sporadic, strip malls, and traffic congestion. If unchecked and unplanned, sprawl impacts our health, our environment, our communities, and our productive agricultural and natural areas. The city of Portland serves as a prime example. During 1982 and 1997, when Portland's population increased by 17%, the amount of farmland and forestland converted to urban uses increased by 108%.

According to the 2000 U.S. Census, the majority of people are employed in the fields of "management/professional/and related occupations," followed by "sales and office occupations." The mean household income, including benefits, in the state is approximately $47,000. Approximately 95% of the population is white and retirees are disproportionately concentrated in the southern coastal towns.

Industries of Coastal Maine: An Overview

According to the 2000 U.S. Census, the top three industries in Maine are, in order: 1) "education/health/and social services;" 2) "retail;" and 3) "manufacturing." Many of the State's top three industries are dependent on natural resources. A comprehensive bibliography on how natural resources contribute to Maine's economy is provided in Maine Audubon Society's publication: *Valuing the Nature of Maine, May 1996.*

In northern and eastern Maine, industry output is dominated by the pulp and paper industry. Along with wood products, it represents the major industry exporting products outside the area. After pulp and paper, the primary industries in eastern Maine are retail trade, construction, and health services (www.emdc.org.CEDS2000). Unfortunately, only the pulp, paper and wood industries consistently pay the state's "livable wage," and these industries are in a difficult investment climate.

A few prominent natural resource-based industries with ties to the Refuge are presented below.

Aquaculture and other commercial fisheries

The Maine aquaculture industry is very diverse and has grown significantly over the past decade. It consists of businesses involved in raising and selling salmon, trout, oysters, mussels, and baitfish. According to a recent report by Planning Decisions Inc., all Maine aquaculture activities account for $130 million in total, annual economic activity in Maine (O'Hara et. al., 2003). Two major subsectors exist in the industry: finfish, primarily salmon, is generally undertaken east of Penobscot Bay, while shellfish culture, is generally located in or near the Damariscotta River. In 2000, the salmon aquaculture industry produced a total of 36 million pounds of salmon, with a total landed value of $78.9 million (Colgan 2002). This was the peak year for the decade. In 2002, there was a slight decline, when 15 million whole pounds of salmon were produced. In addition to direct salmon production, there is additional value added and higher than state-average paid employment in processing facilities, hatcheries for salmon smolt at various inland lake locations around the state, grow-out operations, fish health companies.

Aquaculture operations require a permit from the Army Corps of Engineers and a lease from the State of Maine. As of June 2004, a total of 150 sites were under lease. Table 3-2 shows the distribution of these sites (source: ME DMR, 2005)

Table 3-2 Aquaculture operations in Maine under lease as of June 2004

Product	Number of leases	Acres under lease
finfish	40	740.0
shellfish	63	570.0
limited purpose	31	0.3
experimental	16	29.0

State records do not indicate which of these leases are currently active. As such, not all of this leased acreage may be in active production.

The industry has faced many challenges in recent years. The amount of active acreage has been affected by Infectious Salmon Anemia (ISA), a

highly contagious disease which resulted in the destruction of over 1.1 million pounds of salmon in order to control the spread of the disease, primarily in the Cobscook Bay area (Colgan 2002). Other declines in production from 2000 to 2002 were due to health and environmental problems (O'Hara et al. 2003). In addition, the listing of the wild Atlantic salmon as an endangered species in the rivers of eastern Maine may have effects on the cultured salmon industry from restricted production or increased costs.

Salmon aquaculture is a highly competitive industry in which foreign producers play a major role. Competition from Chile and Norway has been found by the U.S. International Trade Commission to have materially harmed the U.S. industry, including producers from Maine (Colgan 2002). Finally, aquaculture leases are difficult to obtain from the State of Maine, in part because of frequent local opposition to the issuance of new leases, and in part, because of a lengthy lease application process. A bill to place a moratorium on aquaculture leases for two years was considered by the Maine Legislature in 2002.

Lobstering is the principle fishing activity associated in the vicinity of coastal islands. Lobsters are caught year-round in Maine, but during the summer, lobsters migrate inshore to molt and are caught near shore, including around islands. Depending on water depth and bottom type, lobster traps may be placed quite close to shore, but this varies. Lobsters are the single most valuable fish species caught in Maine. Both total landings and the landed value of lobsters have grown significantly over the past 15 years. In 2001, over 48 million pounds of lobster were harvested with a market value of $151.9 million.

The remaining top 10 economically important fisheries in the state include Atlantic salmon, sea urchin, soft clam, cod, flounder, sea scallop, bluefin tuna, shrimp, and witch flounder. All fishery species harvested in Maine in 2001 totaled $241,287,429 in value and 236,268,682 pounds (www.st.nmfs.gov).

Tourism

Tourism is significant to the Maine economy. In 2000, nonresident visitors to Maine directly and indirectly generated: $8.8 billion in sales of goods and services; over 116,000 jobs; and, $2.5 billion in total payroll (Maine Office of Tourism, www.visitmaine.com). This represents 44.0 million trips to Maine, predominantly to coastal areas and mostly during the summer months. Reportedly, overnight visitors come to tour the state (41%), enjoy the outdoors (20%), attend a special event (10%), and for a beach vacation (9%).

Commercial wildlife watching tour boat
USFWS photo

Many people come to the state or travel within the state to engage in wildlife watching. This would include activities such as observing, identifying, photographing, or feeding wildlife. The total number of wildlife watching participants nationally was 66,105,000 in 2001, a 13% decrease from 1991 figures (USFWS 2002). Maine ranks fourth among U.S. states for having the highest percentage of its population engage in wildlife watching; 52% participates. Wildlife watching trip related expenditures in Maine amounted to $64,202,000 in 2001. The national average for wildlife watching expenditures per trip was $448 (USFWS 2002).

Seabird Viewing

Commercial seabird viewing is one wildlife watching activity that warrants a detailed discussion because of its connection with the Refuge. Petit Manan and Machias Seal islands serve as premier seabird viewing destinations for several commercial tour boat operators.

The abundance of seabirds along the Maine coast, coupled with the large number of summer visitors has created a substantial opportunity for firms to provide a variety of services to view seabirds. In order for us to assess the extent of commercial seabird viewing in Maine, and understand the importance of the Refuge to this opportunity, we enlisted the University of Southern Maine for help. Dr. Colgan and students conducted a series of interviews with seabird viewing firms in Maine during the summer of 2001. The results of his work follows.

One hundred and thirty eight companies were identified as providing services potentially involving seabird viewing as a recreational activity. The companies were identified from tourism reference sources, chambers of commerce, and other sources, and were contacted by phone to inquire about the number of customers, average prices, and extent to which seabird viewing was considered a part of the recreational experience. Of these, 120 provided services in coastal waters. The firms are located throughout the coast (Table 3.3), with about two thirds located in the Penobscot Bay area or to the east.

Table 3-3 Distribution of coastal excursion companies. Source: USM Survey

Maine Coastal Counties	Percent Distribution
Cumberland	4.3%
Hancock	21.5%
Knox	36.6%
Lincoln	21.5%
Sagadabhoc	1.1%
Washington	6.5%
Waldo	1.1%
York	7.5%

The companies provide a wide variety of services, from multi-day trips on schooners to 2-6 hour guided sea kayak tours. There are also various types of nature watching services. The most common are whale-watching tours, which often include seabird viewing. There are also dedicated seabird viewing excursions. Prices average about $60 for a full day excursion, $36.00 for an excursion that last one to four hours, and $425 for multi-day excursions.

Firms that were willing to provide figures on total number of visitors taking their excursions reported a total of 156,000 trips per year. Of these, 2,700 trips were on excursions where the primary purpose was seabird viewing, while 127,000 took trips whose secondary purpose was seabird viewing. Adjusting from the sample to the total population implies 5,000 to 7,500 trips primarily for seabird viewing and 350,000 to 450,000 trips with seabird viewing as a secondary purpose.

Based on information provided by the companies, 10-15% of the companies offer services that are predominantly focused on seabirds, 25-30% indicate that seabird viewing is an important part of their services, and the remainder indicate that seabird viewing is incidental to other experiences. More than 95% of the trips taken are of less than one day's duration.

Total spending by visitors on coastal excursions in which seabird viewing plays some role is estimated at $6.24 million in 1990 among survey respondents. The response rate for the surveys was about 33%, which imply

total spending of $15-25 million a year taking into account sample size. However, as noted seabird viewing is only part of the recreational experience, so these figures need to be adjusted downward to reflect the proportion of activity related to seabirds as reported by survey respondents. When this is done, the sample estimated $2.3 million in spending, resulting in a total estimate of $5-10 million in seabird related spending in 2001.

The economic values associated with recreational seabird viewing not tied to commercial trips is also very significant. People who regularly view seabirds as either part of their coastal recreation or as a primary element in their personal recreation activity constitute a significant population. Since this group does not pay a per-trip fee to enjoy seabirds, other means are employed to assess the economic value associated with this recreation. A means employed to assess values from recreational seabird viewing for our project is described below, with a detailed description of the overall economic impact presented in the final EIS, Chapter 4.

In 1996, Dr. Colgan was enlisted by the Service to conduct a mail survey to develop information about the scope of this recreational activity. The survey was sent to members of the MITA and Maine Audubon Society who had actively participated in bird watching activities or who had indicated particular interest in bird watching as a recreation activity. The survey results showed that those engaged directly and indirectly in coastal seabird viewing come from a wide geographic area. Forty-five percent of respondents were from outside Maine, with more than 30 states and one Canadian province represented. The final EIS, Appendix H, provides a summary of the data collected.

A total of more than 10,500 annual trips for seabird viewing was reported in the survey, although this number is somewhat difficult to estimate since many of the respondents live on the Maine coast and report that bird watching is part of their daily routine as opposed to a specific recreational activity.[1] However, it is important to note that, while Maine residents were naturally the most frequent visitors to the coast for bird-watching, non-residents also reported frequent visits.

Pied-billed grebe
USFWS photo

The Maine Audubon Society portion of the survey was addressed to members who had a specific interest in bird watching, so their reported visits were directly related to recreation involving coastal birds. Members of the MITA, on the other hand, engage in a variety of recreation activities along the coast, includ-

[1] Year-round residents were counted as 200 visits for purposes of the analysis.

ing kayaking, sailing, and, camping. A specific question was addressed to MITA members about the extent to which bird-watching was part of their island-related recreation activities. Over 90% of the respondents from MITA considered bird-watching either a regular or an occasional part of their recreation activity.

The survey also asked respondents which of six areas along the coast they most frequently visited for bird-watching. The responses indicated that the area between Portland and Penobscot Bay is the most popular area, although activity is spread throughout the coast.

Forestry

Timber is an important economic crop along coastal Maine and is also important to the state's cultural identity. While acres in timberland across the state have remained fairly stable, the amount that can be used for timber harvesting has declined due to sprawl. The forest and paper industry's existence depends on maintaining both ownership and access to timberland; both of which are compromised with sprawl. The biggest loss of timberlands is occurring in southern counties such as Cumberland and York. Between 1989 and 1995, the amount of timberland in these counties had declined by over 13% (Maine Development Foundation; www.smartgrowth.org). While the vast majority of timber activities occurs on the mainland, some also takes place on the coastal islands. On islands, trees are harvested for firewood or other small woodlot management needs, or to open small fields for agriculture.

Blueberry Production

Similar to timber, blueberries are an important economic crop in Maine with deep cultural roots; in fact, blueberries are one of Maine's chief export products. Sixty thousand acres in Maine are covered by wild blueberry production. Maine is the largest producer of wild blueberries in the world, and accounts for 25% of all blueberry production in North America. Maine's 2003 wild blueberry crop totaled 80.2 million pounds, an increase of 29% from 2002. The total processing value was $27.9 million (NASS, 2004). Management of blueberry fields often includes burning to enhance production, and pesticide and herbicide application to control pest species. In Washington County, where the Refuge Headquarters is located, approximately 10,000 acres are burned each spring.

Blueberry field on Petit Manan Point
USFWS photo

Hunting and Fishing

Hunting and fishing activities generate a sizeable income to the economy of Maine. A study by the University of Maine describes a $329.9 million and $196.2 million economic output for hunting and inland fishing, respectively, in Maine in 1996 (Teisl and Boyle 1998). Both of these activities provide wage and employment benefits across many sectors of Maine's economy. While fishing is significant elsewhere in the state, the Refuge has very limited opportunities for this activity, and therefore, we do not further describe this activity below.

Maine ranks third in the U.S. in having the highest percentage of in-state, big game hunters (USFWS 2002). In 2001, there were 164,000 total hunters in Maine; 95% were hunting big game, 39% were hunting small game, and the number for migratory birds was negligible. Trip-related expenditures for Maine hunters amounted to $53,779,000; a 17% increase in expenditures compared to 1991. These expenditures include food, lodging, transportation, and other trip costs such as equipment rentals, land use fees, etc. The 2001 national averages for expenditures by a hunter per trip were $327 for big game, $167 for small game, and $222 for migratory birds.

Environmental Education

Environmental education is virtually an industry unto itself in coastal Maine. Programs are sponsored through a variety of Federal and State agencies, private businesses, media outlets, and non-profit organizations. These groups provide a range of opportunities to learn about coastal Maine's environmental resources through written materials, educational programs in classrooms and in the field, and public forums. Target audiences for environmental educational are as varied as the environmental organizations themselves. Land-use decision-makers, lawmakers, land trusts, other conservation groups, outdoor users, instructors, schoolchildren, college students, state residents, and vacationing visitors are all potential audiences for Maine's environmental education initiatives.

According to a comprehensive survey completed in *The Wild Gulf Almanac* in 1995, Maine hosts the following range of organizations and land bases that support or engage directly in environmental education:

- 29 educational organizations and programs
- 29 governmental organizations involved in environmental protection
- 10 museums and aquariums
- 21 non-profit conservation groups
- 1 National Park

- 1 National Estuarine Research Reserve
- 2 National Fish Hatcheries
- 1 International Park
- 1 Wilderness Waterway
- 9 National Wildlife Refuges
- 28 state parks and 12 state historic sites
- many nature preserves managed by non-profit conservation groups

In addition, there are 70 land trusts, approximately 20 water quality monitoring groups, and numerous environmentally-based tourism industries.

Environmental education is incorporated, to varying degrees, in the curriculums of Maine's public and private schools. Some school programs are self-managed while others rely on the assistance of the entities noted above. Interestingly, the many environmental organizations vary widely in their offering of educational opportunities. Some, like The Chewonki Foundation and Maine Audubon Society, have a broad diversity of environmental education programs, accommodating many subject areas. Others, like Acadia National Park, are focused on coastal resource protection and recreational opportunities. Some, like the Natural Resources Council of Maine, Conservation Law Foundation, and RESTORE, focus on environmental advocacy, but support environmental education as a critical component of successful advocacy. Groups like Maine Island Trail Association and some private ecotourism businesses, promote educational programs that encourage appropriate use, enjoyment, and stewardship of coastal environments. Finally, groups like The Nature Conservancy and Maine Coast Heritage Trust direct their energies to land protection, but support education that leads to public understanding, appreciation, and ultimately, long-term protection of coastal resources.

Real Estate and Land Development

As discussed above, land development has increased in many areas, especially along Maine's coastal areas. Historically, when the economy in nearby urban areas, such as Boston and New York is doing well, there is tremendous pressure for second home development on both the mainland and islands in Maine. The economic boom of the 1990's has resulted in healthy real estate sales in coastal areas. While environmental issues with sprawl are noted above, a healthy real estate market also results in increased property values and increased property tax revenues to towns.

Average property tax values per acre along coastal Maine range between a low of $122 and a high of $28,400, with a mean value of $4,300 per acre. In general, property values are higher in southern coastal areas than in downeast coastal areas.

On coastal islands, several factors influence opportunities for development. The major factor is cost, including the current market value for islands, the location of and access to the island, the topography of the island for building, protection of the island from storm events, access to water, availability of sewage disposal facilities, and other costs such as taxes.

Recreational Uses on Coastal Islands

Most of what is described above relates to the mainland. However, it is important to recognize there is a large seasonal demand for access to Maine coastal islands because they offer a unique experience. There are many ways for the public to access islands in Maine, depending on the ownership. The Maine Island Trail Association (MITA) maintains the Maine Island Trail, a 325 mile waterway extending from Casco Bay on the west to Machias Bay on the east. This trail includes 104 public and private islands open to visitors; some are day use only, others are open to day use and camping. Two Refuge islands are part of the MITA trail and open to overnight camping: Bois Bubert and Halifax islands. Other details on access to specific Refuge islands are described in Part Two of this chapter.

Other public and private islands are also open to the general public. Acadia National Park allows access to several of the park's islands; access is primarily by private boat. All of the islands owned by the State of Maine are open to the public, accessed by private boat. Some of these islands are State parks; others were acquired to protect habitat for nesting seabirds. The nesting islands are closed to the public during the nesting season. The coastal islands owned by The Nature Conservancy are open to the public. They may offer occasional trips and tours, but generally visitors access these islands using private boats.

Aerial view of Halifax Island
USFWS photo

There are many commercial companies offering trips to visit coastal islands in Maine. These include bird viewing tours, kayak tours, windjammer cruises, lobster tours, and others. People also use mail boats and ferries to access islands.

Maine islands have historically been used for such non-consumptive recreational uses as picnicking, hiking, wildlife observation, photography, and camping. Consumptive uses include berry picking, fishing and shellfishing, and sport hunting for waterfowl (including eiders), upland game birds, and deer.

Refuge Administration

Administrative Organization

As described in Chapter 1, the Maine Coastal Islands Refuge includes five individual refuges. A sixth refuge, Sunkhaze Meadows, is administratively grouped with the Refuge, but will not be evaluated in this document. A separate CCP effort is planned for approximately 2010 for this refuge. Resources shared with Sunkhaze Meadows Refuge include supervision, administrative support services, and field biological staff. A brief description of the resources on Sunkhaze Meadows Refuge is provided below.

Sunkhaze Meadows Refuge

Sunkhaze Meadows Refuge is approximately 10,300 acres, located in the Town of Milford, Penobscot County, Maine, approximately fourteen miles north of Bangor. The refuge is the second-largest and most unique peatland in Maine, and also contains a portion of Sunkhaze stream and extensive streamside wetlands. The refuge is open to big game hunting, upland game hunting, and waterfowl hunting. Sunkhaze stream is a very popular trout fishing stream. Nonconsumptive uses occurring on the refuge include canoeing, cross-country skiing, environmental education and interpretation, wildlife observation and photography, research, and snowmobiling. Carlton Pond Waterfowl Production Area is also managed by the refuge. It is a 1,068-acre marsh located in the town of Troy in Waldo County. In the early 1990's, the Benton and Sandy Stream Divisions were added to the Refuge under the auspices of the 1990 Farm Bill. Located in the towns of Benton and Unity, both are managed for grassland nesting birds.

Refuge Offices

We have two Government Services Administration-leased office buildings in the Towns of Milbridge and Rockport. Our Milbridge office, established in 1997, is considered the Refuge Headquarters and consists of 5,250 square feet of space, 50% of which is dedicated to boat storage and maintenance operations. The office portion provides adequate space for the current four permanent employees, but lacks storage and filing space, and does not provide office space for additional staff. We rent commercial storage space to meet these needs.

Our Rockport office was opened in 1999 and consists of 2,250 square feet of space; approximately 50% is administrative office and 50% is boat and other equipment storage. The office currently meets the needs of two permanent employees and an office for the Refuge Friends Group, Friends of Maine Seabird Islands.

We have been evaluating moving the Refuge Headquarters to mid-coast Maine in conjunction with a proposal to develop a mid-coast environmental education center. The Milbridge office would then become the downeast satellite office. In May 2001, we convened a team of people

Rockport Office
USFWS photo

representing the Service, Maine Bureau of Parks and Lands, Maine Audubon Society, Maine Island Trail Association, Coastal Mountains Land Trust, Maine Coast Heritage Trust, and Tanglewood 4H Camp to discuss a proposal for a new facility. The team developed three purposes for the facility: 1) to provide interpretive and educational programming and exhibits; 2) to facilitate administration of the Refuge; and, 3) to support Refuge operations. We held a public meeting in May 2001 in Rockport to present the proposal, and Congressional representatives were briefed at this time. There was unanimous support for the concept.

A mid-coast location, between Brunswick and Searsport, is recommended because it would provide a central location for management of the Refuge's offshore islands in this region. In addition, this location would be more accessible to the millions of seasonal visitors to Maine's coast, closer to resident Maine population centers, in proximity to major ferry and seabird-viewing tour boat ports, and closer to offices of key partner organizations such as Maine Coast Heritage Trust, National Audubon Society, and the Service's Gulf of Maine Program. Criteria for a site include, but are not limited to, the following:

- within ½ mile of coastal U.S. Route 1 between Brunswick and Searsport;
- on the waterfront, or with an unobstructed view of the water, and/or with foot access to the water;
- no changes in zoning are required, or changes would not result in a protracted conflict with the local authority;
- is consistent with the neighborhood, e.g. would have limited impact on neighbors;
- has good accessability to utilities which do not require costly upgrades;
- has good access to emergency services;
- has minimal to no hazardous materials or contaminants;
- has safe ingress and egress, or development of such is reasonable;
- can accommodate a handicapped-accessible building(s) for Service staff, Friends Group, and partners, as well as an educational and interpretive facility, storage space for boats and maintenance equipment, and parking for cars and buses;
- can accommodate anticipated visitation with minimal adverse impact;

Decommissioned lighthouse on Matinicus Rock
USFWS photo

- is readily accessible to an outdoor environment for educational and interpretive programs;
- is already Service-owned, or a willing seller is available and property is available at fair market value or less;
- facility and site construction environmental impacts would be minimal;
- costs of developing site are reasonable; and,
- can support construction of a facility modeled on the principles of sustainable design, including such things as active and passive solar, and a state-of-the-art septic system and well.

Once there are specific sites to evaluate, a separate review and NEPA compliance document will be necessary prior to a final decision for a new facility. The criteria would be reviewed and refined during that process. We are currently exploring partnership opportunities to develop and occupy the future education center/office complex.

Staffing and Budgets

The current staff consists of six permanent employees: a Refuge Manager, a Deputy Refuge Manager, two Wildlife Biologists, a Small Watercraft Operator, and an Administrative Assistant.

Permanent staff, operations and maintenance budgets over the last six years are included in Table 3-4. Operations funding (1261) includes those funds used for such things as salaries, new purchases, contracts, and new construction. Maintenance funding (1262) is used for maintaining the existing infrastructure.

The specific maintenance funding related to the lighthouses is worthy of mention. Due to the complicated logistics of maintaining offshore island lighthouses and associated buildings, and the national historic preservation standards required for Petit Manan, Matinicus Rock, Libby and Egg Rock lighthouses or associated buildings, the costs are very high. Repairs to the towers, former keeper's houses, sheds and other outbuildings, boat ramps, generators, and debris removal have all been part of these projects. The following costs have been incurred over the last five years:

Petit Manan Light Station:	$742,000
Matinicus Rock Light Station:	$250,000
Egg Rock Light:	$350,000

Table 3-4 Refuge budgets from 1998 to 2004

Year	Permanent Staff[A]	Funding	
		1261 Funds	1262 Funds
1998	6	$398,000	$50,000
1999	6.6	$519,800	$646,700[B]
2000	8.7	$647,800	$208,000[C]
2001	8.9	$632,500	$29,000
2002	7.7	$598,700	$16,800
2003	6.4	$504,283	$89,958
2004	6.0	$493,222	$34,100

[A] Decimal reflects personnel who worked less than one full year

[B] Structural repairs to Matinicus Rock light station totaled $250,000. Structural repairs to Egg Rock light station totaled $350,000.

[C] Structural repairs to historic light house keepers home on Petit Manan Island totaled $127,000. An additional $35,000 was utilized to purchase a new vehicle for the Refuge.

Refuge Revenue Sharing Payments to Towns

The Refuge contributes directly to the economies of several towns in coastal Maine. Since 1935, the Service has made Refuge Revenue Sharing payments to counties or towns for refuge land under its administration. Lands acquired by the Service are removed from the tax rolls; however, under provisions of the Revenue Sharing Act, as amended, the county or other local unit of government receives an annual revenue sharing payment which often equals or exceeds the amount that would have been collected from property taxes if in private ownership. Table 3-5 below portrays payments made to towns during our fiscal year 2002.

Table 3-5 Refuge Revenue Sharing Payments in Fiscal Year 2002.

Town/County	Amount of Payment
Addison	$895.00
Boothbay	$2,958.00
Camden	$86.00
Cutler	$8,505.00
Friendship	$545.00
Gouldsboro	$3,219.00
Jonesport	$1,409.00
Knox County	$2,511.00
Land Use Regulatory Com.	$966.00
Machiasport	$619.00
Milbridge	$14,505.00
Phippsburg	$292.00
South Bristol	$350.00
Steuben	$20,964.00
Swans Island	$1,041.00
Tremont	$1,047.00
Roque Bluffs	$646.00
Vinalhaven	$234.00
Winter Harbor	$413.00
Total	**$61,205.00**

Refuge Step-Down Plans

Over 25 step-down plans are required by the Service's Refuge Manual, although not all are relevant to every refuge. The following is a summary of the status of step-down plans relevant to this Refuge. Chapter 5 presents our schedule for completing those not in final form.

These plans are completed:

- Fire Management Plan, 2002 (includes annual prescribed burn plan update and wildfire prescriptions)
- Continuity of Operations Plan, 1999
- Safety Program and Operations Plan, 2000
- Hunt Plan, 2001 (includes annual hunt program update)
- Land Protection Plan (Appendix A, pending approval of CCP)

These plans are now in draft form or being prepared:

- Inventory and Monitoring Plan
- Habitat Management Plan

These plans need to be completed:

- Visitor Services Plan
- Law Enforcement Plan
- Invasive Species Management Plan
- Cultural Resources Management Plan

Volunteer/Friends Groups (status, activities)

We are very proud of our volunteer program. Recently we have had 25 volunteers annually contribute 2,892 hours performing administrative, public use, and biological duties. Included in these figures are research volunteers who assist with the seabird restoration on refuge islands.

Killdeer
Photo by Bill Buchanan

We are pleased that a Friends of Maine Seabird Islands group was formed in 2002. This Friends group has established a board of directors, secured grant funding, and sponsored a very successful Seabird Symposium. The group is committed to supporting our seabird conservation work through increasing public awareness, building broad-based community support, and by advocating for additional island protection. They will utilize outreach, education and partnerships to achieve their goals.

Research and Special Uses

Our review of Refuge special use permits issued between 1981 and 2004 reveals that there have been 21 different types of uses permitted. We average 12 permits per year. Most of these allow access to Refuge lands for environmental education, scientific sampling, flora and fauna research collections, and commercial tours to islands for wildlife observation. A complete listing of these permits is available from Refuge Headquarters.

Community Outreach

We are involved in community outreach in several ways. We issue periodic news releases regarding Refuge events to the local news media.

Our participation in community events is also an important part of outreach. We staff informational booths at the Sportman's Show in Orono, Lobster Festival in Rockland, and the Common Ground Fair in Unity. Our staff also give presentations about the Refuge to local civic organizations, schools and universities.

Our web site (http://petitmanan.fws.gov/) provides additional information about Refuge resources and management activities.

Partnerships

Our partnerships have been instrumental in accomplishing management goals and objectives. These partnerships include universities and colleges, conservation organizations, several Federal, State and local agencies, land trusts, historic preservation groups, and adjacent landowners. The partnerships have resulted in biological research, cooperative seabird restoration and management, management of other Federal trust resources, land protection, and environmental education and interpretive programs. A summary of some of our partners follows.

Maine Department of Inland Fisheries and Wildlife

Staff from this state agency (MDIFW) served on the planning team for this project. The mission of MDIFW is to ensure that all species of wildlife and aquatic resources in Maine are maintained and perpetuated for their intrinsic and ecological values, for their economic contribution, and for their recreational, scientific, and educational use by the people of Maine. With regards to the coastal environment, this agency owns, holds conservation easements, or manages through agreements with the Bureau of Public Lands, 301 islands and ledges. This includes 88 nationally significant coastal nesting islands. MDIFW works with seabird researchers on issues of management concern. In addition, they conduct recovery work for the State's other threatened and endangered species. They advise private landowners interested in wildlife and habitat protection, and administer the State's hunting, fishing and trapping programs.

The Gulf of Maine Coastal Program

Working in partnership with Federal, State, local, and non-governmental partners, the Service's Gulf of Maine Coastal Program (GOMP) helps identify, protect, and restore significant fish and wildlife habitat. Using existing natural resource data along with biological expertise and state-of-the-art computer mapping and database management capabilities, biologists identify important fish and wildlife habitat. In addition, GOMP directs outreach services and technical assistance to interested organizations, including national wildlife refuges, State agencies, statewide conservation groups, and land trusts.

Since 1994, GOMP has played a key role in protecting more than 9,600 acres of important fish and wildlife habitat, restoring 1,300 acres of coastal wetlands, reopening and restoring fish passage on 670 miles of Atlantic salmon rivers, and leveraging more than $13 million from private, State, and Federal sources. GOMP has helped identify and protect 22 coastal islands through fee title acquisition or the use of conservation easements, and has supported seabird restoration projects on 12 islands.

Gulf of Maine Council on the Marine Environment

The Gulf of Maine Council on the Marine Environment was established in 1989 by the governments of Nova Scotia, New Brunswick, Maine, New Hampshire, and Massachusetts to foster cooperative actions within the Gulf watershed. Its mission is to maintain and enhance environmental quality in the Gulf of Maine to allow for sustained resource use by existing and future generations. The Council's Public Education and Participation Committee publishes *The Gulf of Maine Times*, which emphasizes articles to highlight or promote cooperation "to maintain and enhance environmental quality in the Gulf of Maine."

Maine Anadromous Fish Coordination Office

The Maine Anadromous Fish Coordination Office is co-located at the Craig Brook National Fish Hatchery in East Orland, Maine. Its work entails rehabilitation of imperiled Atlantic salmon stocks through stock enhancement, stock assessment, habitat evaluation, protection, and monitoring, inventory and removal of obstructions to migration, characterizing generic composition of stocks, and outreach and education related to Atlantic salmon conservation. It also works on other interjurisdictional fish species like American shad, river herring, striped bass, rainbow smelt, Atlantic and shortnose sturgeon, and their respective habitats.

Canadian Wildlife Service

The management of wildlife in Canada is a shared responsibility between Federal, provincial, and territorial governments. The Canadian Wildlife Service of Environment Canada (CWS) handles wildlife matters that are the responsibility of the Federal government. These include protection and

management of migratory birds as well as nationally significant wildlife habitat. Other responsibilities are endangered species, control of international trade in endangered species, research on wildlife issues, and international wildlife treaties and issues. CWS also consults with provinces and territories on determining migratory game bird hunting regulations. As a member of the Gulf of Maine Seabird Working Group, CWS participates in seabird management discussions and planning at annually scheduled meetings held in both the U.S. and Canada.

For the past several years, CWS biologists have coordinated with both Refuge and Regional Office staff on Machias Seal Island issues. Sovereignty aside, from Canada's standpoint, CWS is responsible for seabird management on the island. The United States' viewpoint supports the Service's responsibility for managing the same resources on the island. At the field level, both CWS and our staff work together on biological and public access issues. Canadian and U.S. biologists meet annually to discuss seabirds, tour boat issues and landing schedules.

Maine Coast Heritage Trust

The mission of Maine Coast Heritage Trust (MCHT) is to conserve coastal and other lands that define Maine's distinct landscape, protect its environment, sustain its outdoor traditions, and promote the well-being of its people. MCHT has helped landowners, communities, government agencies, and local land trusts for more than 30 years to conserve more than 112,000 acres, including vital wetlands, valuable farm and forest land, hundreds of miles of shoreline, and over 260 entire islands. It now owns only 48 properties outright, and holds conservation easements on 95 others. This organization is considered a leader in Maine coastal island conservation. On several occasions MCHT has purchased islands and held them until the Service could secure appropriate funds for the property.

Other Land Trusts

Land trusts are a variety of private, non-profit organizations that protect land for its natural, recreational, scenic, historical, educational, or productive values. The 90 land trusts in the state play an essential role in Maine's conservation community. Due to inconsistent funding of State and Federal agencies and the development interests of some landowners, conservation land trusts are often the only alternative for preserving threatened lands. Conservation easement, land donation, and fee purchase are their primary methods of land protection. There are 45 land trusts established along the coast of Maine, many of them actively working to protect coastal nesting islands.

The Nature Conservancy, Maine Chapter

The Maine Chapter of The Nature Conservancy protects plants, animals, and natural communities representing the diversity of life in Maine.

Historically, the chapter has played a lead role in protecting island habitats along the Maine coast. Since 1956, the chapter has helped protect 117 coastal islands as habitat for seabirds, waterfowl, shorebirds, eagles, and rare plant and marine communities. Twenty-two of these islands are nationally significant coastal nesting islands. The chapter, supported by over 12,000 member families, owns and manages approximately 40 mainland preserves and 50 coastal islands.

Private Island Owners

Individual landowners in Maine have owned coastal nesting islands for many generations. They have protected the islands and their biological values by conserving the islands' resources and limiting development. Unfortunately, raising tax costs may prohibit some families from retaining ownership of these undeveloped properties.

National Audubon Society

The National Audubon Society (NAS) promotes wise use of Maine's environment through research, education, and advocacy. NAS works cooperatively with the Refuge and the MDIFW on seabird management and restoration projects on several Maine islands. Its current programs include the ongoing protection of seabirds, and informational programs to support threatened and endangered seabirds and seabird habitat restoration. NAS also holds fee title and conservation easements on seven nationally significant coastal nesting islands.

Maine Audubon Society

The Maine Audubon Society promotes wise use of Maine's environment through research, education, and advocacy. Its current programs include protection and information to support threatened and endangered shorebirds, shorebird habitat restoration, loon restoration, and the "loon count." This society also offers field trips on natural history and ecology of coastal waters, and maintains a staff of wildlife biologists who support active field work, education, and a limited advocacy program. It also holds conservation easements on several coastal nesting islands.

State Planning Office–Maine Coastal Program

State Coastal Program staff work on a variety of issues relating to water quality, stewardship, and economic development, and provide technical assistance to municipalities. They work to ensure the continuation of working waterfronts and public shore access points, and support the Maine Coast Week, the Shore Stewards Partnership, and the Penobscot Bay Marine Volunteers.

Island Institute

The Island Institute is a non-profit organization that serves as a voice for the balanced future of the islands and waters of the Gulf of Maine. They are guided by an island ethic that recognizes the strength and fragility of Maine's island communities and the finite nature of the Gulf of Maine ecosystems. Along the Maine coast, the Island Institute seeks to support the islands' year-round communities; conserve Maine's island and marine biodiversity for future generations; develop model solutions that balance the needs of the coast's cultural and natural communities; provide opportunities for discussion over responsible use of finite resources, and provide information to assist competing interests in arriving at constructive solutions. The Institute also works with local non-profit, State, and Federal partners to ensure long-term protection of nesting islands**.**

Maine Island Trail Association

The Maine Island Trail Association's (MITA) mission is to "...establish a model of thoughtful use and volunteer stewardship for the Maine islands that will assure their conservation in a natural state while providing an exceptional recreational asset that is maintained and cared for by the people who use it." MITA encourages a philosophy of low-impact use and active stewardship among its members. It also strives to educate island visitors about natural history, and the ecological sensitivity of the islands. Member-volunteers are encouraged to participate in their island monitoring and Adopt-An-Island programs. Members receive a very popular guidebook to the Maine Islands Trail, along with their *Island Trail* newsletter, and educational information regarding low-impact camping.

Hurricane Island Outward Bound School

Hurricane Island Outward Bound School (HIOBS) is a non-profit educational institution dedicated to outdoor experiential education. It has been using Cross Island since 1969 as a base for both solo and group camping programs. On a 20 acre inholding on the northeast end of Cross Island, the school owns and maintains the former U.S. Coast Guard lifesaving station and boathouse, now known as the Cabot Biological Station. HIOBS is headquartered in Rockland, Maine.

