The Trustees of Reservations

The Natural History of Coskata-Coatue Wildlife Refuge

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First Edition

Photographs

Front Cover: Great Point Lagoon with Great Point lighthouse in the background. The borders of the lagoon are laced with salt marsh cordgrass, *Spartina alterniflora*.

Rear Cover: The Cedars with common hairgrass (*Deschampsia flexuosa*) and red fescue (*Festuca rubra*).

Acknowledgments

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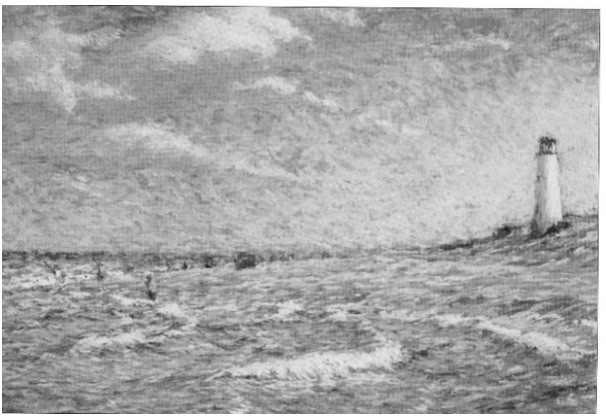
Contents

Jutting out from the northeast corner of Nantucket like a fish hook, Coskata-Coatue Wildlife Refuge comprises 1117 acres of woodlands, dunes, salt marshes, lagoons, and beaches. Each of these habitats has been shaped over thousands of years and is intricately connected with the entire ecosystem that comprises the wildlife refuge (see map) and its land-use history. In addition to its remarkable ecology, the wildlife refuge is noted for its abundance of recreational opportunities.



Geologic History

Nantucket, "the land far away at sea," is a monument to the power of ice and water. Its geologic history, although brief, is full of violent and amazing forces at work. The bedrock which provides a foundation for Nantucket consists of consolidated sedimentary, igneous, and metamorphic rock dating from Precambrian through the Mesozoic age (600 to 66 million years ago). Core samples show that bedrock is over 1400 feet below sedimentary deposits on Nantucket. These cores show layers of coal during the late

Cretaceous (75 million years ago), and a layer of shells between the Illinoian and Wisconsin Glaciations (between 125,000 and 75,000 years ago), indicating periods of both dense terrestrial vegetation and inundation by the sea.

The sediments below Nantucket were deposited similarly to those currently being deposited on New Jersey's coastal plain. Repeated Pleistocene glaciations—Illinoian, Kansan, and Nebraskan—scraped these deposits from the mainland of New England, leaving only scarified bedrock. Twenty-five thousand years ago, the latest glaciation occurred: the Wisconsin glaciation. During this period, the Laurentide ice sheet advanced across New England, reaching the southernmost extent 21,000 years ago. Eighteen thousand years ago, the retreat northward began as the glacier began to melt.

The moraines of Nantucket were created by the displacement of unconsolidated sediment sheets with the Cape Cod Bay lobe of this massive Laurentide ice sheet. Under the glacier's pressure, the sheets were folded and thrust faulted—forced forward and upward—creating a thrust moraine. As the glacier retreated, it deposited overwash material called Quidnet ice-contact deposits in its wake, covering parts of the moraine in areas such as Coskata Woods (Oldale, 1992). This process formed the sandy soils which now make up Nantucket as well as the physiography we see today. This geological history provides the foundation for a harsh but beautiful landscape.

Woodlands

Woodlands of Coskata-Coatue include Coskata Woods and the Cedars, both located in more central areas of the property. Coskata Woods cover approximately 60 acres whereas the Cedars cover 400 acres. Each has its own ecology, history, and beauty.

Coskata Woods

A remaining piece of Pleistocene outwash deposits, overlying Nantucket moraine, barely jutting out above Coskata Pond and surrounding sand dunes provides rooting substrate for Coskata Woods. To the two independent Nantucket tribes, which occupied the east and west sides of the island, respectively, Coskata means "at the broad woods." Just when Tristram Coffin and the other twenty-seven original white settlers arrived in 1659, the old sachem Wauwinet ruled the eastern tribe, probably with his son Nicornoose acting on his behalf. Over the years, these tribes deeded land to settlers who cleared the forested lands to make room for crops and sheep commons. One common was approximately an acre and a half, enough land for one sheep. Between 1659 and 1821, settlers divided the entire 29,380 acres of Nantucket into homesteads and sheep commons, dramatically changing the Nantucket landscape into a vast grassland and heathland (Douglas-Lithgow, 1914).

