

Chapter 7 Natural Resources

Introduction

Kennebunkport’s forests, wetlands, coasts, aquatic, and riparian areas provide diverse habitat and support a variety of species.

The natural resources in the community and region also provide the foundation for a high quality of life in Kennebunkport. Natural resources provide critical ecosystem services, or benefits to people and communities. These ecosystem services can be grouped into four categories: provisioning, regulating, supporting, and cultural services. The maintenance of these ecosystem services is imperative to the community’s sustainability.

This chapter provides a summary of the town’s natural resources. Several maps are included that highlight habitats and natural areas of particular importance.

EXAMPLES OF ECOSYSTEM SERVICES

- **PROVISIONING OF FOOD, FIBER, OR TIMBER**
- **REGULATING SERVICES** SUCH AS TEMPERATURE CONTROL, FLOOD CONTROL, AND POLLINATION THAT MAKE IT POSSIBLE FOR LIFE
- **SUPPORTING SERVICES** LIKE NUTRIENT CYCLES, PHOTOSYNTHESIS, AND THE WATER CYCLE
- **CULTURAL SERVICES** SUCH AS SPIRITUAL OR RECREATIONAL OPPORTUNITIES.

Topography

Kennebunkport has a relatively flat landscape that slopes gradually from the north to sea level at the coast. Low-lying areas include marshes of Goosefare Bay Wildlife Refuge and tidal areas along Smith Brook, Goose Rocks Creek, and east of Sandy Cove Road. The elevation of Goose Rocks Beach and the neighborhoods along Kings Highway are slightly higher, reaching 18 feet in some places. Ocean Avenue in Cape Arundel is perched at approximately 30 feet above sea level. The highest point of land in Kennebunkport is located within the Town Forest near the northern boundary of town where the elevation peaks at 200 feet above sea level.¹ In this region of town, the wooded landscape is punctuated by small hills and valleys. There are approximately 325 acres of steep slopes greater than 25% within the town.² These areas are generally not suitable for development but enhance the diversity of the terrain. Figure 7-1 displays these areas of steep slopes overlaid on a topographic map.

USGS Topographic Map

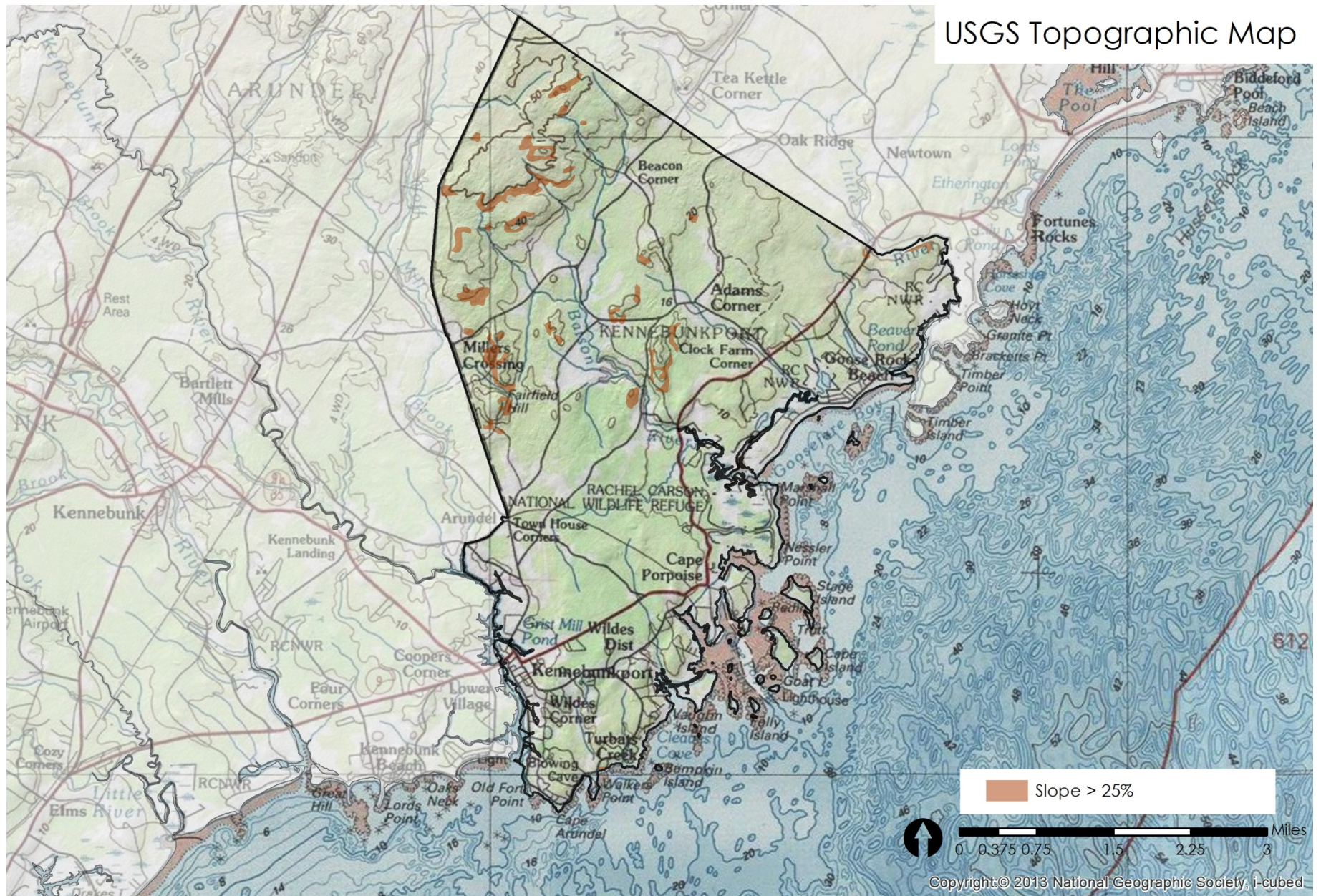


Figure 7-1 USGS topo map with steep slopes (Source: NRCS Soil Web Survey, USGS topo maps assembled by National Geographic Society, i-cubed)

Watersheds

A watershed is the area of land that drains into a stream, lake, or river. A healthy watershed provides ecosystem services such as carbon storage, erosion and sedimentation control, flood control, and water filtration.³ These complex services are challenging and expensive to replicate or replace. As a result, there are significant economic benefits — such as lowering drinking water treatment costs, reducing the need for engineered stormwater infrastructure, and minimizing damage from natural disasters — to maintaining the health of a drainage area.⁴

The land use and activity within a watershed affects the water body that runoff from the surface drains to. Stormwater that runs over developed or impervious surfaces and agricultural lands can pick up and carry soil, nutrients, bacteria, toxic materials, and other pollutants to the surface water it drains to.⁵ Providing natural areas for water to percolate in place, requiring stormwater management for development, and ensuring farms implement best management practices for reducing sediment and nutrient runoff are examples of strategies to keep watersheds healthy.

Kennebunkport lies primarily within the Piscataqua-Salmon Falls River watershed or drainage area (HUC^a 01060003). Less than one acre of the town lies within the Saco River drainage (HUC 01060002) on the very north side of town. The Piscataqua-Salmon Falls River is divided into several smaller drainage areas, including the coastal and Kennebunk River drainages in which the

town is located (Figure 7-2).

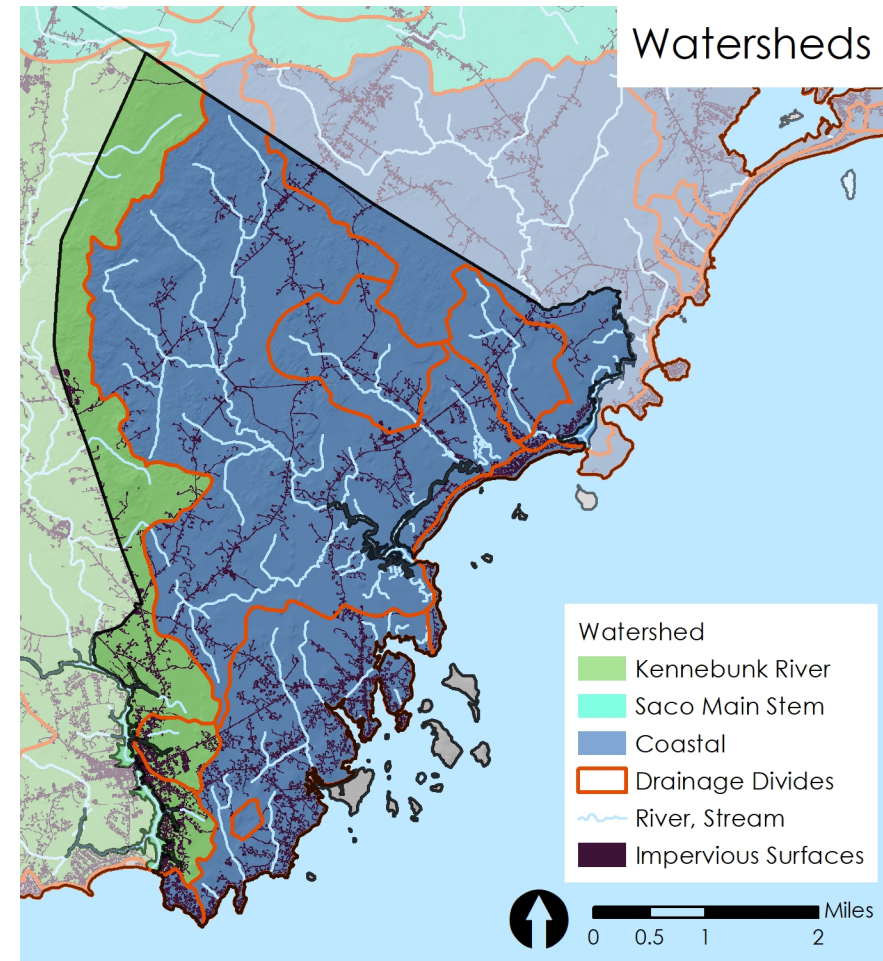


Figure 7-2 Drainage divides in Kennebunkport (Source: MEGIS)

^a A Hydrologic Unit Code (HUC) consists of two to 12 digits based on six levels of hydrologic classification of drainage areas from a regional to a subwatershed scale.

Approximately 82% of Kennebunkport (10,704 acres) is located within the coastal subwatershed. Within Kennebunkport, less than 5% of this subwatershed is covered by impervious surfaces. The remaining 18% of land (2,268 acres), located along the western side of town, is located within the Kennebunk River subwatershed. This area of town contains more urban land use than other areas within the town. The percent of impervious cover in the Kennebunk River subwatershed within Kennebunkport is nearly 6.5%. This is slightly higher than in the coastal subwatershed, yet less than the 10% impervious surface threshold that the Environmental Protection Agency considers the maximum amount a watershed can be impervious and still support a high quality stream system.⁶ As shown in Figure 7-2, a number of drainage areas comprise each of these subwatersheds.

Geology & Aquifers

Geologic History

Multiple events shaped the geology of York County. Sedimentary rocks, including shale, siltstone, mudstone, and limestone, formed from sediments and chemical precipitates deposited in ocean basins. During the Early Devonian Period, which occurred around 416 to 358 million years ago, an episode of mountain building called the Acadian revolution subjected the sedimentary rocks to extreme temperature and pressure.⁷ This resulted in the formation of new rocks, including slate, phyllite, schist, gneiss, quartzite, and granulite. At several points molten rock was injected into the existing metamorphic rocks. Around 395 million

THE BEDROCK THAT UNDERLIES YORK COUNTY HAS A LONG AND COMPLEX HISTORY.