The Chewonki Foundation

The Chewonki Foundation is a non-profit educational institution organized in 1963 to assume ownership and leadership for Camp Chewonki. The Foundation's programs encourage participants to develop their personal potential, gain a sense of community, and heighten their interest in and understanding of the natural world. We grant limited overnight camping on the Refuge's Halifax and Cross Islands for use as part of their educational programs. They are based in Wiscasset, Maine.

Wilderness Management

In 2001, our team began a wilderness review of all current Refuge lands. This review is our formal process to identify and recommend Refuge System lands and waters that merit inclusion in the National Wilderness Preservation System. Wilderness reviews are required in CCPs, and we conduct them in accordance with the refuge planning process outlined in the Service Manual (602 FW 1 and 3), including public involvement and NEPA compliance.

Appendix D presents the results of our wilderness review. In addition, objective 7.5 in chapter 4, outlines specific management direction.

Gadwall duck with duckling
USFWS photo

Cultural and Historic Resources

As is generally the case in coastal settings, the project area is especially rich in archaeological resources, though few have been reported on current Refuge lands. The majority of prehistoric archaeological sites in the area date from the Ceramic Period (ca. 1000 B.C. to A.D. 1600). This probably reflects population density to some extent, but is also a reflection of the instability of coastal environments during preceding periods. Pottery (e.g. ceramic) appears in this period, and daily life appears to have consisted of a mix of hunting and gathering of upland, estuarine, and marine resources, especially soft shell clam (*Mya arenaria*).

Unlike most of the eastern U.S., prehistoric agriculture was only significant in southwestern Maine because of the short growing season. Sites on islands were generally seasonally occupied, presumably as bases to exploit marine resources. A similar pattern of occupation followed European contact, with the important addition of fur trapping for the European market. Some places may have become regular trading locations when European ships arrived in the summer. Summer use of some islands as European cod fishing stations also began in the 17th century. Today, coastal erosion is a severe threat to many prehistoric and 17th century archaeological sites in the study area, especially on the more exposed islands.

Only six prehistoric archaeological sites are recorded within current Refuge property, none of which has been thoroughly examined by Service archaeologists. All are in severely eroded shoreline locations on islands. Most appear to be shell middens dating from ca. 2000 years ago to shortly before European contact. A human burial was reported from one of these sites in the 1950s, and stone tools and pottery have been reported from others, indicating that these sites had considerable potential to add to our knowledge of regional prehistory prior to their damage by erosion. Some may still have research potential, while others may have been completely destroyed by erosion since their discovery.

Extensive permanent settlement of the area by Euro-Americans was hindered by repeated wars with the Native Americans and their French allies until the mid-18th century. Many towns were established in the latter part of the century, with population and economic activity generally concentrated around major estuaries. Some larger islands were settled as fishing and farming communities, although most were only used seasonally for livestock pasture or as seasonal fishing station sites. Lighthouses and lifesaving stations were built by the Federal Government on several islands in the project area during the 19th century. Recreational camps, ranging from single room shacks to elegant mansions, also began to be built on some islands in the latter part of the 19th century.

Recorded historic period archaeological sites on the Refuge are generally set back from the shoreline, with the majority being mainland farm sites. One eroding island historic site has been identified, which appears to have been the foundation of a building dating to circa 1800. Place names such as Stage Island (referring to fish drying racks, or “stages”) indicate that similar sites probably exist on other islands from periods spanning European contact to the present. Most island historic sites probably relate to 18th and 19th century maritime activities or livestock raising. In sheltered areas, these may include tidal zone features, such as remains of piers or vessels. Unrecorded historic sites within the Refuge are likely to also include seasonal shore fishing stations and trading locations dating from the earliest periods of European contact and settlement. Few of these locations

have been successfully located within New England, and even fewer studied through archaeological excavation. Such sites are likely to be among the most significant historic archaeological sites in the nation, and the threat of loss by erosion makes their discovery, study, and protection increasingly urgent.

Lighthouses and Other Historic Structures

On Petit Manan Island, Refuge structures currently listed on the National Register of Historic Places include a light keepers dwelling and outbuildings built in the late 19th century for the Petit Manan Light Station. The dwelling and outbuildings are now used as a research base for the extensive seabird restoration project on the island. These buildings require regular maintenance and have received major repairs in recent years, but further repairs are still needed. Recent funding has addressed significant maintenance needs on the two story dwelling and rain shed. The boathouse was also replaced in 1994. The U.S. Coast Guard retains ownership and responsibility for maintaining the functioning light tower. The Service cooperates with the Coast Guard on all islands with functioning lighthouses to provide access for emergency and scheduled maintenance of structures and aids to navigation.

Lighthouse on Libby Island
USFWS photo

Three of the four lighthouse islands transferred to the Service under the Maine Lights Bill of 1996 are listed on the National Register of Historic Places. It is the responsibility of the Service to maintain the structures on three of these islands to historic preservation standards: Libby Island, Matinicus Rock, and Egg Rock lighthouses. The oldest is Libby Island Light Station, with a granite tower built in 1822 and a brick fog signal building built in 1884. Both are in fairly good condition, but do need some repairs, and will require regular maintenance in the future.

Matinicus Rock Light Station, the most famous of the three, includes an 1848 granite dwelling, an 1890 boathouse, and twin granite towers built in 1858. This light station is strongly associated with Abbie Burgess, one of the most famous 19th century heroines of American lighthouse history, who lived in the lighthouse from 1853 to 1875. The north tower at Matinicus Rock is abandoned and in extremely poor

condition. With its lantern removed and no door or window glazing, rain and snow infiltration has destroyed much of the mortar in this tower. Recent repairs on the dwelling, boardwalk, boat ramp and boathouse have been completed, however all structures here will need regular maintenance. The National Audubon Society currently uses the dwelling as a seasonal research station.

Egg Rock Light Station consists of a frame dwelling with a lantern on its roof, built in 1875, and a brick fog signal building, built in 1904. The dwelling has received significant repairs in recent years including replacing the roof and windows, and applying new storm shutters. The brick fog signal building is in good condition. Regular maintenance on both buildings will be required.

Two Bush Island, the fourth lighthouse island, transferred in 1996, has a functioning light station. It now consists only of a brick tower built in 1897. It has been determined ineligible for the National Register of Historic Places, due to loss of the dwelling, boathouse, and oil house that were originally part of this station. Its maintenance is not required by the National Historic Preservation Act. A lesser level of maintenance to protect the light so that it can remain operational will be required under the Maine Lights Bill of 1996.

Franklin Island, acquired by the Service in 1973 from a Coast Guard transfer, also has a functioning light station which is owned and maintained by the Coast Guard. The lighthouse is on the National Register of Historic Places.

Pond Island, acquired by the Service in 1973 from a Coast Guard transfer, also has a functioning lighthouse which is owned and maintained by the Coast Guard. This lighthouse is on the National Register of Historic Places.

Nash Island, half of which was acquired by the Service in 1981 from a Coast Guard transfer, has a non-functioning lighthouse located on the Service-owned half of the island. The light, however, was conveyed to a nonprofit corporation under the terms of the Maine Lights Bill of 1996. The Coast Guard holds an access easement to this light. The lighthouse is on the National Register of Historic Places.

A fishing camp on Metinic Island, consisting of a wing of a 19th century house that was moved to its present location in the 1930's, has been determined ineligible for inclusion on the National Register of Historic Places. This building was renovated in 2002 and is currently used as a base camp for researchers.

The collapsing ruin of an 1880's lifesaving station on Cross Island has been determined ineligible for National Register listing due to its extreme deterioration. The facility is no longer standing.

Part 2: Refuge Island Resources

Islands Overview

There is an incredible diversity of ecological communities and associated species on the 42 Refuge Islands. The resources protected on these islands are unique to the Refuge System. In the section below, we provide general descriptions on some of the unique Federal trust resources and rare and declining species protected on the islands. This is followed by individual island descriptions and a series of maps with aerial photos of each island. The islands are presented in order from west to east. They are identified by local name and their Coastal Island Registry Number (CIREG); a unique identifier assigned by the State of Maine Planning office. It is important to note that Service island acquisition has been on-going during development of this CCP. The most current list of Refuge islands should be obtained at Refuge Headquarters.

At the end of the chapter, Table 3-42 provides a summary of cover types for the Refuge.

Threatened and Endangered Species (Federal-listed)

Roseate tern

The northeastern population of the roseate tern is Federal- and State-listed as endangered. Together with Arctic and common terns, roseate tern populations were decimated in the Gulf of Maine in the late 1800's due to a combination of shooting and egging for food and bait, and feather collection for the millinery trade (Drury 1973). Conservation legislation passed in the early 1900's provided protection from human persecution, but expanding gull populations soon caused tern numbers to again decrease significantly (Kress 1983).

By 1977, within the entire Gulf of Maine, all three tern populations had decreased to 5,321 total pairs while the number of islands supporting nesting terns had decreased by half. Cooperative efforts by members of the Gulf of Maine Seabird Working Group (GOMSWG) to attract new birds to islands and to control gull predation have reversed this decline and all three species are experiencing population growth. After 15 years of active management, the roseate tern population in Maine has risen from a low of 76 pairs to a record high of 289 pairs in 2001. This represents a 278% increase in Maine's population. In 2002, 379 pairs of roseate terns nested at six sites in the Gulf of Maine (including Canada).

Roseate Tern
Photo courtesy of Gil Lopez-Espina

While the number of breeding pairs has increased in recent years, we continue to be concerned over the poor distribution of nesting pairs across the region. Approximately 87% of the Northeast roseate tern population breeds on three islands: Bird and Ram islands in Massachusetts and Great Gull Island in New York. In Maine, roseate terns only nest on three or four

islands, with 95% of the Maine population on Stratton and Eastern Egg Rock. Petit Manan, Pond, Metinic, and Seal islands support small numbers of nesting roseate tern. Matinicus Rock, Metinic Island, and Egg Rock have had historic nesting, and nesting attempts have been documented on Pond Island. The terns limited nesting distribution significantly increases the potential for a single catastrophic event to affect a major percentage of the population.

Our roseate tern recovery efforts on the Refuge have focused on increasing the number of nesting pairs on islands and maintaining a productivity level of 1.0 fledged chick/nesting pair. We continue to acquire islands with nesting habitat and engage in cooperative seabird restoration efforts to improve the geographic distribution for all three species of nesting terns. The Roseate Tern Recovery Plan (USFWS 1998) goal is to expand the Northeastern U.S. population to over 30 colonies, with six sites supporting at least 200 nesting pairs with high productivity (1.0 fledged chick/pair).

Habitat manipulation is often necessary to enhance or maintain nesting habitat for roseate terns. Available information indicates that these terns generally prefer dense vegetation or some level of overhead cover for nesting (USFWS 2000). This is somewhat contradictory to the more open habitat used by nesting common and Arctic terns. Fortunately, these differences in habitat preference can usually be accommodated on the same island. Interestingly, roseate terns frequently nest within established colonies of common terns (Nisbet 1981). Habitat manipulation includes construction of nest boxes, allowing dense vegetation to develop, control of laughing, herring, and great black-backed gulls, and other predators. We also restrict public access to seabird islands during the nesting season to minimize disturbance. We describe our predator management strategies and public use restrictions in the discussion on common and Arctic tern that follows.

Given the increases in nesting pairs in recent years, and the establishment of several new tern restoration projects, we are optimistic that the population will continue its current growth trend over the next 15 years, resulting in significant progress towards recovery of this species.

Bald eagle

The northern population of the bald eagle is Federal- and State-listed as threatened. Within the Refuge, bald eagles are actively nesting on four islands, and have historically nested on four additional islands. The Gouldsboro Bay Division also contains one active bald eagle nest. Preferred habitat for bald eagles nesting on Maine coastal islands is mature red spruce/ balsam fir forests close to foraging areas. When available, mature hardwood trees are also used. Eagles can be sensitive to disturbance during the nesting season, and will typically nest in areas with little human disturbance. Once disturbed, adult bald eagles may flush from their nest and leave eggs and young chicks exposed to the inclement weather (heat or cold) or susceptible to predation.

Historically, threats to bald eagles have included environmental contaminants, shooting, habitat loss, and human disturbance at nest sites. Extensive public education efforts and Federal and State legislation have significantly reduced many of these threats. The bald eagle population in Maine has responded to this protection, and the population has increased nearly 8% per year for the past 10 years. The state now supports over 290 pairs of eagles (MDIFW 2002). MDIFW has identified permanent protection of eagle nesting areas as the top priority for the future recovery of this species in Maine. In particular, they have specified a recovery objective of at least 50 nesting areas under permanent habitat protection (conservation ownership or easement), with an additional 100 nesting areas under permanent protection or cooperative agreement (MDIFW 2001).

While we monitor nest occupancy and productivity on the Refuge in cooperation with MDIFW, we do not otherwise actively manage these sites. We restrict public access at active nesting sites from February 15 to August 31. At historical nesting sites, we restrict public access from February 15 to May 15 to encourage re-nesting. If birds are not established by May 15, we determine whether or not eagle activity in the area warrants a continued closure through August 31.

Seabirds

In addition to the roseate tern restoration noted above, we are actively managing our Refuge islands for other seabirds of conservation concern. While our management is focused on common and Arctic tern, Atlantic puffin and razorbills, we are also monitoring populations of common eider, laughing gull, common murre, Leach's storm-petrel, and black guillemots.

One management practice we employ for all our seabird species is a restriction on public access to islands during the nesting season. We restrict public access to seabird nesting islands from April 1 to August 31 to minimize human disturbance during this sensitive time of year. On islands where only gulls or eiders are nesting, the closure period is April 1 to July 31 to reflect their earlier nesting seasons. Respective island closures are evaluated annually as new biological information is obtained. Seal Island is an exception to the seasonal closures; it is closed year round due to a safety concern with unexploded ordnance.

Common and Arctic tern

The Arctic tern is State-listed as a threatened species, and the common tern is State-listed as a species of concern due to their small population sizes and limited geographic distribution. Although Arctic and common terns historically nested on over 70 islands, nesting is now limited to less than 30 islands. Unfortunately, due to a combination of habitat loss through development and recreational pressures, and the presence of nesting gulls, the majority of islands used historically are no longer suitable for nesting terns. Of particular concern is the fact that over 60% of common terns and more than 90% of Arctic tern nesting in Maine occur on three Refuge islands: Petit

Manan and Seal islands, and Matinicus Rock. Machias Seal Island, which we manage under an MOU with MDIFW, supports 1,349 pairs of common terns and 2,202 pairs of Arctic terns (GOMSWG 2002). When you include the nesting population on Machias Seal Island, 94% of the Arctic terns nesting in the United States, with the exception of Alaska, nest on four Refuge islands. Our management focus has been on permanent protection of the nesting islands, predator management, vegetation management, and restricted public access. These are described in more detail below.

With regard to predator management, we are trying to provide terns with predator free nesting islands to maximize tern survival and production rates. Methods include: harassment, egg and nest destruction for gulls, trapping of owls and mammals, and shooting predatory owls, herons, and gulls. We have also used an avicide (DCR-1339) to specifically control gulls during the first two to three years of a restoration project on several islands. The use of the avicide is strictly controlled and used only when non-lethal means would not allow us to accomplish our predator control objectives.

Great horned owl
Photo courtesy of the Cornell Laboratory of Ornithology

The presence of a single predator can have disastrous effects on a nesting colony. Both herring and great black-backed gulls are highly efficient predators of tern eggs, chicks and adults. In addition, they compete with the terns for nesting sites. Their presence on a nesting island can lead to complete nesting failure or colony abandonment from an island. Mammalian predators, even a single individual, can also have a disastrous effect on a seabird colony. During the 2001 nesting season, a mink swam to Ship Island and predated on the colony there, resulting in near complete nesting failure; only four common tern chicks were produced from over 300 nests. The effects of predation will vary depending on the type of predator, seabird species, habitat on the island, and time of year predator arrives on the island. We annually monitor the effectiveness of predator control programs and evaluate new and different techniques.

Both common and Arctic tern species tend to nest in areas providing some overhead cover and a mix of vegetation and open space (Cramp 1985, USFWS 2000). The density and height of a particular plant seem to be more significant in determining use by nesting terns than any specific species composition. We are actively managing the vegetation on several of

Common tern chick
Photo by Stacie Schoppman

the tern nesting islands to maintain a high quality nesting substrate and to improve nest productivity. We use a variety of techniques to manage rank vegetation including prescribed burning, sheep grazing, mowing and herbicides. Habitat management efforts will be expanded to the other restoration islands if vegetation conditions warrant management.

Historical information indicates that vegetation on many of the seabird nesting islands was kept short by annual burning by lighthouse keepers or grazing by livestock. In fact, sheep have grazed on Maine coastal islands for approximately 400 years, with a peak population of nearly 20,000 sheep (Fallon 1991). Indirectly, these vegetative treatments benefitted nesting terns and several other seabirds. Interestingly, because of this history, on many islands we are not certain what the native, natural vegetation would look like if burning and grazing had not occurred.

We have an active prescribed burn program, particularly on Petit Manan Island where burning has been very successful at reducing raspberries and other rank vegetation to benefit nesting terns. While burning is a valuable vegetation management tool, its use is limited due to a narrow, optimum burning window where conditions are dry and calm enough to allow access to the island with staff and equipment. Therefore, other tools and techniques are needed as well.

On Metinic Island, we are presently using sheep grazing to manage the vegetation to benefit nesting terns. The family who owns the southern 150 acres of the island maintains a flock of 120 sheep. With the exception of a few small vegetation study plots we maintain, the sheep are generally allowed to graze the entire island. Our plots include two that are permanently fenced, and two reference “unfenced” plots. Several times each season, we record the species composition and plant height in the four plots. Prior to the tern nesting season, we encircle the three acre tern restoration area with electric fence. This practice allows the vegetation to grow to greater heights than if subject to grazing, and provides nesting cover for the terns.

During 1994 and 1995 the Refuge and NAS conducted several vegetation control experiments with sheep and goat grazing on Seal Island (NAS 1994, NAS 1995). As expected, information gathered to date on both Seal and Metinic islands indicates that the sheep are altering the species composition and height of the vegetation. However, it appears that the seasonal fencing of the restoration area on Metinic Island is providing the terns with appropriate nesting cover. At the end of the nesting season, we remove the fence and the sheep may graze the entire island.

Grazing is also occurring on Nash Island. The sheep originate from the contiguous privately owned Big Nash Island and cross at low tide to Nash Island. A small number of terns (2-4 pairs) nest on Nash Island, but we are not actively managing this site. Our concern has been that we have had little, if any, control over grazing intensity or duration on either Nash or Metinic islands. However, on Metinic Island, the current grazing situation appears to provide terns with suitable nesting habitat, by reducing the rank vegetation. At this point in time, we intend to allow grazing to continue on both islands with continued monitoring. It is clear that without grazing as a vegetation management tool, we would eventually need to employ some other labor intensive and expensive method of vegetation control, similar to the other intensively managed seabird restoration islands.

We have also utilized mowing and rototilling as means of managing vegetation for nesting seabirds. On Ship Island, staff have evaluated a combination of techniques (mowing, rototilling, and landscape fabric) in an effort to create additional nesting habitat for the common terns. In 2000, we established three 20' x 20' plots for treatment and monitoring. Each treatment was replicated, for a total of six treated plots. Two plots were mowed only; two plots had the vegetation mowed and then the soil was rototilled; and, two plots had landscape fabric placed throughout the rototilled area. Substrate suitable as nesting material was placed on top of the landscape fabric. The results proved interesting. Mowing by itself proved to be ineffective. The vegetation responded vigorously to the mowing and within a few weeks reached heights which would exclude nesting by terns. Both the rototilled plots and those with landscape fabric provided suitable tern nesting habitat throughout the nesting season. Efforts were repeated the following season. We are continuing to evaluate the results; however, the presence of mink on the island has eliminated most of the nesting.

Atlantic puffin and razorbills

Atlantic puffin and razorbill are State-listed as threatened due to small population sizes (450 pairs of Atlantic puffin and 350 pairs of razorbill in the State of Maine), and limited geographic distribution (four to five islands). Three islands within the Refuge currently support nesting Atlantic puffins: Matinicus Rock, Seal, and Petit Manan islands. In fact, the first two islands support over 90% of Maine's puffin population. Razorbills also nest on four islands within the Refuge: Seal, Petit Manan, and Old Man islands, and Matinicus Rock, with the latter two islands supporting 85% of Maine's population. Machias Seal Island, which we manage under an MOU with MDIFW, supports an additional 2,800 pairs of Atlantic puffin and 543 pairs of razorbill (GOMSWG 2002). When you include the nesting population on Machias Seal Island, 98% of the Atlantic puffin nesting in the U.S. nests on four Refuge islands.

Razorbills were eliminated from Maine by the late 1800's, and had only recovered to 25 pairs by 1977 (MDIFW 1999). The population has

Atlantic puffin
USFWS photo

continued to grow, and in 2002 approximately 350 pairs of razorbill were documented in Maine. It is difficult to determine the exact population size of these burrow nesters, as many sites are inaccessible.

Much of the initial recovery observed in the Maine Atlantic puffin population was due to the extensive efforts of National Audubon Society. Prior to the mid 1970's Atlantic puffin were known only to breed in limited numbers on Matinicus Rock. Between 1973 and 1986, the National Audubon Society translocated 954 puffin chicks from Newfoundland to Eastern Egg Rock, and between 1984-1989, an additional 791 puffin chicks were brought to Seal Island. The translocation effort significantly increased the Gulf of Maine population of puffin in a relatively short period of time.

Habitat for both Atlantic puffins and razorbills appears to be limited on Petit Manan Island. In 1991, 17 artificial burrows of various style were constructed on the island. During that first year, three of the 17 artificial burrows were used by the birds (Lor 1991). Although some of the structures were removed because they did not provide suitable nesting habitat, several of the other structures continue to be used today. A few newly designed structures were placed on the island in 2001, and initial response by the nesting puffins appears promising. Puffins successfully raised chicks in three of the six artificial burrows in 2002. On Petit Manan Island, the number of puffins and razorbills observed on a daily basis and throughout the season have continued to increase over the 15 years. In 2002, the research crew routinely counted over 80 puffins and had a high count of 180 puffins and 43 razorbills. In recent years the number of puffins nesting on the island has varied between 15-24 and no razorbills nest on the island (Jamieson 2002).

As with common and Arctic tern, these species benefit from our predator management program and the restricted public access during the nesting season.

Waterfowl

Numerous species of waterfowl utilize the Gulf of Maine as migration and wintering habitat. Midwinter waterfowl surveys are conducted annually to determine the distribution and number of birds utilizing the coast. The most abundant species recorded during these inventories is the common eider,

but significant numbers of black ducks, bufflehead, common merganser, and long-tailed ducks are also observed. Surf, common, and white-winged scoters also winter along the coast of Maine. Harlequin ducks travel south from their breeding grounds in Canada to Maine to spend the winters along the remote rocky shores found along the coast. The Maine population of harlequin ducks is estimated at 1,500 individuals, and half of that population winters on a limited number of islands along the coast of Maine (MDIFW 2002). MDIFW has listed the harlequin duck as a threatened species.

Despite providing extensive habitat for migrating and wintering waterfowl, only the common eider nests in large numbers on the coastal islands. Current information indicates that 29,000 pairs of common eiders nest on 320 islands in Maine (MDIFW 2001). Eiders have a long history of exploitation throughout their range, and the number of eiders harvested annually in Maine surpasses the harvest of all other sea ducks combined (MDIFW 2001). Historically, they were subjected to the same collection and habitat loss pressures as the terns. Great black-backed gull predation continues to be a major source of duckling mortality (MDIFW 1999).

As with the other seabird species, common eider benefit from our predator management programs, and the restricted public access on seabird nesting islands during the nesting season.

Other Resident Wildlife

With our past survey efforts focusing on bald eagles, colonial nesting seabirds, wading birds, and waterfowl, our information on other wildlife resident to coastal islands is limited. Records indicate that several of the larger forested islands (e.g. Cross and Bois Bubert islands) support or have supported white-tailed deer, moose, black bear, coyote, fox, raccoon, mink, and otter. We will gain new information from our recently initiated small mammal surveys, conducted in conjunction with our botanical inventories. In addition, in 2001 spider, dragonfly and damselfly annual surveys began on several islands and the mainland divisions. We will continue to opportunistically monitor small mammals, invertebrates, and amphibians during other scheduled inventories. However, information gathered to date indicates that abundance and diversity of resident wildlife on offshore islands is lower than the mainland due to harsh winter conditions, lack of food and freshwater resources, or distance from the mainland.

Many of the Refuge islands and surrounding ledges function as haul-out sites for both harbor and gray seals. The seals come ashore, frequently during low tide, to bask, sleep, and nurse pups (Katona et. al. 1993). Their activities are generally limited to the inter-tidal areas on islands not currently managed as restoration sites, or on islands large enough to provide the seals sufficient distance from research crews. Several islands within the Refuge are used as harbor seal pupping areas in May or early June. Gray seals have their pups in January and February and have left the islands long before refuge management activities, such as seabird research and restoration projects, occur for the

season. Recent surveys have indicated that Seal Island is currently the largest gray seal pupping area in the state (Gilbert, Univ. of Maine, pers. comm.).

Island Vegetation

Rare Plants

Plants (and animals) living in the Gulf of Maine are uniquely adapted to cold water currents, the prevalence of fog in summer, and strong cold winds that typically occur off the Maine coast (Conkling 1999). Along the outer islands, this results in harsh environmental conditions similar to those in more Arctic regions. These conditions, which frequently are too harsh for some plants found on the mainland, may give rise to a group of boreal species of plants that typically exist much farther north (Mittelhauser and Morrison 2000).

To date, botanical surveys have been conducted on Cross, Halifax, Eastern Brothers, Libby, John's, Upper Flag, and Petit Manan islands. Other Refuge islands have had limited botanical inventories conducted, including Outer Double Head Shot, Inner Double Head Shot, Old Man, Seal, and Matinicus Rock islands. On the remaining islands, we have been recording unique plants or plant communities in the course of doing other refuge management activities. Rare plant species listed by The Nature Conservancy or the State of Maine and found on the Refuge are listed in Table 3-6. In addition, plants or plant communities of note are mentioned in the individual island descriptions.

Invasive and Non-Native Plants

Invasive plants have become increasingly pervasive in the State of Maine, although their abundance and distribution on the Refuge have not been thoroughly researched. The threats associated with invasive species vary significantly among the different species and their preferred habitats. Initial botanical inventories on Refuge islands suggest that non-native species such as timothy, salt spray rose, and raspberry may be common on many of the coastal islands. We currently do not know the significance of these species to the native flora of the coastal islands. However, the aggressive and resilient nature of invasive species such as purple loosestrife requires frequent and thorough treatments. The method of treatment depends on the species targeted, but mechanical, chemical, and biological control treatments have been utilized by a variety of agencies.

Individual Island Descriptions

In the following discussion, we describe what we know about each of the 42 Refuge islands; its acquisition history, its natural resources, and our management of public use and access. It is important to keep in mind that the biological information is very dynamic, in particular, nesting status, which has implications for management. The island acreage given could be either the actual survey acres or, in the event we did not survey the island, it is the deed acres or military transfer agreement acres. However, our estimate of acres in specific cover types (Table 3-42, at the end of the chapter) was

Table 3-6 Rare plants documented on Maine Coastal Islands National Wildlife Refuge

Island	Common Name	Scientific Name	State Listing	State / Global Rarity Rank[1]
Cross	livid sedge	*Carex livida*	threatened	S2 / G5T5
	coast blite goosefoot	*Chenopodium rubrum*	threatened	S1 / G5
Libby	salt marsh sedge	*Carex recta*	endangered	S1 / G4
	bird's eye primrose	*Primula laurentiana*	special concern	S2 / G5
	northern yarrow	*Achillea millefolium*	special concern	S1 / G5
Eastern Brothers	northern yarrow	*Achillea millefolium*	special concern	S1 / G5
	marsh felwort	*Lomatogonium rotatum*	threatened	S2 / G5
	bird's- eye primrose	*Primula laurentia*	special concern	S2 / G5
	Blinks	*Montia fontana*	special concern	S2 / G5
Halifax	northern yarrow	*Achillea millefolium*	special concern	S1 / G5
Bois Bubert	Nova Scotia false-foxglove	*Agalinis neoscotica*	threatened	S1 / G2?
	bird's- eye primrose	*Primula laurentia*	special concern	S2 / G5
Petit Manan	Blinks	*Montia fontana*	special concern	S2 / G5
	white adder's mouth	*Malaxis monophyllos*	endangered	S1 / G4
John's	sea-beach sedge	*Carex silicea*	special concern	S3 / G5
Upper Flag	pitseed goosefoot	*Chenopodium berlandier varmacrocalycium*	special concern	S1? / G5T?

[1] The definitions for State and Global ranking are as follows:

State Ranking: (determined by Maine Natural Areas Program)
- S1: Critically imperiled in Maine because of extreme rarity or vulnerability to extirpation
- S2: Imperiled in Maine because of rarity (6 - 20 occurrences) or because of other factors making it vulnerable to further decline
- S3: Rare in Maine (20 - 100 occurrences)
- SH: Occurred historically in Maine

Special concern: Rare in Maine based on available information, but not sufficiently rare to be considered threatened or endangered

Global Ranking: (determined by The Nature Conservancy)
- G2?: Globally imperiled because of rarity (6 -20 occurrences) or because of other factors making it vulnerable to further decline (uncertain)
- G4: Apparently secure globally, but with cause for long-term concern.
- G5: Demonstrably widespread, abundant, and secure globally
- T: Indicates subspecies rank
- A: Indicates questionable rank

determined from aerial photos using a GIS mapping tool. Contact the Refuge Headquarters to verify the source for a particular island and to obtain updated biological and management information. The islands are listed in geographic order from west to east. In each island's description, we also list the Coastal Island Registry (CIREG) number, as well as identify which map at the end of the chapter contains the aerial photo for the island (Refer to Maps 3-1 to 3-25 at end of Part 2).

We also list the surveys and studies that have been conducted on each island, some of which are ongoing. Reports on some studies are available from Refuge Headquarters upon request; however, not all data has been analyzed. On several of the islands, we have very little information to share because they are logistically difficult to visit or because other island surveys have taken precedent with available funding and staff. However, a few studies and reports have applicability across several Refuge islands and are recommended reading, including:

- *The Birds and Plants of Petit Manan NWR* (Widrig 1996);
- An evaluation of livestock grazing and habitat restoration on tern nesting islands (Williamson & Schubel 1995); and
- Annual reports for each of the six seabird restoration island projects

The MDIFW has designated many of the Refuge islands as Significant Wildlife Habitat under the State's Natural Resource Protection Act (NRPA). Any seabird nesting island, located within an organized township, that provides suitable habitat and supports 25 or more nests or seabirds would meet the criteria. The majority of Refuge islands qualify as Significant Wildlife Habitat under NRPA. MDIFW has also designated Essential Habitat for bald eagles and roseate terns. Eight bald eagle nests, and six roseate tern nesting islands, located within the Refuge have been designated as Essential Habitat for these species. Both Significant Wildlife and Essential Habitat designations provide MDIFW with additional management oversight and permit authority over actions proposed for these locations to ensure habitats are not degraded due to human activities.

1) Malaga Island (CIREG 81-193; Map 3-1)

This 2.5 acre island lies in the Town of Kittery, York County. The Service purchased a conservation easement in 2002 to permanently protect the island from development.

The island is non-forested with grasses and low shrubs. No botanical or biological surveys are known to us.

2) Smuttynose Island (CIREG 81-182; Map 3-1)

This 39.9 acre island lies in the Town of Kittery, York County, in the Isle of Shoals. The Service purchased a conservation easement in 2002 to

permanently protect from development an active seabird nesting colony on the southern end of the island. A 1995 survey of nesting seabirds recorded 15 eider nests, 1,030 great black-backed gull nests, 387 herring gull nests, and three black guillemot nests. Seabird inventory results are summarized in Table 3-7.

Its habitat consists of 20 acres of shrub lands, and 20 acres of grass, forbs, and shrubs. The shoreline is very rocky. Twenty-four acres of intertidal marine wetlands were also acquired. There are two small structures on its western shore, but their maintenance is not the responsibility of the Service. Public visitation occurs on the island, as tours are conducted by the Starr Island Corporation, located on the adjacent Appledore Island. Seasonal caretakers reside on the northern end of the island.

The seabird nesting area is closed to public access during the seabird nesting season: April 1-August 31. Informational signs alerting visitors to the closure are planned.

Table 3-7 Nesting seabird species, number of pairs, (and year) observed on Smuttynose Island

Species	Number of pairs* (and year) observed
black guillemot	3('76), 3('95)
great black-backed gull	931 adults ('76), 912 ('84), 1030 ('95)
herring gull	1651 adults ('76), 1442 ('84), 387 ('95)
common eider	15 adults ('95)

* Some years, individual adults were counted instead of pairs.

3) Upper Flag Island (CIREG 55-415; Map 3-2)

This 30-acre island, located in the Town of Harpswell, Cumberland County, was acquired in fee in 1998. In 2001, a botanical inventory of the island was conducted (Mittelhauser and Morrison 2001). The island is generally flat on the north side with tall cliffs (up to 10 meters) on the southern and western shorelines. The vegetation is composed primarily of dense, low, woody shrubs with scattered patches of trees and low vegetation. The shrub community is dominated by bayberry, winterberry, chokeberry, and choke-cherry. A variety of grasses, including common hairgrass and Rhode Island bentgrass, are common. The island also contains a small sandy beach and a freshwater wetland on the northern end. Pitseed goosefoot, a state species of species concern, was documented during the 2001 botanical inventory of the island.

Table 3-8 presents the results of nesting seabird surveys. In addition to seabirds, its habitats are used by migrating and nesting songbirds, as well as raptor species, including northern harriers. Recent waterbird surveys have been conducted in conjunction with the Service's Gulf of Maine Project and Harpswell Land Trust.

The island is closed to public access during the seabird nesting season: April 1 to July 31. Information signs alerting visitors to the closure are planned.

This island has been used by recreational beach-goers. Community outreach is planned to raise awareness of seabird nesting activities and of the need for a seasonal closure.

The island is open to waterfowl hunting under State and Refuge regulations.

Table 3-8 Nesting seabird species, number of pairs, (and year) observed on Upper Flag Island

Species	Number of pairs (and year) observed
common eider	100 ('76), 350 ('80), 500 ('82), 300 ('84), 25 ('93)
great black-backed gull	10 ('77), 40 ('82), 10 ('84), 0 ('96)
herring gulls	135 ('76), 75 ('77), 80 ('80), 200 ('82), 25 ('84), 0 ('96)

* Some years individual adults were counted instead of pairs.

4) Ram Island (CIREG 55-605; Map 3-3)

This 10 acre island is located in Harpswell, Cumberland County. It was acquired in fee simple from the private landowner in 1999. The island is unforested and vegetated predominately with grasses and shrubs. Seabird inventories have been conducted and are summarized in Table 3-9.

The island is closed to public access during the seabird nesting season: April 1-July 31. Informational signs alerting visitors to the closure are planned.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-9 Nesting seabird species, number of pairs, (and year) observed on Ram Island

Species	Number of pairs* (and year) observed
common eider	75 ('76), 60 ('80), 117 ('98)
black-crowned night heron	25 ('89)
herring gull	200 ('76); 70 ('80), 295 ('95), 181 ('98)
great black-backed gull	20 ('76), 10 ('80), 25 ('95), 10 ('98)
common tern	67 ('91), 53 ('92), 0 ('95)
double-crested cormorant	124 ('98)

* Some years individual adults were counted instead of pairs.

5) Pond Island (CIREG 73-282; Map 3-4)

This 10-acre island is located at the mouth of the Kennebec River, in the Town of Phippsburg, Sagadahoc County. The island was acquired in 1973 by transfer from the U.S. Coast Guard, who maintain a lighthouse and fog signal on the island.

The vegetation is dominated by a variety of mixed grasses. The eastern and northern sides of the island feature steep rock outcroppings, while a small sand beach is also located on the northern end of the island.