Probably due to its remoteness, Coskata Woods survived this clearing, and in 1711, a town law prohibited cutting in these woods. The result is a mature maritime oak woods with a diverse understory. Individual white and black oaks stretch upwards with thick, gnarled branches. Their old age emanates from each twisting trunk. For decades, salt spray and wind from the ocean and poor soil conditions have slowed the upward growth of trees, creating

broad but stunted canopies.

At Coskata Woods, eastern red cedars and tupelo are found in patches, the former in drier soils, the latter in more poorly drained sites. Woven into the structural framework of the woods is also a shrub thicket mosaic, which appears to be a result of tree mortality—regeneration of the forest is now occurring in these tree gaps as seedlings push their way upwards. In other areas more exposed to wind and salt spray, shrubs prevail.

Within the woods, tree regeneration, shrubs, vines, herbs, and grasses all compete for growing space. Beaked hazelnut, tupelo, sweet pepperbush, arrow-wood, poison ivy, and swamp azalea are the principal shrubs; raspberry, Virginia creeper, black huckleberry, bracken fern, and sassafras are less common.

Scattered within the oak woodlands are tupelo-red maple stands and eastern red cedar stands, each possessing different understory characteristics. Cinnamon and marsh fern are common under tupelo, whereas enchanter's nightshade and white avens grow below dense cedar stands. Shrub species intermingle within.

In the heart of the woods, shrubby clearings are home to winterberry holly, arrow-wood, sweet pepperbush, and red chokeberry. On the edges, dense thickets of Virginia rose, blackberry, rugosa rose, bayberry, black huckleberry, winged sumac, and highbush blueberry impede travel between the forest and the nearby dunes.

Coskata woods is home to a diverse assortment of invertebrates,

which vividly portrays a food web. Herbivores in the woods include leaf beetles, click beetles, plant bugs, and caterpillars of many moth species. Each of these species may specialize on an individual plant or a part of a plant. Predators, although less common than herbivores are none the less a significant part of the food web, regulating herbivore biomass. Predators include lynx spiders, lace wings, ladybird beetles, and ground beetles, which may catch insects that have fallen from their host plant. In addition, the salt marsh mosquito, *Aedes solicitans*, exists in swarms throughout Coskata woods. Females are parasites, requiring a blood meal for reproduction; males are nectar feeders. Their life cycle, however, begins in the salt marsh, for they require moist, salty surfaces for oviposition. Detritivores, scavengers, and generalists, such as ants and carrion beetles, help to complete the circle of the food web.

Beyond its interesting ecology is a myth perpetuated by sailors, whalers, and fishermen. When sailing near Coskata Woods, they would notice a mermaid or other creatures that would flee into the woods. In 1714, for example, a sailor named Valentyn spotted "a creature of a grizzlish or gray color, like that of a codfish skin" who "appeared like a sailor or a man." Two hundred years later, a former lighthouse keeper at Great Point found evidence that someone had been living in the woods. The myth of the mermaid lives on within the ancient trees of Coskata Woods (Philbrick, 1994).

The Cedars

Landward of Coskata beach and the Nantucket Sound lies a stretch of maritime red cedar savanna and woodland, which grows on Holocene dune deposits created when the sea level was lower than

at present. Over time, as sea level rose, the beach berm shifted to the west, creating new land. In this dune forming process, beach grass first takes hold, stabilizing the sand. Eventually, eastern red cedars take root in the sandy soil. The result is an increase in cedar density to the east—the older land. Interspersed among the cedars are common hairgrass and red fescue, which flow in golden waves with the wind. July summons the prickly pear cactus to bloom in these open areas. This is the northern limit of the cactus, which is only found along the Atlantic coast. In the late summer, goldenrods bloom profusely, providing nectar for insects. Within the goldenrod's flowers, lie ambush bugs, which grasp unsuspecting prey with their strong foreceps. Maritime shrubs—bayberry, huckleberry, roses, groundsel tree, and blueberry—form clonal patches throughout the Cedars. Small trees—black cherry, beach plum, and black oak—also grow within this vegetation mosaic. In certain spots, bearberry has clonally out-competed its neighbors, creating patches of this species among lichens, heather, red fescue, and lowbush blueberry.