-YORK COUNTY SOIL SURVEY

years ago, dark-colored igneous rocks and light-colored granite, quartz monzonite, and granodiorite were formed. Another instance of granite injection around Mt. Agamenticus occurred 120 million years ago.⁸

The events of the Pleistocene epoch, which began about two million years ago, shape the topography, surficial geology, and soils seen today in the county. During this period, glacial ice advanced and retreated several times over the region. The last glaciation that occurred is known as the Wisconsin stage. This glacier was thousands of feet thick and last extended south to the Gulf of Maine about 18,000 year ago. The glacier ground up rocks and deposited eroded material as it receded. This material, called glacial till, consisted of a mixture of rock fragments ranging in size from clay particles to boulders.⁹

The glacier depressed the land surface and lowered sea level by about 300 to 350 feet. Sea level rose as the glacier melted and large quantities of clay and silt known as blue clay were deposited in coastal areas. When the final glacial retreat began around 11,800 years ago, it released meltwater and deposited sand and gravel, shaping a new landscape. As the glacier melted, the land rose until around 4,200 years ago, reaching a level about two to nine feet above present sea level. Many lakes, ponds, and marshes were formed during this time.¹⁰

Groundwater & Aquifers

The subsurface water that exists between the spaces between rocks and soil particles is called groundwater. Groundwater is recharged by rainwater and melting snow that percolates into the soil. Water-bearing geologic formations that are capable of yielding a usable amount of groundwater are known as aquifers.¹¹ Kennebunkport has few aquifers, as seen in Figure 7-3. Sand and gravel aquifers with yields of 10 to 50 gallons per minute underlie a small area of northern Kennebunkport in the vicinity of Whitten Hills and Guinea Road as well as Oak Ridge Road at the Biddeford town line.

Soils

Soil Types

The most prevalent soils in Kennebunkport are Lyman-Rock outcrop complex, 3-8% slopes and Lyman-Rock outcrop complex 8-15% slopes, accounting for approximately 24% and 22%, respectively, of the town's land area (Figure 7-4 and Table 7-1). Lyman-Rock outcrop complex is characterized by undulating and gently sloping, somewhat excessively drained soils intermixed with areas of exposed bedrock.¹²

Surficial Geology & Aquifers

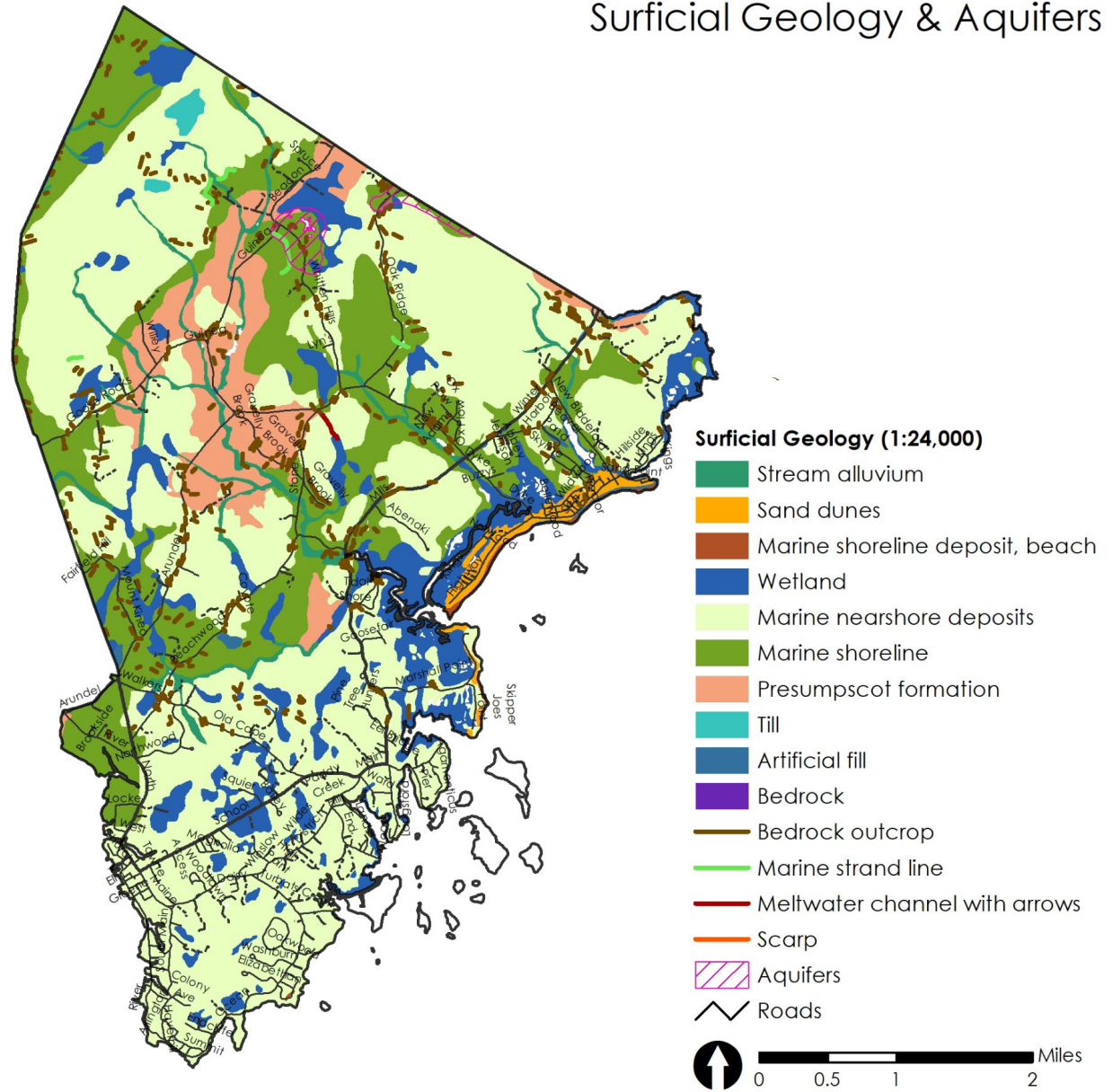


Figure 7-3 Surficial geology and aquifers (Source: Maine Geological Survey)

This type of soil is found on ridges, hill tops, and coastal plains and formed in a thin mantle of glacial till.

Several attributes of this soil type make it less-than-optimal for uses such as development or agriculture. Lyman soils, which comprise 65% of this soil unit, have moderately rapid permeability and low capacity to store water for use by plants. Surface water that drains quickly through soils to the groundwater is not filtered as well as water that slowly percolates. As a result, there is greater potential of groundwater contamination from pollutants carried in stormwater runoff and from septic systems.¹³ The Lyman-Rock outcrop complex has shallow soils with a depth to bedrock of 10-20 inches in some areas and bedrock exposure in other areas. The soil is rocky and often drought prone. These factors make it very poorly suited for farming. While some areas with this soil type are suitable for trees such as sugar maple, eastern white pine, and northern red oak, trees with a shallow root depth are susceptible to uprooting in windstorms.¹⁴

THE INTERACTION OF FIVE FACTORS CONTRIBUTE TO SOIL FORMATION: CLIMATE, PARENT MATERIAL, PLANT AND ANIMAL LIFE, TOPOGRAPHY, AND TIME.
(YORK COUNTY SOIL SURVEY)

Soils

Soil Type Symbol

AdB	PeB
AdC	Pg
BH	Ra
Ba	RoC
Bm	RoE
BrB	Ru
BsB	Sc
BuB	SeC
BuC	Sg
Ch	ShA
CrB	Su
EmB	UH
HU	Ur
LnB	Vp
LnC	W
LnD	Wa
LyB	
LyC	
LyE	
Na	

Soil Characteristics

- ▣ Forestry Soils Group IIB
- ▣ Farmland Soils
- ▣ Poorly & Very Poorly Drained Soils

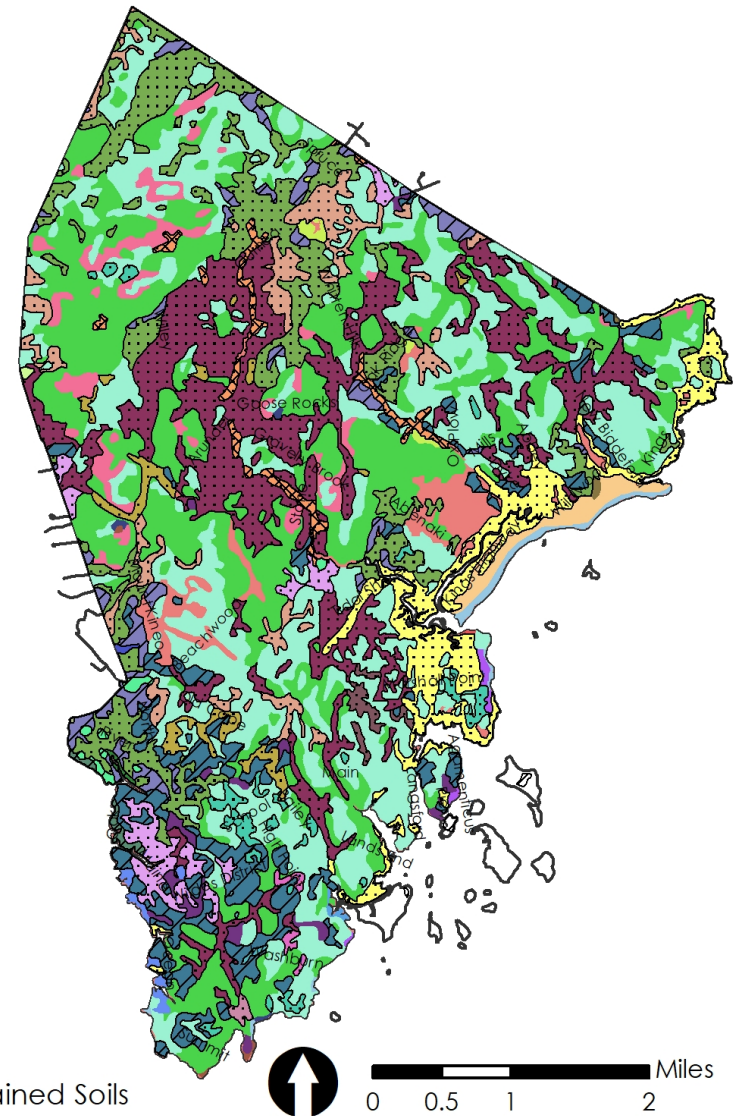


Figure 7-4 Soils map (Source: NRCS Web Soil Survey)

As the region experiences heavier rainstorms and more frequent storm events, hazards to people and property that are associated with this soil type — groundwater pollution and windthrow — may increase.

Along the coast, less stable sand and marsh soils are susceptible to wind and water erosion. The predominant marsh soils area Pemaquid, Todds Point, and Damariscotta soils, 0-2 percent, which are very poorly drained, sandy, mucky soils.¹⁵

Table 7-1 Soils and soil characteristics (Source: USDA NRCS Soil Web Survey)

Symbol	Soil Type	Total Acres	Poorly & Very Poorly Drained	Farmland Soils ^a	Forest Soils (Group IIB)
Bm	Biddeford mucky peat, 0 to 3 percent slopes	152.91	X		
BrB	Brayton and Westbury fine sandy loams, 0 to 8 percent slopes	22.32	X		
BsB	Brayton and Westbury very stony fine sandy loams, 0 to 8 percent slopes	47.42	X		
Sc	Scantic silt loam, 0 to 3 percent slopes	1,830.80	X		
Su	Pemaquid, Todds point, and Damariscotta soils, 0 to 2 percent slopes	625.25	X		
Vp	Vassalboro peat, ponded	13.34	X		
Wa	Waskish peat	5.83	X		
Ru	Rumney fine sandy loam, 0 to 3 percent slopes, frequently flooded	143.36	X		X
Ch	Chocorua peat	422.27	X		
Na	Naumburg sand	1,139.99	X		
Ra	Raynham silt loam	218.46	X		
Sg	Sebago peat	140.79	X		
AdB	Adams loamy sand, 0 to 8 percent slopes	32.20		X	
BuB	Buxton silt loam, 3 to 8 percent slopes	24.99		X	
BuC	Buxton silt loam, 8 to 15 percent slopes	6.78		X	
CrB	Croghan loamy sand, 0 to 8 percent slopes	300.77		X	
EmB	Elmwood fine sandy loam, 0 to 8 percent slopes	3.89		X	
LnB	Lyman loam, 3 to 8 percent slopes, rocky	747.24		X	
SeC	Scio silt loam, 8 to 15 percent slopes	0.60		X	
PeB	Peru fine sandy loam, 3 to 8 percent slopes (Prime Agricultural Soil)	0.48		X*	
LnC	Lyman loam, 8 to 15 percent slopes, rocky	96.29			

Symbol	Soil Type	Total Acres	Poorly & Very Poorly Drained	Farmland Soils ^a	Forest Soils (Group IIB)
LyB	Lyman-Rock outcrop complex, 3 to 8 percent slopes	3,150.96			
LyC	Lyman-Rock outcrop complex, 8 to 15 percent slopes	2,914.59			
AdC	Adams loamy sand, 8 to 15 percent slopes	4.50			
Ba	Beaches, sand	53.19			
BH	Beaches, sand-Hooksan complex, 0 to 8 percent slopes	1.61			
HU	Hooksan-Urban land complex, 0 to 8 percent slopes	18.16			
LnD	Lyman loam, 15 to 25 percent slopes, rocky	6.26			
LyE	Lyman-Rock outcrop complex, 15 to 80 percent slopes	317.14			
Pg	Pits, gravel	26.57			
RoC	Rock outcrop-Lyman complex, 3 to 15 percent slopes	5.59			
RoE	Rock outcrop-Lyman complex, 15 to 80 percent slopes	8.55			
ShA	Succotash sand, 0 to 3 percent slopes	6.37			
UH	Urban land-Hooksan complex, 0 to 8 percent slopes	117.90			
W	Water bodies	319.68			
Ur	Urban land	32.30			
Total Acres		12,960	4,762.7	1,122.3	143.4

^a Farmland soils in Kennebunkport consist primarily of soils of statewide importance. * denotes prime agricultural soils.