Pond Island Lighthouse
USFWS photo

Until 1937, Pond Island supported a common tern colony but similar to many other tern colonies, gulls eventually excluded terns from the island. At one point in time, the adjacent North Sugarloaf Island supported the largest roseate tern colony in Maine. In an effort to restore terns to this historic nesting area, the Service and National Audubon Society initiated a tern restoration project in 1996. In 1999, Pond Island produced its first tern chick in more than 60 years, when 10 pairs of common tern successfully nested on the island. The Pond Island colony has continued to grow and in 2002, the island supported 109 pairs of common tern nested on the island.

Common eider and Leach's storm-petrels also nest on the island. Unfortunately, great-horned owl and mammal predation continue to be a management concern on the island. Table 3-10 presents the nesting seabirds known on the island.

The island is managed in cooperation with National Audubon Society, and biological technicians staff the island during the nesting season. The society also maintains positive working relationships with several neighbors and organizations in the area. The beach on Pond Island could potentially provide limited habitat for least terns and piping plovers. The island is also an important staging area for common and roseate terns in August.

Table 3-10 Nesting seabird species, number of pairs, (and year) observed on Pond Island

Species	Number of pairs (and year) observed
common eider	50 ('76), 75 ('82), 125 ('92), 40 ('98)
herring gull	225 ('76), 225 ('82), 250 ('92), 186 ('95), 0 ('02)
great black-backed gull	100 ('76), 25 ('82), 100 ('92), 79 ('95), 0 ('02)
common tern	0 ('96), 5 ('97), 33 ('00), 135 ('01), 109 ('02)

* Some years individual adults were counted instead of pairs.

The island is closed to public access during the seabird nesting season: April 1 to August 31. Informational signs are in place to alert visitors to the closure period.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Pond Island is located next to a popular beach (Popham Beach) that supports high public use in the summer. Personal watercraft use adjacent to Pond Island may become an issue in the future.

6) Lower Mark Island (CIREG 65-461; Map 3-5)

This 9.5-acre island lies in the Town of Southport, Lincoln County. In 1998, the Service purchased a conservation easement from the Boothbay Region Land Trust to permanently protect from development an active great blue heron rookery. The island's topography is flat to gently rolling, a large stand of dead spruce trees remains and only 30% of the island is vegetated (mixed grasses and forbs). The shoreline of the island is dominated by ledge. Table 3-11 presents the results of nesting seabird surveys.

Table 3-11 Nesting seabird species, number of pairs, (and year) observed on Lower Mark Island

Species	Number of pairs (and year) observed
double-crested cormorant	189 ('94)
great blue heron	10 ('94); 15 ('95)

* Some years individual adults were counted instead of pairs.

The island is closed to public access during the seabird nesting season: April 1 - July 31.

7) Outer Heron Island (CIREG 65-279; Map 3-6)

This 66-acre island is located in the Town of Boothbay, Lincoln County, and was acquired in fee in 1999. Outer Heron is one of the larger forested, undeveloped islands in the region. The island is predominately red spruce with mixed hardwoods, and has a rocky coastline. Extensive felling of trees has created a variety of openings within the canopy. Dense raspberry thickets have developed in these openings.

Outer Heron Island
USFWS photo

Bald eagles were first observed breeding on Outer Heron in 1999. The pair remains active, and has produced at least one eaglet for the past four years. When available, eagles will readily prey on great blue heron adults and young, and the presence of the eagles is believed to have resulted in the abandonment of the island's great blue heron rookery. Table 3-12 presents the results of nesting seabird surveys.

The island is closed to public access during the eagle and seabird nesting season: February 15 to August 31. Information signs alerting visitors to this closure are planned.

The island is open to migratory waterfowl hunting under State and Refuge regulations. Traditional uses on the island have included camping and picnicking.

Table 3-12 Nesting seabirds species, number of pairs, (and year) observed on Outer Heron Island

Species	Number of pairs (and year) observed
common eider	35 ('77)
great black-backed gull	5 ('77), 10 ('95)
herring gull	10 ('77), 0 ('95)
great blue heron	75 ('77), 75 ('82), 125 ('83), 80 ('92), 10 ('95), 0 ('02)

* Some years individual adults were counted instead of pairs.

8) Outer White Island (CIREG 65-278; Map 3-6)

Outer White Island
USFWS photo

This 16-acre island is located in the Town of Boothbay, Lincoln County. The Service acquired the island in fee in May 1995 from the Boothbay Region Land Trust. The island is treeless, with high cliffs and grassy upland.

The Town of Boothbay has designated Outer White Island as a Resource Protection Area, and the Maine State Planning Office has listed it as a Critical Area because of its importance as an eider nesting area. The Service has a partnership with the Damariscotta River Association and the Boothbay Region Land Trust to monitor seabird and other migratory bird use of the island, as well as public use.

An aerial survey completed in June 2002 recorded 191 harbor seals, including 22 seal pups, on the island (Gilbert, Univ. of Maine, pers. com.). Table 3-13 presents the nesting seabirds documented nesting on the island. It is also reported to be an important spring and fall stopover for a variety of migratory birds.

This island is closed to public access during the seabird nesting season: April 1 to August 31.

Table 3-13 Nesting seabird species, number of pairs, (and year) observed on Outer White Island

Species	Number of pairs* (and year) observed
common eider	150 ('77), 50 ('95)
black-crowned night heron	6 ('95)
black guillemot	3 ('76), 15 adults ('95)
herring gull	80 ('77), 169 ('96)
great black-backed gull	80 ('77), 65 ('96)
double-crested cormorant	25 ('95)

* Some years individual adults were counted instead of pairs.

9) Inner White Island (CIREG 65-276; Map 3-6)

This 5-acre island lies in the Town of Boothbay, Lincoln County. The Service purchased a conservation easement in 1998 from the Boothbay Region Land Trust to permanently protect the seabird colony from development. The island is sparsely vegetated with grass and forbs, with the majority of the island dominated by bedrock outcropping. Table 3-14 presents the nesting seabirds known on the island.

Table 3-14 Nesting seabird species, number of pairs, (and year) observed on Inner White Island

Species	Number of pairs (and year) observed
common eider	50 ('77)
herring gull	25 ('77), 78 ('95)
great black-backed gull	90 ('77), 208 ('84), 177 ('95)
double-crested cormorant	80 ('76), 373 ('77), 558 ('82), 925 ('84), 94 ('94)
black guillemot	2 ('76), 1 ('82), 5 adults ('95)

* Some years individual adults were counted instead of pairs.

The island is closed to public access during the seabird nesting season: April 1 - August 31.

10) Little Thrumcap Island (CIREG 65-267; Map 3-7)

This 8.5-acre island in the Town of South Bristol, Lincoln County, was acquired in fee in July 1995 from the Damariscotta River Association (DRA). The treeless island is dominated by mixed grasses and forbs, with some small stands of shrubs. A small beach is located on the north side of the island.

Historically the island supported a tern colony, including endangered roseate terns. We have a partnership with DRA and the Boothbay Region Land Trust to monitor seabird and other migratory bird use of the island, as well as public use. Biological interns spent two years monitoring seabirds and public use on the island. Recent surveys indicate that the island no longer supports nesting by terns or laughing gulls, and there is only limited nesting by common eiders. We continue to be concerned about the impact of predatory mink and owls on the island. Table 3-15 presents the nesting seabirds known on the island.

DRA developed a “seabird island” outdoor classroom curriculum for use on this island.

Public access is allowed year-round on part of this island. Approximately 40% of the island is closed to public access during the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to the closure are in place.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-15 Nesting seabird species, number of pairs, (and year) observed on Little Thrumcap Island

Species	Number of pairs* (and year) observed
roseate tern	5 ('82), 4 adults ('84), 0 ('95), 0 ('97)
common tern	175 ('82), 200 adults ('84), 0 ('95), 0 ('98)
Arctic tern	30 adults ('84), 0 ('95)
laughing gull	75 ('82), 0 ('95)
herring gull	10 ('82), 0 ('95)
common eider	5 ('76), 1 ('98)

* Some years individual adults were counted instead of pairs.

11) Crane Island (CIREG 63-705; Map 3-8)

This 11.8-acre island is located in the Town of Friendship, Knox County. The Service purchased a conservation easement in 2001 to permanently protect an active seabird nesting area from development. The island's habitat includes a mixture of grasses, forbs, and shrubs on seven acres, and dispersed spruce forest on five acres. The island supports a diversity of seabirds as noted in Table 3-16.

The island owner retains a cabin on the northern end of the island.

The island is closed to public access during the seabird nesting season: April 1 to July 31. Informational signs alerting visitors to the closure is planned.

Table 3-16 Nesting seabird species, number of pairs, (and year) observed on Crane Island

Species	Number of pairs (and year) observed
common eider	200 ('76), 150 ('77), 300 ('83)
great black-backed gull	35 ('76), 4 ('95)
herring gull	35 ('76), 12 ('83), 0 ('95)

* Some years individual adults were counted instead of pairs.

12) Franklin Island (CIREG 63-707; Map 3-8)

This 12-acre island is located in the Town of Friendship, Knox County. The island was acquired in 1973 by transfer from the U.S. Coast Guard, and represents the first island acquired by the Service for the Refuge. Ownership of the lighthouse has been retained by the Coast Guard.

Covered with eight acres of spruce trees and four acres of grasses and raspberry thickets, the island once supported one of the largest common eider colonies in Maine. Unfortunately the eider colony was decimated by avian cholera in the mid 1980's. Osprey, herring, great black-backed gulls, black-crowned night herons, black guillemot, and a small population of eiders continue to nest on the island. Table 3-17 identifies seabird species and our observations. Leach's storm-petrel are also nesting on the island,

but because of their nocturnal nature, we do not have an accurate count on this island.

Franklin Island is closed to public use during the seabird nesting season: April 1 to August 31. Informational signs alerting people to the closure are in place. Approximately 500 people visit the island each year.

The island is open to waterfowl hunting under State and Refuge regulations.

Table 3-17 Nesting seabird species, number of pairs, (and year) observed on Franklin Island

Species	Number of pairs* (and year) observed
common eider	1300 ('76), 1300 ('83)
great black-backed gull	45 ('76), 55 ('96)
herring gulls	12 ('76), 100 ('83), 36 ('96)
black-crowned night heron	50 ('83), 4 ('96)
great blue heron	1 ('81), 0 ('94)
black guillemot	2 ('76), 21 ('77), 19 adults ('95)

* Some years individual adults were counted instead of pairs.

13) Metinic Island (CIREG 63-584; Map 3-9)

This 300-acre island is located seven miles offshore, in the Town of Matinicus Isle Plantation, Knox County. The Service owns approximately 149 acres on the north end of the island, acquired in parcels between May 1994 and August 1996. Private landowners currently own about 120 sheep that graze the entire island.

Approximately 119 acres of Service-owned property is dominated by various grass and forb species and shrubs. The most common species are chickweed, sheep sorrel, raspberry, and bayberry. Fencing placed around vegetation plots indicates that grazing is significantly altering the species composition and height of the vegetation on the island. For example, Kentucky bluegrass, redtop, and sweet vernal grass are common in fenced areas, while these species are uncommon in grazed areas. Another 30 acres of Service-owned land in the center of the island is dominated by red spruce and balsam fir. A bald eagle pair established a nest here in 2004.

Sheep grazing on Metinic Island
USFWS photo

Several hundred pairs of terns, including a small number of roseate terns, nested on Metinic Island in the 1980's. The decline of the Metinic colony coincided with the initiation of

predator control efforts on Seal Island. We believe the Metinic Island birds moved over to take advantage of the gull-free island. Arctic and common terns have continued to nest on the south end of the island on private land; however, due to the presence of nesting gulls, the colony produces very few chicks. The Service initiated a tern restoration project on the north end of the island in 1998. Decades of sheep grazing had significantly reduced the vegetation, limiting available nesting habitat for the terns. A five-acre "peninsula" was fenced to allow the vegetation to recover and provide some shelter for the terns. Gull harassment and nest removal are utilized on the northern peninsula of the island in an effort to minimize predation on the terns.

Although terns landed among the decoys and sound system, no nesting occurred within the fenced area during the first year of the social attraction efforts. However, in 1999, one pair of common terns and two pairs of Arctic terns nested adjacent to the decoy area. Later in the season, an additional nine pairs of terns nested near the decoy area. The colony has continued to grow and in 2002, 139 pairs of common tern and 112 pairs of Arctic tern nested on the north end of the island. In addition, 15 pairs of terns nested on private land on the southern end of the island. Unfortunately, we believe gull predation continues to significantly limit the productivity of the birds nesting at the southern end of the island. Black guillemot, common eider, herring gull, great black-backed gull nest on Metinic Island. Leach's storm-petrel also nests on the island, but because of their nocturnal nature, we do not have an accurate count on this island. Table 3-18 presents nesting seabirds known on the island.

Biological technicians are hired seasonally to work on the tern restoration program. The interns census terns, control predators, conduct food habit and productivity studies, and monitor vegetation response to grazing.

The refuge portion of Metinic Island is closed to public use during the seabird and bald eagle nesting seasons: February 15 - August 31. Informational signs alerting visitors to this closure are in place.

Table 3-18 Nesting seabird species, number of pairs, (and year) observed on the northern end of Metinic Island

Species	Number of pairs (and year) observed
common tern	180 ('84), 3 ('96), 32 ('01), 139 ('02)
Arctic tern	220 ('84), 25 ('91), 39 ('94), 29 ('96), 79 ('01), 112 ('02)
common eider	1000 entire island ('89), 246 northern end ('01)
herring gull	322 entire island ('95), 220 northern end ('01)
great black-backed gull	117 entire island ('95), 59 northern end ('01)
black guillemot	300 adults ('83), 363 adults ('95), 31 northern end ('01)

* Some years individual adults were counted instead of pairs.

14) Two Bush Island (CIREG 63-653; Map 3-10)

This 8-acre island is located in the Town of St. George, Knox County, and was transferred to the Service in 1999, under the Maine Lights Bill of 1996. The island is treeless and densely vegetated with grasses and forbs such as timothy, yarrow, nightshade, bayberry, rugosa rose, Scotch lovage, and buttercup. The Service is responsible for the light house structure, however the Coast Guard continues to maintain the navigational aids.

Historically, Two Bush Island supported nesting of common, Arctic, and roseate terns. The Refuge considered the island as a potential restoration project, until the higher priority Metinic Island was acquired. As indicated in Table 3-19, a variety of seabird species nest on the island, however, no terns currently nest here.

The island is closed to public use and access during the seabird nesting season: April 1 to July 31. The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-19 Nesting seabird species, number of pairs, (and year) observed on Two Bush Island

Species	Number of pairs (and year) observed
common eider	25 ('76), 75 ('83), 66 ('92), 14 ('96), 93 ('01)
double-crested cormorant	27 ('92), 15 ('95), 0 ('96)
great black-backed gull	27 ('92), 11 ('96), 14 ('01)
herring gull	10 ('83), 154 ('92), 83 ('96), 111 ('01)

* Some years individual adults were counted instead of pairs.

15) Matinicus Rock (CIREG 63-940; Map 3-11)

This 28-acre island lies in outer Penobscot Bay, in the Town of Matinicus Isle Plantation. The Refuge acquired the island in 1999, under the Maine Lights Bill of 1996. The island is dominated with granite out-croppings interspersed with vegetation. Dominant vegetation includes witch grass, timothy, angelica, aster, red fescue, and chickweed. The east side of the island is steep and rocky with large boulders that plunge into the sea. The west side of the island tapers off gradually and contains a gravel beach. Its habitats include approximately 10 acres of grassland and 18 acres of rock ledge. The Service is responsible for the light house structures, however the Coast Guard continues to maintain the navigational aids.

Matinicus Rock was the only Atlantic puffin colony (two pairs) within Maine to have survived the market hunting that decimated most seabird colonies in the late 1800's and early 1900's. Since 1900, the island has been a principal breeding site for Arctic terns on the Maine coast. It continues to be a highly diverse and productive seabird colony. Common and Arctic tern, laughing gulls, Leach's storm-petrels, common eiders, Atlantic

puffins, razorbills, and black guillemots nest on Matinicus Rock. Terns numbers had declined in the 1990's, presumably due to the rapid growth of the nearby Seal Island tern colony. However, in recent years the colony has increased to 1,200 pairs of terns. Matinicus Rock remains home to the largest Atlantic puffin and razorbill colony in Maine.

The laughing gull population continues to increase, and now supports 624 pairs. The most recent alcid survey found over 300 puffin burrows, and 168 razorbill burrows. The island is predominantly an Arctic tern colony (999 pairs), but also supports 198 pairs of common terns. Small numbers of roseate terns have nested on the island, but not in recent years. Common murres continue to visit the social attraction area, but have yet to nest on the island. Table 3-20 presents the nesting seabirds known on the island.

We manage the island in cooperation with National Audubon Society. Biological technicians staff the island, conduct biological surveys (food and productivity studies), annually census the island, control predators, and band terns. We are participating in Arctic tern and Atlantic puffin research projects in cooperation with the University of New Brunswick. Annual survey and study results are available upon request from Refuge Headquarters.

The island also supports a wide variety of migrating songbirds, shorebirds and raptors, and island researchers continue to document the use of the island by these species.

The island is closed to public access during the seabird nesting season: April 1 to August 31. Information signs alerting visitors to this closure are in place. The island is open to waterfowl hunting under State and Refuge regulations.

Table 3-20 Nesting seabird species, number of pairs, (and year) observed on Matinicus Rock

Species	Number of pairs (and year) observed
Arctic tern	600 ('76), 651 ('84), 1252 ('90), 990 ('95), 1030 ('00), 999 ('02)
common tern	50 ('84), 25 ('90), 247 ('95), 176 ('00), 198 ('02)
black guillemot	175 ('76), 108 ('95)
Atlantic puffin	75 ('76), 75 ('83), 300+ ('01)
razorbill	12 ('76), 20 ('83), 15 ('91), 47 ('95), 168 ('01)
laughing gull	30 ('76), 114 ('84), 203 ('90), 285 ('95), 355 ('00), 624 ('02)
common eider	30 ('76), 231 ('92), 28 ('94)
herring gull	115 ('76), 4 ('94), 0 ('96)
great black-backed gull	31 ('76), 2 ('94), 0 ('96)
Leach's storm-petrel	550 ('76), 706 ('94)

* Some years individual adults were counted instead of pairs.

16) Seal Island (CIREG 63-923; Map 3-12)

This 65-acre island is located in Vinalhaven, Knox County. The U.S. Navy transferred Seal Island to the Service in 1972. The island was used as a bombing target for the Navy from the 1940's to the early 1960's.

The habitat on Seal Island consists of 35 acres of grasslands and 30 acres of rock ledge. This combination of habitats offers prime seabird nesting sites, with boulder fields and ledges for Atlantic puffins, razorbills, and black guillemots, grass and ledge areas for terns, raspberry thickets for eiders, and soft peat and glacial till soils for Leach's storm-petrels. A vegetation study was conducted in 1985 by Rappaport and Wesley.

Seal Island was once home to the largest Atlantic puffin colony in the Gulf of Maine. For over 200 years it was also a summer campsite for fisherman harvesting herring, groundfish, and lobster. The fishermen also used their nets to harvest the nesting seabirds, which led to the demise of the colony by 1887. The island was eventually recolonized by cormorants, gulls, and terns. However, by 1953 the growing gull population had completely displaced all nesting terns.

In 1984, the National Audubon Society, Canadian Wildlife Service and the Refuge began a seabird restoration project on the island. In an effort to re-establish Seal Island as an Atlantic puffin breeding colony, NAS translocated puffin chicks from Newfoundland between 1984-1989. The effort proved highly successful, and for the first time in nearly 100 years, puffins successfully bred on Seal Island in 1992. The puffin colony has continued to grow and in 2002 the island supported 181 pairs of puffins and one pair of razorbills.

Only four other islands support nesting razorbills in the state, so we are hopeful that additional razorbills will initiate nesting on Seal Island. In conjunction with the puffin restoration efforts, social attraction equipment (sound system and decoys) was utilized to attract terns to the island. After six years of effort, 20 pairs of Arctic and common terns nested on the island in 1989. The colony has increased dramatically since that time, with 1,057 pairs of Arctic terns and 1,582 pairs of common terns nesting in 2002. Seal Island is now home to the largest tern colony in Maine.

Seal Island
USFWS photo

Leach's storm-petrel, black guillemot, common eider, great cormorant, great black-backed and herring gulls also nest on the island. The island is also only one of ten islands in Maine that hosts nesting great cormorants. Small numbers of roseate terns have also nested on the island in recent years.

We continue to work cooperatively with National Audubon Society on the Seal Island

seabird restoration project. Biological technicians staff the island, conduct biological surveys (food and productivity studies), annually census the island, control predators, and band seabirds. Researchers are currently supporting Arctic tern and Atlantic puffin research projects in cooperation with the University of New Brunswick. Annual survey and study results are available upon request at Refuge Headquarters. Table 3-21 presents the nesting seabirds known on the island.

In 2000, Seal Island was recognized as the largest gray seal pupping island in Maine. In 1999, winter flights were conducted to count seals, and they estimated 400 adults and 150-200 pups were on the island (Gilbert, Univ of Maine, 1999). The island is also used by harbor seals as a pupping island.

Raptor surveys were conducted in 1997 and 1998 (Drury 1997, and Drury and Goodhue 1998). The island is considered an important foraging area for migrating peregrine falcons and other raptors.

The island is closed to public access year round due to the presence of unexploded ordnance. Information signs alerting visitors to the closure are in place.

Table 3-21 Nesting seabird species, number of pairs, (and year) observed on Seal Island

Species	Number of pairs (and year) observed
Arctic tern	16 ('89), 180 ('90), 517 ('95), 890 ('00), 1057 ('02)
common tern	1 ('89), 80 ('90), 645 ('95), 1205 ('00), 1582 ('02)
Atlantic puffin	0 ('91), 7 ('92), 26 ('95), 126 ('00), 181 ('02)
common eider	200 ('77), 324 ('86), 285 ('95), 465 ('96)
double-crested cormorant	38 ('76), 35 ('84), 23 ('95), 22 ('96)
great cormorant	4 ('94), 8 ('95), 8 ('96), 12 ('00), 18 ('01), 27 ('02)
Leach's storm-petrel	724 ('94)
great black-backed gull	300 ('76), 221 ('95), 129 ('98)
herring gull	800 ('76), 110 ('95), 90 ('98)

* Some years individual adults were counted instead of pairs.

17) Roberts Island (CIREG 63-174; Map 3-13)

This 10-acre island is located in the Town of Vinalhaven, Knox County. The island was acquired in 1995 as a gift from the Vinalhaven Land Trust.

The vegetation on the island is dominated by mixed grasses and a few stand of shrubs. The north end of the island has a cobble beach, and a portion of the island raises 120' above sea level. In addition to supporting a variety of nesting seabirds, the island supports roosting and feeding bald eagles, feeding harlequin and black ducks, migrating peregrine falcons, harriers, sharp-shinned hawks, merlin, and brant. Mink predation has been a significant problem on the island, and in some years they have eliminated all black guillemot productivity. A contract was awarded to a local trapper for several years in an effort to remove the mink. Although several mink have

been removed, additional animals continue to swim to the island from Vinalhaven. A fall raptor migration study was conducted in 1998 (Drury & Goodhue 1998). Table 3-22 presents nesting seabirds known on the island.

The Maine Department of Inland Fisheries and Wildlife has recognized the island's significance to wildlife in the Penobscot Bay Conservation Plan (Maine State Planning Office, 1987). The island has been included in the State of Maine Natural Areas Program since December 1977.

The island is closed to public access during the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to the closure are in place.

Table 3-22 Nesting seabird species, number of pairs, (and year) observed on Roberts Island

Species	Number of pairs* (and year) observed
common eider	350 ('77), 700 ('86), 272 ('96)
black guillemot	40 ('86), 103 adults ('94), 7 ('97), 4 ('98), 40-60 adults ('99)
herring gull	100 ('77), 150 ('86), 425 ('96)
great black-backed gull	10 ('77), 50 ('86), 10 ('96)
double-crested cormorant	67 ('86), 80 adults ('94)

* In some years, individual adults were counted instead of pairs.

18) Little Roberts Island (CIREG 63-175; Map 3-13)

This 1-acre island is located in the Town of Vinalhaven, Knox County. The island was acquired as a gift in 1995 from the Vinalhaven Land Trust.

Vegetation on the island is dominated by mixed grasses and ericaceous shrubs. The island is one of ten islands in Maine to support nesting of great cormorant. The island also supports nesting of black guillemot, common eider, great black-backed gull, and herring gull. As with Roberts Island, mink predation continues to be a management concern for this island.

The island is closed to public access during the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to the closure are in place.

Table 3-23 Nesting seabird species (and year) observed on Little Roberts Island

Species	Number of pairs* (and year) observed
common eider	50 ('77); 100 ('81); 25 ('86)
black guillemot	15 ('77); 110 adults ('95); 62 adults ('95)
herring gull	25 ('77), 10 ('86); 22 ('96)
great black-backed gull	5 ('86); 21 ('96)
double-crested cormorant	148 ('77); 302 ('81), 138 ('86); 7 ('95), 100 ('99)
great cormorant	3 ('94); 6 ('95); 1 ('96); 3 ('97); 30 ('98), 10 ('00); 13 ('01); 21 ('02)

* In some years, individual adults were counted instead of nesting pairs.

19) Bar Island (CIREG 59-244; Map 3-16)

The Refuge acquired 17.2 acres of this island in fee simple from The Nature Conservancy in 1994. It is located in the Town of Tremont, Hancock County. The northern half of the island is privately owned and contains several seasonal homes. The vegetation on the Service-owned portion of the island is a mix of habitats including grassy meadow with small shrubs and red spruce trees.

Bar Island
USFWS photo

The island supported several hundred pairs of common eider in the 1970's and early 1980's, however the population was eliminated by avian cholera in the mid 1980's. Table 3-24 presents the nesting seabirds known on the island.

No public access closures are currently being implemented because there has been no recent seabird activity.

Table 3-24 Nesting seabird species, number of pairs, (and year) observed on Bar Island.

Species	Number of pairs (and year)observed
common eider	700 ('76), 400 ('77), 450 ('81), 20 ('84)
herring gull	2000 ('76), 300 ('77), 20 ('84), 4 ('85)
great black-backed gull	300 ('76), 1 ('85)
double-crested cormorant	15 ('77), 0 ('84)

* Some years individual adults were counted instead of pairs.

20 & 21) Eastern and Western Barge islands (CIREG 59-342 and 59-343 respectively; Map 3-16)

The Service acquired each of these 0.5-acre islands in fee simple from The Nature Conservancy in 1994. They are located in the Town of Tremont, Hancock County. The Barge islands are essentially rock ledges with areas of mixed grasses. The ledges support nesting gulls, common eider, and cormorants, and provide a haul out area for seals. Table 3-25 presents the nesting seabirds known on the island. Surveys completed in 1993 and 2002 recorded over 100 seals on West Barge. Observers recorded 35 seals on East Barge in 1993, and 75 seals in 2002 (Gilbert, Univ. of Maine, pers. com.).

These islands are closed to public access during the seabird nesting season: April 1 to July 31. Informational signs alerting visitors to this closure may not be feasible do to the geology of the islands (rock ledge) or necessary, due to the small size and difficulty accessing the islands.

These islands are open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-25 Nesting seabird species, and year (and year) observed on Eastern and Western Barge Islands

Species	Number of pairs (and year) observed	
	Eastern Barge	Western Barge
common eider	10 ('77), 3 ('84), 2 ('94)	1 ('76), 1('84), 1 ('94)
herring gull	0 ('84), 3 ('89), 1('94)	10 ('93), 0 ('95)
great black-backed gull	20 ('77), 8 ('84), 2 ('89), 12 ('94)	50 ('77), 14 ('84), 22 ('89), 20 ('95)
double-crested cormorant	25 ('76),115 ('77),85 ('84), 7 ('92), 27 ('94)	280 ('77), 259 ('79), 5 ('84), 66 ('89), 111 ('94), 104 ('97)

* Some years individual adults were counted instead of pairs.

22) Ship Island (CIREG 59-341; Map 3-16)

The 11.2-acre Ship Island was acquired in fee simple from The Nature Conservancy in 1994. It is located in the Town of Tremont, Hancock County. The adjacent Trumpet Island is accessible at low tide by an intertidal bar. The majority of the vegetation on Ship Island is dominated by grasses and ericaceous shrubs, including rugosa rose, raspberry, elder, and Angelica. A small stand of black cherry is located on the northern end of the island. The western shore of the islands is comprised of an extensive sandy beach, while the remainder of the island is surrounded with cobble.

Historically, Ship Island supported over 300 common tern nests, while an additional 500 pairs nested on Trumpet Island. However, by the 1930's gulls had eliminated all nesting by terns. In 1993, a tern restoration project was initiated on these islands through a cooperative agreement with The Nature Conservancy. Gull control was initiated and continued through 1995. After more than a 50-year absence, terns returned to Ship Island in 1995 with a single nesting pair of common terns. The colony continued to grow and in 1999, 558 pairs of common terns nested. The colony completely abandoned the island during the 2000 nesting season, presumably due to mammalian predators. During the 2001 season, 261 pairs of terns established nests, but abandoned the island after a mink arrived on the island. Terns attempted to nest on the island during the 2002 season, but once again abandoned the island early in the nesting season. All efforts to trap predators have been unsuccessful. Table 3-26 presents the nesting seabirds known on the island.

Ship Island
USFWS photo

Refuge biological technicians staff Ship Island, conducting biological surveys on the tern colony (food and productivity studies), predator control and banding. Vegetation management to improve and maintain tern nesting habitat is on-going using vegetation mats and mechanical disturbance.

Also of note is the fact that an avian cholera epidemic in the early 1980's significantly reduced the common eider population on Ship Island.

The island is closed to public access during the seabird nesting season: April 1 to August 31. The island has informational signs alerting visitors to this closure.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-26 Nesting seabird species, numbers of pairs, (and year) observed on Ship Island

Species	Number of nests (and year) observed
common eider	200 ('76), 300 ('77), 25 ('81), 115 ('84), 115 ('92), 71 ('96)
herring gull	250 ('76), 115 ('83), 345 ('89), 87 ('94), 0 ('96), 0 ('02)
great black-backed gull	250 ('76), 131 ('81), 136 ('92), 0 ('96), 0 ('02)
double-crested cormorant	350 ('76), 440 ('77), 442 ('79), 3 ('84), 0 ('94), 0 ('02)

* Some years individual adults were counted instead of pairs

23) Trumpet Island (CIREG 59-340; Map 3-16)

This 3.2-acre island was acquired in fee simple from The Nature Conservancy in 1994. It is located in the Town of Tremont, Hancock County. The adjacent Ship Island is accessible at low tide by an inter-tidal bar. The majority of the vegetation on Trumpet Island is dominated by dense stands of raspberry, rugosa rose, and elder.

Historically, Trumpet Island supported over 500 pairs of common terns, while Ship Island supported an additional 300 pairs of terns. However, by the 1930's gulls had eliminated all nesting by terns. (See Ship Island summary for details of tern restoration effort.) In the late 1980's and early 1990's, hundreds of cormorants were illegally shot and clubbed to death on the island. Table 3-27 presents nesting seabirds known on the island.

As noted for Ship Island, an avian cholera epidemic in the early 1980's significantly reduced the common eider population on adjacent islands. A single pair of American oystercatcher have also nested on the island for the past several years.

The island is closed to public access during the seabird nesting season: April 1 to July 31. Trumpet Island has informational signs alerting visitors to this closure.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-27 Nesting seabird species, number of pairs, (and year) observed on Trumpet Island

Species	Number of nests (and year) observed
common eider	150 ('77), 164 ('81), 348 ('84), 330 ('89), 200 ('94), 112 ('96)
herring gull	50 ('77), 100 ('82), 74 ('84), 48 ('89), 7 ('94)
great black-backed gull	50 '(77), 25 ('82), 61 ('84), 72 ('89), 43 ('94)
double-crested cormorant	636 ('83), 290 ('89), 487 ('92), 338 ('95), 0 ('96), 0 ('02)

* Some years individual adults were counted instead of pairs.

24) Little Marshall Island (CIREG 59-470; Map 3-14)

This 16.5-acre eagle nesting island is located in the Town of Swan's Island, Hancock County. The Service purchased the island in 2000. The island is dominated by mixed hardwoods, red spruce, and balsam fir.

Bald eagles were first observed nesting on the island in 1986. Although the pair has used several different trees for nesting, they have consistently nested on Little Marshall since 1986.

The island is closed to public use during the bald eagle nesting season: February 15 to August 31. Informational signs alerting visitors to this closure period are planned.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

25) John's Island (CIREG 59-483; Map 3-15)

This 43-acre island, located in the Town of Swan's Island, Hancock County, was acquired in 1998 in fee simple from a private individual. It is vegetated by grasses and herbs, with a few stands of shrubs, including choke cherry, winterberry, and elder. Raspberry dominates much of the vegetated area, with approximately 25% of the island's vegetation comprised by this one species. The perimeter of the island consists of granite ledge, ranging from gradual slope to steep cliff.

This island is a harbor seal pupping ground, and 144 animals were observed in 1997 (Gilbert, Univ. of Maine, pers. comm.). An aerial survey of John's Island completed in June 2002 recorded 169 harbor seals, including 60 seal pups (Gilbert, Univ. of Maine, pers. comm.). It supports common eiders, great and double-crested cormorants, and black-backed and herring gulls, and is one of only ten islands in Maine with nesting great cormorants. A botanical survey was conducted in 1999 and 2000 by Mittelhauser and Morrison. Of note is the identification of a State-listed Species of Special Concern, seabeach sedge (*Carex silica*). Table 3-28 presents nesting seabirds known on the island.

John's Island is closed to public use during the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to this closure period are planned.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-28 Nesting seabird species, number of pairs, (and year) observed on John's Island

Species	Number of pairs (and year) observed
black guillemot	300 ('86), 225 ('95), 250 ('00)
common eider	75 ('77), 400 ('86), 1000 ('96); 277 females ('00)
great black-backed gull	150 ('76), 400 ('86), 234 ('95), 78 ('00)
herring gulls	100 ('77), 600 ('86), 288 ('95), 97 ('00)
double-crested cormorant	55 ('76), 182 ('84), 158 ('95), 100 ('96), 35 ('99), 42 ('00)
great cormorant	4 ('93), 20 ('95), 17 ('96); 4 ('98), 1 ('00), 0 ('02)

* Some years individual adults were counted instead of pairs.

26) Egg Rock (CIREG 59-301; Map 3-17)

This 12-acre island was transferred to the Service in 1999 under the Maine Lights Bill of 1996. The island lies at the entrance of Frenchman Bay, in the Town of Winter Harbor, Hancock County. A significant portion of the island is dominated by rock out-croppings, with the remainder of the island dominated by mixed grasses, Angelica, and goldenrod.

The Egg Rock lighthouse, owned by the Service, is on the National Historic Register. It has undergone significant renovations in recent years.

The island's historical significance for colonial nesting seabirds is well documented. Roseate, common, and Arctic terns all nested on Egg Rock after an increasing gull population caused terns to abandon Petit Manan Island in the early 1980's. In 1981, 300 pairs of common and Arctic terns nested on the island. In 1984, three pairs of endangered roseate terns also nested on Egg Rock. However, when we initiated gull control efforts on Petit Manan Island in 1984, the terns returned to that location abandoning Egg Rock. Terns have not nested on Egg Rock since 1984. Seabirds and their nesting status on the island are listed in Table 3-29.

Egg Rock lighthouse
USFWS photo

In addition to the species noted above, black guillemots and Leach's storm-petrels also nest on the island. Harbor seals use Egg Rock as a haul out area. A survey completed in June 2002 documented 297 seals on Egg Rock, including 75 seal pups (Gilbert, Univ of Maine, pers. com.).