The Cedars are located on Coatue, which means "at the pine woods." Lighthouse keepers of the eighteenth and nineteenth century used Coatue to access the town of Nantucket via horseback and row boat. Along the way, a keeper might pass dozens of shipwrecks despite charts Captain Pinkham, the first lighthouse keeper, created in 1790. A lifeguard station located along the shore helped to save those escaping their sinking ships. A fire on Coatue in the 1800s, as well as sheep grazing during this time, also portray this area's history and undoubtedly shaped the cedar savanna we see today.

During this time, the whaling industry was booming. After the Native Americans taught the white settlers to whale, whaling was established as a business in 1690, producing large quantities of oil. By 1842, eighty-six whaling ships were in operation and the population of Nantucket peaked at 10,000 inhabitants; the whaling trade extended throughout the world, bringing spices, silks, teas, and other goods back to Nantucket. A scarcity of whales, the discovery of gold in the California hills, increased use of petroleum, the Great Fire of 1846, and a decreased value of whale products reduced the population to 4,120 only thirty years later (Douglas-Lithgow, 1914).

Vertebrates

Patrolling above and within these woodland habitats are barn swallow, tree swallow, red-tailed hawk, American crow, kestrel, osprey, and northern harrier, many of which also frequent other habitats of the wildlife refuge for feeding or breeding. Passerine birds, such as summer tananger, have also been seen darting among the branches.

In woodland and other terrestrial habitats of the wildlife refuge, white-tailed deer commonly bound across the grass-covered dunes. In addition, many species of rodent and other mammals scurry through the shrubs.

Wetlands

Wetlands of Coskata-Coatue range in size from small swales covering less than one acre to the Glades and Coskata Pond, which stretch for approximately 300 acres at the heart of the refuge. The Great Point Lagoon covers an additional 40 acres. These wetlands provide the home to many species, including clams, crabs, and commercial fish.

Swales

Speckled to the east of Coskata woods, where moraine meets sand dunes, are freshwater and brackish wetlands found within swales. Each swale is home to a unique species assemblage. A large swale to the northeast of the woods is composed primarily of narrow-leaved cattail, with one dense patch of common reed occurring in the northwest corner of the marsh. Underneath the cattail are marsh ferns, marsh St. John's-wort, poison ivy, annual salt marsh fleabane, slender-leaved goldenrod, and Elliott's goldenrod. Along the swale edge are highbush blueberry and bayberry. Another swale located to the southeast of Coskata woods is composed of marsh fern, wool grass, cinnamon fern, and water smartweed.

To the east of the Cedars, where a vehicle trail once created a depression, prairie cordgrass, salt marsh bullrush, and three-square sedge grow in a swale lined with switchgrass.

Salt Marshes, Ecosystem Functions, and Processes

Throughout the wildlife refuge, salt marshes play a significant ecological role and comprise a large portion of the property. Salt marshes are among the most productive of the biosphere's ecosystems. Tidal marshes also play an important role in the

cycling of nutrients within marine ecosystems. The unique flora which comprise tidal marshes and the wealth of wildlife and marine animals which rely on these systems, make these areas important both for their economic and aesthetic value. Preserving the function of the wetland ecosystem is therefore necessary to maintain its human value.

The salt marshes of New England formed after the last glaciation during the period when the rate of sea level rise slowed enough to allow plants to colonize newly exposed mud flats. Niering and Warren (1980) estimate that between 3000 and 4000 years ago, the rapid post-glacial sea level rise of 2.3 millimeter per year began to slow to about one millimeter per year. During this time, marsh sedimentation rates approximated those of sea level rise. Marsh communities survived this gradual sea-level rise by expanding seaward onto newly-formed mud flats and landward towards the increasingly flooded upland and freshwater marshes (Niering and Warren 1980). This process of both landward and seaward development of the marsh led to elevation differences, drainage channels, and other microtopography features. For example, in the Glades, a ridge and valley pattern occurs. These patterns, in turn, affect the water flow and community patterns in the marsh.