Agricultural Soils

Kennebunkport’s soils are generally not well suited for agriculture. Less than one acre in town is considered prime farmland. As defined by the US Department of Agriculture, prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crop and is available for these uses.¹⁶ Approximately 8.7% of soils are classified designated as *farmland of statewide importance*: areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.¹⁷

Agriculture

As noted in the 2012 Comprehensive Plan, sub-optimal growing conditions and the high price of land are significant constraints on farming. Currently there are ## recognized farms in Kennebunkport. Most of the active crop is in hay production (Note: To be confirmed). Although residents have gardens for their own use, commercial farming in marginal soil is not especially viable in town at the present time. However,

the town is home to horses kept for riding and several beef-cattle and sheep farms.

Strategies to increase the viability of local food production and preserve the scenic open landscapes that dot Kennebunkport's landscape include pairing energy production (solar arrays) with agriculture, allowing accessory uses, land conservation, and participation in tax relief programs.

LOCAL FOOD PRODUCTION IS AN IMPORTANT COMPONENT OF REDUCING THE ECOLOGICAL FOOTPRINT OF INDIVIDUALS AND COMMUNITIES. THE ECOLOGICAL FOOTPRINT IS THE IMPACT OF A PERSON OR COMMUNITY ON THE ENVIRONMENT, EXPRESSED AS THE AMOUNT OF LAND REQUIRED TO SUSTAIN THEIR USE OF NATURAL RESOURCES.

There are seven properties that participate in the farmland current use program. The total area of land registered in the program is 77 acres. This represents a decline in the acreage of land in this program of nearly 80% over the last decade.¹⁸ Small farms and open space are important to the rural character of the community (Note: to be reaffirmed during public input). Agricultural land and vegetation also provide important environmental benefits such as groundwater recharge, surface water runoff management, and habitat for wildlife.¹⁹

Kennebunkport is currently located in the USDA plant hardiness zone 5b (Source: USDA). Maine recently experienced a shift in the boundaries of these zones: the overall zone boundaries have shifted north by half a zone as annual minimum winter temperatures have declined and the growing season has lengthened.²⁰ As the climate warms, Maine will experience a longer growing season. In the future, it may be viable to grow crops that are traditionally found farther to the south. However, there will also be an increased risk of drought and invasive species.

Forest Soils

The USDA classifies soils into six important forest soil groups: IA, IB, IC, IIA, IIB, and "not rated." In Kennebunkport, Rumney fine sandy loam is the only soil type that is classified as suitable for forestry. This soil type comprises approximately 143 acres of land within the town and is classified as Group IIB. Group IIB soils are poorly drained with a high seasonal water table. The productivity of this soil class is lower than IA, IB, or IC, and the soil fertility is better suited for softwoods than hardwoods.

Forestry

As noted in the 2012 Comprehensive Plan, tree stands in Kennebunkport are still recovering from the 1947 fire. Participation in the Tree Growth current use program has remained fairly constant over the last decade with 14 parcels and 707 acres registered in the program.²¹ Landowners who participate in this program must enroll at least 10 acres that they intend to grow and from which they plan to harvest forest products. They must also prepare a management plan and keep it up to date. Table 7-2 provides a summary of timber harvest in Kennebunkport from 1991 through 2017. During this period, an average of 89 acres per year were harvested. The number of acres harvested in 2013-2016 was over 30% less than the amount harvested in 1991-1994.

Table 7-2. Summary of timber harvest information (Source: DACF Maine Forest Service)

Year	Selection harvest (acres)	Shelter-wood harvest (acres)	Clearcut harvest (acres)	Total harvest (acres)	Change of land use (acres)	Number of active Notifications
1991-1994	105	0	25	130	20	6
1996-1999	157	0	4	161	4	8
2000-2004	98	0	0	98	26	8
2007-2012	42	5	0	47	0	5
2013-2016	82	0	0	82	59.25	6
2017	13	0	0	13	6	4
Total	497	5	29	531	115.25	37
Average	83	1	5	89	19	6

Notes: Data compiled from Confidential Year End Landowner Reports to Maine Forest Service. Data is only reported where three or more landowner reports reported harvesting in the town to protect confidential landowner information.

Soil Drainage

The USDA classifies soils into seven drainage classes based on the frequency and duration of wet periods in conditions similar to those under which the soil was formed. Approximately 37% (4,763 acres) of soils in Kennebunkport are classified as poorly or very poorly drained soils.

The Town requires satisfactory subsurface soils conditions for drainage and sewage disposal for approval of a building permit.²² A soils report is required for all proposed uses that require subsurface waste, commercial or industrial developments, and similar intensive land uses. Areas with very poorly drained soils are classified and regulated as wetlands in Kennebunkport.

SOIL DRAINAGE CLASS

Poorly drained - Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow-depth. Free water at shallow depth is usually present. This water table is commonly the result of low or very low saturated hydraulic conductivity of nearly continuous rainfall, or of a combination of these.

Very poorly drained - Water is removed from the soil so slowly that free water remains at or very near the ground surface during much of the growing season. The occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.(Source: NRCS)

Habitats

Habitats Essential to Species of Greatest Conservation Need

Maine’s State Wildlife Action Plan (SWAP) identifies a prioritized list of Species of Greatest Conservation Need (SGCN) based on several primary and secondary themes. The SWAP uses the Northeast Terrestrial Habitat Classification System (NETHCS), which was developed by The Nature Conservancy and NatureServe, to classify habitat. The classification identifies the extent of habitats and community types that are essential to the conservation of SGCN.²³ The dominant habitats in Kennebunkport, as classified in the SWAP, are Central Oak-Pine and Northern Hardwood & Conifer upland forest, followed by Northern Swamp. These habitats account for approximately 34%, 24%, and 15%, respectively, of the town (Table 7-3 and Figure 7-5).

SGCN PRIORITIZATION THEMES

PRIMARY THEMES

RISK OF EXTIRPATION

POPULATION TREND

ENDEMICITY

REGIONAL CONSERVATION CONCERNS

SECONDARY THEMES

CLIMATE CHANGE VULNERABILITY

SURVEY KNOWLEDGE

INDIGENOUS CULTURAL SIGNIFICANCE

(SOURCE: SWAP)

Table 7-3 Area of habitat types in Kennebunkport (Source: Derived from The Nature Conservancy Maine NETHCS GIS data)

Habitat	Area (Acres)	Area of District (%)
Central Oak-Pine	4,413.3	33.8%
Northern Hardwood & Conifer	3,104.3	23.8%
Northern Swamp	1,978.9	15.1%
Urban/Suburban Built	1,168.1	8.9%
Tidal Marsh	796.9	6.1%
Agricultural	489.6	3.7%
Emergent Marsh	424.0	3.2%
Coastal Grassland & Shrubland	276.8	2.1%
Wet Meadow / Shrub Marsh	227.5	1.7%
Ruderal Shrubland & Grassland	133.2	1.0%
Water	30.2	0.2%
Rocky Coast	22.2	0.2%
Northern Peatland	1.1	0.0%

SWAP Habitat and Endangered, Threatened & Species of Concern (ETSC)

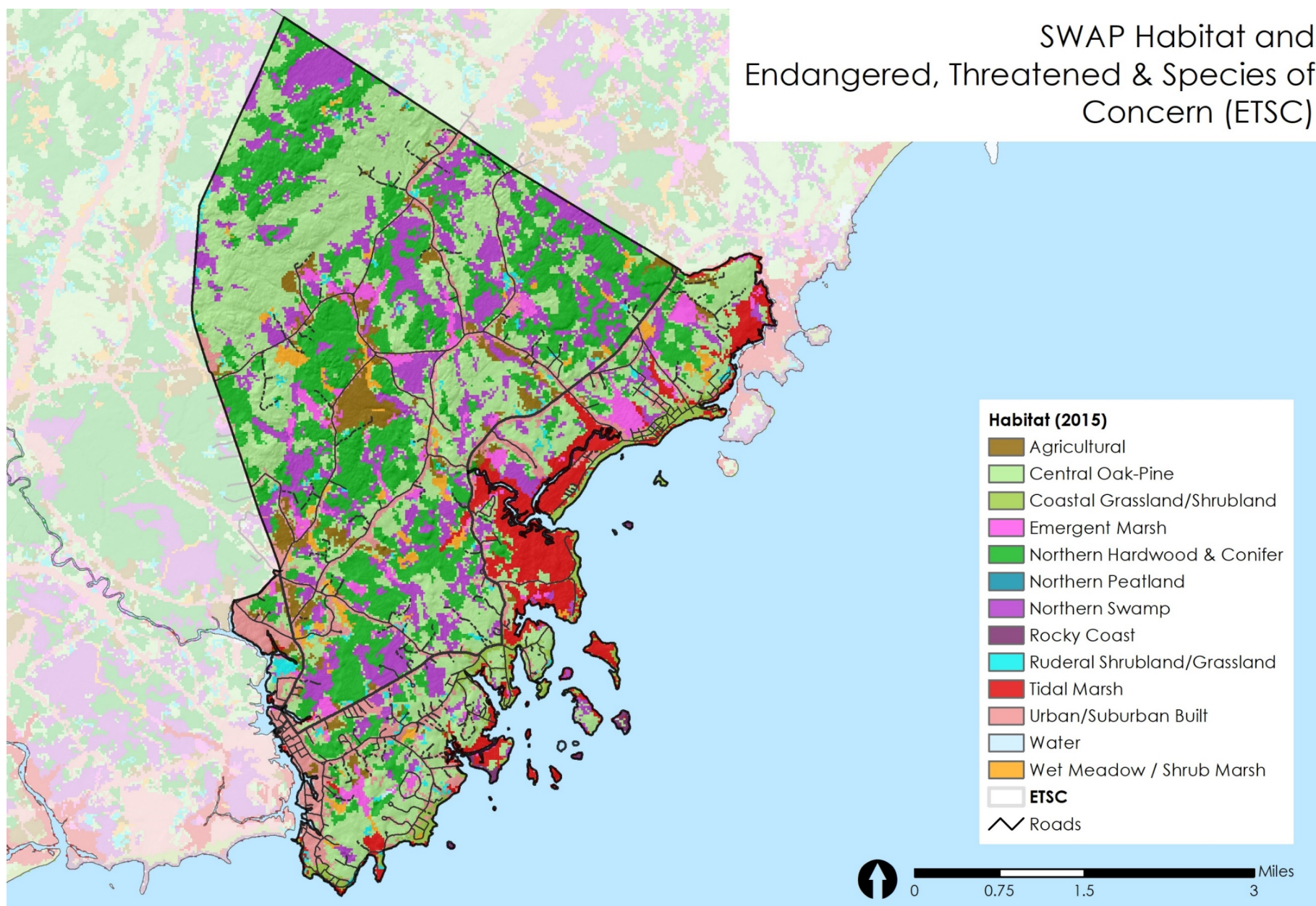


Figure 7-5 Maine Wildlife Action Plan Habitat class (Source: The Nature Conservancy)

Beginning with Habitat (BwH) Focus Areas

The Maine Department of Inland Fisheries and Wildlife (MDIFW) has designated 140 focus areas of statewide ecological significance in Maine in support of the SWAP. Two areas are located partially within Kennebunkport: the Biddeford/Kennebunkport Vernal Pool Complex and the Wells and Ogunquit Marsh (Figure 7-6). The focus areas are intended to help communities and landowners plan for and conserve priority lands.

