Ecological and Land Management Survey of Napatree Beach and Napatree Point, Westerly, Rhode Island

Submitted by
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NATURAL HISTORY SURVEY
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Site Location
Napatree Point and Napatree Beach are located in the village of Watch Hill in the town of Westerly, Washington County, Rhode Island. Napatree is located in the United States Geological Survey's Watch Hill, Rhode Island, and Mystic, Connecticut topographic quadrangles (Figure 1). The beach and western point of Napatree together form a barrier beach that extends into Little Narragansett Bay, in the southwestern corner of Rhode Island.

Directions
Napatree Beach can be accessed via Bay Street in Watch Hill. Travel Rt. 1 South to 1A, towards Westerly, Rhode Island. Follow Rt. 1A and then take a left onto Ocean View Highway, Watch Hill. Turn right onto Ninigret Ave. and follow until it intersects with Wauwinnet Ave. Take a right onto Wauwinnet Ave. and follow down the hill to Bay Street. Follow Bay Street towards the downtown shopping area. The parking area is on the right by the harbor.

Access/Parking
Parking can be found along Bay Street. Members of the Misquamicut Club Beach Club or the Watch Hill Yacht Club may also find parking in their designated parking lots at the harbor. Trails out to Napatree Point begin just on the other side of the fence around the Misquamicut Club Beach Club parking lot.

Survey Dates and Observers
Surveys were conducted on 21 July, 25 July, 12 August, 19 August, and 27 September, 2005 by Kristen Puryear (RINHS). Rick Enser (RI Natural Heritage Program) assisted on 21 July. Virginia Brown (RINHS Contractor) conducted insect surveys on 25 July, 2 August, 1 September, and 18 September 2005.

Property Description

Napatree beach is a barrier beach along the southern Rhode Island Coast. The beach extends west from Watch Hill Cove, and terminates at Napatree Point out in Little Narragansett Bay. Approximately 90% of the Napatree property is owned by the Watch Hill Fire District. The remainder of the land is owned by a combination of the Watch Hill Conservancy, the State of Rhode Island, the Town of Westerly, and a few private landowners (Barnes, personal communication). The Watch Hill Conservancy is pursuing the acquisition of these inholdings for conservation (Barnes, personal communication). About 70 acres of the land area at Napatree are currently in conservation (Barnes, personal communication).

The barrier beach is approximately 2000 meters long and 150 meters wide. The southern side of Napatree is dominated by a sloping sandy beach that transitions into vegetated dunes. The dunes divide the north and south shorelines. The northern side is also dominated by sandy beach, but is narrower and includes mudflats and gravelly shoreline towards the western end.

The barrier beach widens and becomes more ecologically diverse at its western end, near Napatree Point. The western tip consists of a complex of Maritime Dunes, shrubby areas, salt marsh, and Marine Intertidal Sand/Gravel Beach not found on the rest of Napatree. The remains of Fort Mansfield, a late 19th century military structure, are dug into the center of the western point. Napatree Point itself is a rocky shoreline that gradually gives way to gravel beach and a thick wrack line that makes an excellent feeding area for shorebirds. The western tip of Napatree curves northeastward like a hook, forming the northern edge of a tidal pond that is also fed by a tidal creek and small salt marsh (Figure 2).