This island is closed to public use during the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to this closure period is planned. Local tour boats periodically come close to the island to view the seabirds and seals, and to interpret the lighthouse.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-29 Nesting seabird species, number of pairs, (and year) observed on Egg Rock Island

Species	Number of pairs* (and year) observed
common terns	300 pairs of common & Arctic terns ('81), 325 ('84)
Arctic terns	60 ('84)
roseate terns	3 ('84)
common eider	15 ('89), 34 ('94), <5 ('99), 20 ('01)
great black-backed gull	56 ('89), 5 ('94), 65 ('95), <10 ('00); 12 ('01)
herring gulls	48 ('89), 241 ('92), >200 ('99); >150 ('00); 414 ('01)
laughing gulls	175 adults ('81)

* Some years, individual adults were counted instead of pairs.

27) Abbott Island (CIREG 79-837; Map 3-19)

This 3.5-acre island is located in Carrying Place Cove, Town of Steuben, Washington County. The Service acquired the island in fee simple from a private party in 1996. It is dominated by conifer forest, with some understory vegetation species that are not found on the adjacent mainland: Indian cucumber root (*Medeola virginiana*), painted trillium (*Trillium undulatum*), bluebead-lily (*Clintonia borealis*), and hobblebush (*Viburnum alnifolium*). Striped maple (*Acer pensylvanicum*) and various orchids are also found here. The mud flats surrounding the island are used by migrating shorebirds and waterfowl, including black duck, mallard, goldeneye, and teal.

It is open to waterfowl hunting under State and Refuge regulations.

28) Sally Island (CIREG 79-836; Map 3-19)

This 1-acre island is located in Dyer Bay, Town of Steuben, Washington County. It was acquired in August 1996 by donation from The Conservation Fund. The island is connected to Petit Manan Point at low tide, and is characterized by a dense spruce stand. Bald eagles were first observed nesting on the island in 1985. The pair experienced alternating years of nest occupancy until they moved to the adjacent island in 2001. No other botanical or biological surveys are known to us.

When occupied by bald eagles, the island is closed to public access during the eagle nesting season: February 15 to August 31. If eagles are not nesting on the island, Sally Island is open to public visitation (day use) after May 15th. Informational signs alerting visitors to the closure are planned.

29) Petit Manan Island (CIREG 79-933; Map 3-18)

This 10-acre island lies 2.5 miles south of Petit Manan Point in the Town of Steuben, Washington County. It was acquired in 1974 by transfer from the U.S. Coast Guard. The Coast Guard continues to maintain the 119' lighthouse tower and navigational aids, and the Service maintains several historical structures on the island. Petit Manan has long been considered one of the most important islands in the Gulf of Maine for colonial nesting seabirds.

Botanical inventories, including those for rare plants, were conducted in 1995, 2001, and 2002 (Widrig 1996 and Mittelhauser 2002). Vegetation on the north and east side of the island includes a variety of grasses, Angelica, raspberry, asters, meadowrue, blueberry, and beachpea. The southwestern and central areas of the island are dominated by a dense stand of raspberry which is rapidly expanding each year. Calamagrostis occupies a large portion of the western half of the island. The invasive species dodder established a strong foothold on the northern end of the island in 2000. Extensive vegetation management occurs, utilizing a variety of techniques such as burning, herbicide, and mechanical treatment to improve nesting seabird habitat. Annual monitoring of this vegetation and its response to treatment dictates what to do in forthcoming years.

Dodder, an invasive plant, has established a strong foothold on Petit Manan Island
USFWS photo

Significant numbers of terns had historically nested on the island, including 1,500 nesting pairs observed in 1971. However, when human presence on the island ended with automation of the light station in 1972, the numbers of nesting gulls gradually increased to the point they excluded all nesting terns by 1983. Tern restoration was initiated in 1984 in partnership with the College of the Atlantic. One of the first actions was the removal of herring and black-backed gulls. Within one week of the gull control effort, terns returned to nest on Petit Manan Island. The seabird colony has continued to grow, and the island now supports nesting by eight species of seabirds and waterfowl. Razorbill and common murre also routinely visit the island, however no nesting efforts have been

documented. Leach's storm-petrels and black guillemots also nest on the island. The island also supports migrating songbirds, shorebirds and raptors. Table 3-30 presents the nesting seabirds known on the island. An annual report is available upon request from Refuge Headquarters.

Biological technicians live on the island each nesting season and conduct biological surveys (food and productivity studies), predator control and banding. Our staff and seasonal technicians conduct a complete census of the island each year; and record observations of all species observed on or adjacent to the island. Habitat restoration work continues as a cooperative endeavor with the Gulf of Maine Seabird Working Group and MDIFW. We are currently participating in Arctic tern and Atlantic puffin metapopulation studies with the University of New Brunswick.

The results of a spider inventory (Jennings 2000) and botanical inventory (Mittlehauser 2000) for this island is also available at Refuge Headquarters .

The island is a popular tour boat destination. Several tour boats per day pause offshore to observe the island's seabirds during June - August. Refuge staff meet annually with the tour boat companies to discuss issues of concern, and we provide them with periodic updates throughout the seabird nesting season.

Petit Manan Island is closed to public access during the seabird nesting season: April 1 to August 31. It is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-30 Nesting seabird species, number of pairs (and year) observed on Petit Manan Island

Species	Number of pairs (and year) observed
common tern	700 ('76), 6 ('81), 410 ('84), 1093 ('90), 1355 ('95), 990 ('02)
Arctic tern	800 ('76), 450 ('84), 729 ('90), 796 ('95), 671 ('02)
roseate tern	3 ('76), 8 ('84), 48 ('90), 61 ('95), 27 ('02)
Atlantic puffin	0 ('84), 7 ('90), 13 ('95), 20 ('02)
laughing gull	60 ('76), 200 ('84), 300 ('91), 487 ('95), 838 ('02)
common eider	6 ('76), 10 ('84), 20 ('89), 53 ('95), 113 ('02)

* Some years individual adults were counted instead of pairs.

30) Bois Bubert Island (CIREG 79-824; Map 3-20)

The Service owns in fee simple 1,321 acres of this 1,500-acre island in the Town of Milbridge, Washington County. Portions of the island were acquired in 1979 and 1987 by donation and purchase from The Nature Conservancy, and in 1987, 1994, and 1997 by purchase from private

parties. The island is located about one mile east of Petit Manan Point, and is characterized by red and white spruce forests, balsam fir, tamarack, and associated hardwoods. Two freshwater wetlands are also located on the island, as well as an extensive area of early successional habitat. A cover type map utilizing national vegetation classification standards was completed in 2002 (Map 3-26).

The island's jack pine woodlands represent two of only eight known stands in Maine, and are considered a rare community type by the Maine Natural Areas Program (MNAP 1983 and Elliott 1999). Although jack pine is occasionally a component of other forest communities, this woodland type is the only community with jack pine as the dominant species. Our long-term goal in maintaining these stands is to continue providing a diversity of habitats within the Refuge, and to contribute to the ecological diversity of coastal Maine.

Other rare plants are present on Bois Bubert as well. The State-listed threatened Nova Scotia false-foxglove (*Agalinis neoscotica*) occurs on the island as does bird's eye primrose *(Primula laurentia*), a State species of special concern (Widrig 1996).

Bald eagles were first observed nesting on the island in 1996, and with the exception of 2000, have produced at least one eaglet per season. The wetland on the southern end of the island and the surrounding inter-tidal habitat provide extensive stopover habitat for waterfall during fall migration. Limited waterfowl banding has occurred on the island.

The results of a spider inventory for this island are available at Refuge Headquarters (Jennings 2001).

Freshwater pond on Bois Bubert Island
USFWS photo

Currently, we are working cooperatively with the Maine Island Trail Association and others to provide low impact educational and recreational opportunities for island users, including overnight camping. The Refuge owns one cabin on the island that can be used to house researchers. Several private inholdings include seasonal homes on the island.

One Refuge area on the southern end of the island is closed year-round to protect nesting and roosting birds. Additional informational and regulatory signs are needed to alert visitors to this closure.

Refuge lands on the island are open to deer hunting under State and Refuge regulations.

31) Nash Island (CIREG 79-627; Map 3-21)

The Service owns five acres of the 16.7 acre grassland island located in the Town of Addison, Washington County. The Service acquired the property by transfer from the Coast Guard in 1978; the remainder of the island is privately owned. The island supports a variety of nesting seabirds, including a small number of nesting terns, as indicated in Table 3-31.

Sheep grazing occurs on the neighboring Big Nash island. Sheep routinely use an inter-tidal bar to graze on Nash Island.

Nash Island is closed to public access during the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to this closure are in place.

Table 3-31 Nesting seabird species, number of pairs, (and year) observed on Nash Island

Species	Number of pairs (and year) observed
common eider	20 ('77), 6 ('87), 50 ('89)
common tern	5 ('84), 1 ('98), 4 ('00), 4 ('02)
Arctic tern	20 ('84)
great black-backed gull	50 ('87), 120 ('95)

* Some years individual adults were counted instead of pairs.

32) Inner Sand Island (CIREG 79-614; Map 3-21)

This 17.8-acre island in the Town of Addison, Washington County, was acquired in 1999 in fee simple from a private party. The island is composed of 15 acres of spruce/fir forest and approximately 2.8 acres of upland meadow and shrub.

Although the island has historically supported nesting gulls, none were observed during the 1995 aerial survey of the island. Table 3-32 presents nesting seabirds known on the island.

This island is closed to public use during the seabird nesting season: April 1 to July 31. Informational signs alerting visitors to this closure period are planned.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-32 Nesting seabird species, number of pairs, (and year) observed on Inner Sand Island

Species	Number of pairs* (and year) observed
common eider	125 ('77), 200 ('89)
great black-backed gull	100 adults ('76), 10 ('77), 5 '(89), 0 ('95)
herring gulls	1000 adults ('76), 150 ('77), 20 ('89), 0 ('95)

* In some years, individual adults were counted instead of pairs.

33) Schoppee Island (CIREG 79-566; Map 3-22)

This 16.5-acre island is located in the Town of Roque Bluffs, Washington County. The Service acquired the island in fee simple in 2000. The island is dominated by red spruce with small areas of hardwoods, grasses and shrubs. There is evidence of wind-throw over the years, resulting in a patchwork appearance created by a diversity of age classes and tree height. Hardwood species found on the island include white and yellow birch, mountain ash, and alder.

Schoppee Island
USFWS photo

Schoppee Island is a historic bald eagle nesting island. Eagles were first observed nesting on the island in 1968, however the site was not monitored during the 1970's. They were again documented nesting on the island in 1980, but that was the last year they nested on the island.

The island is closed to public access during the bald eagle nesting season: February 15 to August 31. If eagles have not initiated nesting on the island by May 15, the island is then open to day use by the public. Informational signs alerting visitors to the closure are planned.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

34) Halifax Island (CIREG 79-570; Map 3-22)

This 75-acre island is located in the Town of Jonesport, Washington County. The island was acquired in fee simple in June 1995 from The Conservation Fund.

Island vegetation is comprised of 45 acres of wetland and peatland communities, and 30 acres of various ericaceous shrub-dominated communities (huckleberry, sheep laurel, Rhodora, blueberries, crowberries, and small trees). There are also lichen-covered rock outcrops, sparsely vegetated nearshore headlands and cliffs, and beach strand. Several extremely fragile plant communities can be found here (acidic fen, plateau bog lawn, dwarf shrub bog, moss lawn bog, and acidic shoreline outcrop).

A baseline avian and botanical survey was conducted in 1998 and 1999 (Famous and Spencer-Famous 1999). Of note on the island are:

- maritime slope bog community; a very rare community type
- northern yarrow (*Achillea millefolium var. borealis*); a State Species of Special Concern
- pearl-wort (*Sagina nodosa*); a State rare species

- dragon's mouth orchid (*Arethusa bulbosa*); a State rare species
- roseroot stonecrop (*Sedum rosea*), beachhead iris (*Iris hookeri*), and oysterleaf (*Mertensia maritima*)

A nationally significant population of fall migrating whimbrels forages on the crowberries growing on Halifax Island. Black guillemots were recorded nesting on the island during surveys from 1965-73 showing eight nesting pair, and in 1977 when two nesting pair were observed. No seabirds have been recorded nesting on the island since then.

Historically, sheep were grazed on the island; however, this practice was discontinued in the 1980's. Currently, we are working cooperatively with the Maine Island Trail Association and others to provide low impact educational and recreational opportunities for island users, including overnight camping.

A majority of the island is closed year-round to public access to protect unique botanical features. The western portion of the island is open year round. Informational signs are in place alerting visitors to the closure and the sensitive plant habitat areas.

This island is open to migratory waterfowl hunting under State and Refuge regulations.

35) Eastern Brothers Island (CIREG 79-513; Map 3-22)

Eastern and Western Brothers Islands
USFWS photo

This 17-acre island in the Town of Jonesport, Washington County, is a recognized seabird nesting island and historical nesting area for peregrine falcons. The Service acquired the island in fee simple in May 1997 from a private party. The MDIFW owns Western Brothers Island, which is joined to Eastern Brothers by an intertidal area.

The vegetation on the island is dominated by mixed grasses, raspberries, and other herbaceous species. The perimeter of the island is surrounded by rock ledges of varying height and associated 60- to 70-foot rock cliffs. Sheep were grazed on the island for over 125 years; however, the practice was discontinued in the late 1990's. A complete avian and botanical inventory was conducted in 1998 and 1999 (Famous and Spencer-Famous 1999). Notable plant species include:

- northern yarrow (*Achillea millefolium*); a State Species of Special Concern
- Arctic blue flag (*Iris setosa*); a State rare species (over 20,000 plants observed on the island)
- dragon's mouth orchid (*Arethusa bulbosa*); a State rare species

- pearl-wort (*Sagina nodosa*); a State rare species
- maritime slope bog; a rare plant community type

This island is a harbor seal pupping ground, and 112 animals were recorded in 1997 (Gilbert, Univ. of Maine, pers. com.). It also provides habitat for a variety of nesting seabirds including common eiders, black guillemots, herring and great black-backed gulls and Leach's storm-petrels as indicated in Table 3-33.

The island is closed to public access during the seabird nesting season: April 1 to August 31. Informational signs are in place to alert visitors to this closure.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-33 Nesting seabird species, number of pairs, (and year) observed on Eastern Brothers Island

Species	Number of pairs (and year) observed
common eider	75 ('77), 0 ('83), 40 ('95)
great black-backed gull	600 ('91), 1131 ('95)
herring gulls	0 ('95)
black guillemots	150 ('77), 100 ('83), 75 ('95)
Leach's storm-petrel	25 ('77), 8 ('95)

* Some years individual adults were counted instead of pairs.

36) Libby Island (CIREG 79-360; Map 3-23)

Lying at the entrance of Machias Bay, this 43-acre island was transferred to the Service in 1999, under the Maine Light Bill of 1996. It is located in the Town of Machiasport, Washington County. It is also commonly referred to as "Little Libby" Island. The Service owns and is responsible for the maintenance of the lighthouse and associated historical structures. The Coast Guard is responsible for the aids to navigation.

The island contains a variety of habitats including: dense stands of shrubs (Virginia rose, meadowsweet, and black chokeberry), American cranberry, creeping juniper, and beach strand community. Dwarf ericaceous shrubs and mixed grasses dominate the upland. Two wetland communities were also documented (Bochan and DiGirolamo 1999). Prior botanical inventories had been conducted in the late 1970's and early 1980's (Lewis, Univ. of Maine, pers. com.).

Libby Island is adjacent to the MDIFW-owned Big Libby Island, which has supported over 1,500 pairs of common eiders, 1,100 pairs of great black-backed gulls, and 200 herring gulls. In the late 1800's and early 1900's Big Libby also was an active tern colony. Mink have been observed on Libby, and it is possible they may have limited seabird use of the island in recent years. Table 3-34 presents nesting seabirds known on the island.

Harbor seals use adjacent ledges as pupping and haulout areas.

A 20-acre aquaculture lease has been granted for the waters immediately north of Big and Libby islands. Although the facility was only operational for one year, the lease remains valid and pens could be placed at the site in the future.

This island is closed to public use during the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to this closure period are planned.

The island is open to migratory waterfowl hunting under State and Refuge regulations.

Table 3-34 Nesting seabird species, number of pairs, (and year) observed on Libby Island

Species	Number of pairs (and year) observed
black guillemot	10 ('76), 5 ('91), 20 ('92), 10 adults ('01)
common eider	0 ('92), 10 ('01)
great black-backed gull	0 ('91), 2 ('01)
herring gull	0 ('91), 40 ('01)

* Some years individual adults were counted instead of pairs.

37) Old Man Island (CIREG 79-313; Map 3-24)

This 6-acre island is part of the Cross Island National Wildlife Refuge complex, located in the Town of Cutler, Washington County. It was acquired in 1980 from a private individual, along with the other five islands in the Cross Island complex .

Vegetation on the island is sparse, with a variety of mixed grasses interspersed with rock outcroppings. Steep cliffs and sea stacks are located along the perimeter of the island. A botanical inventory was conducted on the island during the 1979, 1980, and 1982-84 field seasons (Lewis, Univ. of Maine, pers. com.).

Old Man Island is one of only six nesting sites for razorbills in the Gulf of Maine. Between 130 and 150 adult razorbills were observed annually over a 10-year period. Of historical note, Old Man Island is reported to be the only location within Maine that supported nesting of common eiders in the early 1900's when two nests were observed (Norton 1907). This island also supports other nesting seabird species of interest as noted in Table 3-35.

Old Man Island
USFWS photo

Although public access on the island will always be limited by the topography of the island, the island is closed to public use during

the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to this closure period are planned.

Table 3-35 Nesting Seabird species, number of pairs, (and year) observed on Old Man Island

Species	Number of pairs* (and year) observed
razorbill	10 ('77), 35 ('91), 130-150 adults ('01)
common eider	100 ('77), 14 ('86), 100 ('91), 100 ('95)
great black-backed gull	100 ('77), 29 ('91), 164 ('95)
herring gull	500 ('77), 26 ('91), 126 ('95)
double-crested cormorant	215 ('77), 306 ('91), 302 ('94)
Leach's storm-petrel	400 ('95)
black guillemot	100 ('77), 55 adults ('91), 125 adults ('95)

* In some years, individual adults were counted instead of pairs.

38) Mink Island (CIREG 79-345; Map 3-24)

This 11-acre island is part of the Cross Island National Wildlife Refuge complex, located in the Town of Cutler, Washington County. It was acquired in 1980 from a private individual, along with the other five islands in the Cross Island complex. The island is completely forested with red spruce and balsam fir.

Bald eagles were first observed nesting on Mink Island in 1996. It is believed that one pair of eagles has moved among Mink, Cross, and Outer Double Head Shot Island in recent years. The Mink Island nest was last occupied in 2002. Occupancy and productivity are monitored on an annual basis by MDIFW.

This island is closed to public access during the bald eagle nesting season February 15 to August 31. Informational signs alerting visitors to this closure are planned.

39) Outer Double Head Shot Island (CIREG 79-352; Map 3-24)

This 14-acre island is part of the Cross Island National Wildlife Refuge complex, located in the Town of Cutler, Washington County. It was acquired in 1980 from a private individual, along with the other five islands in the Cross Island complex.

The vegetation on the northern half of the island is dominated by red spruce and balsam fir, while the southern portion of the island is dominated by mixed grasses. A botanical inventory was conducted on the island between 1979 and 1984 (Lewis, Univ. of Maine, pers. com.).

Bald eagles were first observed nesting on Outer Double Head Shot in 1985. It is believed that one pair of eagles has moved among Outer Double Head Shot, Mink, and Cross Islands in recent years. The Outer Double

Head Shot Island nest was last occupied in 2000. Occupancy and productivity are monitored on an annual basis by MDIFW. The island also supports nesting seabird species of interest as noted in Table 3-36.

This island is closed to public access during the bald eagle and seabird nesting season: February 15 to August 31. Informational signs alerting visitors to this closure period are planned.

Table 3-36 Nesting seabird species, number of pairs, (and year) observed on Outer Double Head Shot Island

Species	Number of pairs* (and year) observed
common eider	100 ('77), 0 ('91), 100 ('95)
great black-backed gull	10 ('91), 23 ('95)
herring gull	200 ('95), 30 ('91), 25 ('95)
black guillemot	50 ('77), 140 adults ('95)

* In some years, individual adult birds were counted instead of pairs.

40) Inner Double Head Shot Island (CIREG 79-351; Map 3-24)

This 8-acre island is part of the Cross Island National Wildlife Refuge complex, located in the Town of Cutler, Washington County. It was acquired in 1980 from a private individual, along with the other five islands in the Cross Island complex.

The vegetation on the northern half of the island is dominated by red spruce and balsam fir, while the southern portion of the island is dominated by mixed grasses. A botanical inventory was conducted on the island between 1979 and 1984 (Lewis, Univ. of Maine, pers. com.). The island supports small nesting populations of black guillemot, herring gulls, and Leach's storm-petrels.

This island is closed to public use during the seabird nesting season: April 1 to August 31. Informational signs alerting visitors to this closure period are in place.

Scotch Island
USFWS photo

41) Scotch Island (CIREG 79-350; Map 3-24)

This 10 acre island is part of the Cross Island National Wildlife Refuge complex, located in the Town of Cutler, Washington County. It was acquired in 1980 from a private individual, along with the other five islands in the complex.

The island is immediately adjacent to the northeast corner of Cross Island. The vegetation on Scotch Island consists of red spruce, balsam fir, and yellow and paper birch.

Scotch Island is open to public access year around (day use only).

42) Cross Island (CIREG 79-347; Map 3-24)

Cross Island (1,654 acres) was acquired in 1980 from a private individual, along with the other five islands in the Cross Island National Wildlife Refuge complex. It is located in the Town of Cutler, Washington County. Two private inholdings occur on the island. Outward Bound has a 19-acre inholding, and uses parts of the island for solo wilderness experiences. The Cabott family also owns a 20-acre inholding.

Cross Island
USFWS photo

Its varied topography includes hills, bays, inlets, high sea cliffs, and several cobble beaches scattered along all but its rugged south shoreline. A 12-acre tidal pond lies between Northwest Head and the island proper. Cover types on the island include dense stands of red and white spruce, balsam fir, yellow and paper birch, and red and striped maple. Several grassy openings with sedges, cranberry, and blueberry are also found on the shores. Associated wetlands support eel grass and other submerged aquatics, saltmarsh and salt meadow cordgrasses, sea lavender, black rush, and American three-square bulrush. A cover-type map of Cross Island is available.

Botanical species of note on the island are livid sedge (*Carex livida*) and coast blite goosefoot (*Chenopodium rubrum*), both State-listed threatened species, and a rare community type called maritime slope bog.

Bald eagles were first observed breeding on Cross Island in 1981. It is believed that one pair of eagles has moved among Cross, Outer Double Head Shot, and Mink Islands in recent years. The Cross Island nest was last occupied in 1994. Occupancy and productivity are monitored on an annual basis by MDIFW.

The island has resident populations of white-tailed deer and furbearers, as well as eagles and osprey. Colonial nesting seabirds include common eider, Leach's storm-petrel, black guillemot, and double-crested cormorants. Migrating black ducks and shorebirds use the island saltmarsh and inter-tidal areas.

The following surveys have been conducted on the island and any published results are available from the Refuge Headquarters upon request:

- Habitat analysis of Cross Island using SPOT imagery (Podolsky & Labaree 1990)
- Deer pellet count (USFWS 1991)
- Neotropical landbird monitoring program (Famous1993)
- Botanical survey focusing on wetland habitats (Mittelhauser & Morrison 2000)

A 45-acre aquaculture site is located 1/4 mile off Northwest Head. A study to examine the potential effects of aquaculture site development adjacent to the island's nesting birds was conducted in 1991 (Famous 1991). Unfortunately, information was not collected prior to the placement of the aquaculture pens, so comparisons to historic use of the area are not possible.

A Refuge cabin located in Northwest Head is used by researchers under permit.

The island is open to public access year around (day use only). Informational signs are in place alerting visitors.

Outward Bound uses several areas for solo campsites under a special use permit. In addition, Bold Coast Charter, in the Town of Cutler, runs an interpreted tour on the island. Approximately 325 people visit the island annually.

Other Islands Affiliated with the Refuge

Machias Seal Island (Map 3-25)

This 15-acre island is located at the mouth of the Bay of Fundy, 12 miles south of Grand Manan, New Brunswick, Canada, and 12 miles off the coast from the Town of Cutler, Maine. Claimed by both the United States and Canada, the island hosts abundant populations of Atlantic puffins, Arctic terns, common terns, razorbills, and Leach's storm-petrels. In 1944, Canada designated this island area as a Migratory Bird Sanctuary pursuant to the Canadian Migratory Birds Convention Act, as amended. Table 3-37 presents nesting seabirds known on the island.

The island is a popular destination for birding enthusiasts, who visit it each summer to observe and photograph the birds. There is transportation to the island via three chartered cruises (two United States and one Canadian). The MDIFW has established ownership of the island and, under MOU, has transferred management authority to the Service. Under this authority, the Service (through the Refuge) monitors and regulates U.S. tour boat captains. U.S.-based tours during June and July seabird breeding seasons are regulated through the issuance of special use permits. At present, no more than 30 people are allowed to visit the island each day for 3 hours during the months of June and July, and they are restricted to well-marked paths and observation blinds.

By verbal agreement with Canada, Canadian biologists manage the wildlife resources on the island. The University of New Brunswick's Atlantic Co-operative Wildlife Ecology Research Network maintains a research crew on the island. The Service attempts to meet at least annually with Canadian biologists to discuss wildlife issues and exchange information on avian populations, public use, and commercial tourism. An extensive amount of research and survey work has been conducted on the island.

Table 3-37 Nesting seabird species, numbers of pairs (and years) observed on Machias Seal Island

Species	Numbers (and year) observed
Atlantic puffin	1,827 ('00), 2,800 ('01)
razorbill	543 ('01)
common tern	325 ('94), 897 ('98), 1,349 ('02)
Arctic tern	2,140 ('94), 2,094 ('98), 2,202 ('02)
roseate tern	1 ('01)
common eider	132 ('98), 106 ('02)
laughing gull	1 ('02)

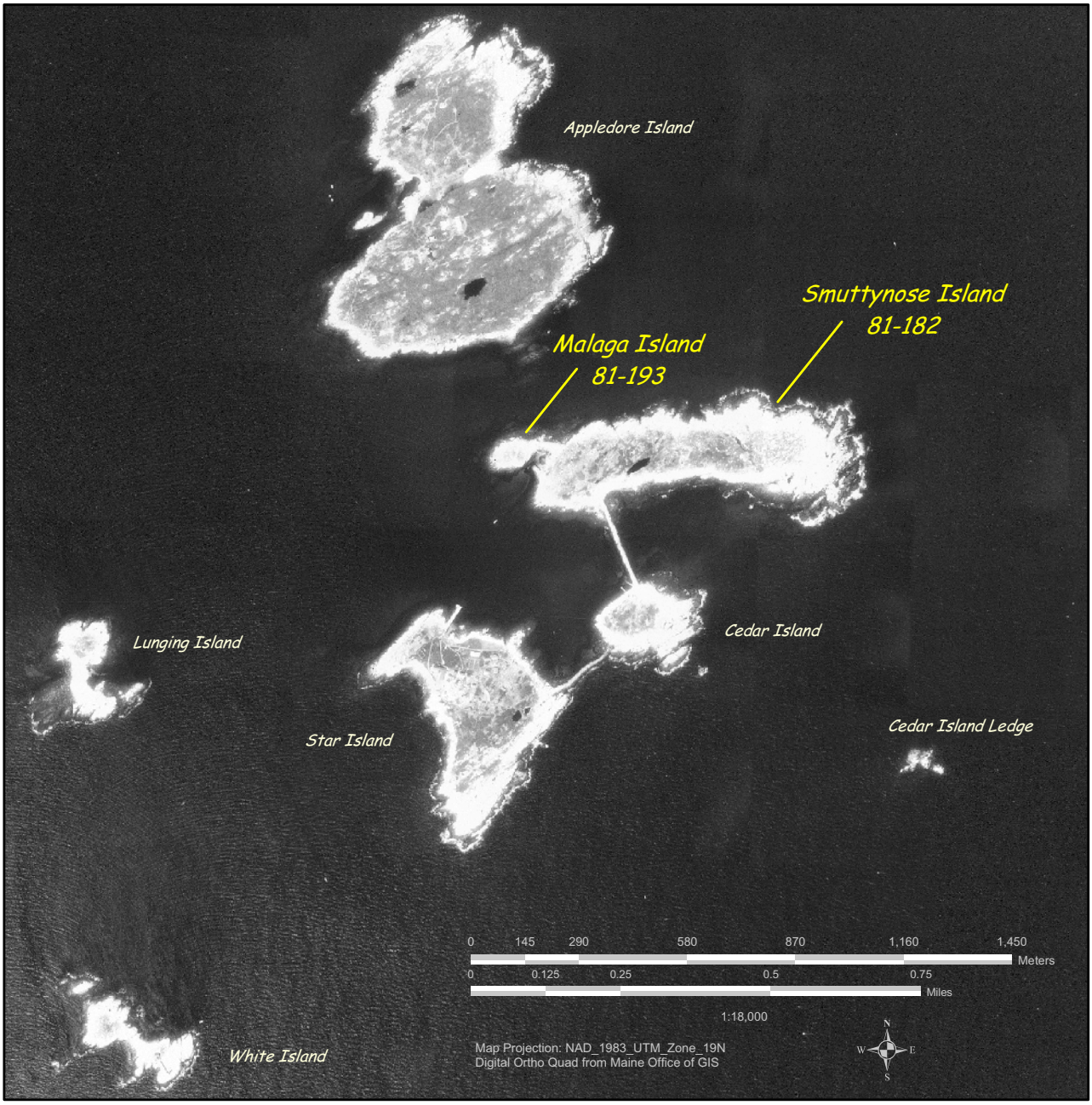
* Some years individual adults were counted instead of pairs.

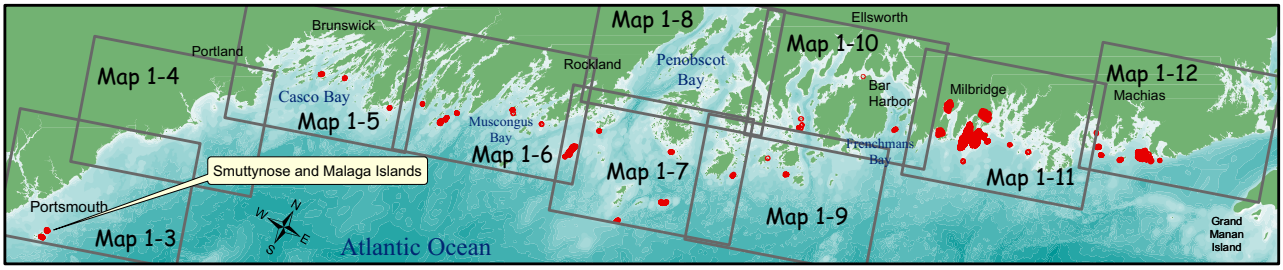
Banded purple sandpipper
USFWS photo

Map 3-1

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Smuttynose and Malaga Islands