Salt marsh processes include nutrient cycling and energy flows, which directly affect food web interactions. The high productivity of salt marshes provides both direct and indirect supplies of energy for secondary consumers. Direct consumption includes primarily herbivory by mammals, birds, and insects; indirect consumption generally involves the detrital pathway. Once marsh vegetation is decomposed to varying degrees, the high protein and caloric

detritus supports large numbers of estuarine species such as larval, juvenile, and adult sport and commercial fish; oysters, clams, macroinvertebrates, bacteria, and other species.

The Glades

A ridge and valley pattern dominates the Glades, a unique salt marsh-maritime shrubland complex which is located between the Cedars and Coskata Pond . The topography occurs at a small scale, with only a few vertical feet separating the ridges from the valleys, yet the vegetation differs markedly along this elevation gradient. The low marsh is composed primarily of salt marsh cordgrass. This cordgrass quickly cedes to salt meadow cordgrass, within which grows spike grass and sea lavender. In high salinity pannes, glasswort survive where other species cannot. Ridges are

The ridge and valleys of the Glades, Lloyd Raleigh

composed of groundsel tree, white sea blite, marsh elder, and lance-leaved goldenrod. More developed ridges include beach plum, red fescue grass, and eastern red cedar shrubs. These ridges are some of the oldest dunes on Nantucket, formed recently in the Holocene (est. 2,000 years B. P.) when the glaciers had retreated and the sea level was rising. Now these dune areas have flooded, resulting in salt marshes within the valleys (Oldale, 1985).

Great Point Lagoon

Distinct differences in soil characteristics affect vegetation patterns at the Great Point Lagoon. Soil moisture varies from saturated peat to dry sand dunes. Anoxic conditions exist in more stagnant sections as the smell of sulfur emanates from low-lying unvegetated peat; other areas are more favorable to plant and animal life. Due to rainfall, evaporation, and overwash, the Great Point lagoon exhibits great temporal fluctuations in water levels and salinity, affecting species composition. Over the last several years, for example, the Lagoon has become much smaller, leaving peat-laden sands behind. Growing in these sands are sea blites, sedges, lady's thumb, fall panic-grass and salt marsh fleabane. Each of these species is distributed in bands and patches according to its preferred growing space within the gradient of soil conditions. Along the lagoon in more inundated organic areas are distinct bands of high and low marsh composed of salt meadow cordgrass and salt marsh cordgrass, respectively. Within the high marsh are also salt marsh fleabane and sea lavender. In low lying salt pannes are glassworts. Nearby, a stand of three-square swordgrass, dotted with salt marsh bullrush, exists in a mucky swale.

Wetland Birds

The high productivity of salt marshes can be seen in the large numbers of birds that frequent Coskata Pond, the mudflats surrounding the Glades, Great Point Lagoon, and the wetlands south of Coskata woods. Probing for food within mudflats and sands are many species of shorebirds. Terns, with their distinctive flying and diving foraging display are also present in large numbers: least tern, roseate tern, common tern, and arctic tern. More generalist gulls patrol the wetlands and shores for a meal: greater

black-backed gulls, herring gulls, and an occasional Iceland gull, ring-billed gull, lesser black-backed gull, Bonaparte's gull, and laughing gull. Meanwhile, herons wait silently for a fish to swim by: snowy egret, great egret, black-crowned night heron, little blue heron, and tri-colored heron. At the Glades, osprey poles rise from the marsh; often one is occupied by a breeding osprey pair. Many other birds are also found in and around the wetlands.

Dune Complexes

Surrounding the Lagoon, along the Galls, and behind every beach berm of Coskata are dune complexes, covering approximately 200 acres. The degree of disturbance determines vegetation composition in these highly shifting environments at the land-ocean interface. Four primary plant associations can be found within the dunes of Coskata-Coatue: bayberry-beach plum alliances, heather alliances, beach grass alliances, and sparse herbaceous alliances. These associations grade into one another and also mix with other areas. For example, the Cedars' habitats include many species also found in the dune complexes—the presence of a species can therefore be seen in relation to its growing space requirements and is not exclusive to a particular community.

The bayberry-beach plum alliance can be seen as the most developed dune community, stabilizing dunes in the process. These maritime shrublands occur in patches along older dunes. Other plant species in the shrublands include poison ivy, Virginia rose, rugosa rose, sheep sorrel, groundsel tree, seaside goldenrod, eastern red cedar, and slender-leaved goldenrod. Within this association, are many herbivores: leaf beetles, plant bugs, leaf hoppers, and tree hoppers; and nectar feeders: adult hover flies;

male greenheads and mosquitoes; adult ant lions and parasitoid wasps. Checkered beetles and soft-winged flower beetles patrol flowers and foliage to prey on these herbivores.