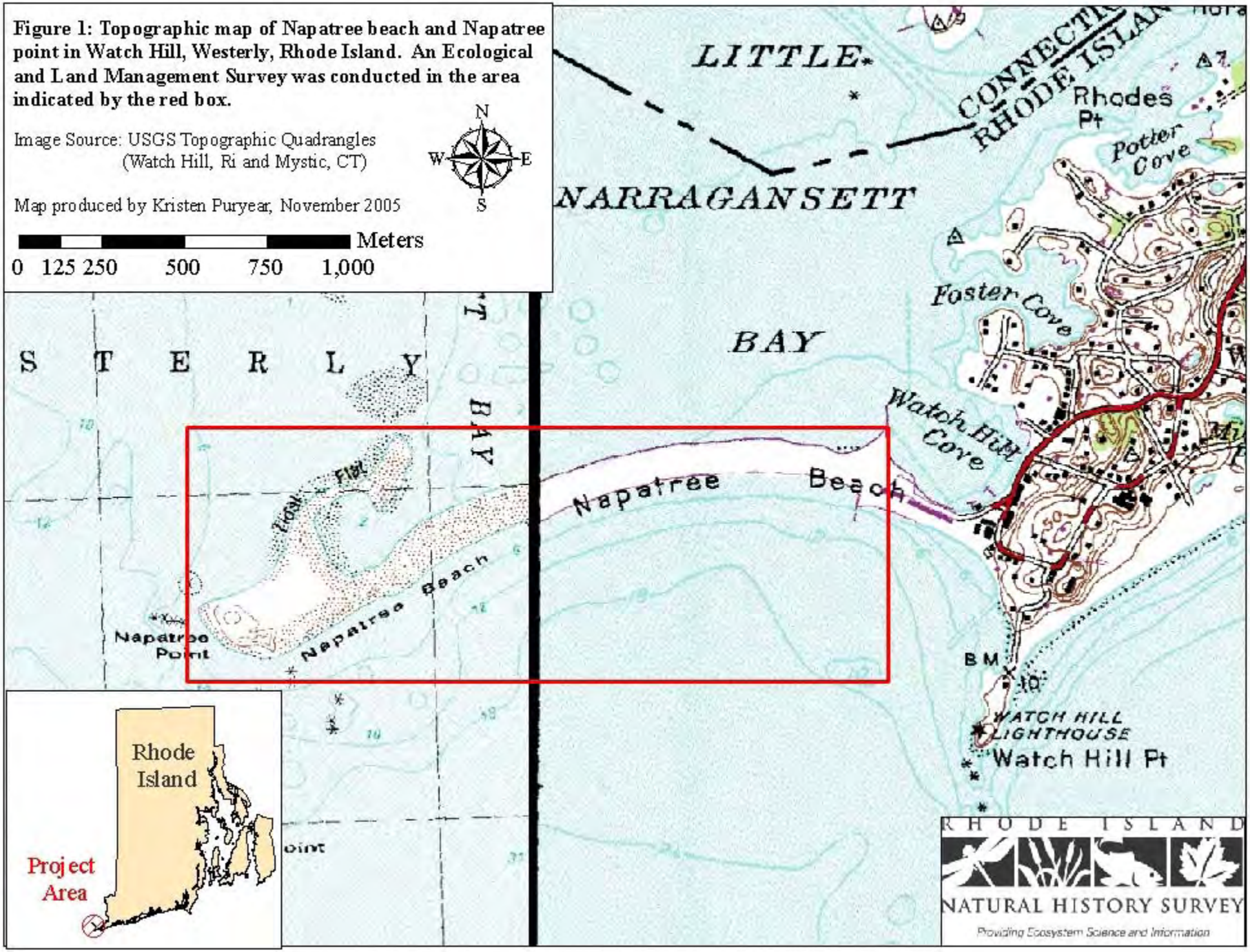

Figure 1: Topographic map of Napatree beach and Napatree point in Watch Hill, Westerly, Rhode Island. An Ecological and Land Management Survey was conducted in the area indicated by the red box.

Image Source: USGS Topographic Quadrangles
(Watch Hill, Ri and Mystic, CT)

Map produced by Kristen Puryear, November 2005

Figure 2: Aerial photograph of the western end of Napatree, including Napatree Point. The remains of Fort Mansfield can be seen in the photo. Note also the rocky beach on the western point, as compared to the sandy beach along the southern shore.

Image Source: RIGIS 1997 Orthophotograph

Map produced by Kristen Puryear, November 2005

N
W E
S

Meters

0 25 50 100 150 200

Natural Communities

Eleven different natural community types were identified on the barrier beach system at Napatree (Figure 3). The property is dominated by a Maritime Dune complex but also includes many smaller natural communities that tolerate the range of environmental conditions present in a barrier beach system, such as salt, wind, high tides, and drought. A Marine Subtidal subsystem exists below the lowest tide range of the barrier beach. Although this subsystem is beyond the land-ownership boundary it is affected by land uses on the barrier beach and by boats and house boats that anchor at Napatree Point, and is therefore included in the natural community descriptions below.