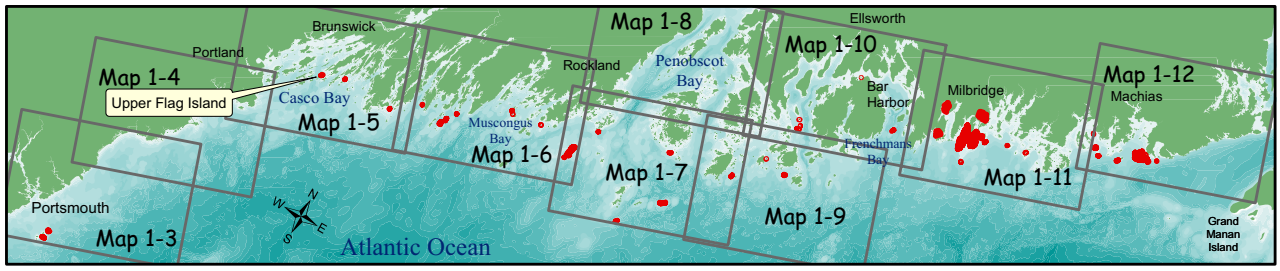




Map 3-2

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

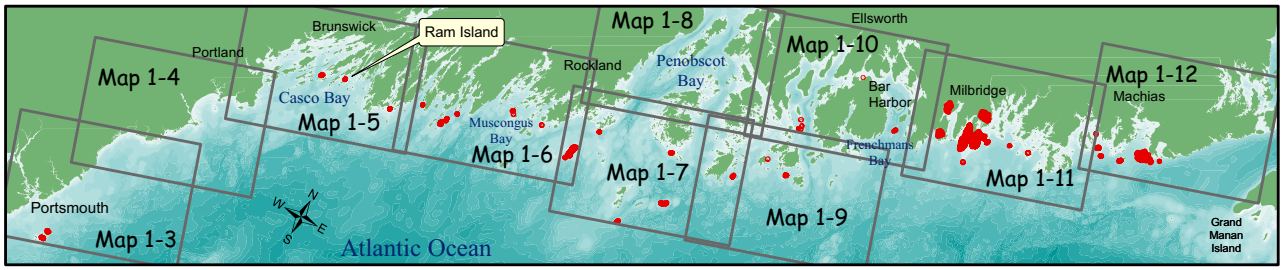
Upper Flag Island



Map 3-3

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

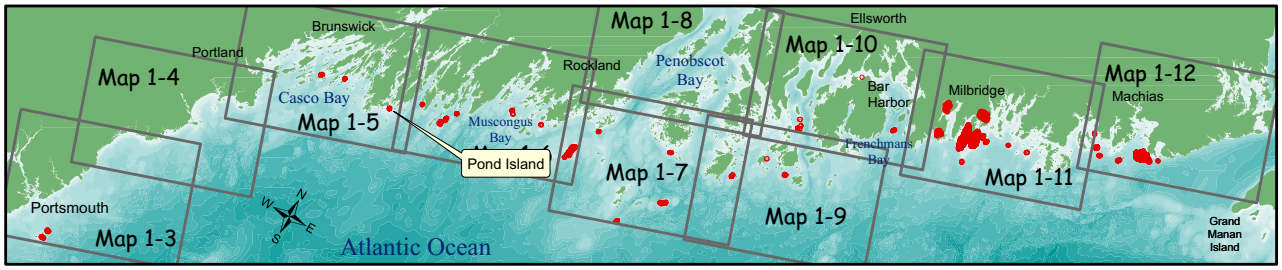
Ram Island



Map 3-4

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

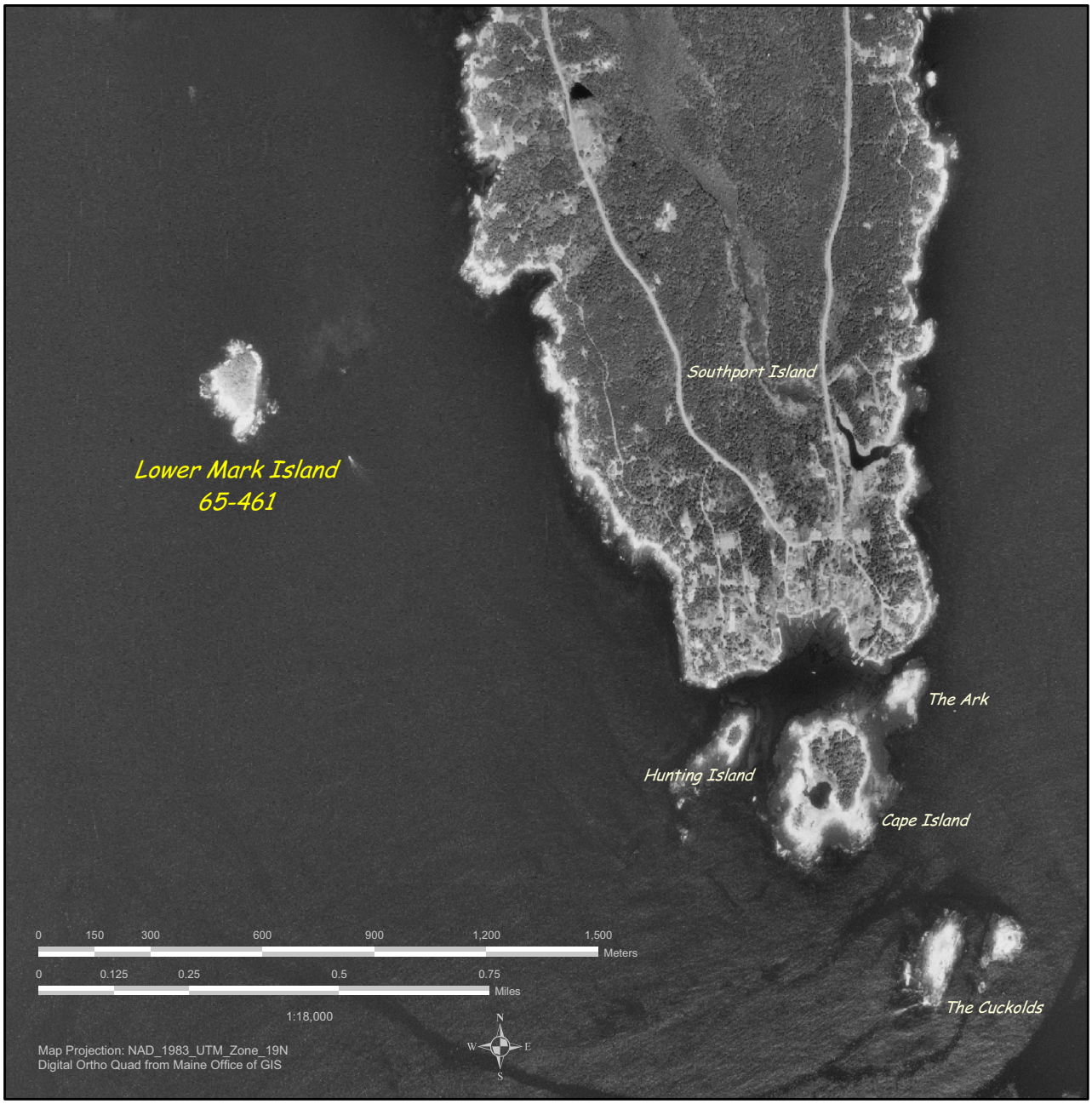
Pond Island National Wildlife Refuge

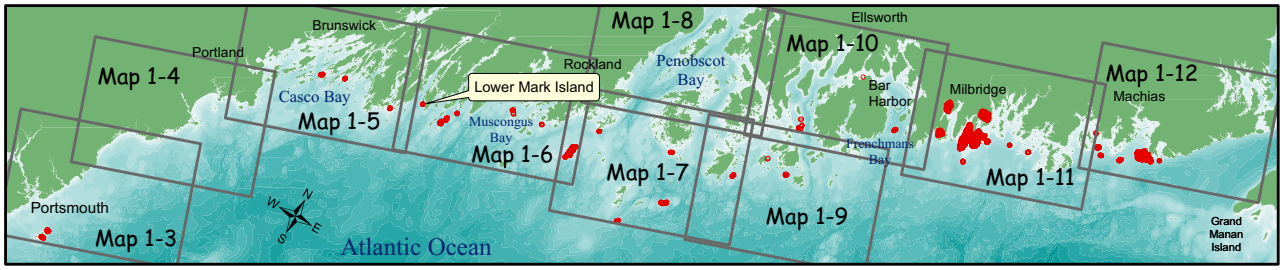


Map 3-5

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Lower Mark Island

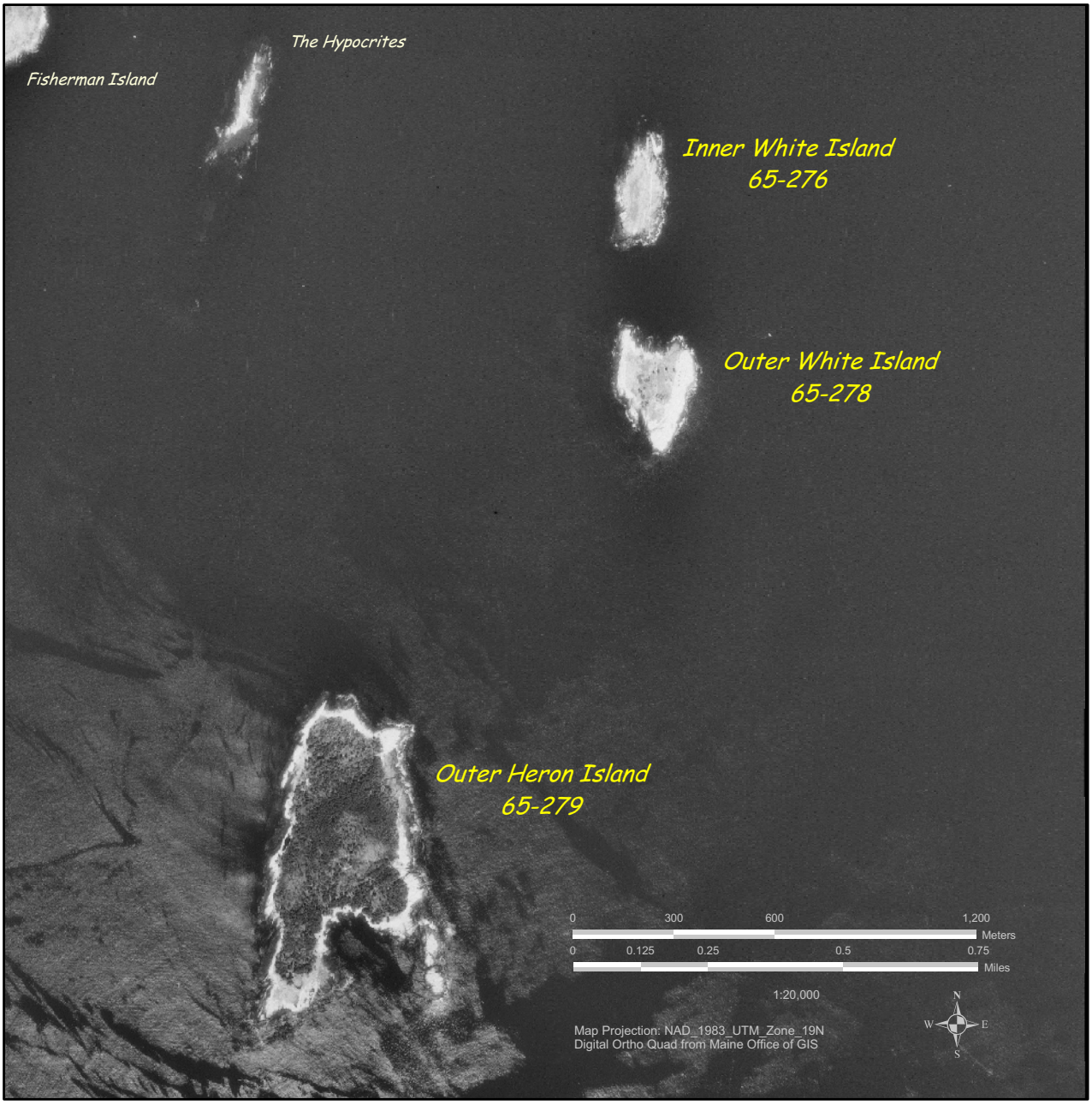


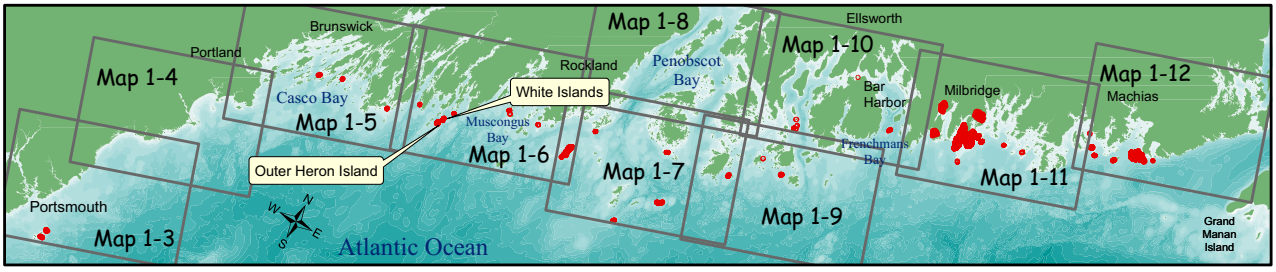


Map 3-6

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Outer Heron, Inner White and Outer White Islands

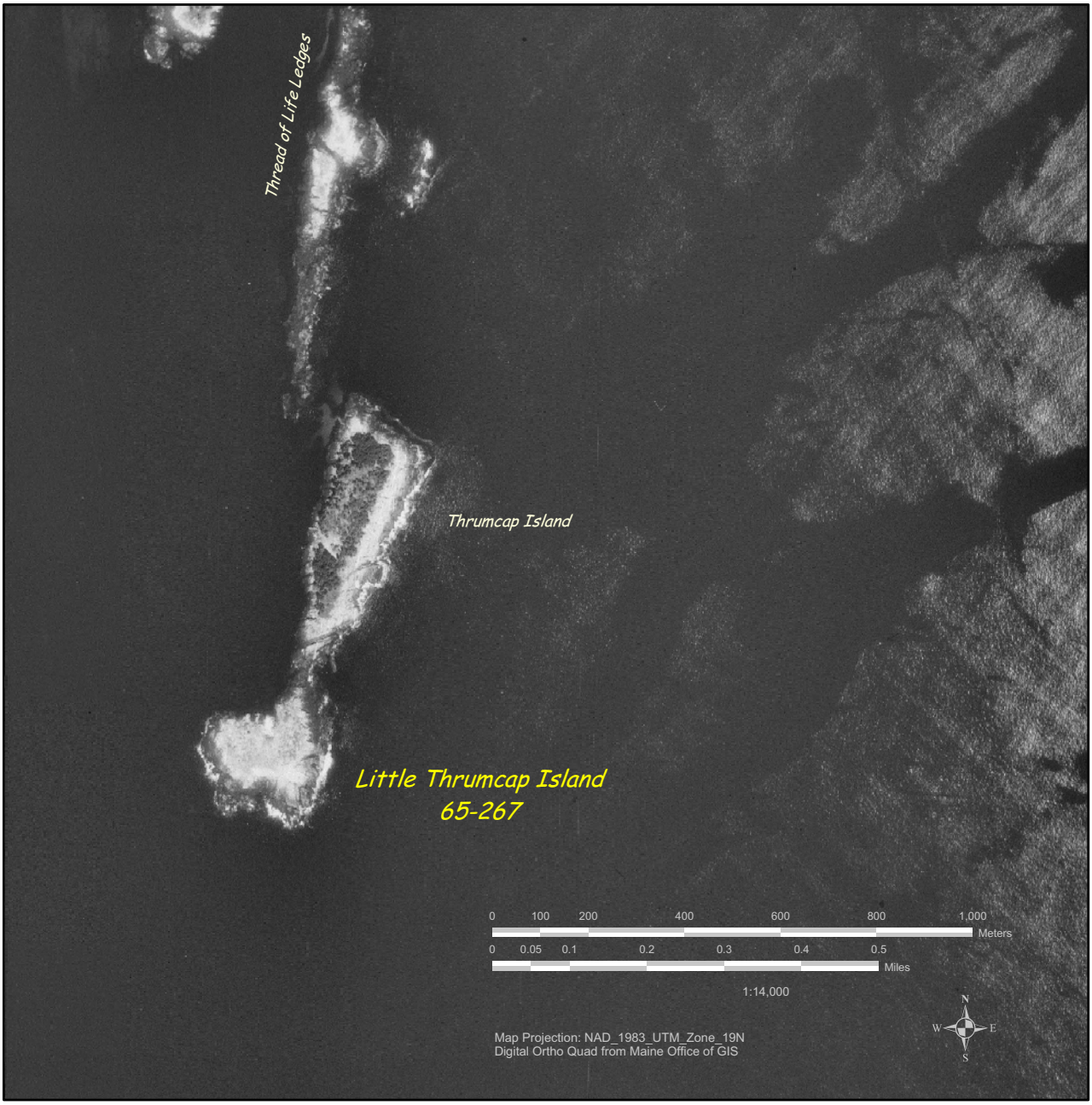


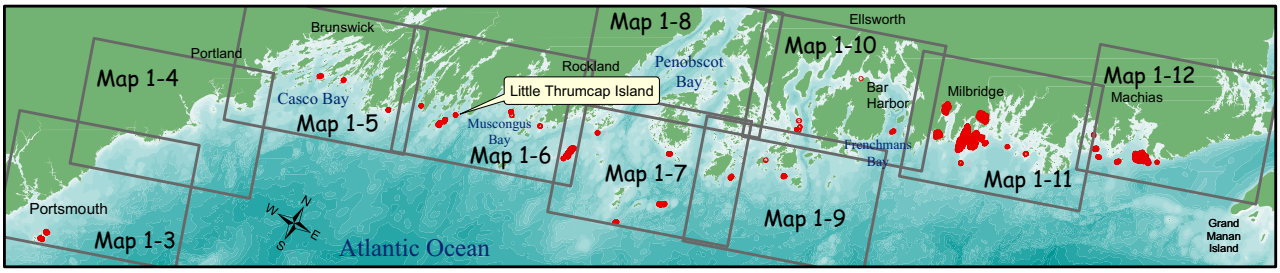


Map 3-7

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Little Thrumcap Island

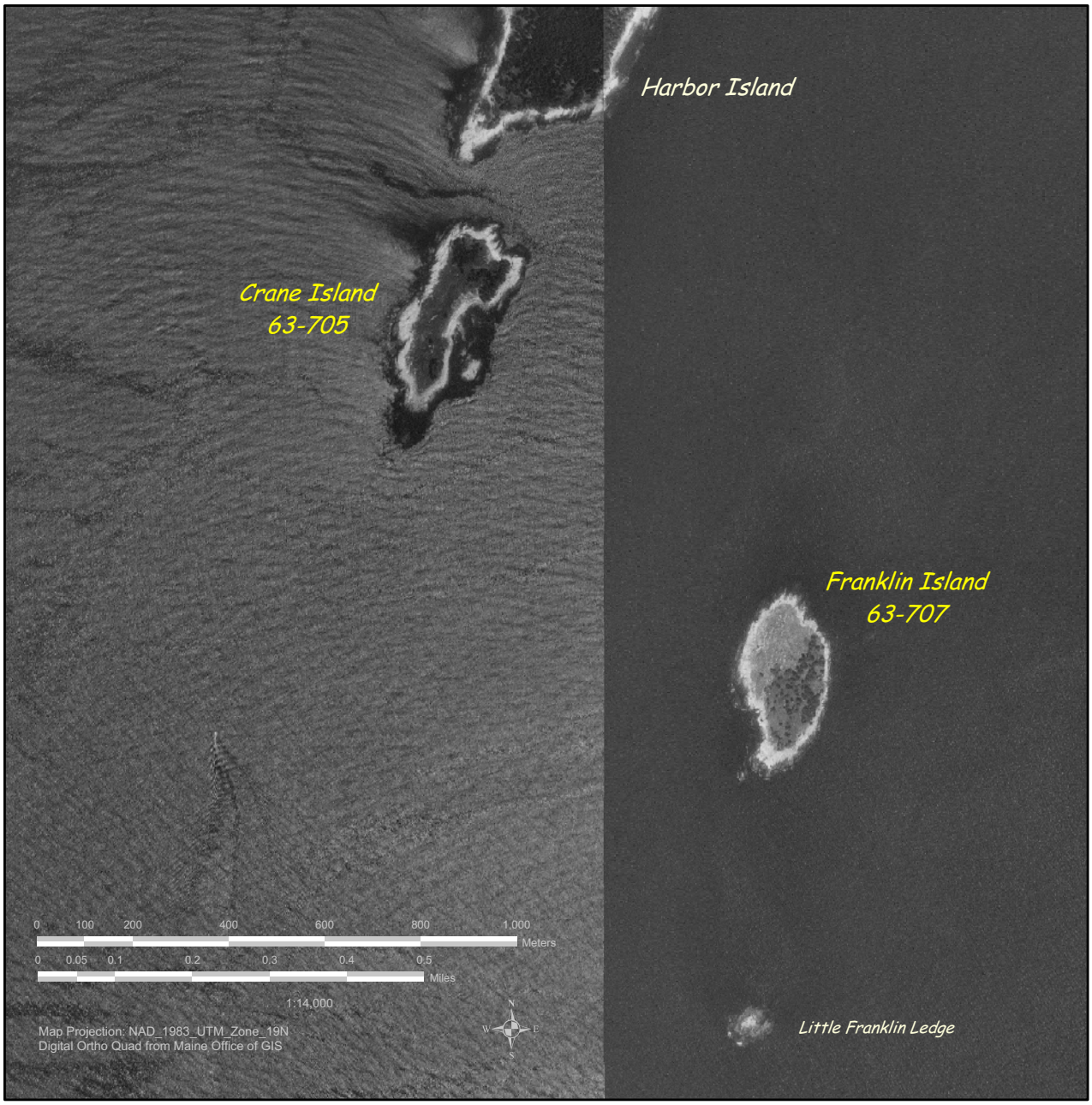


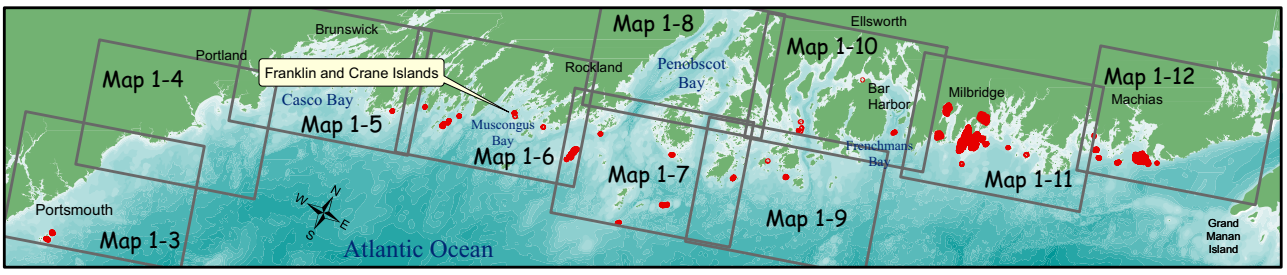


Map 3-8

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Franklin Island National Wildlife Refuge and Crane Island

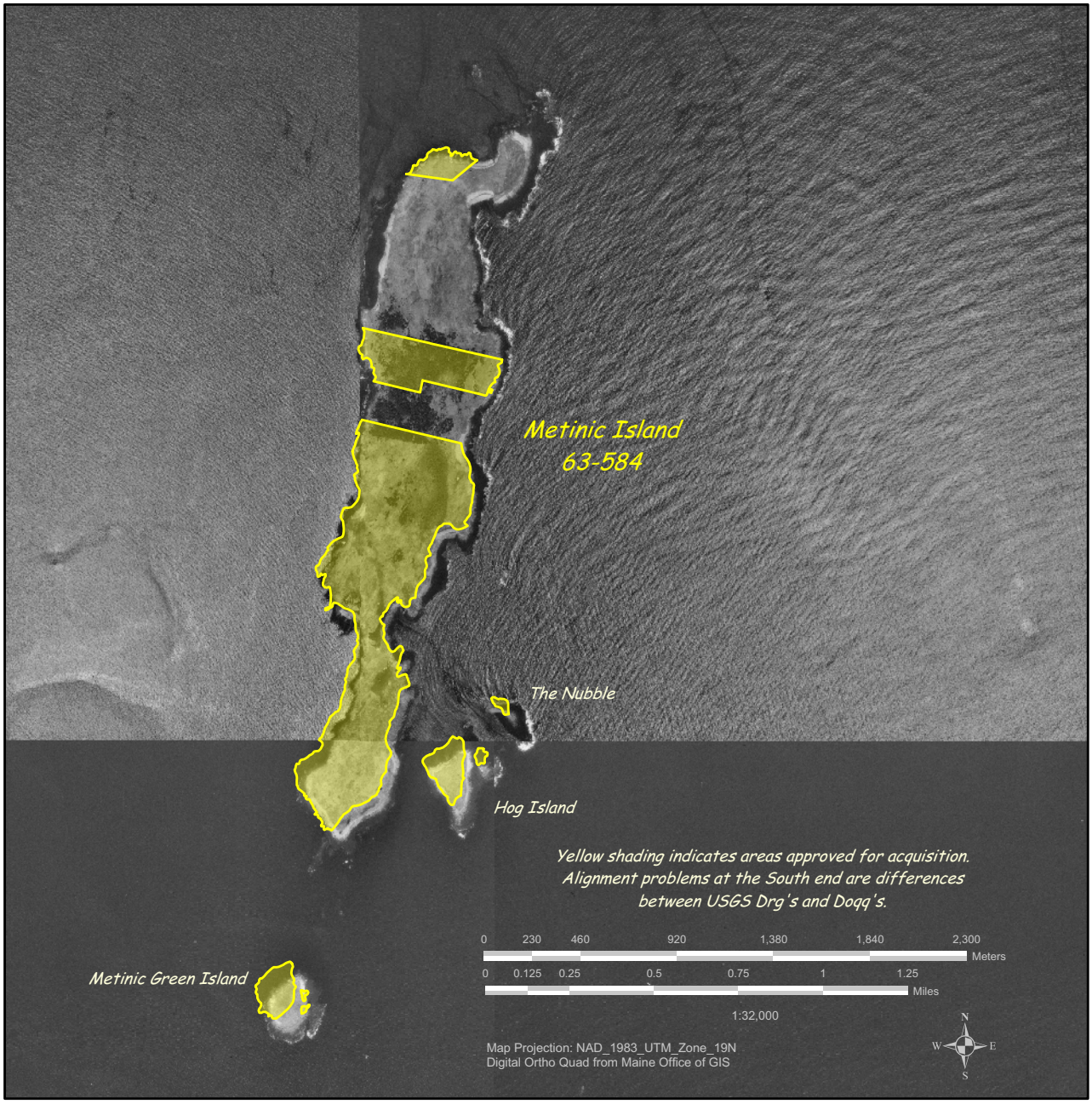


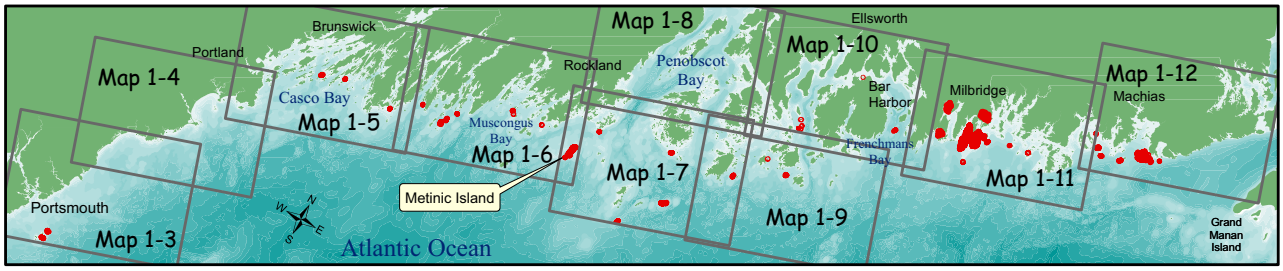


Map 3-9

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL ASSESSMENT

Metinic Island

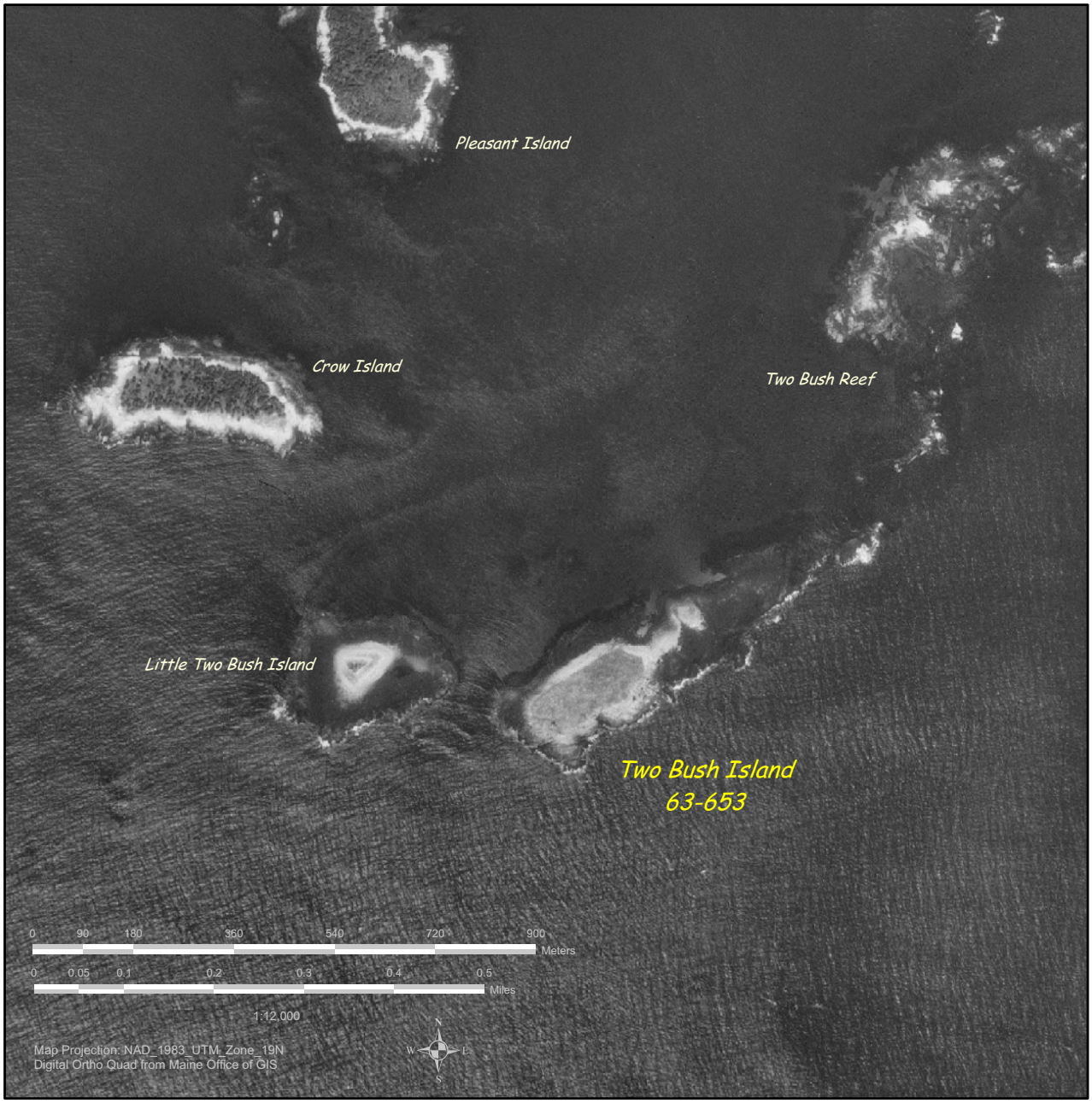


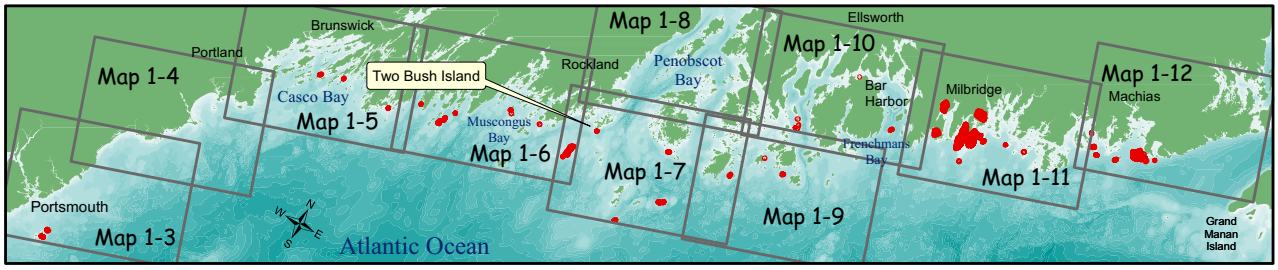


Map 3-10

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Two Bush Island

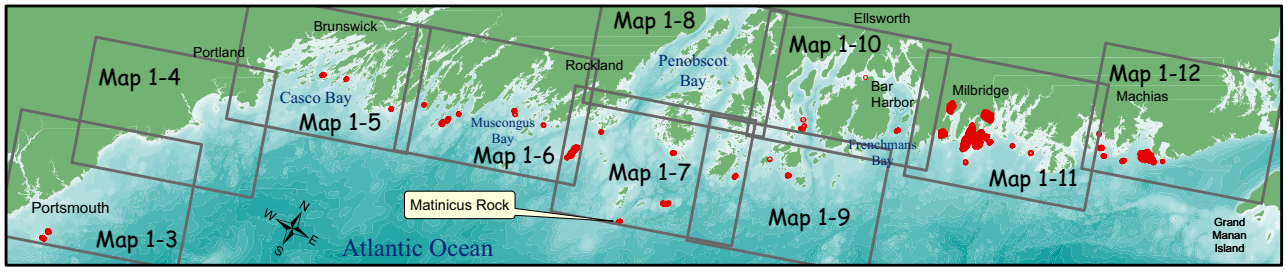




Map 3-11

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

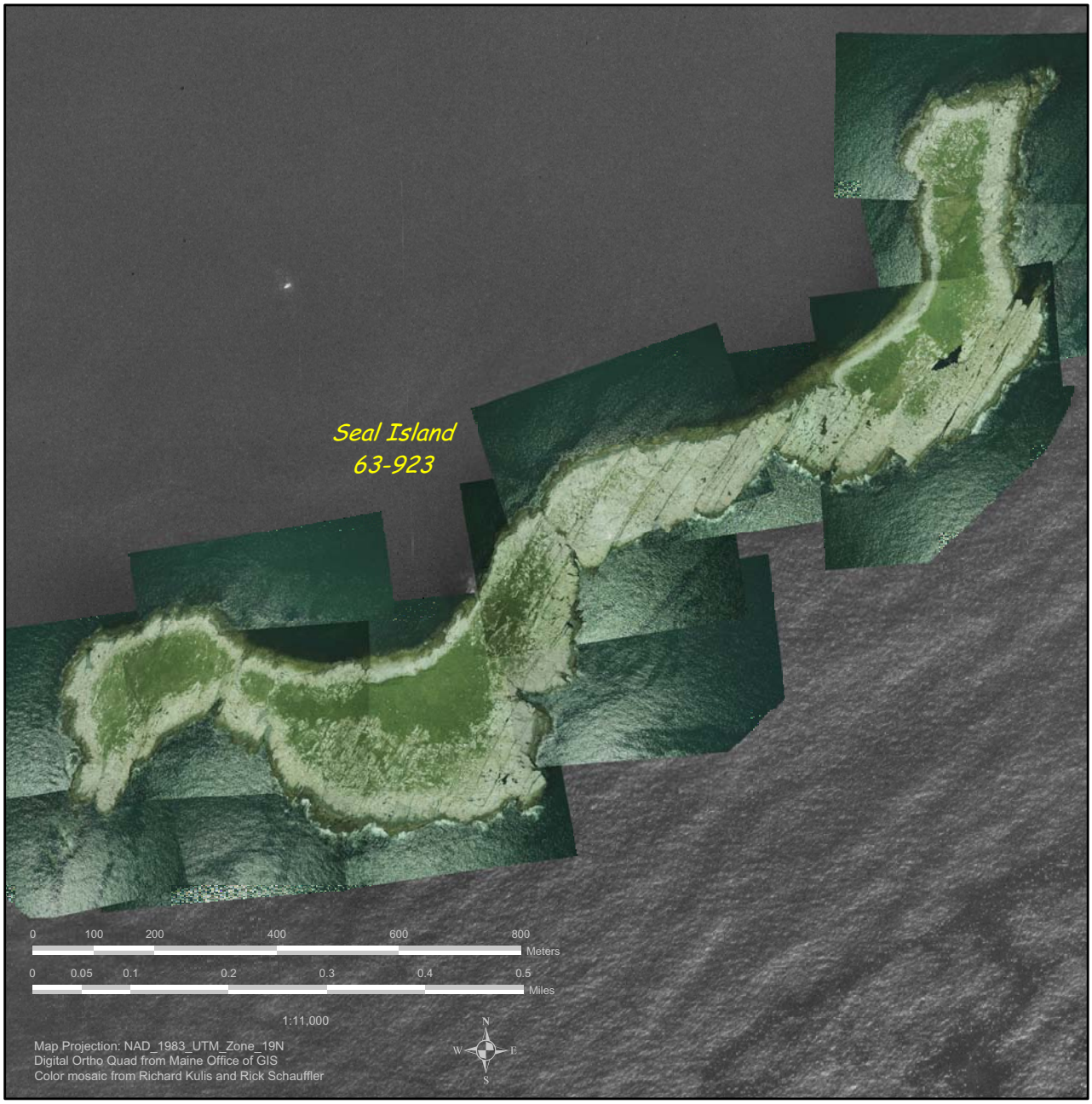
Matinicus Rock

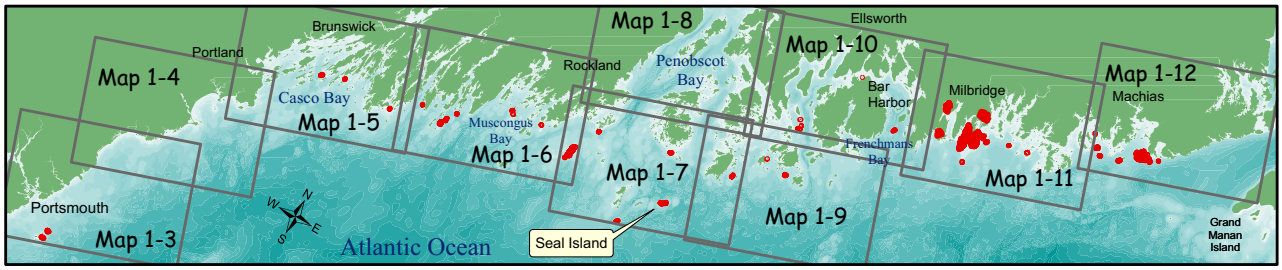


Map 3-12

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Seal Island National Wildlife Refuge