Heather occurs in patches along with tall, sheep sorrel, sickle-leaved golden aster, seaside goldenrod, and lichens. This association is most often found in wide expanses of sterile sand behind the foredunes, where sand shifts constantly in the wind, but overwash is less common. Much of the ground in these areas is bare sand; therefore, herbivores are not an important component of this system. Sand colored band-winged grasshoppers are commonly seen within this habitat, and plant bugs, leaf hoppers, and leaf beetles can be found busily eating the more succulent plants.

The foredunes are dominated by beach grass, with beach pea trailing within its dense, windswept culms. This species uses rhizomes within its root system to propagate clonally and often one can see new dune-building culms aligned along these radiating rhizomes. As wave energies shift throughout the years, these dune communities may either be built or destroyed: large storms may overwash these dunes and create barren sand for the next community to colonize. Grasshoppers are fairly common within this habitat as are leafhoppers. Less common is a treehopper which is a thorn mimic and likely feeds on rose species.

In less stable sands such as those found in overwash areas and along the Galls and Great Point, the obligate seeder plant species thrive. Each year they rely on efficient seed dispersal mechanisms and disturbance to create new habitat. Due to these mechanisms,

these plants are more randomly distributed within the sandy substrate. Marsh orach, primroses, wild peppergrass, seaside spurge, salt marsh sand spurry, maritime pinweed, seaside goldenrod, sea rocket, sea poppy, sedges, and sea beach knotweed are some of the species found in this habitat.

Within the sand dune habitats, horned lark, northern harrier, American crow, kestrel, song sparrow, eastern kingbird, great-crested flycatcher, dark-eyed junco, northern flicker, killdeer, and other birds forage for seeds, insects, dead animals, rodents, or small birds.

From the tall dunes at Great Point, a view stretches panoramically in all directions. To the west lies the historic town of Nantucket; to the east stretches the Atlantic Ocean. The constellation Cygnus speckles the summer night as the lighthouse at Monomoy extends its light over the horizon.

Out of the dunes rises the Great Point lighthouse, rebuilt in 1986 with the help of $1,000,000 in appropriations garnered with the help of Senator Edward Kennedy. The first lighthouse, built in 1785, was made of wood; a fire destroyed it in 1816. A new stone lighthouse was built two years later; it would last until 1984. During this time, many keepers lived solitary lives out at Great Point. In 1955, however, the lighthouse was automated, ending the fabled history of keepers.

In 1857, kerosene and lard replaced whale oil to fuel the light, typifying the nation-wide shift away from whale products and the decline of the whaling industry. Despite the light at Great Point,

shipwrecks were still common in the shifting shoals.

The Beaches: land-ocean interface

Beaches are shaped and formed by shallow-water processes, waves, and storms creating the entire nine mile length of shoreline for the refuge. Wave energy dictates the profile of the beach berm and longshore currents move sand parallel to the shore. At Great Point, two longshore currents, each moving north along either side of Great Point and the Galls, converge, creating a rip current. Presently, sea levels are rising by about ten centimeters every century, with estimates up to 30 centimeters reported (Oldale 1992). The combination between the longshore current erosion, storms, and sea level rise can cause extreme erosion; Nantucket and Martha's Vineyard each lose substantial amounts of land each decade to erosion. In addition, Great Point is shifting as sand deposition occurs to the west and erosion to the east. In the winter

of 1984, the old lighthouse collapsed into the water during a storm, vividly dramatizing the powers of erosion. A hurricane in 1896 ruptured a stretch of beach just north of Wauwinet House, built just two decades earlier. The cut remained open for twelve years,

Great Point Lighthouse rubble, 1984
Nantucket Life-Saving Museum

physically separating Coskata-Coatue from Nantucket proper. This stretch of beach is known as the Haulover; cod fishermen looking for a shortcut to fishing areas to the east would haul their boats over this stretch of beach. Areas of the Galls have also been opened following storm events. Over time, longshore currents filled in the cuts, creating the beach we see today.