Representative photos of some natural communities at Napatree can be seen in Appendix A. Natural community descriptions follow those outlined in Enser and Lundgren (2005). An earlier draft (Enser 2002c) of the natural community descriptions can be found online at: http://www.dem.ri.gov/programs/bpoladm/plandev/heritage/pdf/comclass.pdf

Marine Subtidal: Includes the open water and subtidal aquatic beds of marine areas. This area is below the lowest tide line and is permanently inundated with salt water. May contain eelgrass beds, algae, and a large number of fish and mollusk species.

Marine Intertidal Mud Flat: The area between the highest and lowest tides where the substrate is dominated by organic rich silt or sand (Appendix A). May contain softshell clams (*Mya arenaria*) and blue mussel (*Mytilus edulis*). These mudflats are a critical feeding area for shorebirds and concentrations of migratory birds.

Marine Intertidal Sand/Gravel Beach: A sand and gravel area located between the high and low tide lines (Appendix A). Lacks vascular plants and experiences fluctuating levels of moisture and salinity. Important feeding area for migratory shorebirds, which feed on the abundant benthic invertebrates.

Tidal Creek: Tidally influenced brackish or saline creek that drains a coastal saltmarsh. The creek banks are exposed at low tide and typically support fiddler crabs (*Uca* spp.).

Brackish Marsh: Salinity and water levels vary. Contains a combination of plants typically found in both fresh water marshes and saltwater marshes, including narrowleaf cattail (*Typha angustifolia*), tall reed (*Phragmites australis*), robust bulrush (*Scirpus robustus*), and rose mallow (*Hibiscus moscheutos*). Provides nesting habitat for several species of birds. Typically found near tidal rivers or coastal ponds with access to the ocean.

Low Salt Marsh: A regularly flooded community in sheltered areas below mean high tide (Appendix A). Usually found near the edges of mudflats and tidal creeks and is dominated by salt marsh cordgrass (*Spartina alterniflora*) along with mats of marine algae. Fiddler crabs (*Uca* spp.) and seaside sparrow (*Ammodramus maritimus*) may be found here.

High Salt Marsh: Sheltered marsh between high tide and limit of spring tide flood lines (Appendix A). Irregularly flooded and dominated by small patches of salt-meadow cordgrass (*Spartina patens*), spike grass (*Distichlis spicata*), and black grass (*Juncus gerardii*). May also include sea-lavender (*Limmonium carolinianum*) and seaside gerardia (*Agalinis maritima*).

Salt Shrub: A shrub-dominated community that develops at the upland edge of a salt marsh, either as a linear border or as a shrub island within the marsh (Appendix A). Shrubs typically include salt