The Biddeford/Kennebunkport Vernal Pool Complex comprises approximately 16,035 acres, 50% of which are within Kennebunkport.²⁴ The high concentration of pocket swamps and vernal pools in undeveloped landscape make this area significant. Vernal pools provide habitat to rare species such as Blanding's and spotted turtles. Ecological services that this focus area provides include:

- Retention of sediments and nutrients.
- Storage and conveyance of floodwaters
- Contribution to regional biodiversity by providing high quality habitat for rare species
- Protection of water quality.²⁵

This area also provides several economic benefits, including recreation, hunting, groundwater recharge, and provisioning of forest products.²⁶

The Wells and Ogunquit Marsh comprises 12,095 acres along the coast, extending from Ogunquit through Kennebunkport. Five acres of the northern end of this focus area are located in Kennebunkport. This focus area contains the second largest salt marsh complex in the state and is home to extensive areas of undisturbed habitat. The ecological services that this focus area provides include:

- Nutrient export to marine food webs

BwH FOCUS AREAS

BwH FOCUS AREAS ARE "LANDSCAPE SCALE AREAS THAT CONTAIN EXCEPTIONALLY RICH CONCENTRATIONS OF AT-RISK SPECIES AND NATURAL COMMUNITIES AND HIGH-QUALITY NATURAL COMMUNITIES, SIGNIFICANT WILDLIFE HABITATS, AND THEIR INTERSECTION WITH LARGE BLOCKS OF UNDEVELOPED HABITAT."

FOCUS AREAS ARE DEFINED AS NATURAL AREAS OF STATEWIDE ECOLOGICAL SIGNIFICANCE THAT CONTAIN UNUSUALLY RICH CONCENTRATIONS OF AT-RISK SPECIES AND HABITATS THAT SUPPORT RARE PLANTS, ANIMALS, NATURAL COMMUNITIES, HIGH QUALITY COMMON NATURAL COMMUNITIES; SIGNIFICANT WILDLIFE HABITAT; AND THEIR INTERSECTIONS WITH LARGE BLOCKS OF UNDEVELOPED HABITAT.

ONE OR MORE OF THE FOLLOWING MUST BE PRESENT BEFORE AN AREA IS CONSIDERED A CANDIDATE FOCUS AREA:

- GLOBALLY RARE PLANT OR ANIMAL
- 3 OR MORE HEALTHY POPULATIONS OF A RARE PLANT SPECIES
- ANY HEALTHY POPULATION OF A RARE ANIMAL SPECIES
- RARE NATURAL COMMUNITY
- EXCELLENT EXAMPLE OF A COMMON NATURAL COMMUNITY
- GOOD EXAMPLE OF A COMMON NATURAL COMMUNITY AND ONE OR MORE HIGH VALUE WILDLIFE HABITATS
- LARGE UNDEVELOPED BLOCK AND AT LEAST ONE OF THE FOLLOWING: A GOOD EXAMPLE OF A COMMON NATURAL COMMUNITY OR HIGH VALUE WILDLIFE HABITAT OR TWO

- Major migratory stopover for bird species
- Cleans water running off land prior to discharge into ocean
- Nursery for juvenile fish and shellfish.²⁷

The Wells and Ogunquit Marsh provides economic benefits such as attracting tourism for wildlife observation and recreation, buffering storm surge, and supporting local marine resource industries.²⁸

Table 7-4 displays rare species and rare and exemplary natural communities of these focus areas. A statewide map of focus areas is available at: https://www.beginningwithhabitat.org/pdf/NorthMaine_Draft10_Large_10_08_2010.pdf.

Table 7-4. Rare species and rare and exemplary natural communities (Source: MDIFW)

Name	Status	STATE RANK	GLOBAL RANK	Source
Piping Plover	Endangered Species	S2B	G3	ETSC Animals
Rare Animal	Endangered Species	S2	G4	ETSC Animals
Rare Animal	Species of Special Concern	S4	G4	ETSC Animals
Rare Animal	Threatened Species	S3	G5	ETSC Animals
Salt Marsh Tiger Beetle	Species of Special Concern	SNR	G5	ETSC Animals
Saltmarsh Sparrow	Species of Special Concern	S3B	G4	ETSC Animals
Oak - Hickory Forest	Natural Community	S1	G4G5	NAP Communities
Salt-hay Saltmarsh	Natural Community	S3	G5	NAP Communities
Beach wormwood	Species of Special Concern	S1S2	G5T5	NAP Plants
Button Sedge	Species of Special Concern	S2	G5	NAP Plants
Rare Plant	Species of Special Concern	S2	G4?T4Q	NAP Plants
Saltmarsh False-foxglove	Species of Special Concern	S3	G5	NAP Plants
Small Reed Grass	Species of Special Concern	S3	G5	NAP Plants
Spotted Wintergreen	Endangered Species	S2	G5	NAP Plants
Plover/Tern EH				

Notes: Ranking is on a scale of 1 to 5 with 1 being the rarest. State ranks are determined by the Maine Natural Areas Program (MNAP). Global rarity ranks are determined by The Nature Conservancy.

BwH Focus Areas & Conservation Land

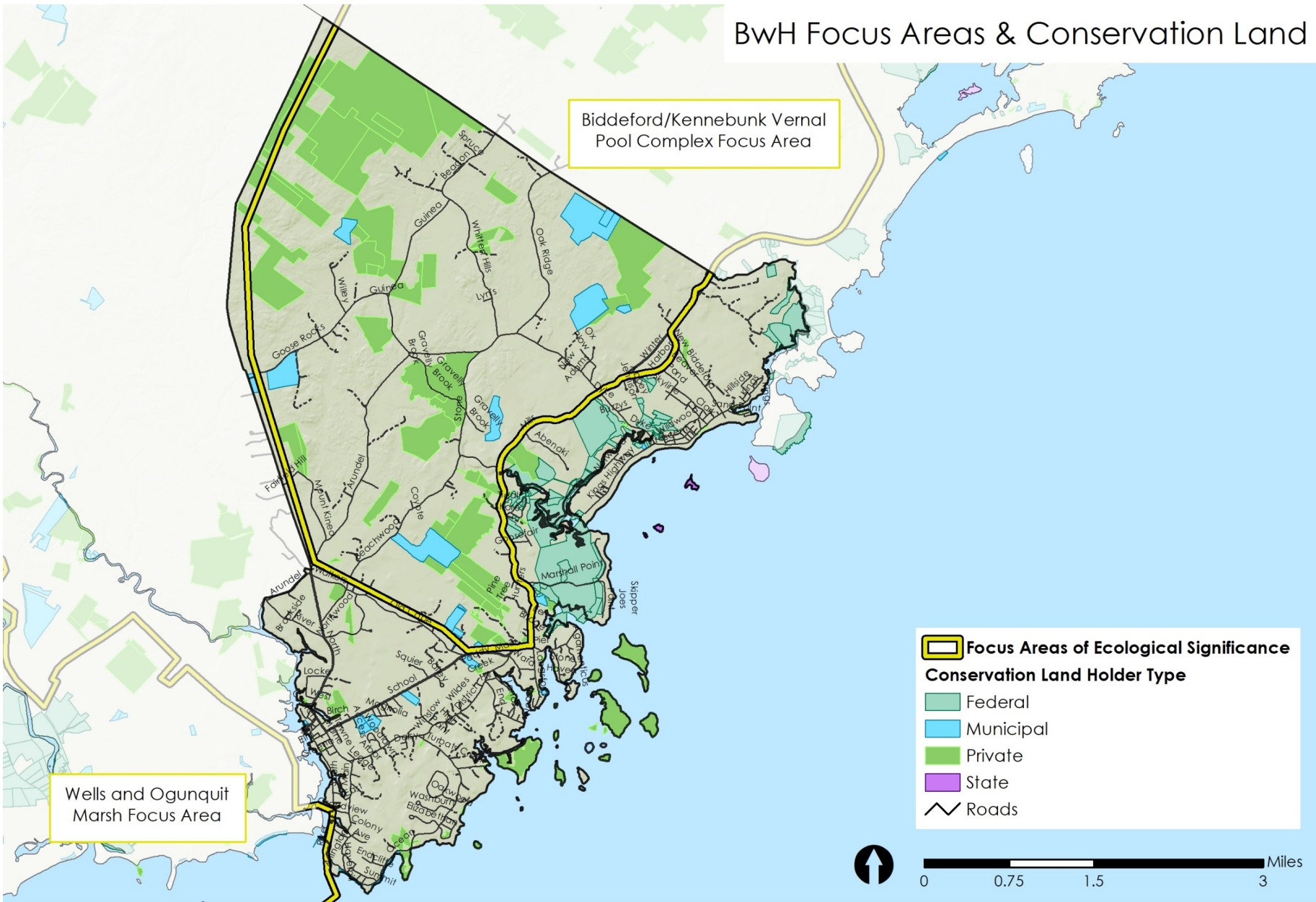


Figure 7-6 Beginning with Habitat (BwH) Focus Areas and conservation land (Source: MNAP, Conservation land provided by multiple State Agencies & NGOs)

Maine Natural Areas Program (MNAP) Natural Community Types

MNAP has identified 104 different natural community types in the state. These community types have been assigned a rarity rate of 1 (rare) through 5 (common) within Maine and globally. Two rare or exemplary natural communities have been documented in Kennebunkport: oak-hickory forest and salt-hay saltmarsh.²⁹

Oak-hickory forest

Oak-hickory forest is an upland forest type that is characteristic of the Central Appalachian Mountains.³⁰ This forest occurs primarily in southern, coastal Maine and extends to the south and west. Species that dominate this forest type include shagbark hickory, oaks, and sedge lawn. The shrub layer may include witch hazel, shadbushes, striped maple, and maple-leaved viburnum. The canopy of this forest type is moderately opened to closed. Oak-hickory forest provides habitat for birds such as scarlet tanager and ovenbird.³¹

Oak-hickory forests are ranked S1 within the state indicating that they are critically imperiled in Maine due to extreme rarity or vulnerability to extirpation from the state. In Kennebunkport, there is a 12.9-acre patch of this natural community on the northeastern side of town near the coast (Figure 7-9).

RARE PLANTS ASSOCIATED WITH OAK-HICKORY FOREST: BITTERNUT HICKORY, BOTTLEBRUSH GRASS, CHESTNUT OAK, AND SCARLET OAK. RARE ANIMALS ASSOCIATED WITH THIS HABITAT: RED-WINGED SALLOW AND WHIP-POOR-WILL.

Salt-hay saltmarsh

Salt-hay saltmarsh occur throughout coastal Maine, although few large examples remain. Salt-hay saltmarsh are highly productive tidal marshes dominated by saltmeadow cordgrass, smooth cordgrass, or black grass, depending on tidal inundation.³² This ecological focus area is associated with beach barrier systems or edges of estuaries. Soils in the saltmarsh consist of thick, rich peat. Saltmarsh provides habitat for species including Nelson's sharp-tailed sparrow, seaside sparrow, and the rare saltmarsh sharp-tailed sparrow, as well as wading birds and shorebirds such as black-crowned night-heron and least tern. There are approximately 570.3 acres of salt-hay saltmarsh in Kennebunkport.

RARE PLANTS ASSOCIATED WITH SALT-HAY SALTMARSH: DWARF GLASSWORT, LILAEOPSIS, SALTMARSH BULRUSH, SALTMARSH FALSE-FOXGLOVE, SLENDER BLUE FLAG. ASSOCIATED RARE ANIMALS: BIG BLUET, BLACK-CROWNED NIGHT-HERON, LAUGHING GULL, LEAST TERN, SALTMARSH SHARP-TAILED SPARROW, SHORT-EARED. OWL.

High Value Plant & Wildlife Habitat

Figure 7-9 and Figure 7-10 show the location of rare, threatened, and endangered or declining plant and animal species, significant habitat, and rare and exemplary natural communities.³³ MDIFW has identified 40 locations where rare or endangered species have recently been seen in Kennebunkport.

Essential Habitats

Essential habitats are areas that currently provide or historically provided physical or biological features that are essential to the conservation of an endangered or threatened species in Maine. While the essential habitat designation does not affect private landowners unless project requires a permit or license from, or are funded or carried out by, a state agency or municipality, these areas may require special management considerations to sustain the species they support.³⁴ Essential habitats in Kennebunkport are displayed in Figure 7-9 and Figure 7-10 and summarized briefly in Table 7-5.