The results from beach processes create habitat for many species. Tides push seaweed, such as wrack, onto the berm, creating a wrack line. This wrack line is home to many invertebrate species. Within the sands, other invertebrates depend on the diurnal flooding to filter food from the water. Feeding upon these animals are piping plovers, sanderlings, and tiger beetles. Overwash created during storm events also provides breeding habitat for piping plovers and terns. The terns, which feed on fish in the ocean, show

the importance of marine inputs into terrestrial systems; without the ocean as a food source, Great Point would be devoid of its often vast tern colony, which can number in the hundreds. Likewise, gray and harbor seals, which occupy the tip of Great Point, feed on the fish and invertebrates around the rip tide. Harp and hooded seals also occasionally frequent Great Point. Since 1972, the Marine Mammal Protection Act has protected these amazing creatures, allowing them safe harbor in areas like Great Point. Smaller islands scattered in the shoals also provide haul-out sites for seals. Every year these small islands come and go, testimony to the dynamic nature of the ocean.

Over one-third of the least tern population for Massachusetts has historically occurred at Great Point, making it one of the most productive shorebird habitats in the northeastern United States. In May, they arrive from their winter habitats further south, beginning elaborate courtship rituals. By June, the colony dots the light-colored sand, their sand-colored eggs camouflaged perfectly. Northern harrier and American crow periodically enter the colony in search of a meal; often they are driven away by flocks of bombarding terns. A month later, precocial least tern broods dart along the sand, blending in as little cotton balls.

Piping plover also inhabit beach habitat. After performing court-ship rituals and defending their territory from other piping plover pair, a pair will nest, the female laying four eggs. Within a month, eggs that have escaped detection from predators and have survived inclement weather will hatch. Quickly chicks feed and prepare for their long journey to their wintering grounds in the southeastern United States; in a month they must grow and learn to fly.

At the turn of the century, plovers and terns were hunted for their feathers; plovers were even considered a delicacy. Excessive hunting led to the enactment of the Migratory Bird Treaty Act of 1918, which prohibited poaching of these bird species. Since then, a decline in shorebird populations has been attributed to human development, unmanaged recreational uses, increasing gull populations, and ground predators. Recently, however, piping plovers and least terns have begun to rebound in Massachusetts, due in part to stewardship and monitoring. At Coskata-Coatue Wildlife Refuge, shorebird protection is a priority and state guidelines needed to protect shorebirds are followed.

After the terns and plovers have migrated south, large numbers of seabirds make the shores of Coskata-Coatue their winter home. Just off-shore along the beach are red-breasted merganser, oldsquaw, common loon, brant, white-winged scoter, common eider, red-breasted loon, northern, mute swan, black scoter, double-crested cormorant, and bufflehead. In the spring, these birds will migrate, in turn, to their summer nesting areas as soaring gannets take their place in the summer. The cycle of life continues once again.

Bibliography

Butler, Karen T. 1996. *Nantucket Lights*. Nantucket, MA: Mill Hill Press.

Douglas-Lithgow, R. A. 1914. *Nantucket: A History*. New York: G. P. Putnam's Sons.

Mitsch, W. J. and J. G. Gosselink. 1986. *Wetlands*. New York: Van Nostrand Reinhold.

Niering, W. A. and R. S. Warren. 1980. Vegetation Patterns and Processes in New England Salt Marshes. *Bioscience*. 30: 301-307.

Nixon, S. W. and C. A. Oviatt. 1973. The Ecology of a New England Salt Marsh. *Ecol. Monogr*. 43:463-498.

Oldale, Robert N. 1992. *Cape Cod and the Islands: the Geologic Story*. Parnassus Imprints, East Orleans, Massachusetts.

Oldale, Robert N. 1985. *A Geologic Map of Nantucket and Nearby Islands, Massachusetts.*

Philbrick, Nathaniel. 1994. *Away Off Shore*. Nantucket, MA: Mill Hill Press.