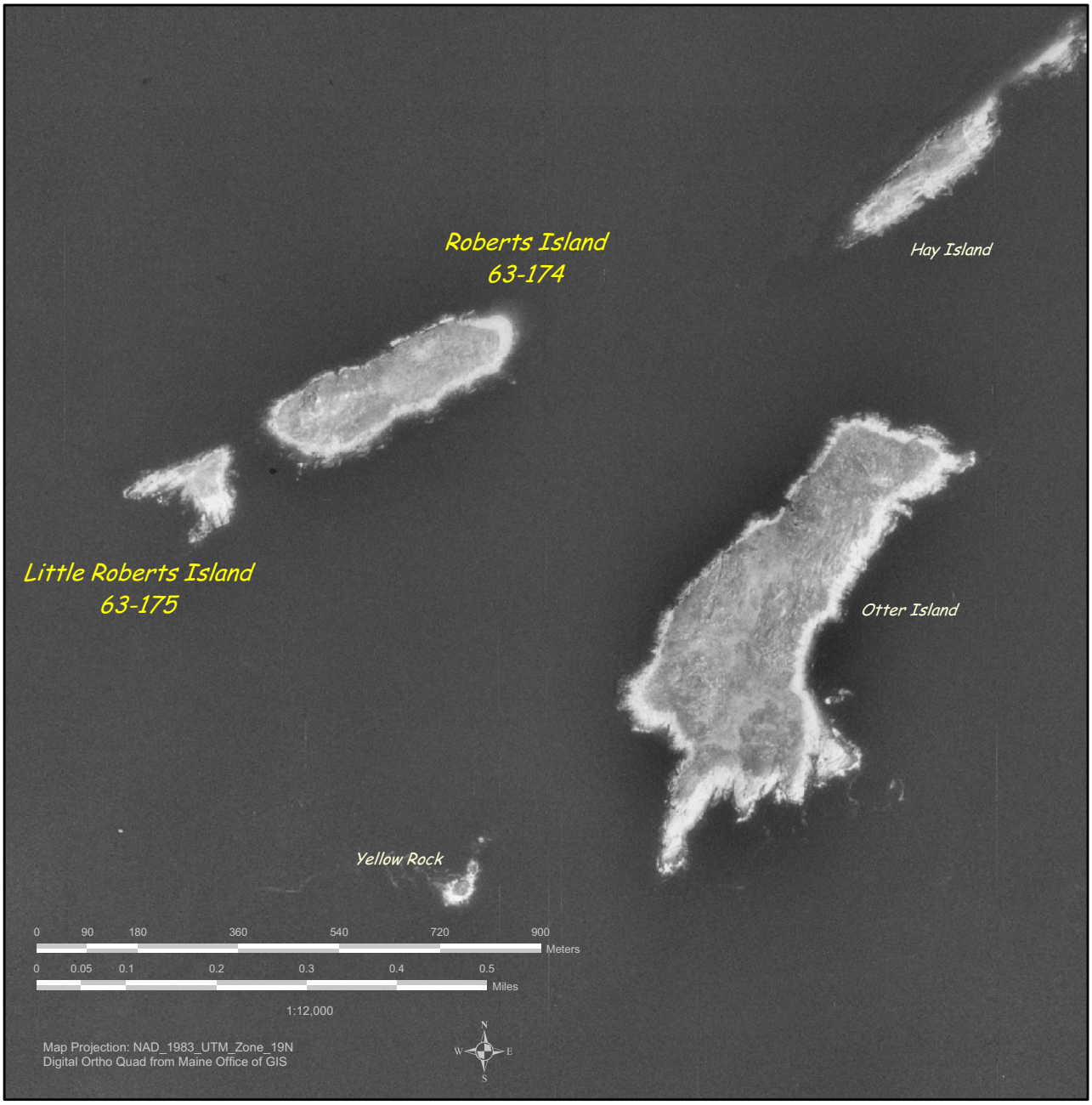


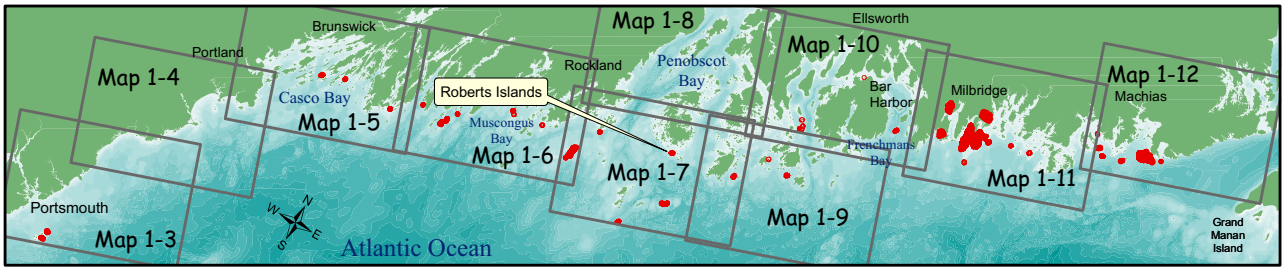


Map 3-13

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Roberts and Little Roberts Islands

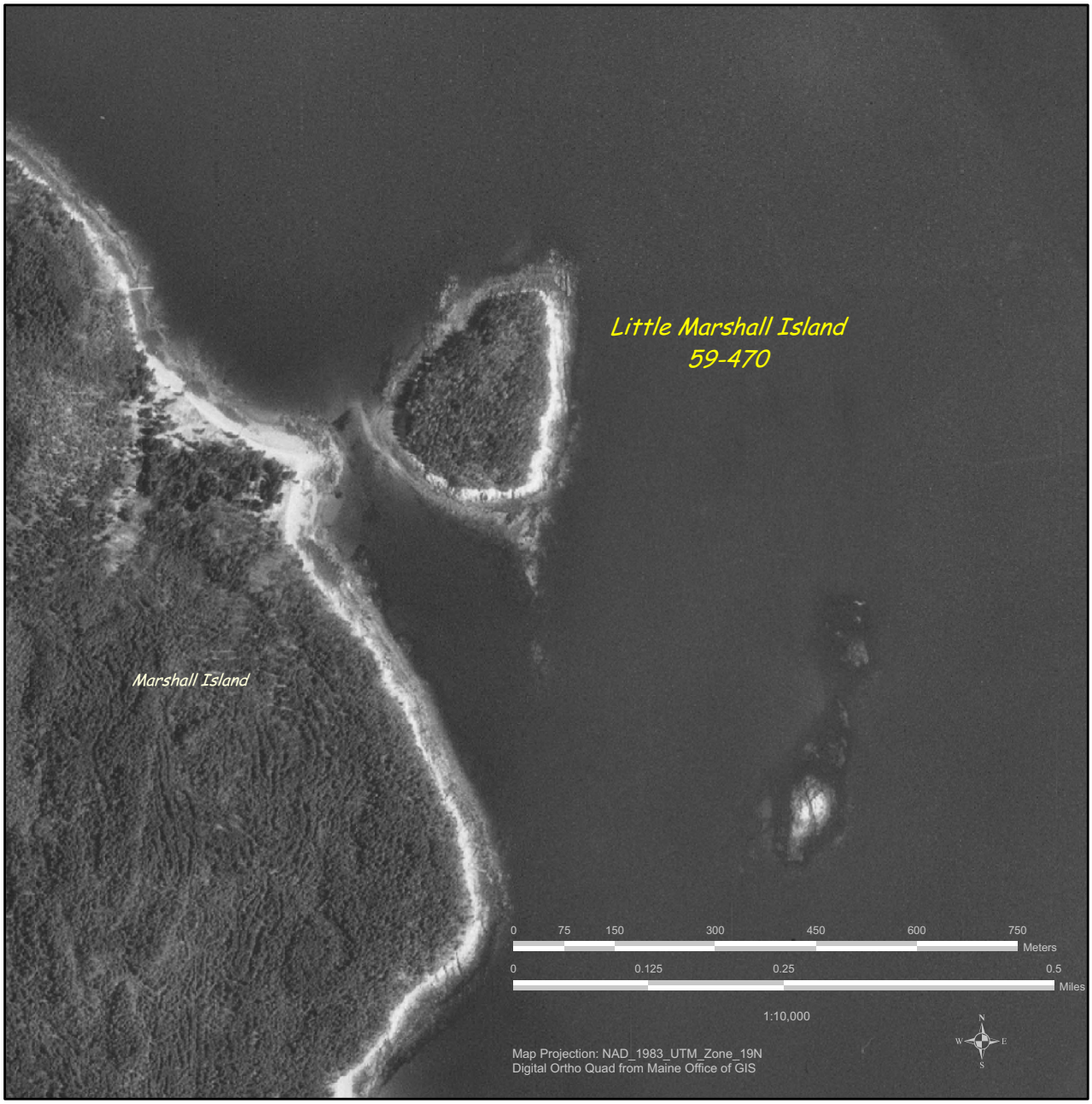


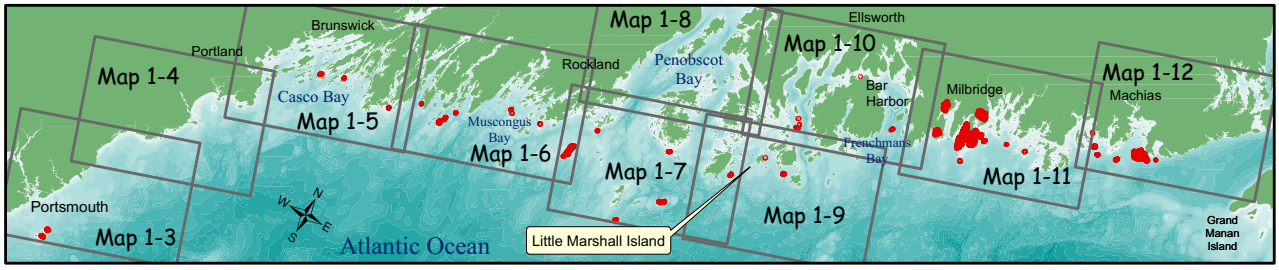


Map 3-14

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Little Marshall Island

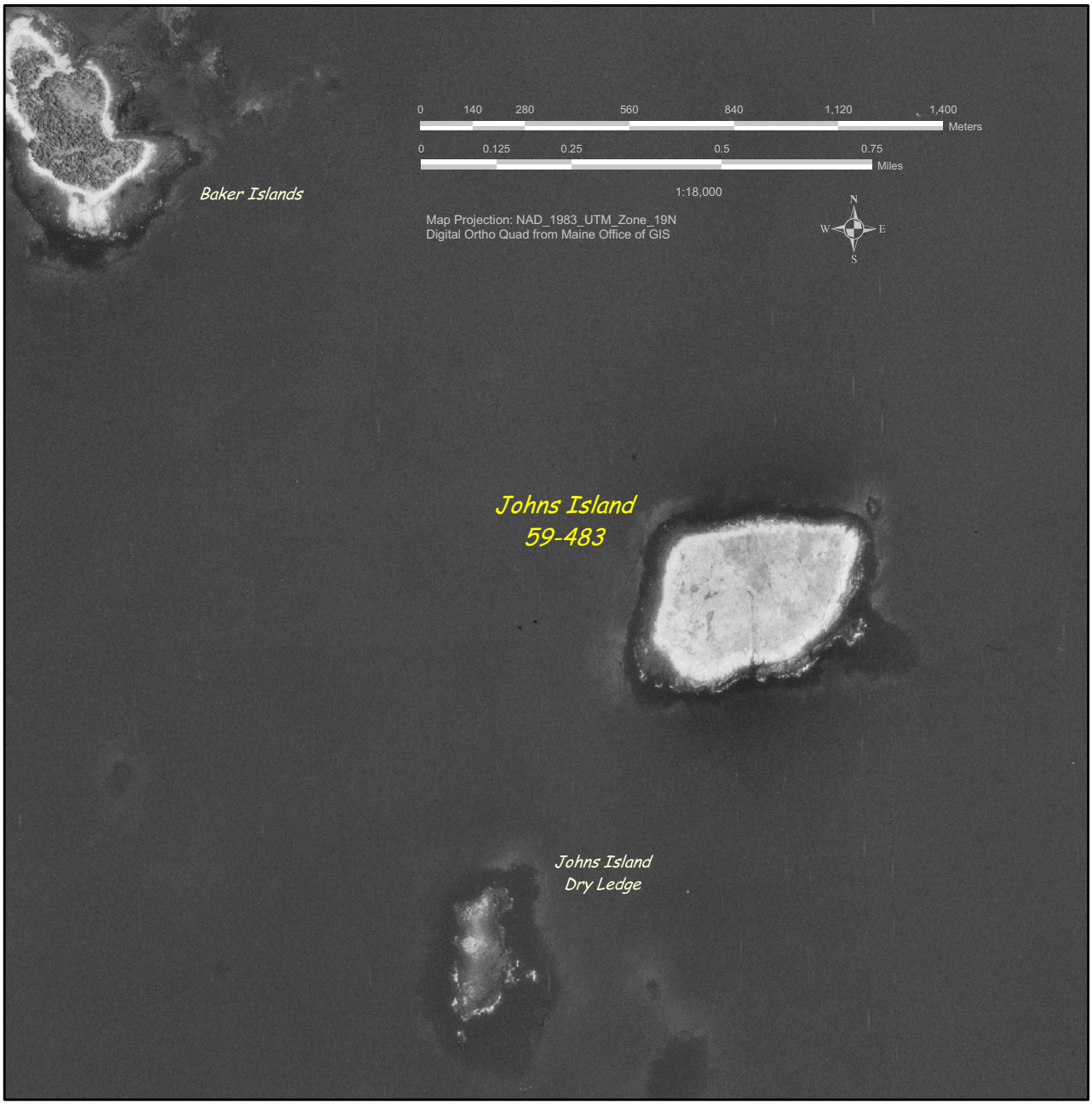


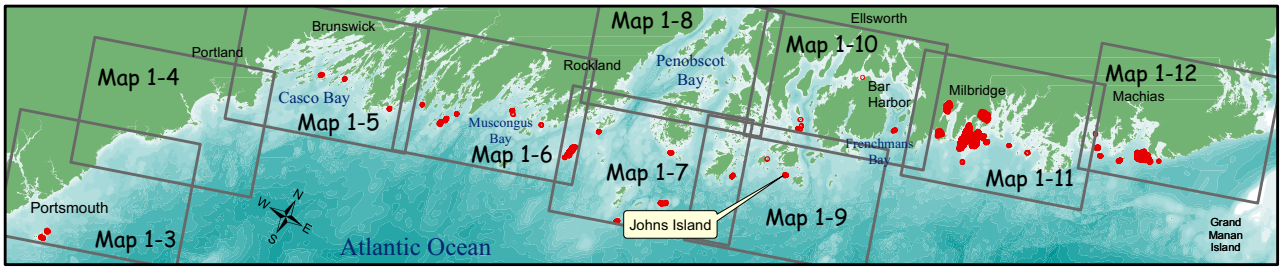


Map 3-15

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Johns Island

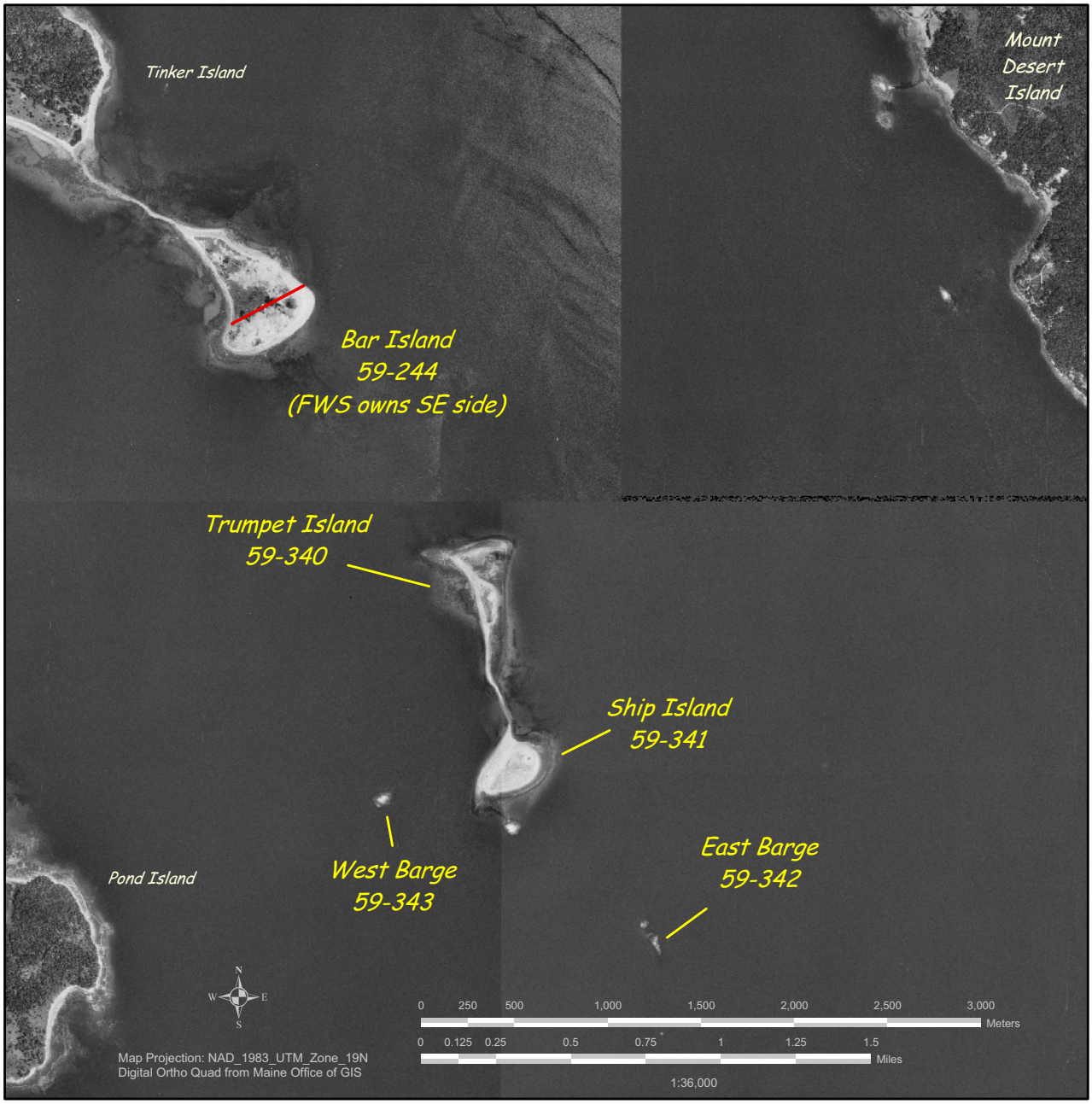


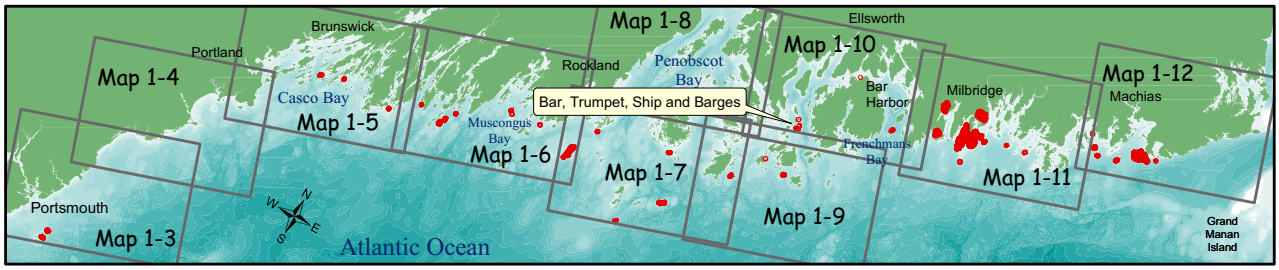


Map 3-16

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Bar, Ship and Trumpet Islands, East and West Barges