Known threats to bird habitat include recreation (beaches), cumulative impacts of development, habitat fragmentation, intensive forest practices, invasive species, and various forest pests and diseases.

RARE SPECIES IN KENNEBUNKPORT

ANIMAL SPECIES ACCOUNTS

BLANDING'S TURTLE
 PIPING PLOVER, LEAST TERN
 SALTMARSH SPARROW
 SALTMARSH TIGER BEETLE
 SPOTTED TURTLE
 WOOD TURTLE

PLANT SPECIES ACCOUNTS

BEACH WORMWOOD
 BUTTON SEDGE
 PALE GREEN ORCHIS
 SALTMARSH FALSE-FOXLGLOVE
 SMALL REED GRASS
SEE RANKING IN TABLE 7-4.

Table 7-5 Designated essential habitat description (Source: MDIFW Habitat Dataset Fact Sheets)

	Essential Habitat
Deer Wintering Areas	Forested areas used by deer when snow depth in the open/hardwoods exceeds 12 inches, deer sinking depth in the open/hardwoods exceeds 8 inches, and mean daily temperatures are below 32 degrees.
Vernal Pools	The pool depression used for breeding by amphibians and other indicator species as well as the habitat within a 250-foot buffer of the depression.
Roseate Tern	Coastal nesting areas to maintain breeding habitat and prevent disturbance that may cause nesting failure. The dataset was developed to provide special protection to maintain breeding habitat and to prevent disturbance that may cause nesting failure of roseate terns.
Seabird Nesting Areas	An island, ledge, or portion thereof in tidal waters that has 25 or more documented nests, adult seabirds associated with nests, or combination thereof (single species or aggregate of different species in any nesting season since 1976 provided that the island, ledge, or portion thereof continues to have suitable nesting habitat. Seabird Nesting Islands have adopted a Natural Resources Protection Act (NRPA) habitat.
Tidal Wading Bird and Waterfowl Habitat	Four habitat components support tidal waterfowl and wading birds: mudflats, salt marshes, eelgrass beds, and mussel bars. The dataset depicts Significant Wildlife Habitats under NRPA and important wildlife coastal habitats for oil spill response.
Inland Wading Bird and Waterfowl Habitat	Based on composition of wetland subtypes, acreage and diversity of wetland habitat, interspersions of vegetation and water, and percent of open water. Mapped areas show IWWHs that are regulated under NRPA.
Shorebird Areas	Significant Wildlife Habitat under the NRPA. Addresses migratory shorebird coastal staging habitats that meet shorebird feeding and roosting requirements during migration.

High Value Plant & Wildlife Habitats

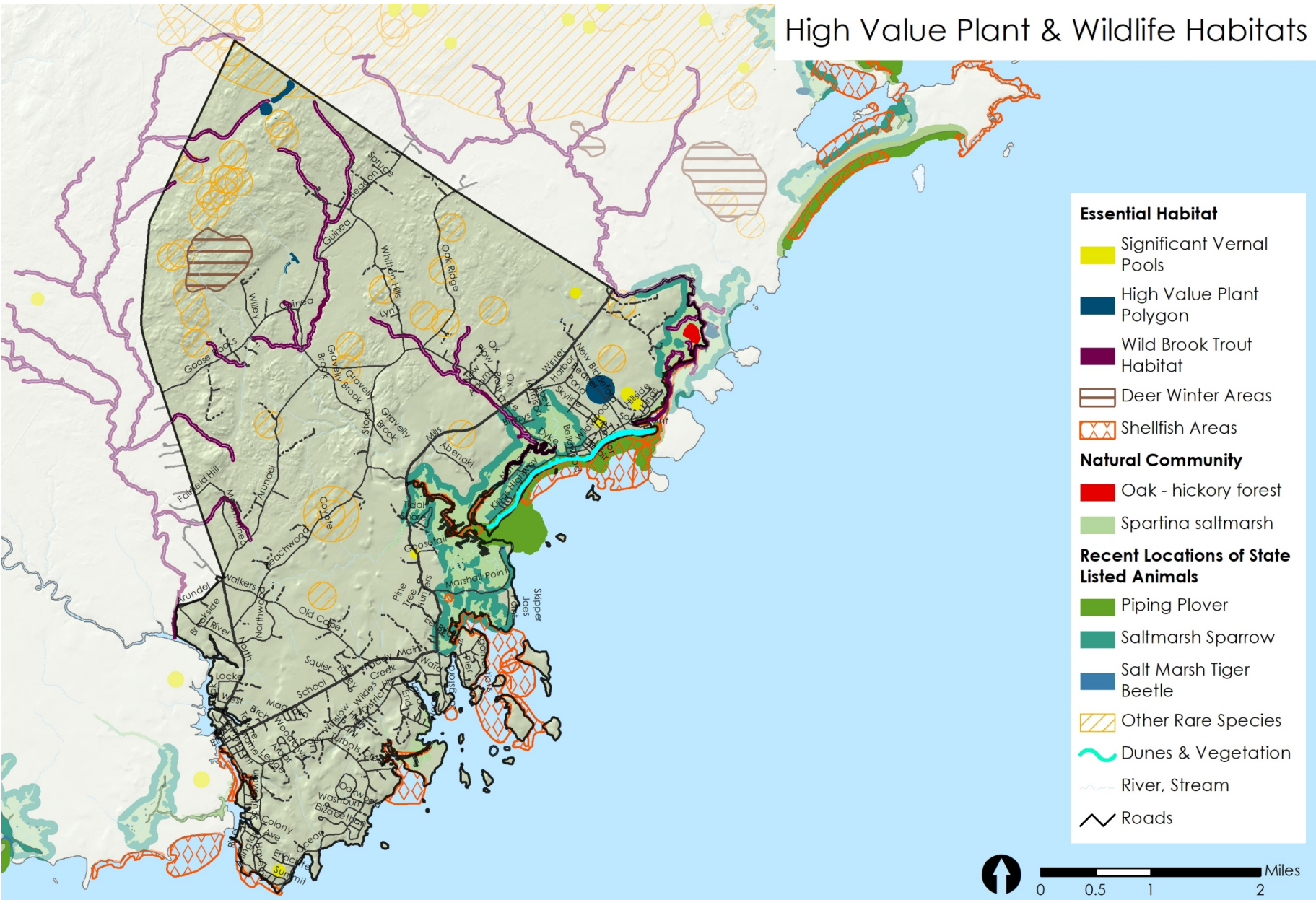


Figure 7-9 High value plant and animal habitat (Source: MDIFW, MDMR)

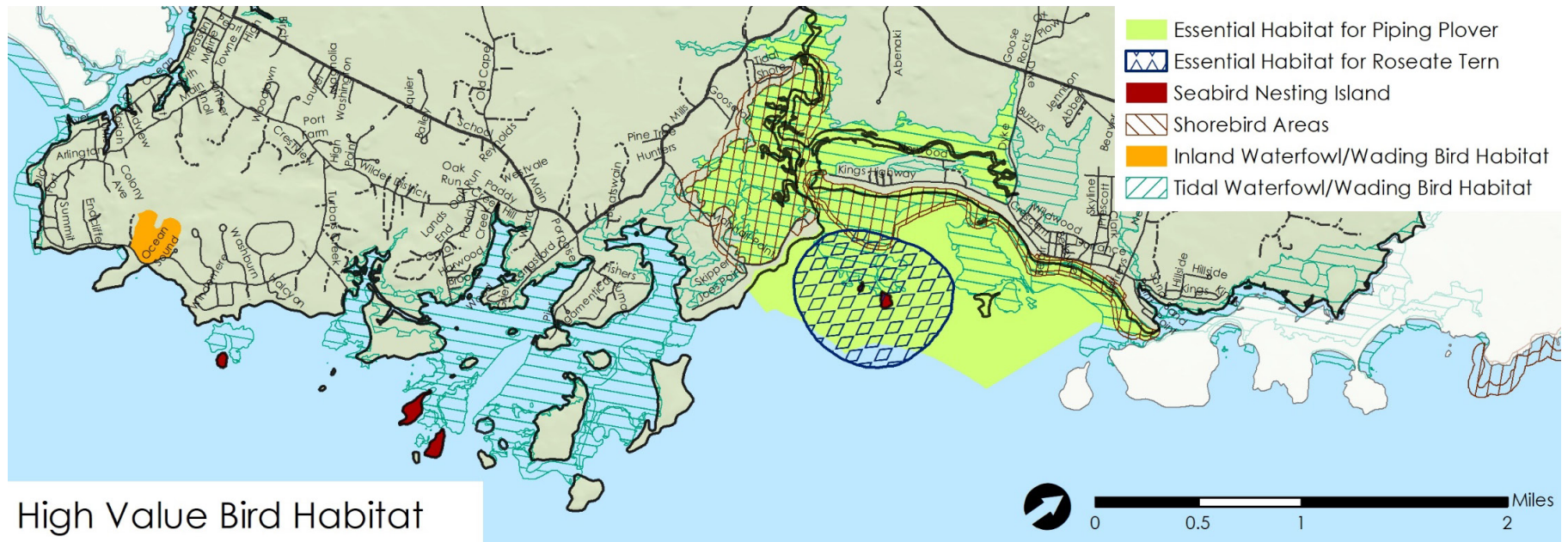


Figure 7-10 High value bird habitat (Source: MDIFW, MDMR)

Undeveloped Habitat Blocks

Undeveloped habitat blocks are large tracts of land that have not been fragmented by roads and development. Undeveloped blocks are home to a variety of plants and animals. These areas are also important to the state’s natural resource-based economy and outdoor activities.³⁵

MDIFW has mapped and identified a total of 7,142 acres of “undeveloped habitat blocks” within Kennebunkport (Figure 7-7). The largest unfragmented area in town, located to the northwest of Guinea Road, comprises 2,086 acres within the town and is

part of a 3,035 acre block that extends into Arundel and Biddeford.

Maintaining large undeveloped areas and corridors or connections between these areas will be especially important to helping wildlife respond to changes in climate that impact the suitability of habitat and composition of species in an area. As shown in Figure 7-6, most of the town’s conservation land is located within and surrounded by large undeveloped blocks of land. Long term increases in temperature will likely drive many species that are able to migrate north. Species that are already at the northern edge of their range, unable to compete with new

species or invasive species, or unable to find suitable growing conditions or habitat will be especially vulnerable to climate change. Maintaining large blocks of undeveloped land will help mitigate the impact of climate on species as well as the disconnect between the boundaries of conservation land and the future location of valuable habitats and species.

Aquatic & Shoreland Habitats

Streams, rivers, tidal areas, and ponds and the land around these resources create aquatic and shoreland habitat. As shown in Figure 7-8, Kennebunkport has significant wetlands, streams, and coastal resources. Within a 250-foot buffer of coastal and tidal rivers, there are nearly 1,100 acres of habitat that supports a variety of plant and animals.

There are approximately 2,731 acres of wetlands within Kennebunkport, accounting for 22% of the town's land area. Wetlands and the land surrounding wetlands provide several key functions including hydrologic functions, biogeochemical functions, biological functions, and cultural functions. These functions, which are discussed further in Chapter 8 Water Resources, influence aquatic and riparian habitats.

Wetlands and marshes also provide important flood storage. Minimizing development and prioritizing conservation of these resources and surrounding uplands prevents development in at-risk areas as well as facilitates salt marsh migration to higher ground and preservation of this habitat as sea levels rise.

Kennebunkport has approximately 557.4 acres of saltmarsh (Figure 7-9). Salt marsh is considered a rare natural community in Maine that provides critical habitat to the saltmarsh sparrow and salt marsh tiger beetle, both ranked species of special concern, as well as the endangered piping plover.

Salt marshes provide another valuable service due to their ability to capture and hold carbon at an order of magnitude higher than land ecosystems. Conversely, should the marshes sustain damage, to pollution for example, the release of the stored carbon into the atmosphere would be proportionately greater.³⁶

There are approximately 4.3 miles of dunes and dune vegetation located along the coast (Figure 7-9). Sand dunes provide ecological value and buffering capacity against storm surge. Maintaining the health of dune grasses is necessary to the stability of the dunes. Should the dune grass succumb to disease or be otherwise disturbed or removed, the dune system's function as a storm surge barrier would diminish due to erosion, and low-lying areas such as Goose Rocks would be exposed to coastal storms. As the sea rises, and coastal storms become more severe, the dunes' protective function will serve as one of the community's first lines of defense. Healthy dunes are the most cost-effective protection for coastal residents, and for that reason the health of the dune grass should be monitored on a regular basis.