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narrow-leaved cattail	*Typha*	*angustifolia*
oxeye daisy	*Chrysanthemum*	*leucanthemum*
pasture thistle	*Cirsium*	*pumilum*
path rush	*Juncus*	*tenuis*
pearly everlasting	*Anaphalis*	*margaritacea*
poison ivy	*Toxicodendron*	*radicans*
poor man's weatherglass	*Anagallis*	*arvensis*
prairie cordgrass	*Spartina*	*pectinata*
prickly dewberry	*Rubus*	*hispidus*
prickly pear cactus	*Opuntia*	*humifusa*
Queen Anne's lace	*Daucus*	*carota*

raspberry	*Rubus*	*ideus*
red chokeberry	*Aronia*	*arbutifolia*
red fescue	*Festuca*	*rubra*
red fescue	*Festuca*	*rubra*
red maple	*Acer*	*rubrum*
rugosa rose	*Rosa*	*rugosa*
salt-marsh cordgrass	*Spartina*	*alterniflora*
salt-meadow cordgrass	*Spartina*	*patens*
salt marsh bullrush	*Scirpus*	*maritimus*
salt marsh sand spurry	*Spegularia*	*marina*
sassafras	*Sassafras*	*albidum*
sea beach knotweed	*Polygonum*	*glaucum*
sea lavender	*Limonim*	*carolinianum*
sea poppy	*Glaucium*	*flavum*
sea rocket	*Cakile*	*edentula*
seabeach orach	*Atriplex*	*arenaria*
seabeach sandwort	*Arenaria*	*peploides*
seaside goldenrod	*Solidago*	*sempervirens*
seaside spurge	*Euphorbia*	*polygonifolia*
sedge species	*Cyperus*	*spp.*
sheep sorrel	*Rumex*	*acetosella*
sickle-leaved golden aster	*Crysopsis*	*falcata*
slender leaved goldenrod	*Euthamia*	*tenuifolia*
small sundrops	*Oenothera*	*perennis*
smooth sumac	*Rhus*	*glabra*
southern arrow-wood	*Viburnum*	*dentatum*
southern sea blite	*Suaeda*	*linearis*
spike grass	*Distichlis*	*spicata*
spotted touch-me-not	*Impatiens*	*capensis*
strawberry	*Frageria*	*sp.*
swamp azalea	*Rhododendron*	*viscosum*
swamp gooseberry	*Ribes*	*hirtellum*
sweet goldenrod	*Solidago*	*odora*
sweet pepperbush	*Clethra*	*alnifolia*
switchgrass	*Panicum*	*virgatum*
tall wormwood	*Artemesia*	*caudata*
three-square swordgrass	*Scirpus*	*americanus*
Tupelo	*Nyssa*	*sylvatica*
velvetgrass	*Holcus*	*lanatus*
Virginia creeper	*Parthenocissus*	*quinquefolia*
Virginia rose	*Rosa*	*virginiana*
Virginia wild rye	*Elymus*	*virginicus*
water smartweed	*Polygonum*	*scandens*
white avens	*Geum*	*canadense*
white oak	*Quercus*	*alba*
white sea blite	*Suaeda*	*maritima*
whorled loosestrife	*Lysimachia*	*quadrifolia*
wild peppergrass	*Lepidium*	*virginicum*
winged sumac	*Rhus*	*copellina*
winterberry	*Ilex*	*verticillata*
wool grass	*Scirpus*	*cyperinus*
yarrow	*Achillea*	*millefolium*