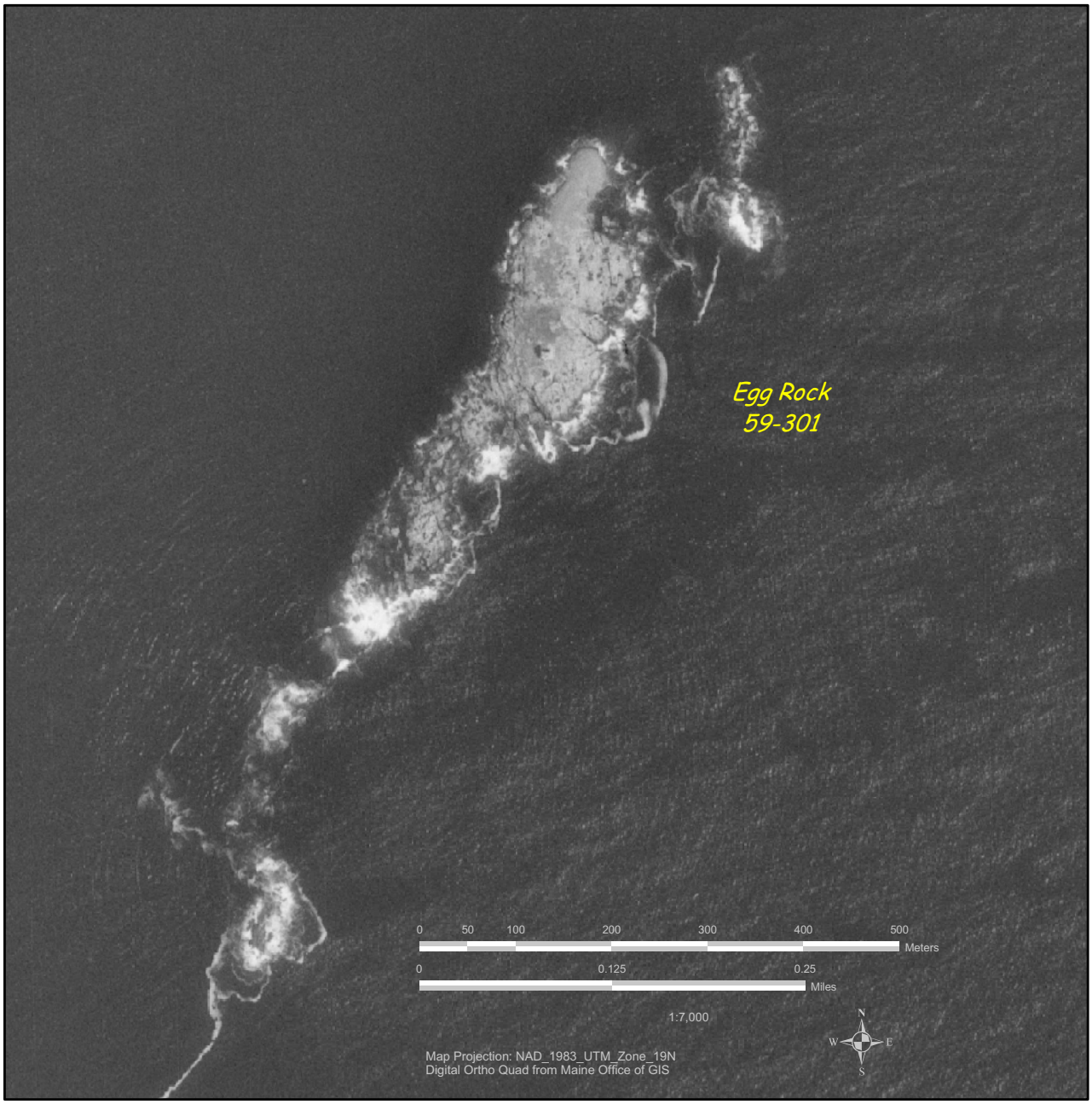


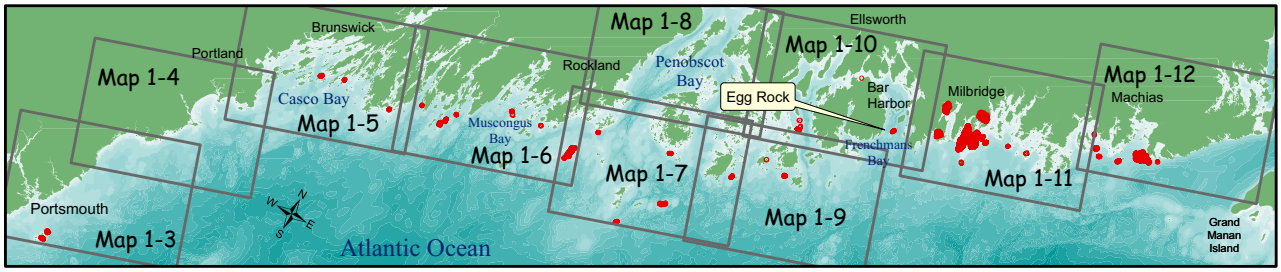


Map 3-17

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Egg Rock

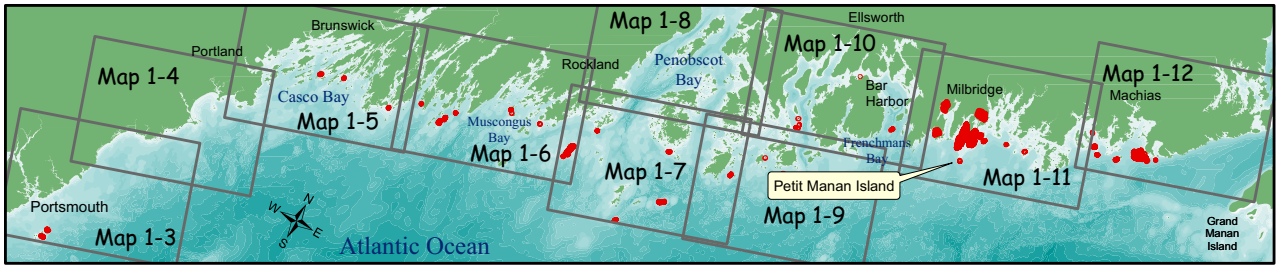




Map 3-18

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

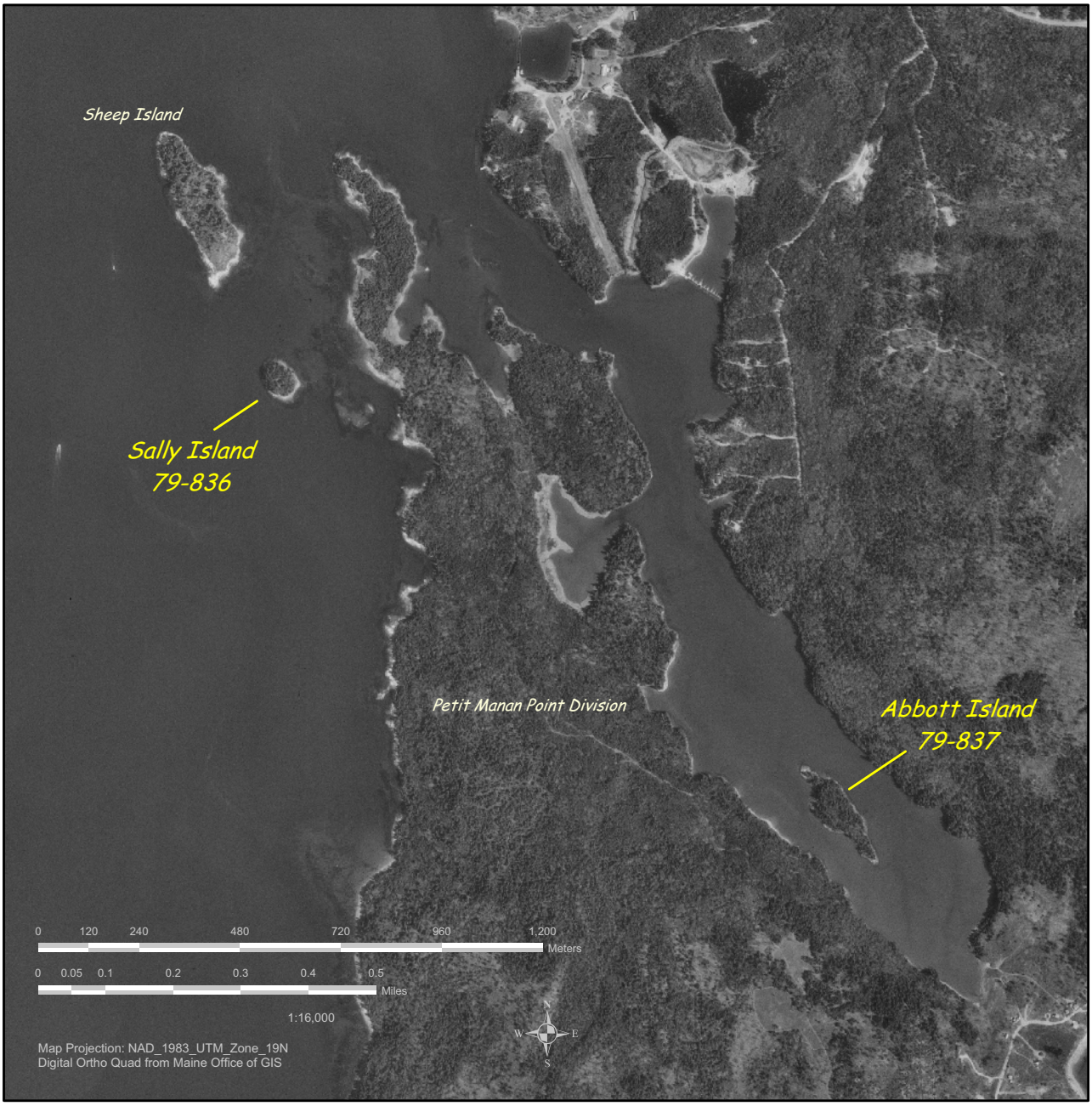
Petit Manan Island

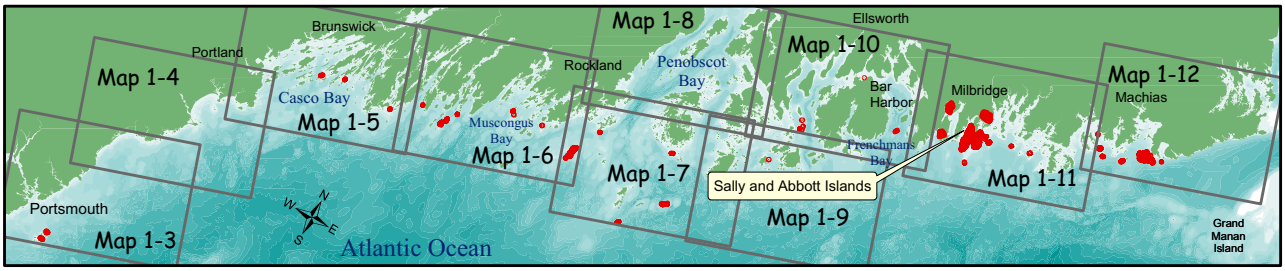


Map 3-19

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Sally and Abbott Islands

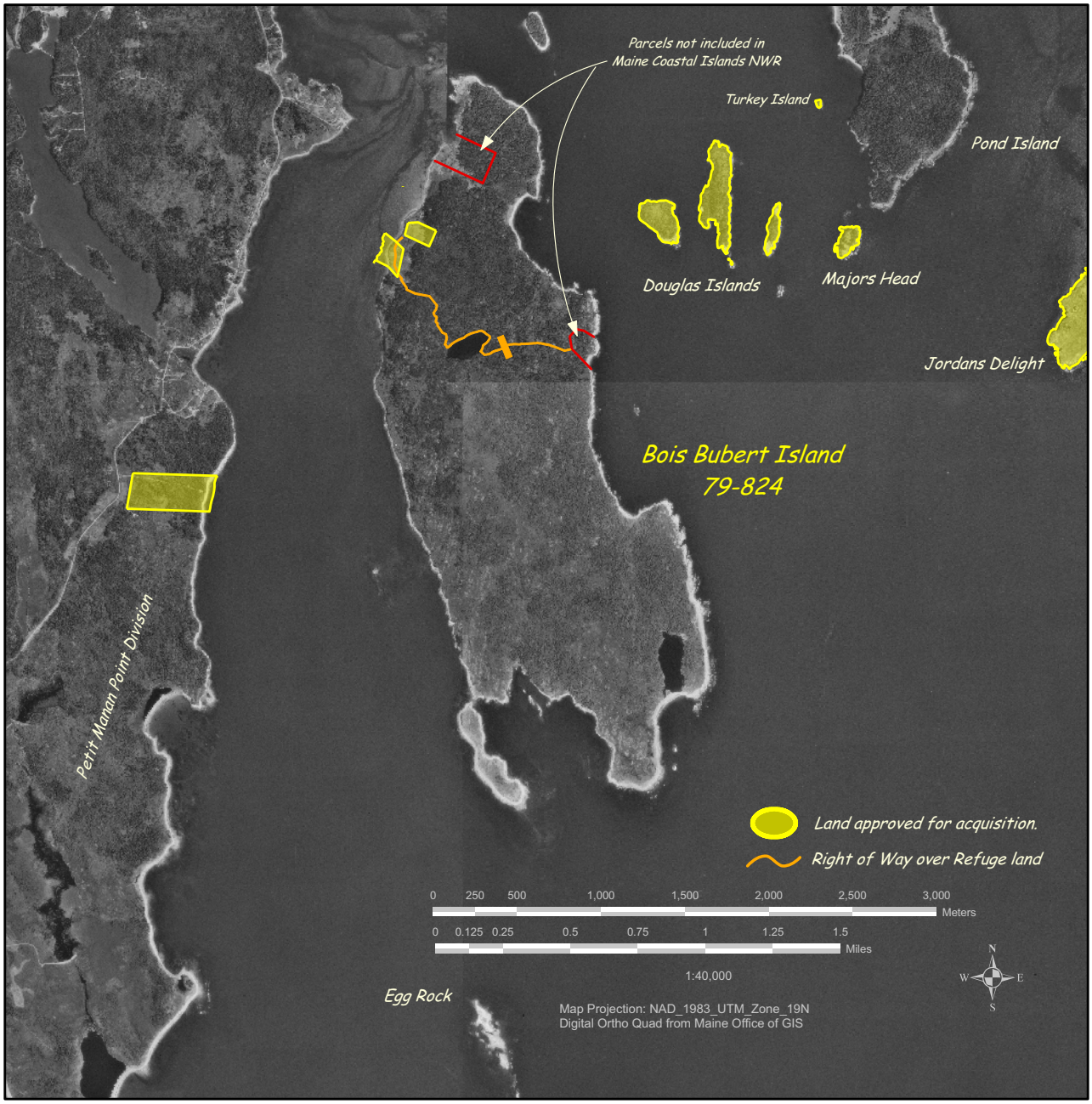


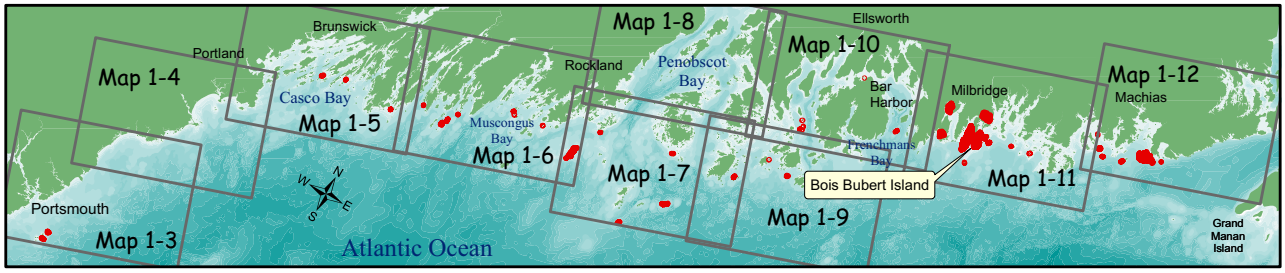


Map 3-20

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Bois Bubert Island

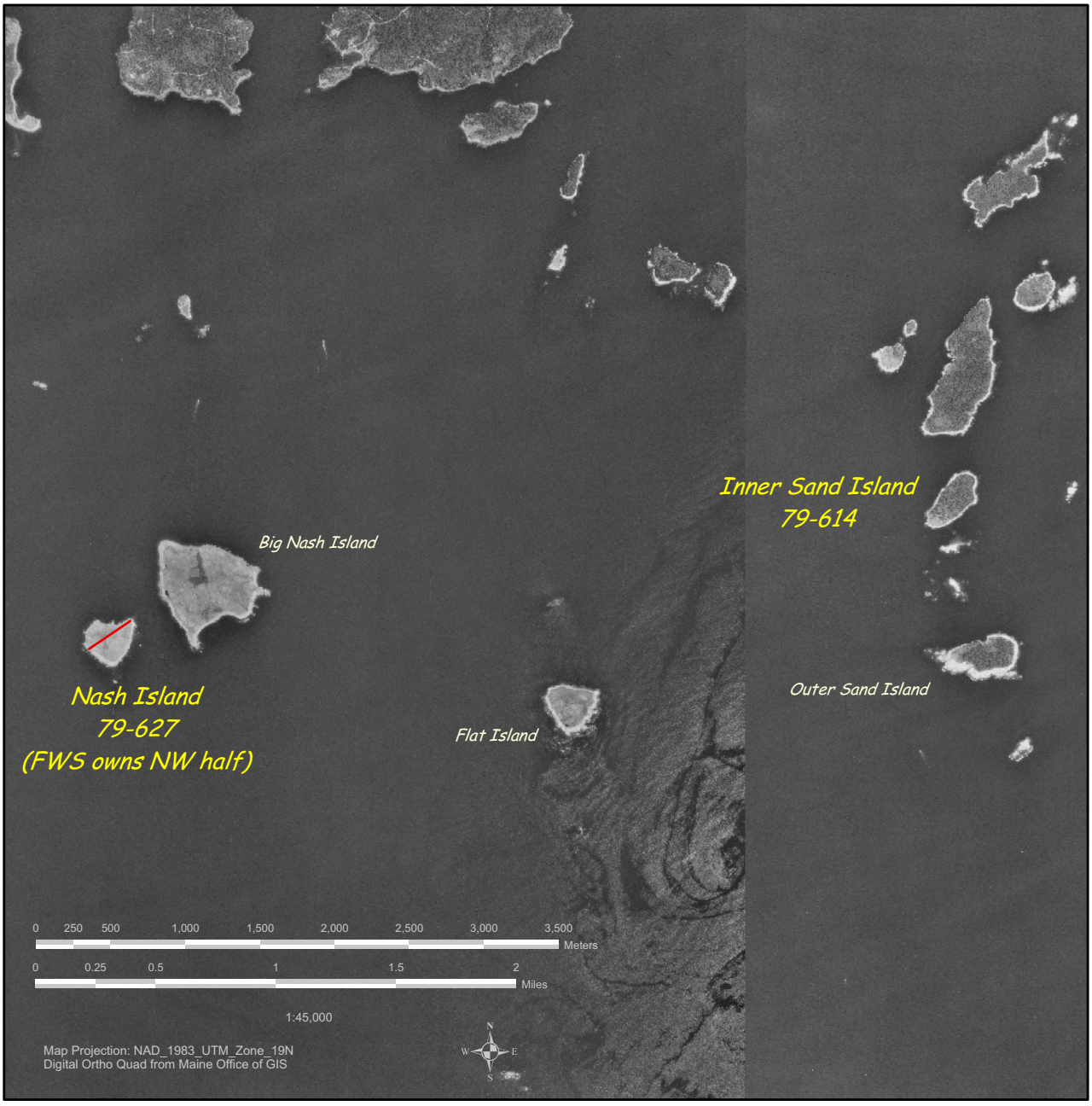


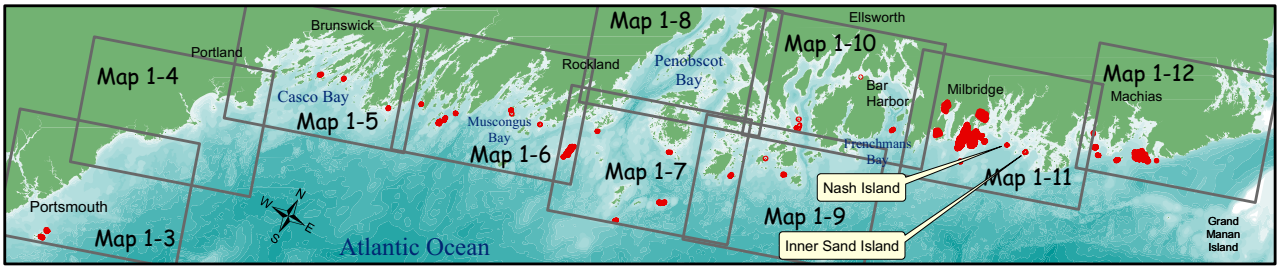


Map 3-21

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Nash and Inner Sand Islands

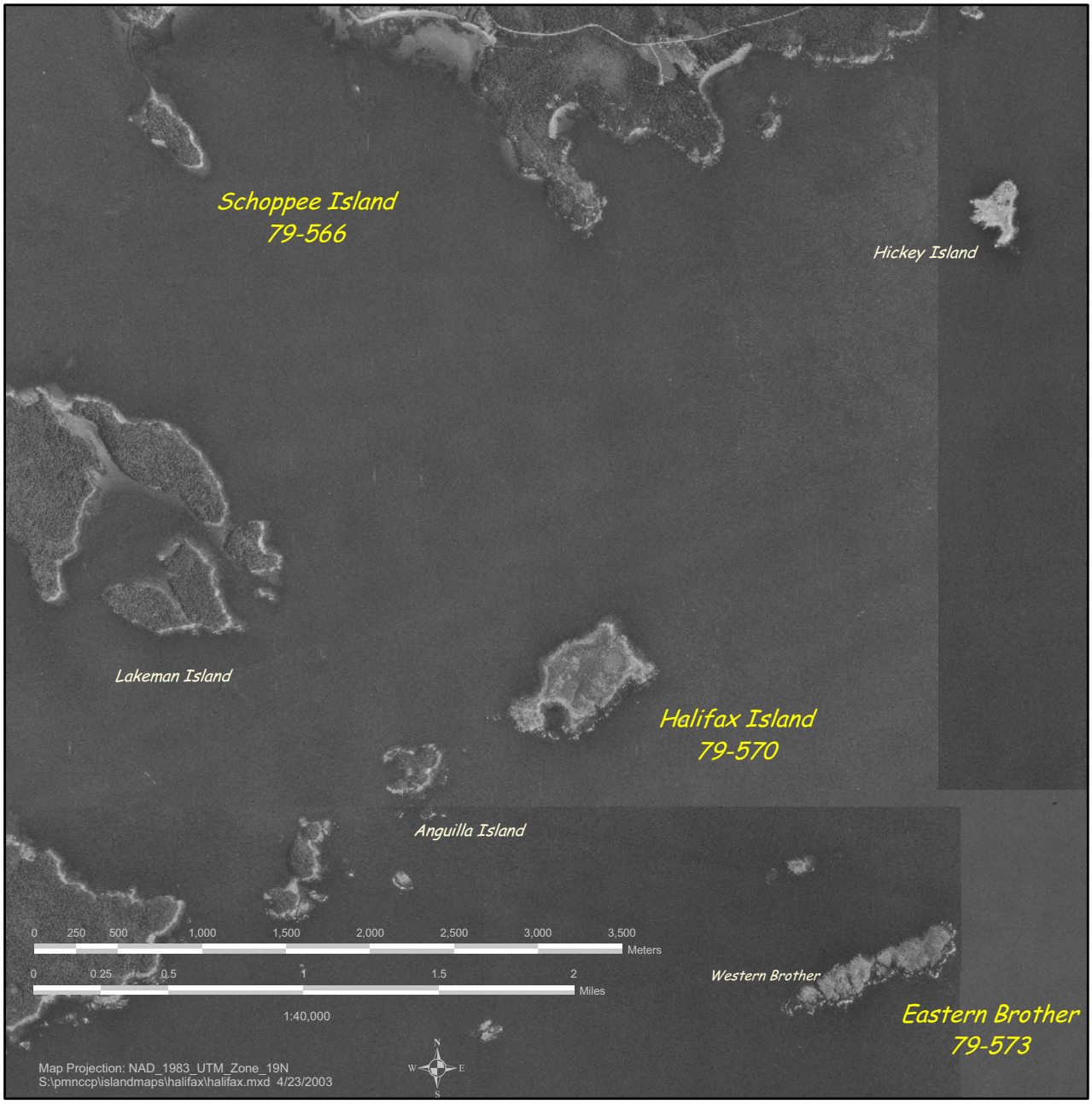


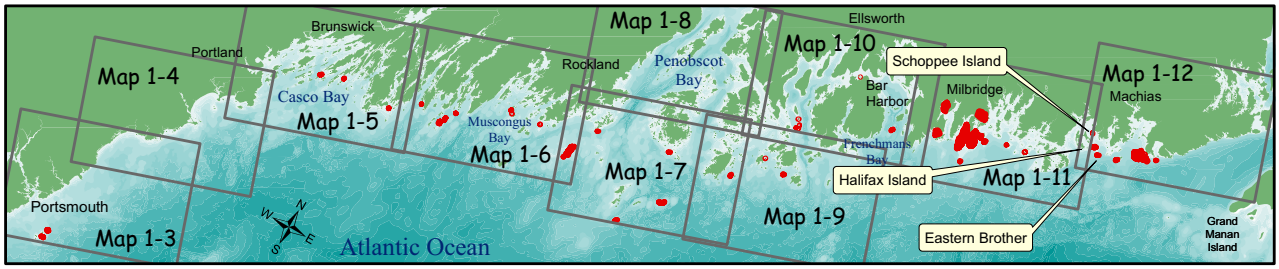


Map 3-22

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMEN

Halifax, Schoppee and Eastern Brothers Islands

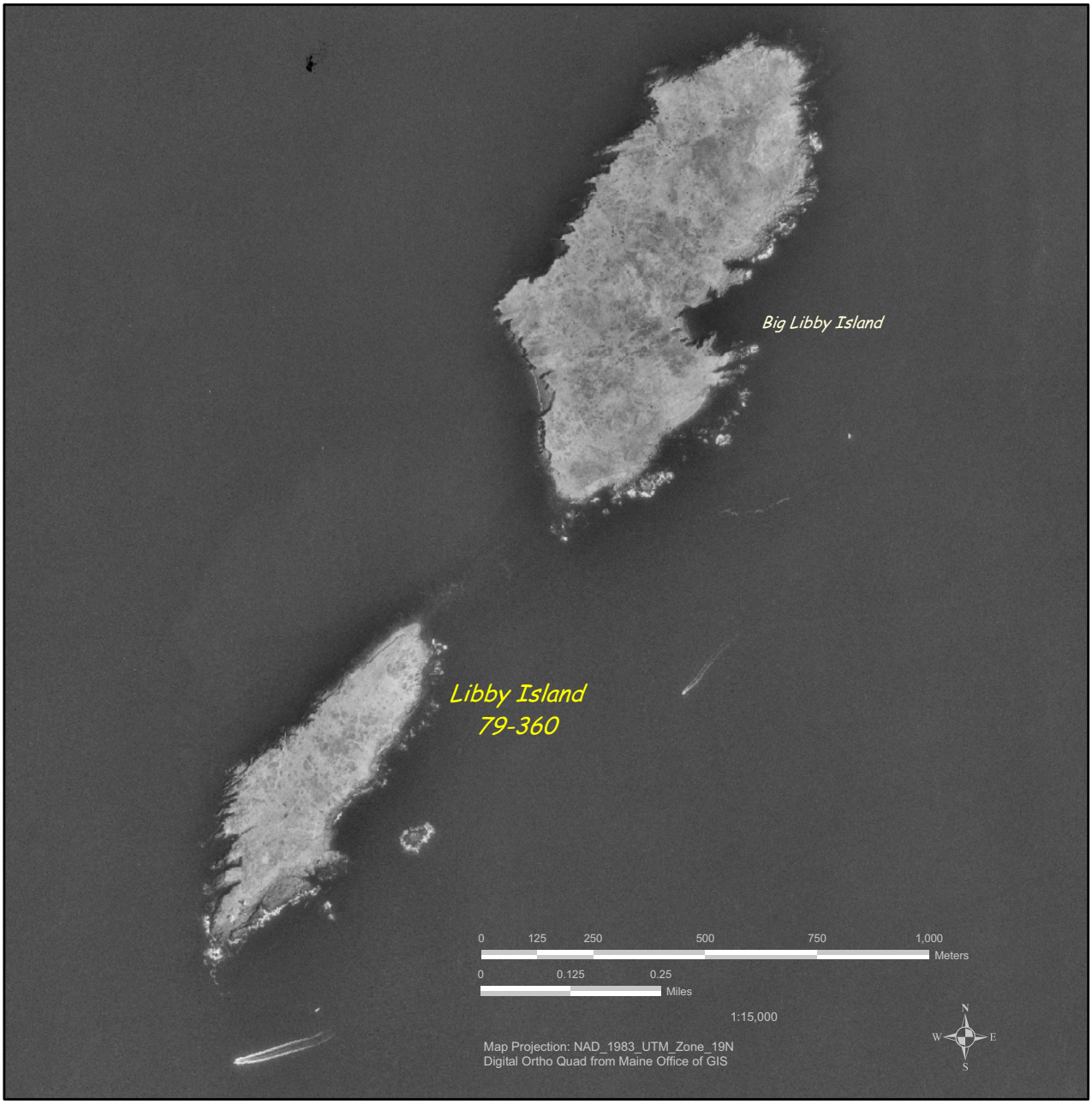


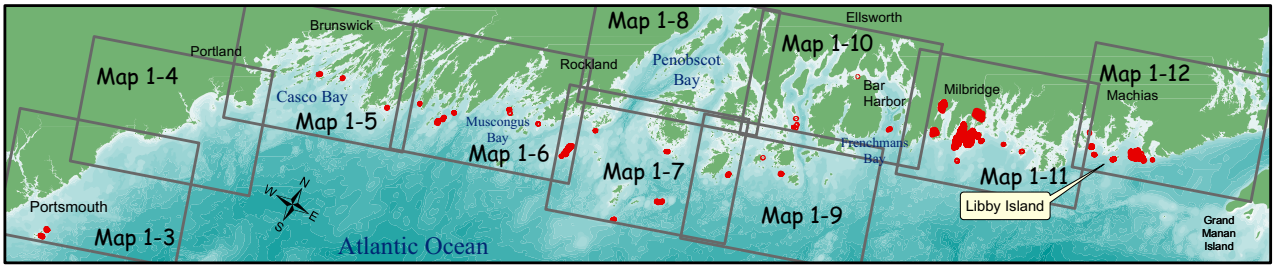


Map 3-23

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Libby Island

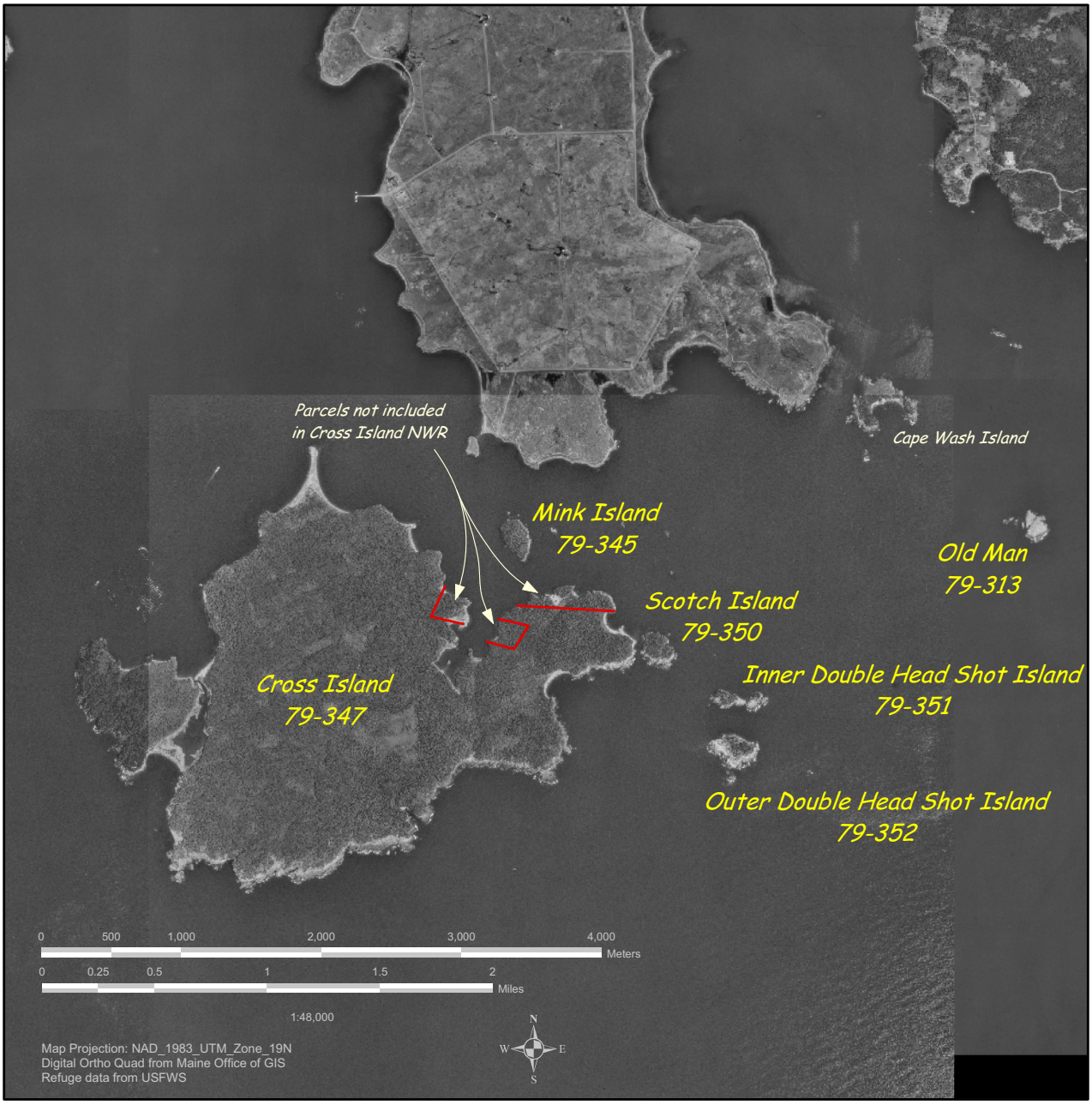


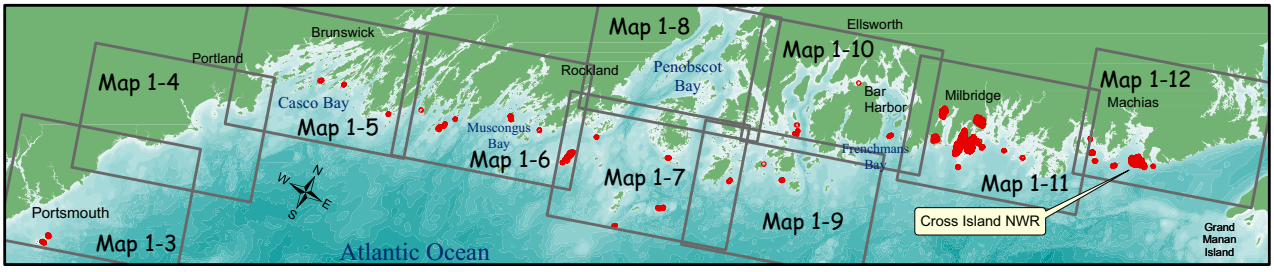


Map 3-24

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Cross Island National Wildlife Refuge

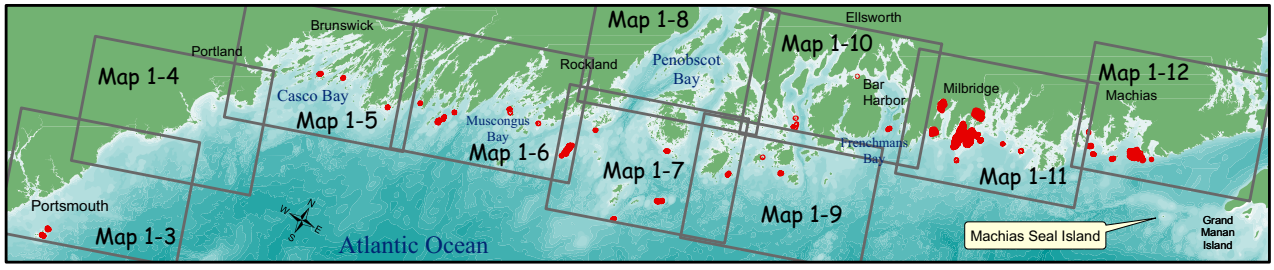




Map 3-25

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Machias Seal Island



Part 3: Refuge Mainland Resources

The Refuge's mainland is composed of three divisions: Petit Manan Point, Gouldsboro Bay, and Saywers Marsh. A fourth division, Corea Heath, is a pending transfer from the U.S. Department of the Navy. All mainland divisions are part of the Petit Manan Refuge. Each one is ecologically diverse, providing habitat for a tremendous variety of resident and migratory species.

A primary management objective on these lands is to protect and restore critical stopover points for Neotropical migratory land birds, waterfowl, and shorebirds during their spring and fall migrations along the Maine coast. In recent years, management emphasis has also been on acquiring private inholdings from willing sellers, conducting baseline biological surveys, and providing high quality interpretive trails. Each of the divisions is described in more detail below.

Table 3-42, at the end of this chapter, presents a summary of cover types for the entire Refuge.

Petit Manan Point Division

Acquisition History

Much of Petit Manan Point was acquired by the Service in 1976 from The Nature Conservancy and William Mague. It consists of 2,195 acres in the Town of Steuben, Washington County. Map 3-26 depicts current Service ownership.

This division has had an interesting and colorful past. At the turn of the century, most of Petit Manan Point was owned by the Maine Coast Club, a company that intended to develop the land for "rusticators." Tennis courts, a golf course, a saltwater swimming impoundment, a deer enclosure, a wharf, and even a casino were built. In addition, portions of the property were subdivided into building lots. However, its expectations were never realized, and the club went bankrupt. Most of Petit Manan Point was eventually acquired by the Mague family, who turned it back into a saltwater farm, using the cleared areas for sheep pasture and blueberry fields. The old club buildings gradually disappeared, and, aside from two old camps and a small chapel, few traces of it remain.

Biological Resources

Petit Manan Point has an uncommon diversity of habitats, including rocky ledges, sphagnum bogs, exposed cobble beaches, blueberry barrens, maritime slope bog, cedar swamp, jack pine stands, red spruce forests with some mixed hardwoods, coastal raised heath peatlands, fresh and saltwater marshes and old hayfields. The Point also includes over 10 miles of shoreline. Some of the more exposed areas have a distinct, rugged and windswept character. A cover-type map using national vegetation classification standards was completed

in 2002. Acres calculated from cover typing are based on GIS and may vary from deed acreage. A summary of cover types by acre is presented in Table 3-38 below; Map 3-27 portrays the cover types on the landscape.

Table 3-38 Petit Manan Point Division cover types by acres

Cover Type	Acres (GIS)	Percent (%) of Area
Mature conifer forest	905	41
Northern hardwood -mixed forest	453	21
Early successional forest	226	10
Open field	70	3
Jack pine woodland	11	0.5
Freshwater wetlands	219	10
Maritime saltmarsh & estuary	8	0.4
Saltwater tidal / aquatic bed	302	14
Building / camp	1	0.1
Total	**2,195**	**100**

Several rare plants and community types have been documented on Petit Manan Point. The State-listed plants include: Nova Scotia false-foxglove (*Agalinis neoscotica*), Pickering's reed bent-grass (*Calamagrostis pickeringii*), salt-marsh sedge (*Carex recta*), swarthy sedge (*Carex adjusta*), and moonwort (*Botrychium lunaria*) (Widrig 1996). The rare or noteworthy community types include: maritime slope bog, tall meadow, Larch forest, maritime spruce-fir, jack pine, spruce-fir flats, spruce woodland, northern white cedar swamp, and spruce slope forest (MNAP 2002).

Petit Manan Point is noted for its use by migrating waterfowl, songbirds, shorebirds, and raptors. Annual breeding bird surveys are ongoing, including, marsh bird, grassland bird, woodcock, and land bird. A variety of land bird species of concern (Appendix B) have documented breeding on the refuge, include American woodcock, eastern wood-pewee, chestnut-sided warbler, and bobolink. We have participated in the Monitoring Avian Productivity and Survivorship (MAPS) program for five years on Petit Manan Point. The emphasis of this program is to measure demographic parameters such as migratory landbird survival and productivity rates at over 500 MAPS stations continent-wide. This data will be pooled to help evaluate what and where population fluctuations are occurring for captured species. This MAPS station is one of the top 5% in terms of productivity of stations in North America, excluding Alaska. On the average, 337 birds are captured each year, representing 43 species (Brokaw and Burke 1997, Taylor and Famous 2000). Common warbler species captured include magnolia, black-and-white, black-throated green, and Nashville warbler. Other common species include American redstart,

Bobolink
USFWS photo

white-throated sparrow, hermit and Swainson's thrush, and common yellowthroat. Bird and plants species checklists are available from the Refuge Headquarters upon request.

The three impoundments on Petit Manan Point are used extensively by migratory waterfowl; it is common to observe over 4,000 ducks during fall migration in the area. These three freshwater wetlands cover 219 acres, and are managed to provide habitat for fall migratory waterfowl, shorebirds, and wading birds. The most abundant species observed are American black duck, mallard, and green-wing teal. We have been trying to increase wild rice production in one of the impoundments to provide high quality waterfowl forage.

Current upland habitat management activities include mowing and prescribed burning as means of maintaining open fields. Use of fire to manage open habitats has an historic and cultural context in this part of Maine. Blueberries, a chief export product for Maine, are managed using prescribed fire. In spring, burning is commonplace in Washington County, with more than 10,000 acres of blueberry lands burned each year. Prior to acquisition, Refuge lands on the Point were burned to maintain blueberry fields.

Approximately 65 acres of these same fields are scheduled for burning in the approved Fire Management Plan every 3 to 5 years, laid out in 11 separate burn units. The objective is to maintain blueberry and grass fields for forage and nesting bird habitat. Invasive sweetfern and other woody vegetation will be controlled by burning. We burn during the spring (April-May) or fall (September-November), as conditions permit and outside the upland bird nesting season. Because of the narrow burn window, precipitation levels, and the humid coastal climate, burning has not always been accomplished. Other limitations, like inadequate fuel in blueberry fields, may limit fire's effectiveness in some areas. During years when burning is not feasible, we use mowing to accomplish vegetation management.

Northern pintail ducks
USFWS photo

Efforts to inventory invertebrates on Petit Manan Point have recently been initiated. A refuge volunteer is currently conducting dragonfly and damselfly surveys (Hildreth 2001 and Hildreth 2002). At this point in time, 33 species of Odonates have been documented on the refuge, several of which are considered rare or special concern in Maine. We have also recently initiated extensive survey efforts for spiders. To date, 178 species have been documented on the refuge, including several new records for the state of Maine, and several previously undescribed species (Jennings 2000, Jennings 2001,

and Jennings 2002). Efforts to document presence and abundance of amphibians and vernal pools on Petit Manan Point will continue.

Public Use

A seasonal biological technician was hired between 2000 - 2002 to work on the Point to conduct baseline wildlife and habitat surveys, monitor public use, and conduct outreach with Refuge visitors. Current public use estimates are approximately 15,000 visitors per year.

The Point has two hiking trails, the John Hollingsworth Memorial and Birch Point trails. There is a parking lot at each trailhead; the Hollingsworth trailhead has approximately 6 spaces, and the Birch Point trailhead has approximately 15 spaces. The Hollingsworth trail is self-guided with interpretive panels. A visitor information kiosk is located at the Birch Point Trail head. Interpretive programs are occasionally given by Refuge staff and volunteers on both trails. Teacher-led environmental programs take place on these trails as well.

In addition to the trail use, roadside blueberry picking, by hand for personal use, is popular in the fall.

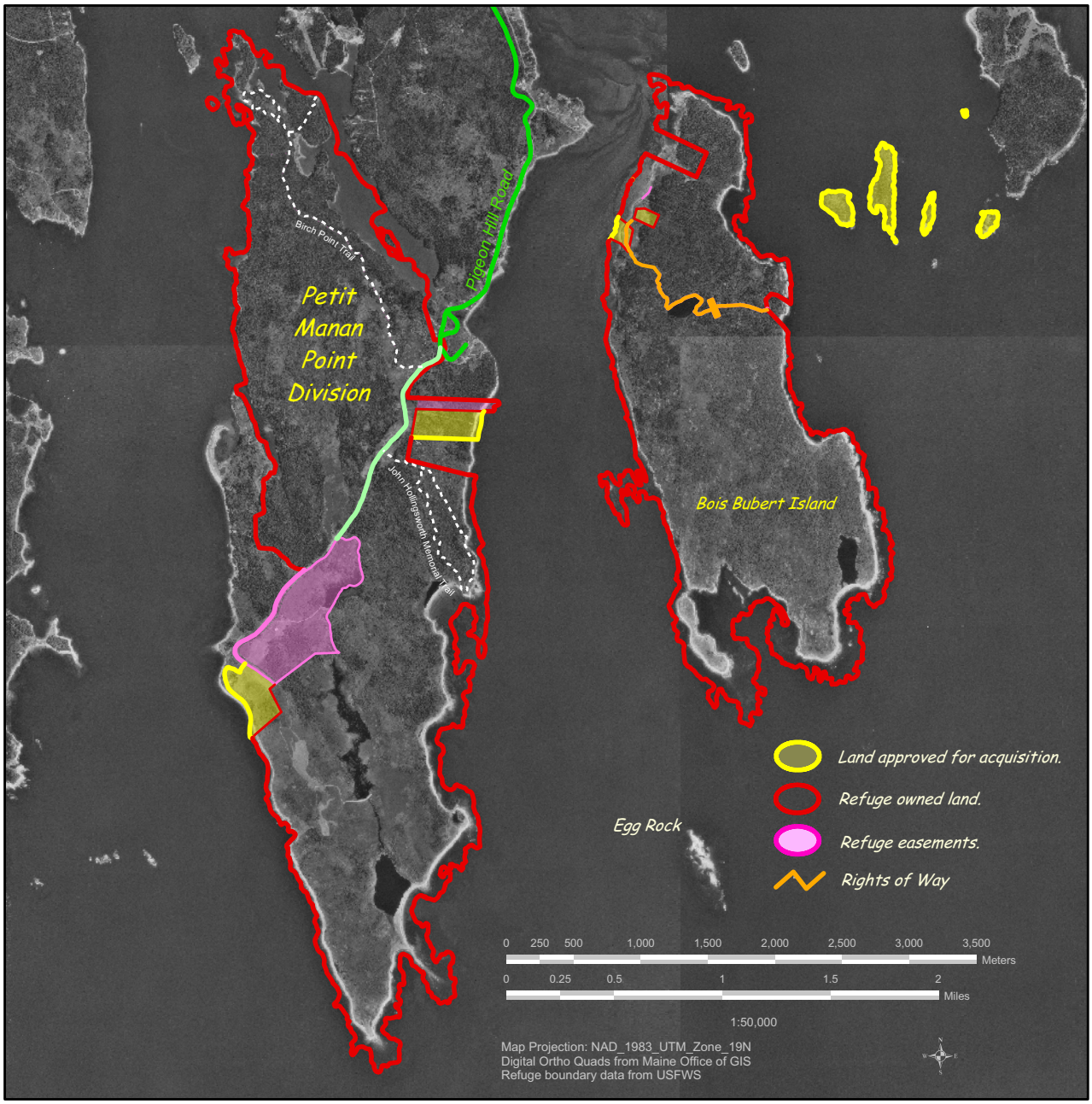
The Division has not previously been open to hunting, but with approval of the CCP, a new hunting program is established consistent with the details in Chapter 4, Objective 6.4 (Hunting).

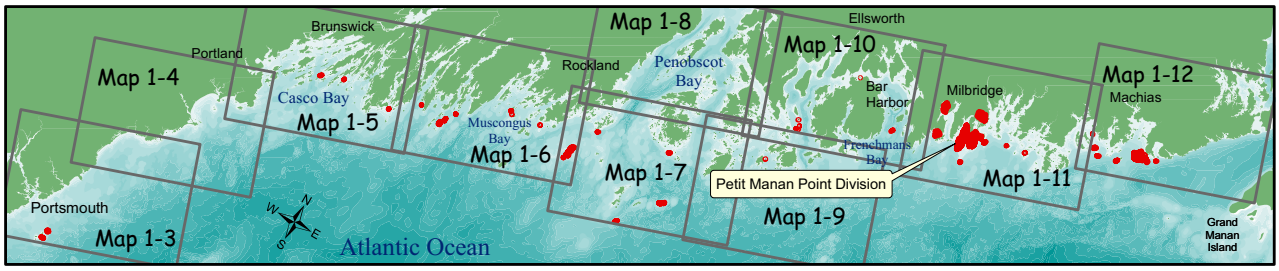
Semipalmated sandpipers
Photo by Craig Snapp

Map 3-26

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Petit Manan Point Division and Bois Bubert Island

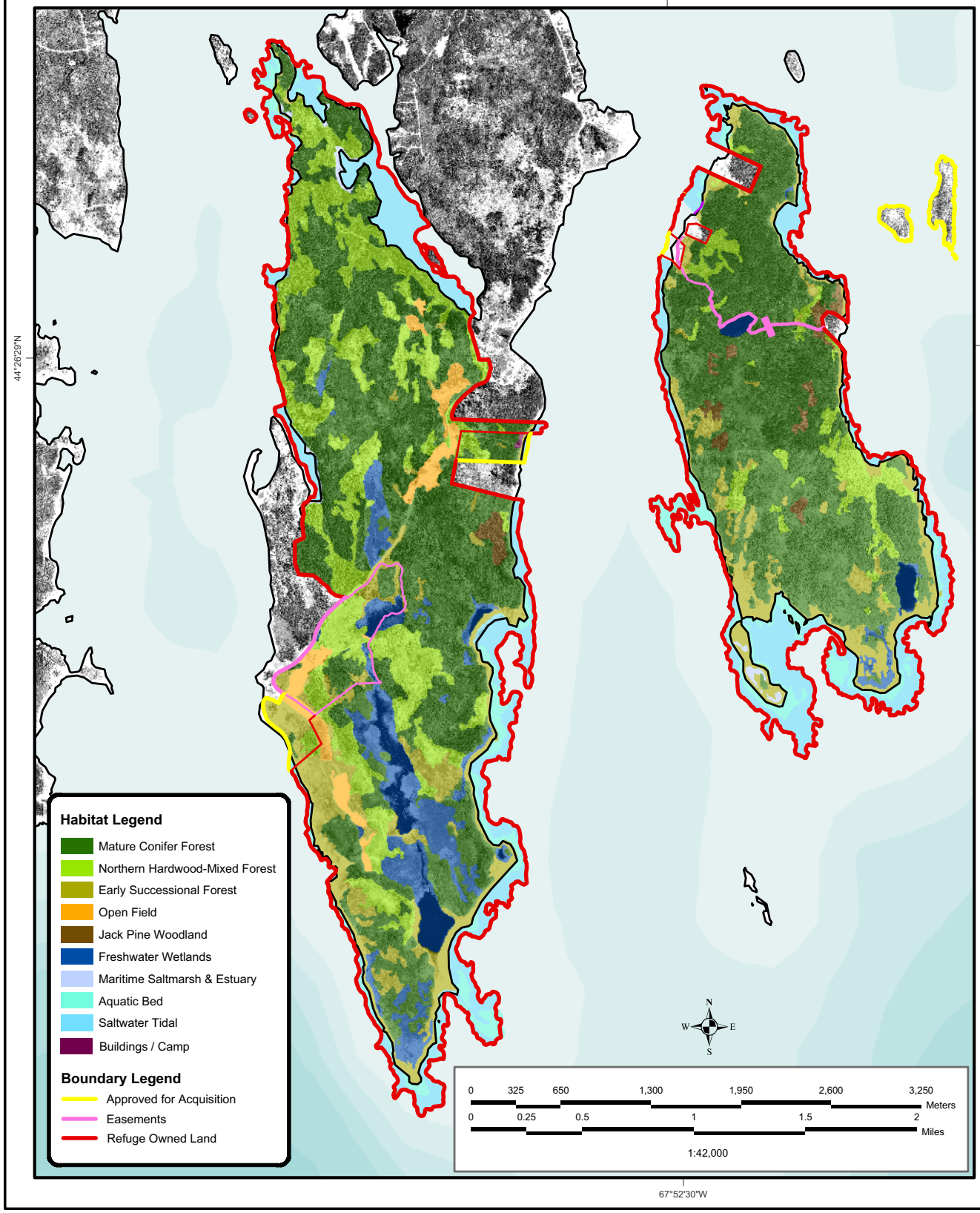




Map 3-27

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Petit Manan Point Division and Bois Bubert Island Cover Types



Gouldsboro Bay Division

Acquisition History

The Gouldsboro Bay Division is a 607 acre parcel in the Town of Gouldsboro, Hancock County. It was acquired in 1994 and 1995 by donation and sale from a private landowner. Additional tracts were acquired in 1998 and 2000. Map 3-28 depicts current Service ownership. Historically, the division was once the site of the Gouldsboro Town center and the surrounding lands were dotted with farms. The town buildings and farms gradually disappeared and, aside from several old foundations, stone walls and apple trees scattered about, few traces remain.

Biological Resources

A national vegetation classification standards cover type map was completed in 2002. A summary of habitat cover types by acre is presented in Table 3-39 below; Map 3-29 portrays the cover types on the landscape.

Forest stand age varies throughout the division as limited cutting occurred on the property prior to Service acquisition.