Undeveloped Habitat Blocks and Connections

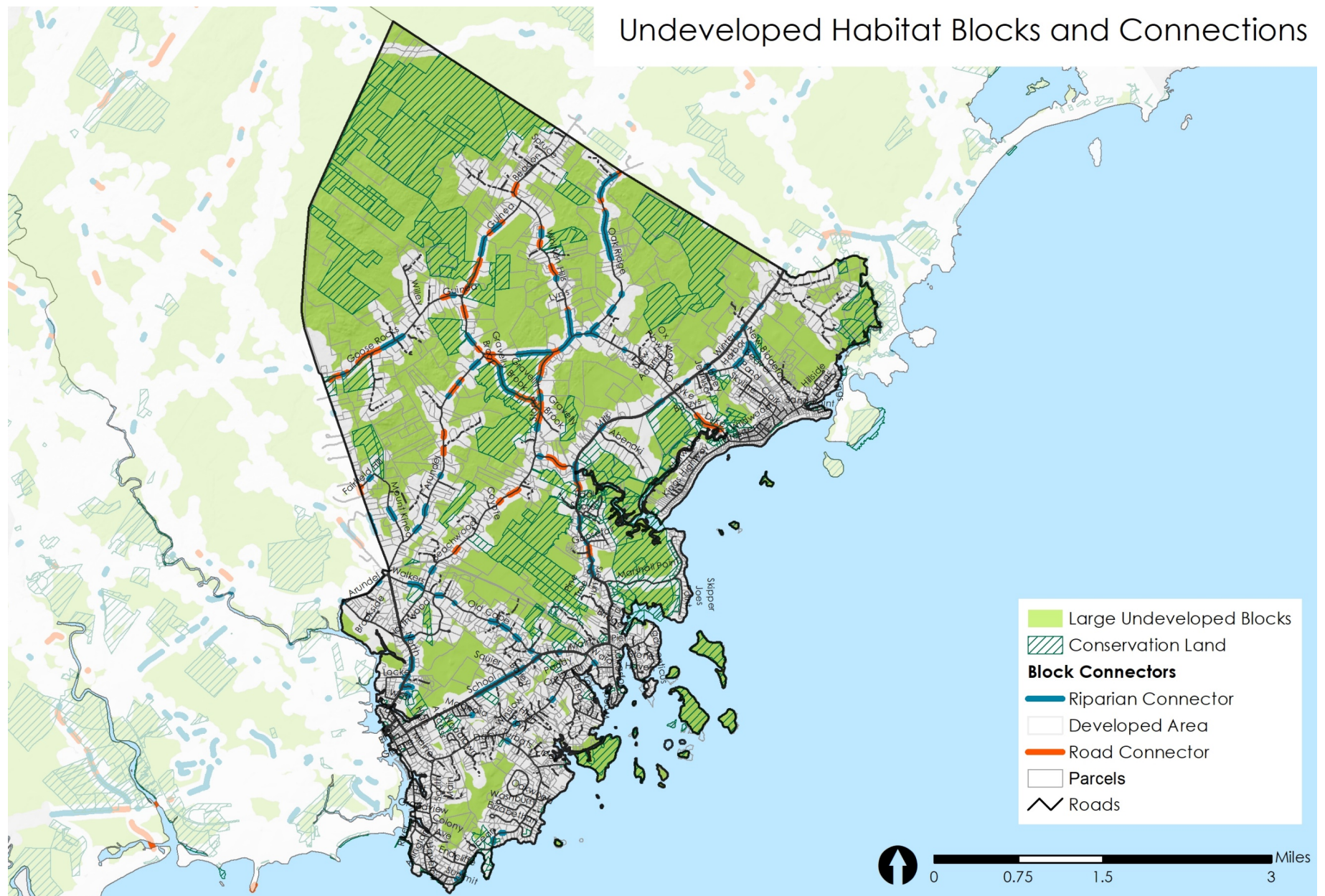


Figure 7-7 Undeveloped habitat blocks and connections (Source: BwH, MDOT, MDIFW)

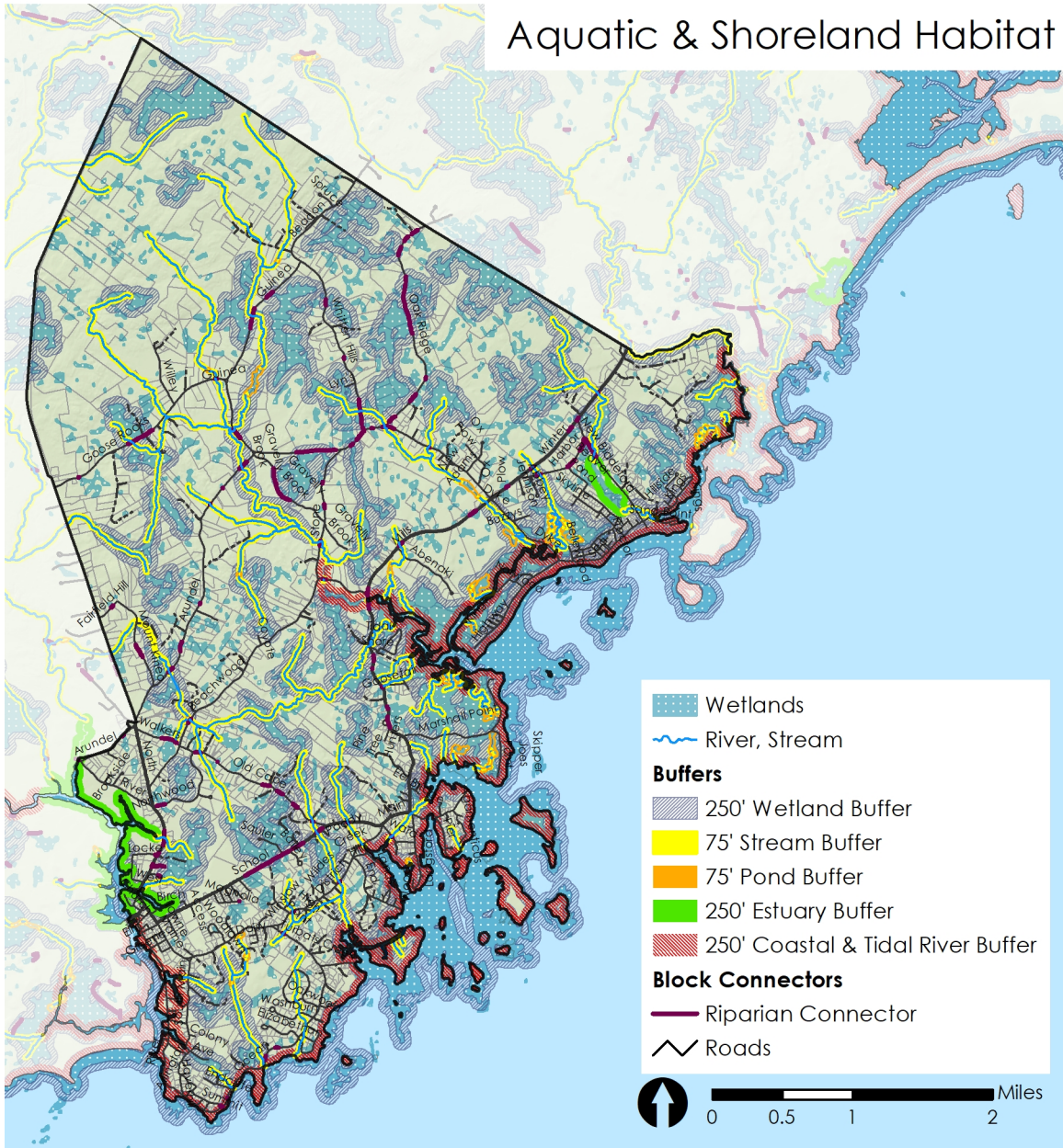


Figure 7-8 Aquatic and riparian habitat of water resources and their associated buffers (Source: Nat. Hydrography Dataset, BwH, NWI, MNAP, MDIFW)

Shoreland and Resource Protection

Article 4 Zone Regulations and Article 5 Shoreland and Resource Protection Performance Standards contain the land use regulation and standards for land uses within designated shoreland zones. The Mandatory Shoreland Zoning Act requires that municipalities adopt, administer, and enforce local ordinances to regulate activity in these areas. The shoreland zone includes all land area within 250 feet of the following:

- normal high-water line of any great pond or river;
- upland edge of a coastal wetland, including all areas affected by tidal action, and
- upland edge of defined freshwater wetlands; and
- all land areas within 75 feet, horizontal distance, of the normal high-water line of certain streams.

The Town has designated a Shoreland Zone and a Resource Protection Zone in its Land Use Ordinance (LUO). For the purposes of compliance with the state's shoreland zoning guidelines, the Dock Square and Riverfront Zones are considered Shoreland General Development Districts. These areas are displayed on the official map on file in the Municipal Offices and described in Article 3 of the LUO.

Resource Protection District includes areas within the shoreland zone in which development would adversely affect water quality, biological ecosystem, or scenic and natural values. The General Development District includes areas of existing, intensively developed areas in the Dock Square and Riverfront Zones.

The uses and activities allowed in these areas are limited in order to protect coastal and inland water resources. The Town imposes a 75-foot minimum setback for all structures within shoreland zones except in the Dock Square District, where a reduced setback of 25 feet is permitted.

The Town requires a larger minimum lot size (40,000 sf) than the minimum lot area required by the state for residential dwelling units within the shoreland zone adjacent to tidal areas (30,000 sf)

Discussion of standards on adjacent shorelands in neighboring communities to be developed.

Natural Resources Co-occurrence

MDIFW has developed natural resources co-occurrence maps for the purpose of highlighting areas where there are relatively more environmental assets compared to other areas. The map in Figure 7-11 displays the co-occurrence map developed by the state using buffer zones around water features, important natural communities, animal and plant species that are listed, and areas of undeveloped land. As seen in Figure 7-11, coastal areas in the vicinity of Goosefare Bay Wildlife Refuge and the northern region of town have the highest co-occurrence value. This information can be useful when prioritizing conservation projects and the allocation of resources toward conservation, maintenance, and monitoring activities. It can also guide the community in identifying areas that are perhaps least suitable for development due to the presence of environmental assets.