Index of Bird Species

American black duck	*Anas*	*rubripes*
American crow	*Corvus*	*brachyrhynchos*
American oystercatcher	*Haematopus*	*palliatus*
arctic tern	*Sterna*	*paradisaea*
bald eagle	*Haliaeetus*	*leucocephalus*
barn swallow	*Hirundo*	*rustica*
black-bellied plover	*Pluvialis*	*squatarola*
black-crowned night heron	*Nycticorax*	*nycticorax*
black scoter	*Melanitta*	*nigra*
Bonapart's gull	*Larus*	*philadelphia*
brant	*Branta*	*bernicla*
bufflehead	*Bucephala*	*albeola*
Canada goose	*Branta*	*canadensis*
common eider	*Somateria*	*mollissima*
common loon	*Gavia*	*immer*
common tern	*Sterna*	*hirundo*
common yellowthroat	*Geothlypis*	*trichas*
dark-eyed junco	*Junco*	*hyemalis*
double-creasted cormorant	*Phalacrocorax*	*auritus*
dunlin	*Calidris*	*alpina*
eastern kingbird	*Tyrannus*	*tyrannus*
eastern phoebe	*Sayornis*	*phoebe*
goldeneye	*Bucephala*	*spp.*
great-crested flycatcher	*Myiarchus*	*crinitus*
great egret	*Casmerodius*	*albus*
greater black-back gull	*Larus*	*marinus*
greater yellowlegs	*Tringa*	*melanoleuca*
herring gull	*Larus*	*argentatus*
horned lark	*Eremophila*	*alpestris*
Hudsonian godwit	*Limosa*	*haemastica*
Iceland gull	*Larus*	*glaucoides*
kestrel	*Falco*	*sparverius*
killdeer	*Charadrius*	*voc*
laughing gull	*Larus*	*atricilla*
least sandpiper	*Calidris*	*minutilla*
least tern	*Sterna*	*antillarum*
lesser black-back gull	*Larus*	*fuscus*
lesser golden-plover	*Pluvialis*	*dominica*
lesser yellowlegs	*Tringa*	*flavipes*
little blue heron	*Egretta*	*caerulea*
mallard	*Anas*	*platyrhynchos*
mute swan	*Cygnus*	*olor*
northern flicker	*Colaptes*	*auratus*
northern gannet	*Sula*	*bassanus*
northern harrier	*Circus*	*cyaneus*
oldsquaw	*Clangula*	*hyemalis*
osprey	*Pandion*	*haliaetus*
peregrine falcon	*Falco*	*peregrinus*
piping plover	*Charidrius*	*melodus*
red-breasted loon	*Gavia*	*stellata*
red-breasted merganser	*Mergus*	*serrator*
red-tail hawk	*Buteo*	*jamaicensis*
red-wing blackbird	*Agelaius*	*phoeniceus*
ring-bill gull	*Larus*	*delawarensis*

ring-necked pheasant	*Phasianus*	*colchicus*
roseate tern	*Sterna*	*dougallii*
ruddy turnstone	*Arenaria*	*interpres*
sanderling	*Calidris*	*alba*
savanna sparrow	*Passerculus*	*sandwichensis*
scarlet tananger	*Piranga*	*olivacea*
scaup	*Aythya*	*spp.*
semipalmated plover	*Charadrius*	*semipalmatus*
semipalmated sandpiper	*Calidris*	*pusilla*
short-billed dowitcher	*Limnodromus*	*griseus*
snowy egret	*Egretta*	*thula*
snowy owl	*Nyctea*	*scandiaca*
song sparrow	*Melospizaa*	*melodia*
spotted sandpiper	*Actitis*	*macularia.*
stilt sandpiper	*Calidris*	*himantopus*
summer tananger	*Piranga*	*rubra*
tree swallow	*Tachycineta*	*bicolor*
tri-colored heron	*Egretta*	*tricolor*
turkey vulture	*Cathartes*	*aura*
whimbrel	*Numenius*	*phaeopus*
white-winged scoter	*Melanitta*	*fusca*
willet	*Catoptrophorus*	*semipalmatus*
Wilson's phalarope	*Phalaropus*	*tricolor*

Glossary

anoxic	depleted of oxygen.
bedrock	solid rock below sediment and soil
berm	the upper slope of the beach, just before the dunes.
brackish	somewhat salty.
culm	the aboveground stem of grasses and sedges.
detritivore	an animal that feeds on detritus.
detritus	organic material composed of decomposing plants and animals.
ecosystem	a self-sustaining unit of plants, animals, and bacteria interacting with each other and the physical environment.
generalist	an animal that feeds on several types of food.
herbaceous	describing annual and perennial herbs.
Holocene	the current geological epoch of the Quaternary Period.
igneous	of volcanic origin.
Laurentide	describing an ice sheet originating in Canada during the Wisconsin glaciation.
metamorphic	characterized by physical or textural change caused by pressure, heat, or chemical action.
microtopography	small-scale changes in terrain.
moraine	a mass of rock, gravel, sand, silt, and clay deposited directly from a glacier.
obligate	necessary for survival or propagation of a species.
outwash	gravel and sands deposited from meltwater streams originating at a glacier.
parasitoid	a parasite that ultimately kills its host.
passerine	small to medium sized bird species, typically perching songbirds.
Pleistocene	the epoch preceeding the Holocene.
physiography	a description of the landscape and its nature.
rhizome	a creeping underground stem of a plant, aiding in propagating a plant.
savanna	a community type with sparse trees and a grassy understory.
understory	vegetation occurring under a forest canopy.

Lovers of nature should rally to preserve for themselves and all people...these scenes of natural beauty

Charles Eliot, 1891
Founder of
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