Canada geese with goslings
USFWS photo

Annual breeding bird surveys are ongoing, including land bird, marsh bird, and bald eagle. This division also has a MAPS station that has been monitored for the past three years. This station includes 337 bird captures per year, including 43 different species (Brokaw and Burke 1997, Taylor and Famous 2000). The common bird species are the same as those mentioned for Petit Manan Point. Bald eagles were first observed breeding on Gouldsboro Bay Division in 2001, and the nest site was again active in 2002. Efforts to document presence and abundance of amphibians and vernal pools on Gouldsboro Bay Division will continue.

Table 3-39 Gouldsboro Bay Division habitat cover types by acres

Cover Type	Acres (GIS)	Percent (%) of Area
Mature conifer forest	253	41.6
Northern hardwood -mixed forest	123	20
Early successional forest	5	0.8
Maritime saltmarsh & estuary	28	4.6
Saltwater tidal / aquatic bed	198	33
Total	**607**	**100**

Public Use

A hiking trail to the saltmarsh, an overlook, and interpretation of an historical site are in the developmental stage. Unfortunately, there is illegal use of all-terrain vehicles (ATVs) to access the saltmarsh. Signs are in place to alert ATV users that all-terrain vehicles are not allowed on the refuge.

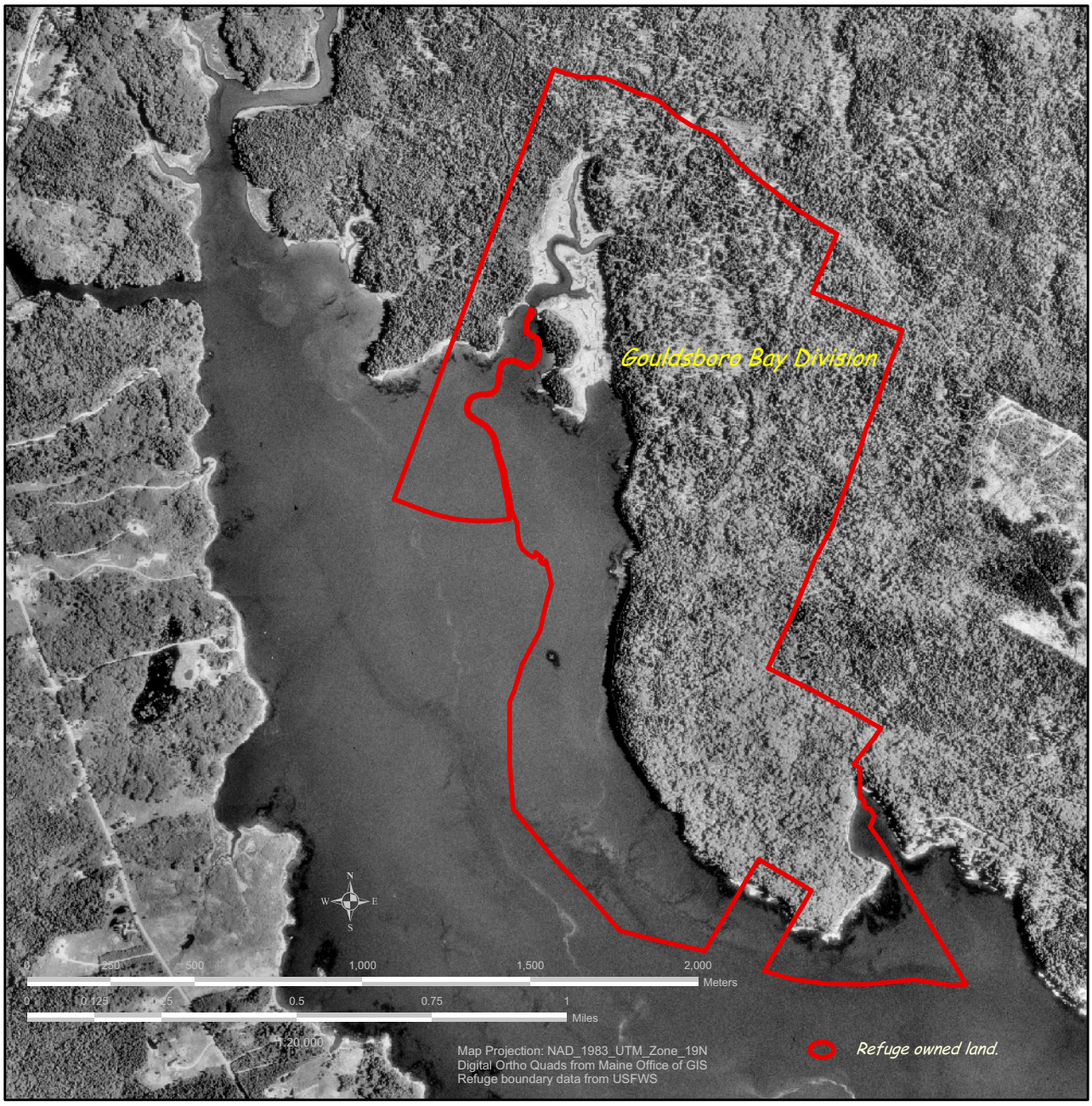
This division is open to hunting migratory gamebirds and waterfowl, and small and big game under State and Refuge regulations.

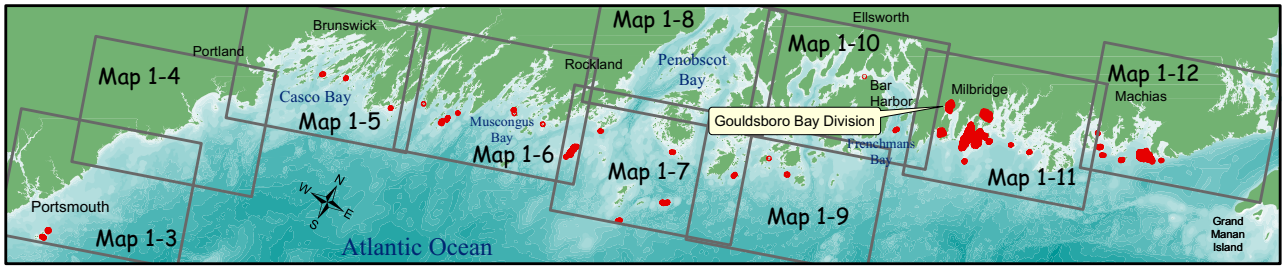
Green frog
USFWS photo

Map 3-28

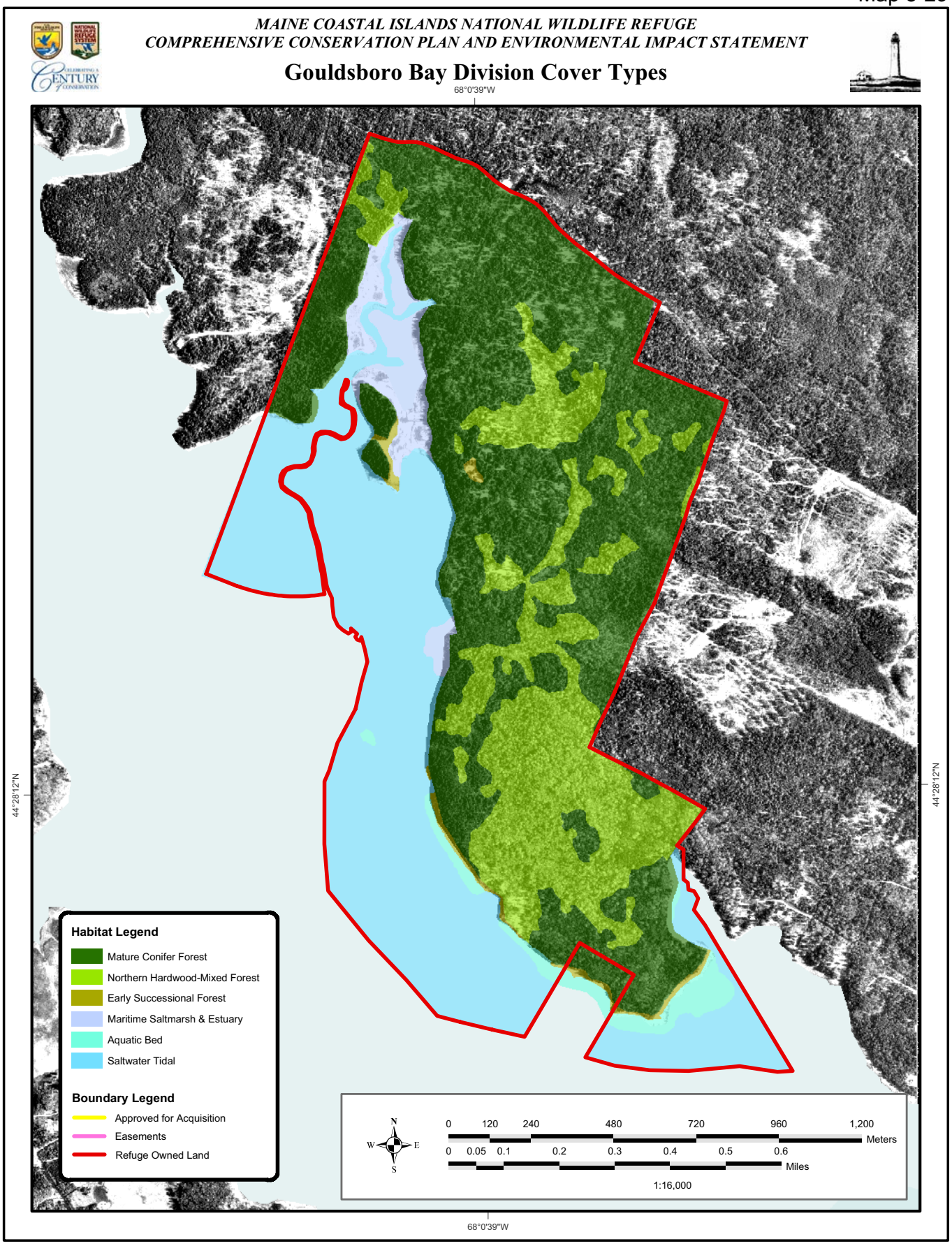
MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Gouldsboro Bay Division





Map 3-29


MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT
Gouldsboro Bay Division Cover Types
68°0'39"W
44°28'12"N
Habitat Legend
Mature Conifer Forest
Northern Hardwood-Mixed Forest
Early Successional Forest
Maritime Saltmarsh & Estuary
Aquatic Bed
Saltwater Tidal
Boundary Legend
Approved for Acquisition
Easements
Refuge Owned Land
N
W
E
S
0 120 240 480 720 960 1,200
Meters
0 0.05 0.1 0.2 0.3 0.4 0.5 0.6
Miles
1:16,000

Sawyers Marsh Division

Acquisition History

The Sawyer's Marsh Division, Town of Milbridge, Washington County, consists of 933 acres acquired through fee title in 1998 and 2000. Map 3-30 depicts the current Service ownership. The area lies to the northeast of Petit Manan Point, at the head of a broad tidal marsh used extensively by migratory shorebirds and waterfowl, including black duck, goldeneye, wood ducks and Canada geese. A majority of the marsh is privately owned. The outlet for this tract is Bobby's Creek estuary, which eventually drains into the Narraguagus River and the Gulf of Maine.

Biological Resources

The upland habitat surrounding the marsh consists of several large stands of white birch, various other hardwood species, red spruce, and balsam fir. Forest stand age varies throughout this upland, as a portion of the area was burned in a wildfire in the early 1950's, and timber harvesting occurred on the property prior to acquisition by the Service.

A national vegetation classification standards cover type map was completed in 2002. A summary of habitat cover types by acre is presented in Table 3-40; Map 3-31 portrays the cover types on the landscape.

Dragonfly
USFWS photo

Table 3-40 Sawyers Marsh Division habitat cover types by acres

Cover Type	Acres (GIS)	Percent (%) of Area
Early successional forest	4	0.4
Mature conifer forest	403	43
Freshwater wetland	69	7.4
Northern hardwood - mixed forest	455	49
Maritime saltmarsh & estuary	2	0.2
Total	**933**	**100**

Many species of shorebirds and wading birds utilize the shallow waters and adjacent intertidal areas for feeding.

A seasonal biological technician was hired in 2002 to initiate baseline wildlife surveys. Waterbird surveys are currently being done on this area. We have also recently initiated extensive survey efforts for spiders. To date, 178 spiders species have been documented on the refuge, including several new records for the state of Maine, and several previously undescribed species (Jennings 2001 and Jennings 2002). Efforts to document presence and abundance of amphibians and vernal pools on Sawyers Marsh Division will continue.

Public Use

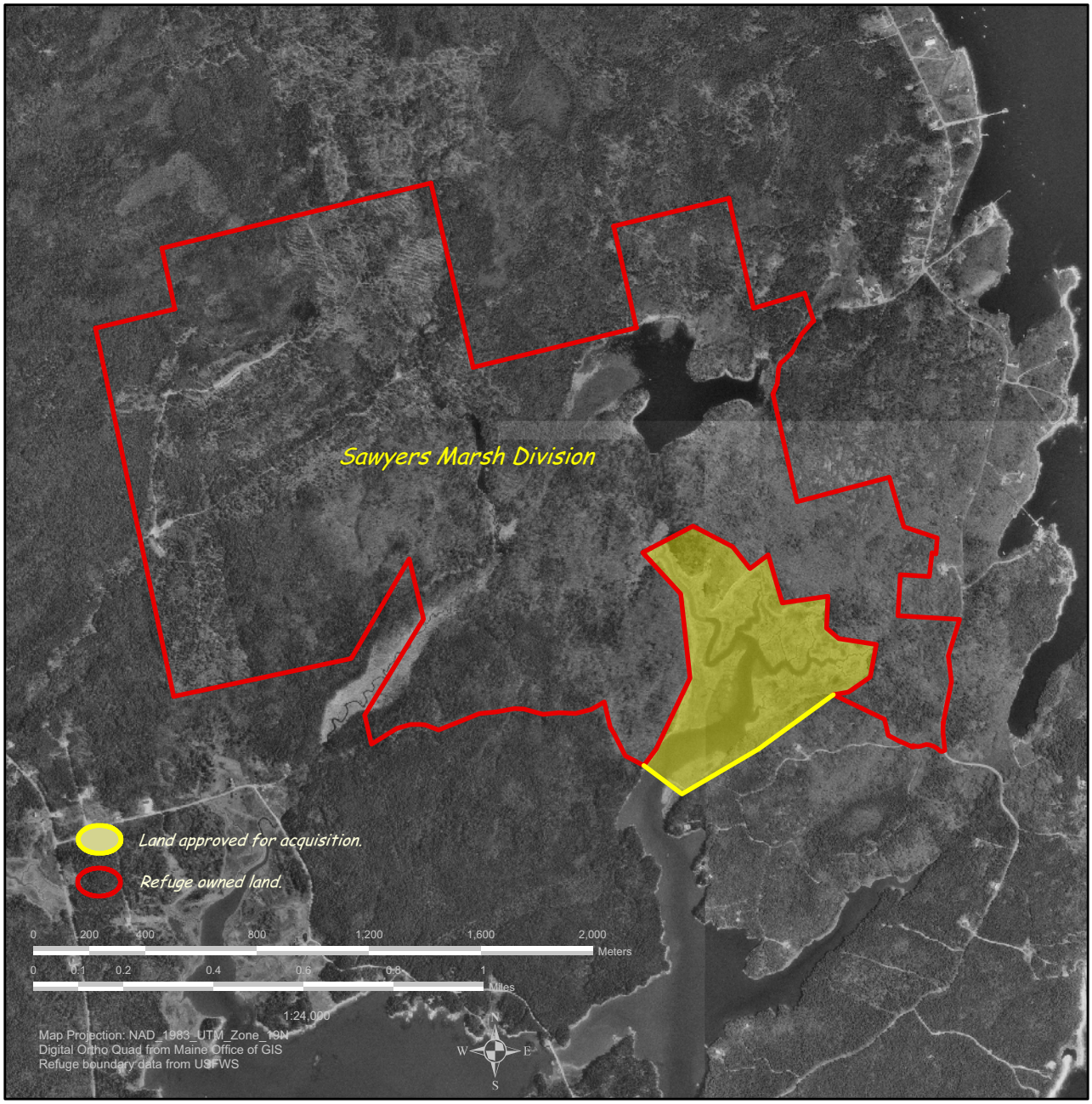
This area allows little opportunity for public access as it is surrounded by privately-owned land. ATVs vehicles are, however, illegally using this area for access to the saltmarsh similar to the Gouldsboro Bay Division. Signs are in place to alert ATV users that vehicles are not allowed on refuge lands.

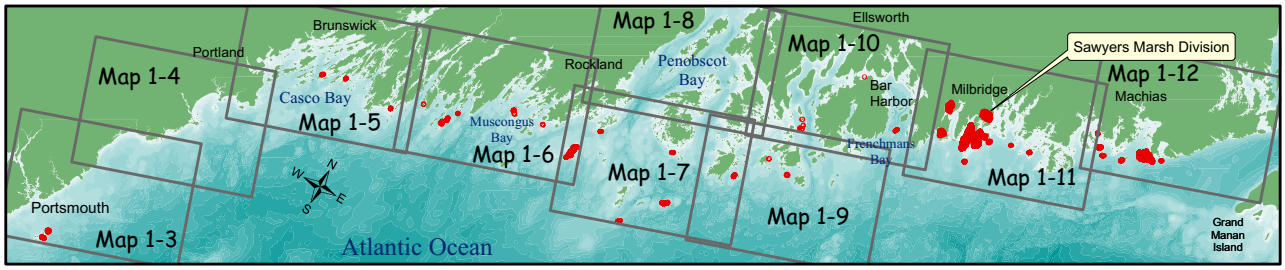
This division is open to hunting migratory gamebirds and waterfowl, and small and big game under State and Refuge regulations.

Map 3-30

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Sawyers Marsh Division

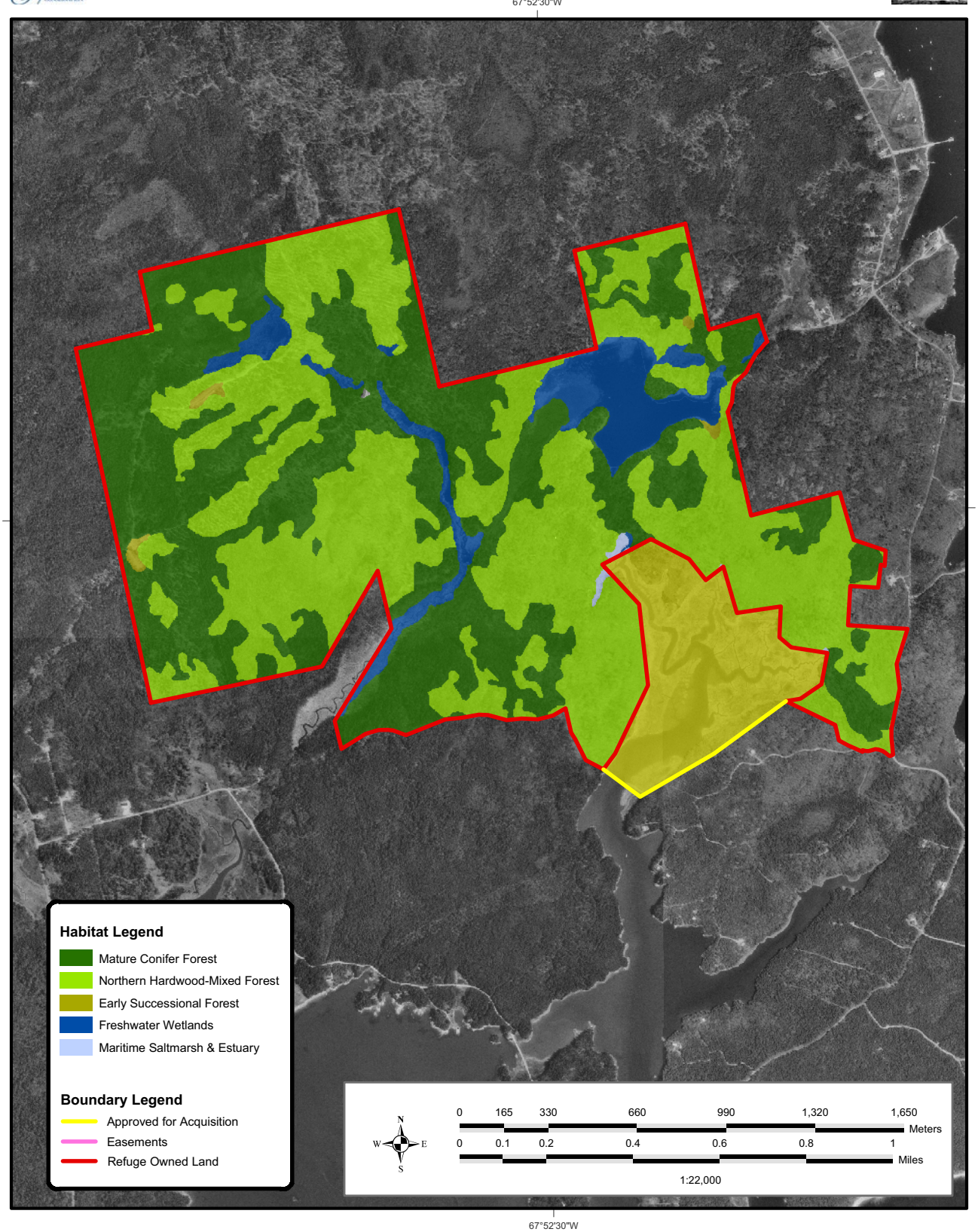




Map 3-31

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Sawyers Marsh Division Cover Types



Corea Heath Division (pending transfer from the U.S. Navy)

Acquisition History

The Corea Heath Division is an approximately 400 acre raised coastal peatland situated on the Schoodic peninsula in the Town of Gouldsboro, Washington County. The U.S. Navy has occupied the site since the 1950's, using it as a communications facility (a high frequency direction finding network). Roads, support buildings, and extensive antennae arrays marked the landscape during this time. In 2002, the U.S. Navy ended its mission on Schoodic peninsula and began the transfer of U.S. Navy lands to the National Park Service as part of Acadia National Park, to the towns of Gouldsboro and Winter Harbor, and to the Service. The Corea Heath portion of the former U.S. Navy facility was designated for transfer to the Service. Map 3-32 depicts which lands are approved for the transfer to the Service. The transfer is scheduled for 2004. In addition to the botanically significant peatland or "heath," the Service will also receive 3 to 4 acres with two buildings that can be used for future office and storage space.

Biological Resources

The ecological values and unique features of Corea Heath are well-documented (Worley 1980, Glanz et al. 1999). Characterized as a coastal plateau bog, the area is wholly affected by a maritime climate which is in part responsible for the varied plant communities that occur there. Among

Indian Pipe is only one of the many plant species that flourishes on Refuge lands.
USFWS photo

115 coastal raised peatlands in Maine, Corea Heath ranks 5th for coastal peatland features, and 6th for all peatland features.

In 1950, the U.S. Navy designated a 240 acre portion of the heath as an Ecological Preserve Area. Ecological communities occurring at Corea Heath include: open bog, forested bog, open fen, acidic ledges, coniferous and birch woodlands, and more than a mile of boulder and cobble shoreline.

A biological inventory was completed by the University of Maine and Acadia National Park in 1996. Floral and faunal inventories included amphibians, terrestrial mammals, bats, birds, and bryophytes. A copy of the biological inventory is on file at the Refuge office in Milbridge.

A national vegetation classification standards cover type map was completed in 2002. A summary of habitat cover types by acres is presented in Table 3-41 below; Map 3-33 portrays these cover types on the landscape.

Table 3-41 Corea Heath Division habitat cover types by acres

Cover Type	Acres (GIS)	Percent (%) of Area
Northern hardwood -mixed forest	59	14.7
Early successional forest	26	7
Freshwater wetland	179	44.7
Mature conifer forest	129	32
Jack pine woodland	1	0.2
Saltwater tidal / aquatic bed	3	0.7
Building / camp	3	0.7
Total	**400**	**100**

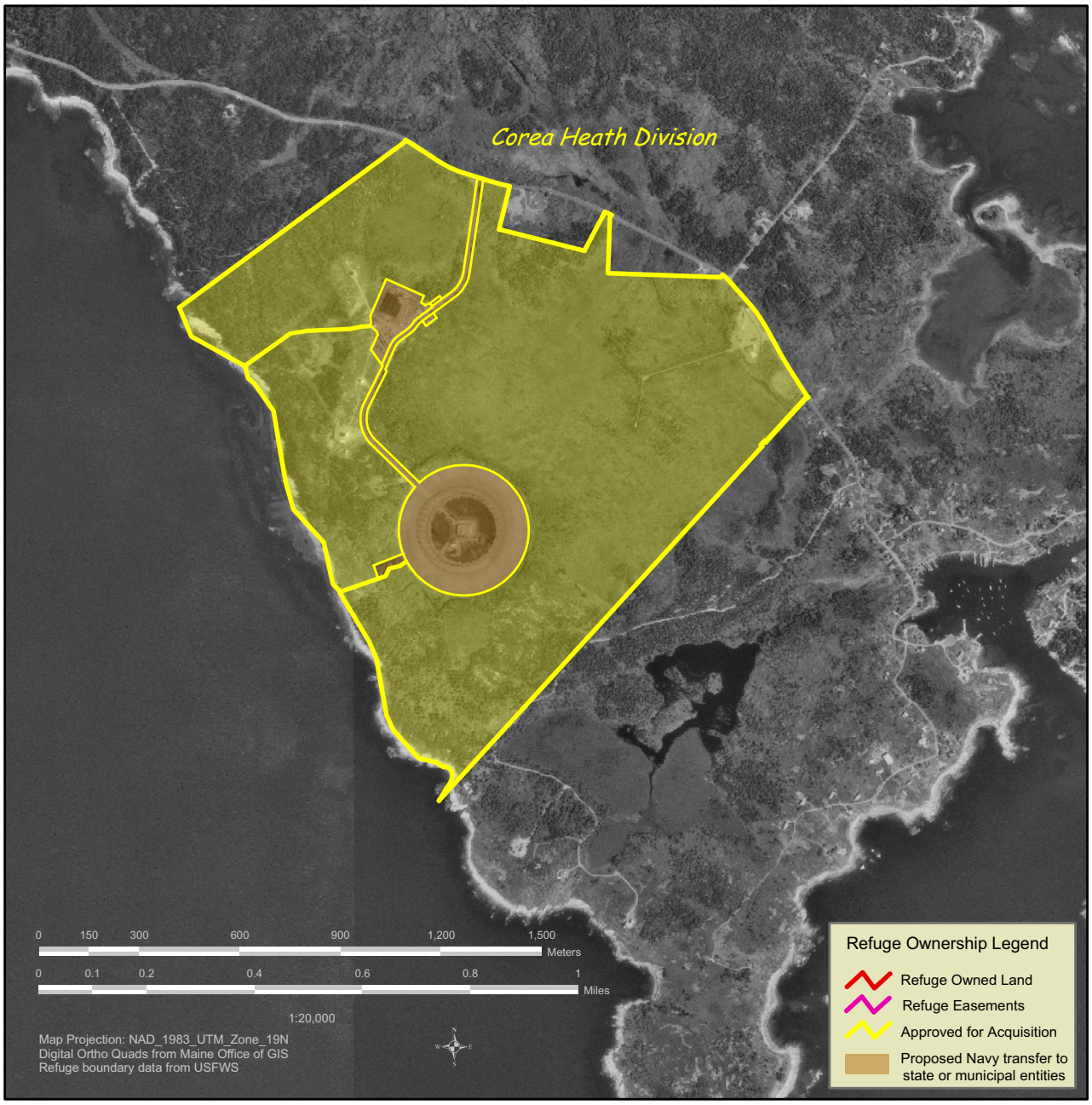
Public Use

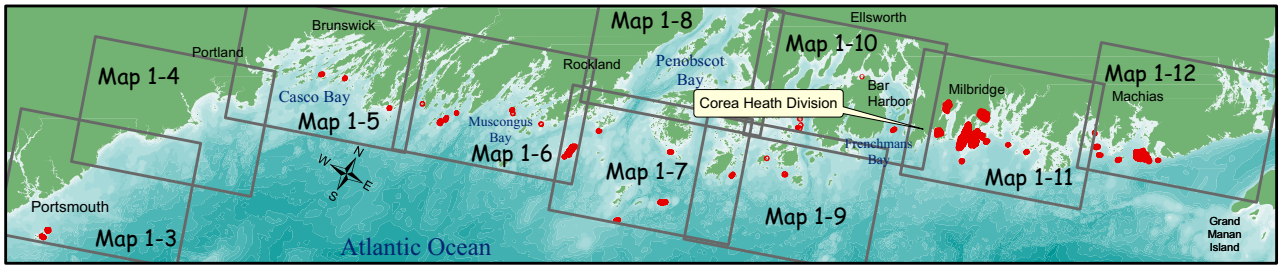
The area has been closed to public access and use since it was acquired by the U.S. Navy in the 1950's.

Map 3-32

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Corea Heath Division





Map 3-33

MAINE COASTAL ISLANDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT

Corea Heath Division Cover Types

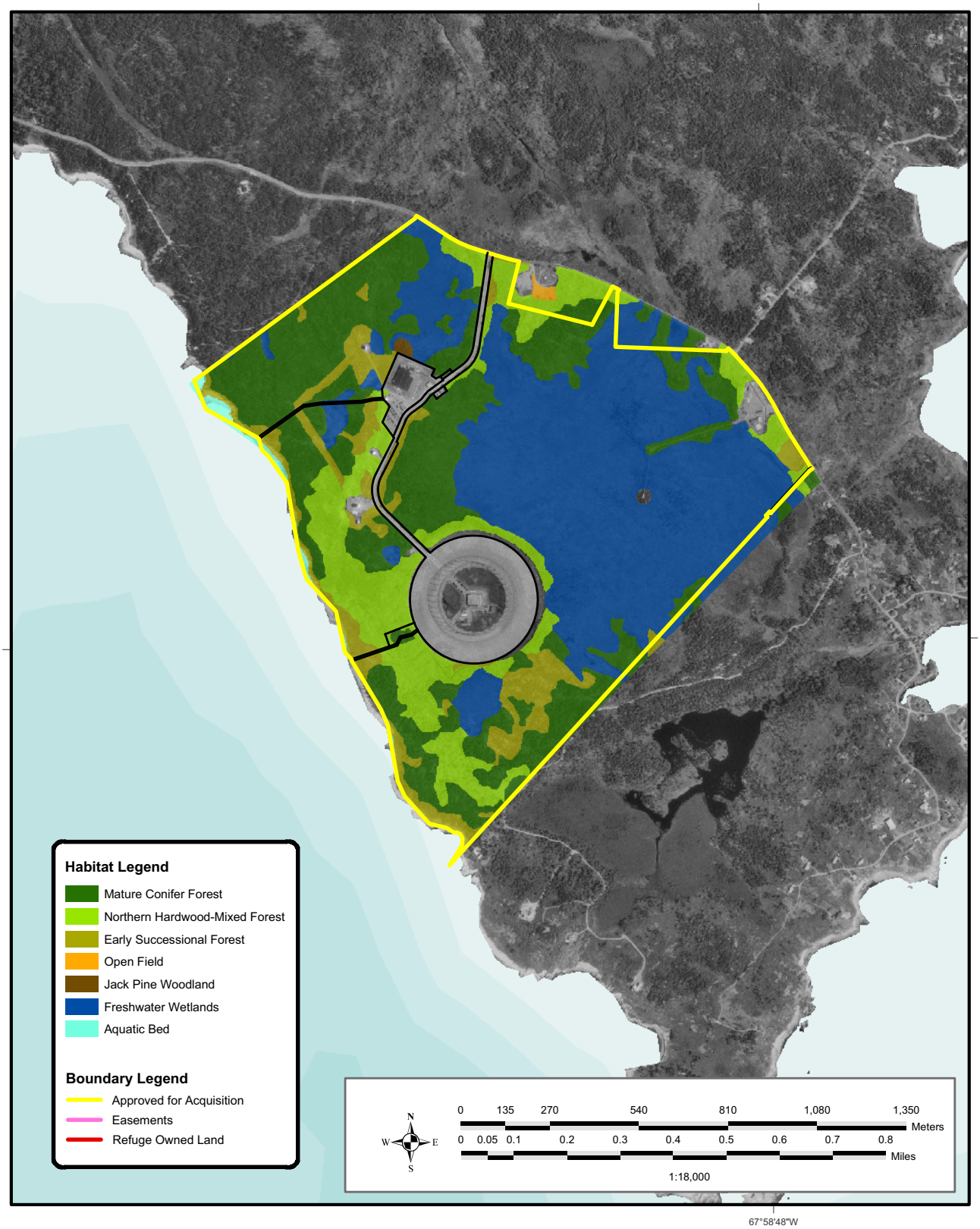


Table 3-42 Summary of cover types by location on Maine Coastal Islands National Wildlife Refuge

Cover Types	Petit Manan Point Division	Gouldsboro Bay Division	Sawyers Marsh Division	Corea Heath Division	All 4 Divisions Total Acreage	Bois Bubert Island	Cross Is NWR (6 isl)	Other* Islands	Total Acreage
Open Field Grassland	70	0	0	0	70	0	0	392.5	462.5
Early Successional Forest/Shrub Habitat	226	5	4	26	261	164	29	105.5	559.5
Freshwater Wetland	219	0	69	179	467	28	99	49	643
Maritime Saltmarsh & Estuary	8	28	2	0	38	4	27	0	69
Mature Conifer Forest	905	253	403	129	1690	734	1248	162.2	3834.2
Northern Hardwood-Mixed Forest	453	123	455	59	1090	92	53	0	1235
Jack Pine Woodland	11	0	0	1	12	28	0	0	40
Saltwater tidal/Aquatic bed	302	198	0	3	503	271	240	17.5	1031.5
Camps/Buildings	1	0	0	3	4	0	0	0	4
Ledge	0	0	0	0	0	0	7	75.5	82.5
Totals	**2195**	**607**	**933**	**400**	**4135**	**1321**	**1703**	**802.2**	**7961.2**

* Acres estimated from aerial photos; other acres in table are either survey acres or deed acres.

"Other" Refuge Islands

(Listed Under Their Predominant Cover Type)

Conifer Forest
Outer Heron (66 acres)
Inner Sand (18 acres; 15 forested/3 shrub)
Schoppee (16.5 acres)
Little Marshall (14 acres)
Sally (1 acre)
Abbott (3.5 acres)
Franklin (12 acres; 7 forested/5 grass)

Early Successional Forest/Shrub
Trumpet (3 acres)
Ship (11 acres; 6 shrub/5 grass)
Upper Flag (30 acres; 26 shrub/4 wetland)
Smuttynose (50 acres; 20 shrub/20 grass/10 aquatic bed)
Crane (12 acres; 8 shrub/4 forested)
Lower Mark (9.5 acres)

Ledge
Malaga (10 acres; 2.5 ledge/7.5 aquatic bed)
East Barge (0.5 acres)
West Barge (0.5 acres)
Little Roberts (1 acre)

Open Field/Grassland
Metinic (150 acres; 120 grass/30 forested)
Libby (43 acres)
Eastern Brothers (17 acres)
Nash (5 acres)
Petit Manan (10 acres)
John's (43 acres)
Egg Rock (13 acres; 8 grass/5 ledge)
Roberts (10 acres)
Two Bush (8 acres)
Pond (10 acres; 4 grass/6 ledge)
Seal (65 acres; 35 grass/30 ledge)
Matinicus Rock (28 acres; 10 grass/18 ledge)
Bar (17.2 acres; 12 grass/5.2 forested)
Inner White (5 acres; 3 grass/2 ledge)
Outer White (16 acres; 11 grass/5 ledge)
Ram (10 acres; 8 grass/2 ledge)
Little Thrumcap (8.5 acres; 5.5 grass/3 ledge)

Machias Seal (10 acres; managed under MOU with MDIFW)

Wetland
Halifax (75 acres; 45 wetland/30 shrub)