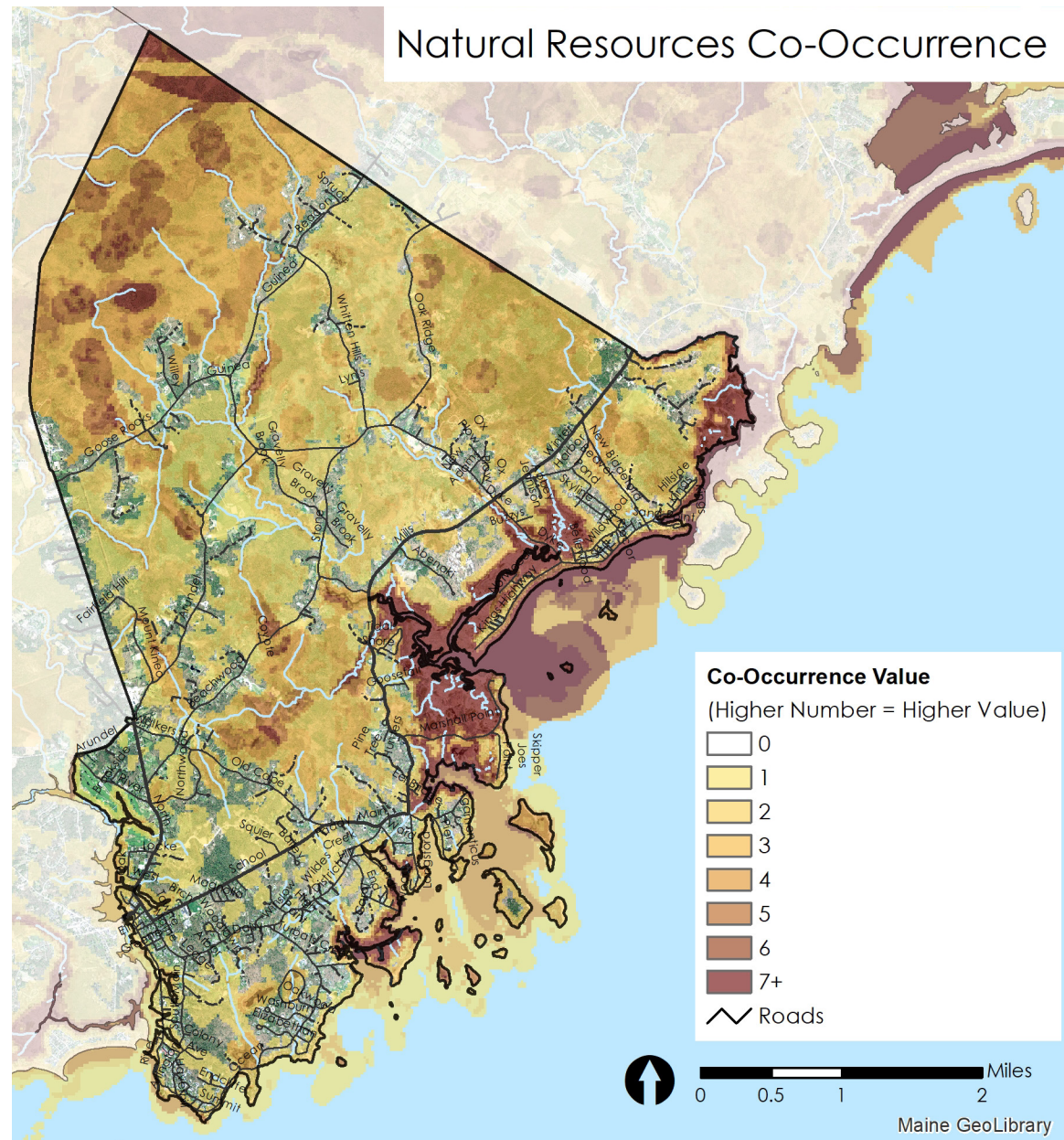


Figure 7-11 Natural resources co-occurrence map (Source: Co-Occurrence model developed by MDIFW)

Resilient Lands

The Nature Conservancy has developed a Resilient Lands mapping tool that provides information about a landscape’s resiliency to climate change.^b According to this tool, Kennebunkport scores for resilience, landscape diversity, and local connectedness are average compared to other sites within the same geophysical setting (Figure 7-12). Figure 7-13 displays a map of the analysis results. The darker green areas show areas with a higher resilience score while orange tones indicate areas

with a lower than average score.

The resilient and connected networks analysis for Kennebunkport found that 450.8 acres of land act as a *climate corridor*, or narrow conduit in which the movements of plants and animals becomes highly concentrated. The analysis also determined that 1,897.7 acres are considered *resilient areas*, or places buffered from climate change because they contain many connected micro-climates that create climate options for species.

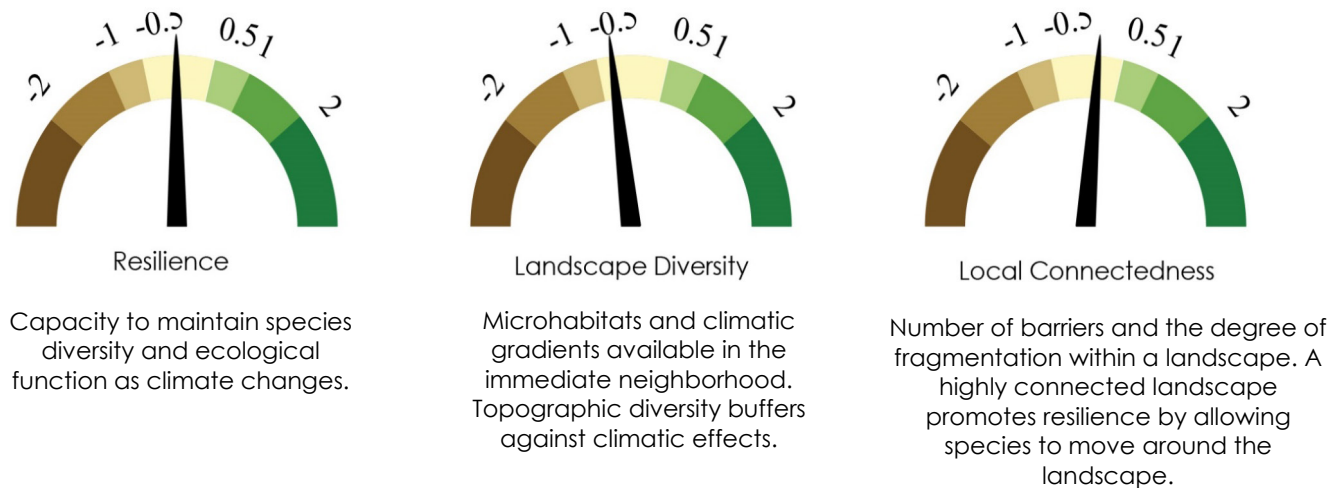


Figure 7-12 Resilient and connected networks in Kennebunkport (Source: TNC Resilient Land Mapping Tool)

^b For more information and to explore this mapping tool, visit <https://www.conservationgateway.org/ConservationByGeography/NorthAm>

[erica/UnitedStates/edc/reportsdata/terrestrial/resilience/resilientland/Pages/Mapping_Tool.aspx](https://www.conservationgateway.org/ConservationByGeography/NorthAm/erica/UnitedStates/edc/reportsdata/terrestrial/resilience/resilientland/Pages/Mapping_Tool.aspx)

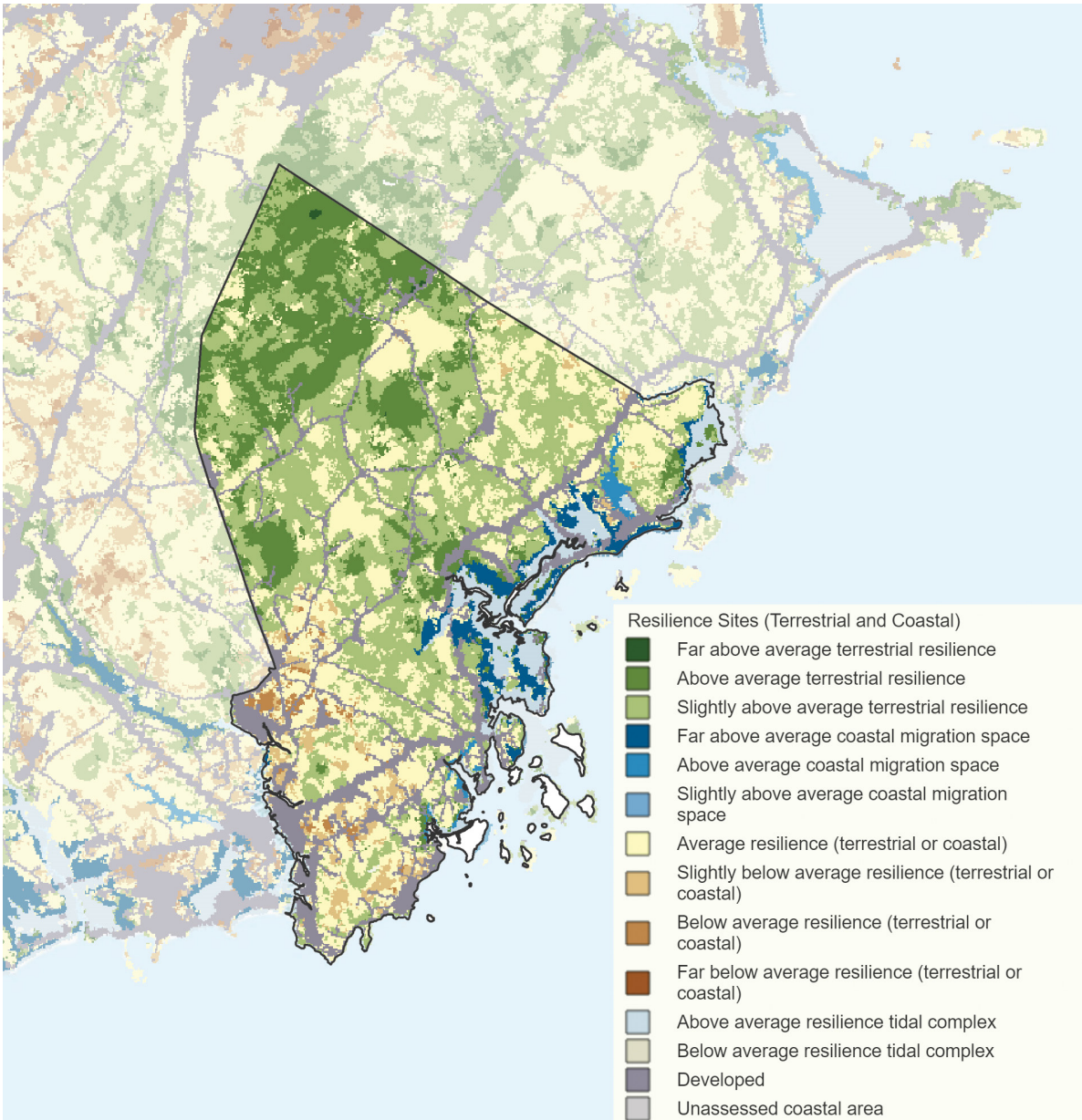


Figure 7-13 Map of resilience sites in Kennebunkport and overall score (Source: TNC Resilient Land Mapping Tool)

Conservation Land

Conservation land provides a multitude of benefits to plant and animal species, people, and communities. Land that is protected from development and in a natural state provides high quality habitat to diverse species. Connected tracts of conservation land that form large undeveloped blocks and corridors through otherwise developed areas are critical for species that have a large range and those that require interior woodland habitat away from forest edges along fields, roads, or developed areas. Undeveloped lands provide ecosystem services such as stormwater management, flood control, air purification, and carbon sequestration. Conservation land also provides places to recreate and enjoy nature.

The economic benefits of conservation land are well documented. The market value of property increases with proximity to parks and open space. Conservation land that enables the preservation of farmland supports local agricultural industry and provides employment opportunities. Forests and natural lands recharge groundwater and reduce stormwater runoff, thereby contributing the quality and quantity of drinking water, as well as reducing the cost of treatment. Conservation land is also a significant draw to people and employers looking to relocate to an area with the scenic qualities and recreation opportunities provided by open space.³⁷

There are 270 parcels of conservation land totaling 3,166.6 acres in Kennebunkport. Figure 7-6 displays conservation land parcels by the land holder. A majority of land (71%) is privately head by the Kennebunkport Conservation Trust (KCT) (Table 7-5). Almost all properties are conserved through fee simple ownership, as

opposed to by conservation easement or management transfer agreement (Table 7-6).

Table 7-5 Conservation land by holder type (Source:Multiple State Agencies & NGOs)

Holder Type	Number of Parcels	Acres	Percent of Area
Federal	112	555.4	17.5%
Municipal	35	357.1	11.3%
Private	119	2,247.6	71.0%
State	4	6.4	0.2%
Total	270	3,166.6	100.0%

Table 7-6 Conservation land by type of land conservation (Source: Multiple State Agencies & NGOs)

Conservation Type	Number of Parcels	Acres	Percent of Area
Easement	8	97.0	3.1%
Fee	260	3,067.1	96.9%
Management Transfer Agreement	2	2.5	0.1%
Total	270	3,166.6	100.0%

In addition to having significant acreage of conservation land – around one quarter of the town’s area is conserved – the diversity of habitats found in the town are well represented by the conserved locations. Forests, meadows, wetlands, brooks, beaches, and islands are among the conserved ecosystems and habitats. Conservation land also provides public access to historic assets such as the Grist Mill property on Mill Lane.

Over 550 acres of conservation land are part of the Rachel Carson

National Wildlife Refuge. The refuge was established in 1966 to protect salt marshes and estuaries for migratory birds. Habitats found within the refuge include forested upland, barrier beach/dune, coastal meadows, tidal salt marsh, and rocky coast. The portion in Kennebunkport is part of a 50-mile-long stretch of protected coastal land in York and Cumberland counties.

Smith Preserve

KCT's largest holding is the 1,100-acre Smith Preserve located in northern Kennebunkport. While the forested preserve offers 10 miles of recreational trails and features brooks, picnic rocks, bridges, its key role is providing wildlife habitat. The preserve is part of a 3,000 acre block of undeveloped land that provides habitat for species including deer, bobcats, coyotes, hares, owls, partridges, turtles, and others.

Town Forest

The Town has designated certain properties in Kennebunkport as Town Forest (Figure 7-13). These lands were transferred to the KCT in an effort to expand and permanently protect the large undeveloped wildlife habitat in the northern corner of town. There are currently 19 parcels totaling 978.4 acres of designated Town forest held by KCT. The Town Forest land represents over 30% of conservation land within the town. Approximately 64% of this land is permanently protected to maintain a primarily natural state, while the remainder is secured for municipal uses and in natural cover. Most of the Town Forest lies within the Biddeford/Kennebunk Vernal Pool Complex Focus Area.

- Status of management plans, trails, other improvements
- Town forester / tree warden?
- Management needs

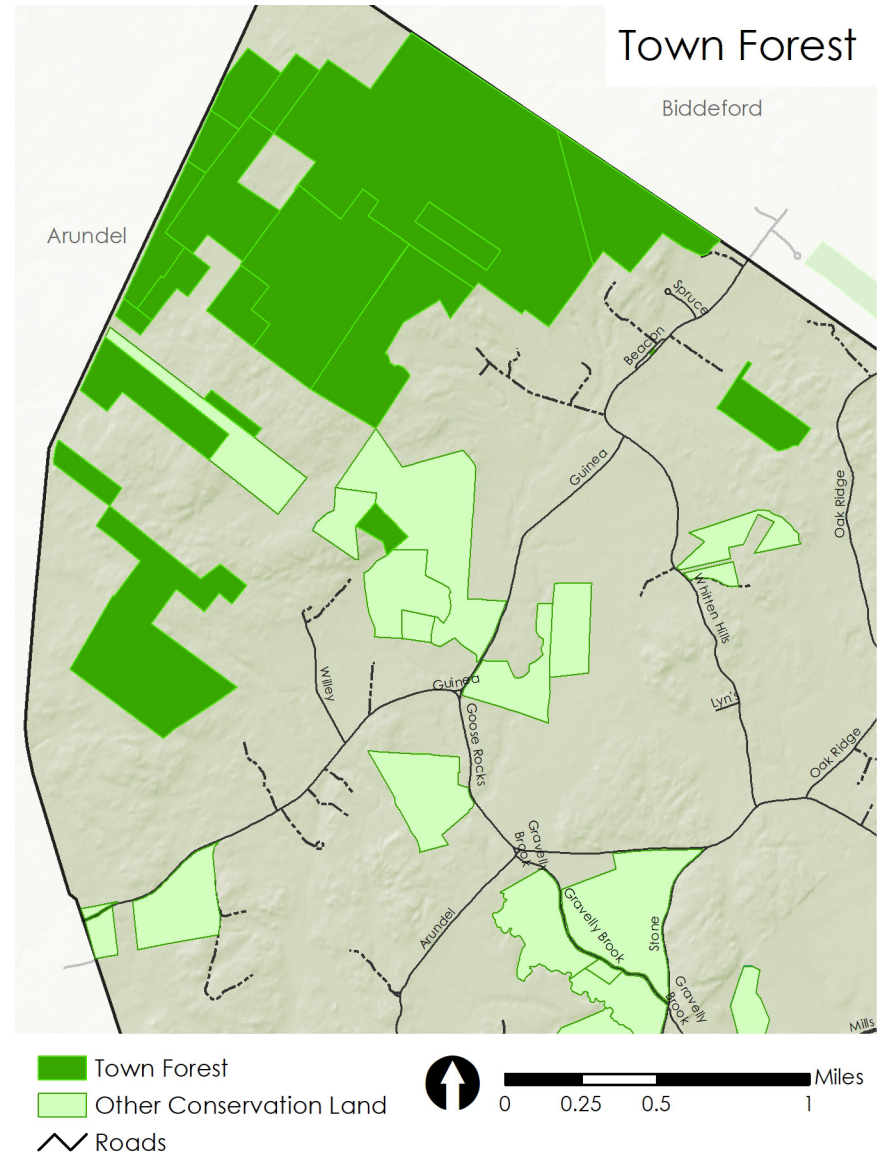


Figure 7-13 Town Forest conservation land

Areas & Vistas of Natural Beauty

Scenic vistas are a fundamental element of the town's character and identity. The town's 2012 Comprehensive Plan identifies several unique natural areas and vistas. These locations are included on the map "Lands Not Readily Available for Development" and include the following:

- Ocean Avenue, from Parson's Way around to Walker's Point.
- Cape Porpoise, including the Pier, the Harbor and the islands.
- Goose Rocks Beach
- The view across the mouth of the Batson River from Goosefare Farm on Route 9.
- The Kennebunk Riverfront, including the Monastery grounds across the river.
- The Colony Beach
- Turbat's Creek

During the preparation of this 2030 Comprehensive Plan, the community reaffirmed these locations and/or identified additional areas and vistas of natural beauty that contribute to the high quality of life that Kennebunkport offers. **To be completed following public input.**

Shade Trees

Shade trees provide habitat for wildlife in urban settings, serve to connect larger patches of habitat, and provide important ecosystem services such as temperature regulation, water filtration, and air purification, in addition to enhancing the aesthetic qualities of streetscapes. Shade trees also help keep buildings cool, lowering demand for energy and cooling costs. As the region experiences more hot days over the century, the presence of shade trees in urban and suburban areas will become increasingly important. The Town has a Shade Tree Program and committee that is dedicated to preserving, maintaining, and planting shade trees. The Shade Tree Program:

- Maintains an inventory of Town trees along streets, walkways and public parks. A special tag identifies tree that are monitored for health and safety.
- Publicizes and educates on tree quality, diversity and care.
- Monitors elm tree health, preservation, disease detection treatment, and removal.
- Recommends replacement trees, respecting species' variety, location and compatibility.
- Interacts with Tree Warden concerning public and private tagged tree issues.
- Participates in Arbor Day celebrations and assures that Tree City USA requirements are fulfilled annually.

The Shade Tree Committee has developed a [shade tree inventory map](#) and a self-guided [downtown walking tour](#). The committee also posts alerts about invasive species, which are a threat to many hardwoods.

Kennebunkport has been named a 2018 Tree City USA by the Arbor Day Foundation in honor of its commitment to effective urban management. This designation was achieved because the Town meets the programs four requirements: a tree board or department (Shade Tree Committee), a tree care ordinance, an annual community forestry budget of at least \$2 per capita, and an Arbor Day observance and proclamation.

Threats to Natural Resources

Loss of habitat and climate change are two of the primary threats to natural resources in Kennebunkport. While the community has succeeded in securing large tracts of conservation land, development will continue to occur in town and throughout the region and remains a threat to the quality and availability of habitat. Stormwater runoff associated with development may increase the risk of pollution of aquatic and riparian habitat as well as groundwater resources. Recreation and tourism in coastal areas in particular can present a risk to nesting and foraging habitat in the town's valuable marshes.

Salt marsh habitat is also vulnerable to sea level rise. As sea level

rises and precipitation increases, the prevalence of undersized culverts will increase, presenting challenges to fish and wildlife as well as marshes. Marshes will rise along with sea level, so long as the rate of sea level rise is not excessive. The challenge for the Town will be to identify suitable areas for marsh migration, and to remove barriers to migration.

Climate change will present a multitude of know and unknown threats to individual species and ecosystems ranging from saltwater intrusion and changing species composition to increased threat of invasive species. The complexity and interconnectedness of ecosystems makes it difficult to predict exactly what the region's natural communities will be like in the future.

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- ¹ Maine Geological Survey. 2-foot contour GIS data.
- ² USDA Natural Resources Conservation Service (NRCS) Soil Web Survey. <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- ³ US EPA. Benefits of Healthy Watersheds. <https://www.epa.gov/hwp/benefits-healthy-watersheds>
- ⁴ US EPA. The Economic Benefits of Protecting Healthy Watersheds. https://www.epa.gov/sites/production/files/2015-10/documents/economic_benefits_factsheet3.pdf
- ⁵ MEDEP. Watershed Management. <https://www.maine.gov/dep/land/watershed/>
- ⁶ US EPA. Watershed Academy Web. 8 Tools of Watershed Protection in Developing Areas. https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=1280
- ⁷ USDA Natural Resources Conservation Service Soil Survey of York County Maine. 1982. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/maine/ME031/o/york.pdf
- ⁸ USDA Natural Resources Conservation Service Soil Survey of York County Maine. 1982. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/maine/ME031/o/york.pdf
- ⁹ USDA Natural Resources Conservation Service Soil Survey of York County Maine. 1982. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/maine/ME031/o/york.pdf
- ¹⁰ USDA Natural Resources Conservation Service Soil Survey of York County Maine. 1982. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/maine/ME031/o/york.pdf
- ¹¹ ME Geological Survey
- ¹² USDA Natural Resources Conservation Service Soil Survey of York County Maine. 1982. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/maine/ME031/o/york.pdf
- ¹³ USDA Natural Resources Conservation Service Soil Survey of York County Maine. 1982. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/maine/ME031/o/york.pdf
- ¹⁴ USDA Natural Resources Conservation Service Soil Survey of York County Maine. 1982. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/maine/ME031/o/york.pdf
- ¹⁵ USDA Natural Resources Conservation Service (NRCS) Web Soil Survey. <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- ¹⁶ USDA. Soil Access Prime and other Important Farmlands. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1338623.html
- ¹⁷ USDA. Soil Access Prime and other Important Farmlands. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1338623.html
- ¹⁸ Town of Kennebunkport Annual Report. 2018.
- ¹⁹ GrowSmart Maine. Planning for Agriculture Farming-Friendly Communities. <http://growsmartmaine.org/wp-content/uploads/2011/04/Agricultural-Brief-Update-4-27-17.pdf>
- ²⁰ University of Maine. Maine's Climate Future. 2015 Update. <https://mco.umaine.edu/pubs/pdf/mcf-2015.pdf>
- ²¹ Town of Kennebunkport Annual Reports
- ²² Town of Kennebunkport Land Use Ordinance Article VI, Section 6.3 Soil Suitability.
- ²³ MDIFW. Maine's Wildlife Action Plan. 2015. https://www.maine.gov/ifw/docs/2015%20ME%20WAP%20All_DRAFT.pdf
- ²⁴ Beginning with Habitat. Focus Areas of Statewide Ecological Significance. Biddeford/Kennebunkport Vernal Pool Complex.
- ²⁵ Beginning with Habitat. Focus Areas of Statewide Ecological Significance. Biddeford/Kennebunkport Vernal Pool Complex.
- ²⁶ Beginning with Habitat. Focus Areas of Statewide Ecological Significance. Biddeford/Kennebunkport Vernal Pool Complex.
- ²⁷ Beginning with Habitat. Focus Areas of Statewide Ecological Significance. Biddeford/Kennebunkport Vernal Pool Complex.

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- ²⁸ Beginning with Habitat. Focus Areas of Statewide Ecological Significance. Biddeford/Kennebunkport Vernal Pool Complex.
- ²⁹DACF. Maine Natural Areas Program (MNAP). Natural landscapes of Maine: A Guide to Natural Communities and Ecosystems. 2018. https://www.maine.gov/dacf/mnap/about/publications/community_classification.htm
- ³⁰ DACF. Maine Natural Areas Program (MNAP). Natural landscapes of Maine: A Guide to Natural Communities and Ecosystems. 2018. https://www.maine.gov/dacf/mnap/about/publications/community_classification.htm
- ³¹ DACF. Maine Natural Areas Program (MNAP). Natural landscapes of Maine: A Guide to Natural Communities and Ecosystems. 2018. https://www.maine.gov/dacf/mnap/about/publications/community_classification.htm
- ³² DACF. Maine Natural Areas Program (MNAP). Salt-hay saltmarsh factsheet.
- ³³ MDIFW. Beginning with Habitat Program. Beginning with Habitat Guidebook. 2012. https://www.beginningwithhabitat.org/about_bwh/
- ³⁴ MDIFW. Essential Wildlife Habitat. <https://www.maine.gov/ifw/fish-wildlife/wildlife/endangered-threatened-species/essential-wildlife-habitat/index.html>
- ³⁵ MDIFW. Beginning with Habitat Program. Beginning with Habitat Guidebook. 2012. https://www.beginningwithhabitat.org/about_bwh/
- ³⁶ <https://oceanservice.noaa.gov/facts/bluecarbon.html>
- ³⁷The Trust for Public Land. The Economic Benefits of Land Conservation. 2007. http://cloud.tpl.org/pubs/benefits_econbenefits_landconserve.pdf