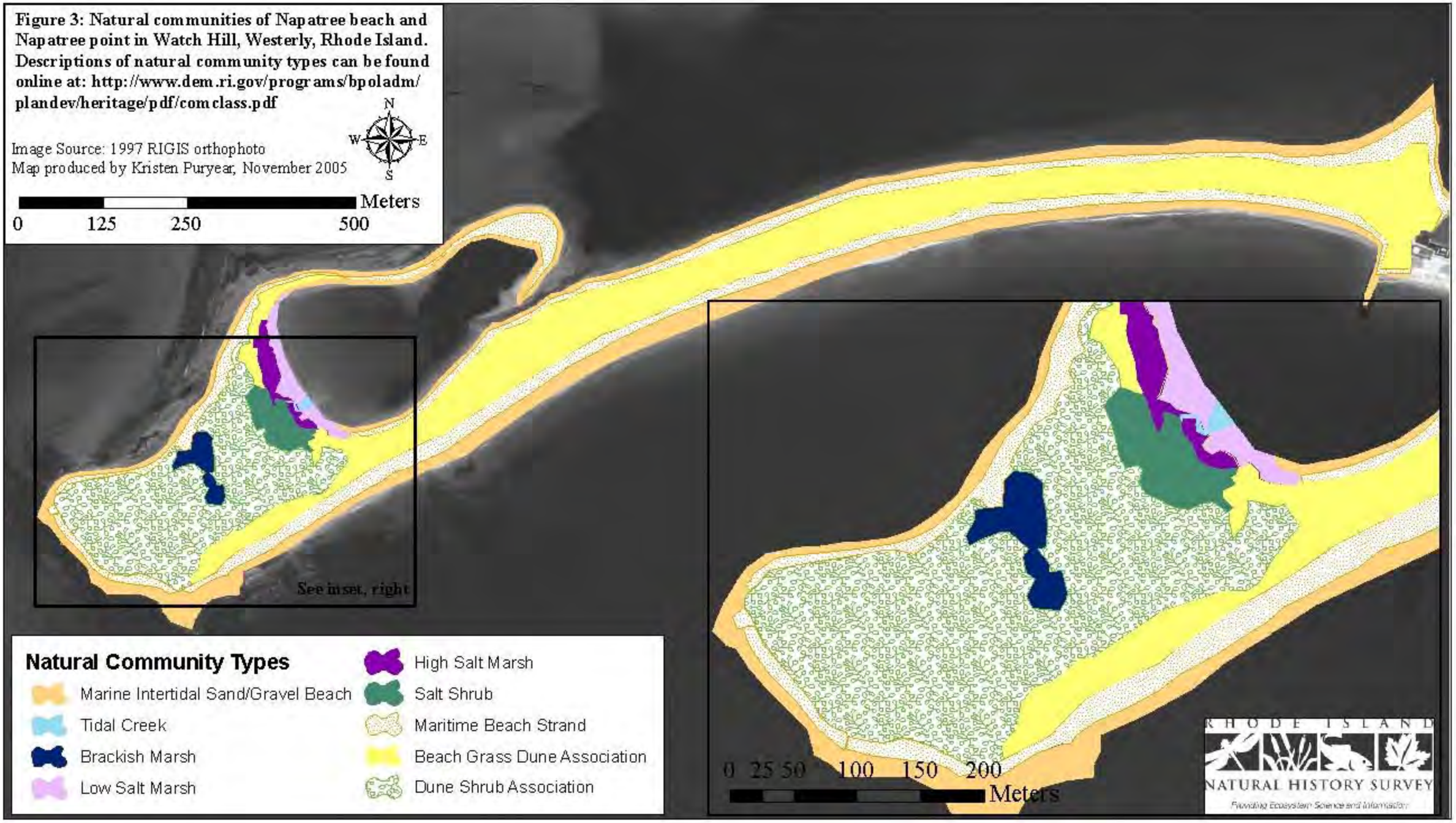
Figure 3: Natural communities of Napatree beach and Napatree point in Watch Hill, Westerly, Rhode Island. Descriptions of natural community types can be found online at: http://www.dem.ri.gov/programs/bpoladm/plandev/heritage/pdf/comclass.pdf
Image Source: 1997 RIGIS orthophoto
Map produced by Kristen Puryear, November 2005
N
W
E
S
Meters
0 125 250 500
See inset, right
Natural Community Types
Marine Intertidal Sand/Gravel Beach
Tidal Creek
Brackish Marsh
Low Salt Marsh
High Salt Marsh
Salt Shrub
Maritime Beach Strand
Beach Grass Dune Association
Dune Shrub Association
0 25 50 100 150 200
Meters
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marsh elder (*Iva frutescens*) and groundsel-tree (*Baccharis halimifolia*). Herbaceous plants may be dominated by salt meadow cordgrass (*Spartina patens*) and switchgrass (*Panicum virgatum*).

Maritime Beach Strand: A community that is regularly disturbed by wind and storm waves and therefore contains only sparse vegetation dominated by orach (*Atriplex patula*), sea rocket (*Cakile edentula*), and seabeach sandwort (*Honkenya peploides* var. *robusta*) (Appendix A). Tiger beetles (*Cicindela* spp.) are often present.

Beach Grass Dune Association (Maritime Dune community type): Located on the active portions of sand dunes and subject to sand shifting (Appendix A). Dominated by plants such as beachgrass (*Ammophila breviligulata*), seaside goldenrod (*Solidago sempervirens*), beach-pea (*Lathyrus japonicus*), and dusty miller (*Artemisia stellariana*). May also include large stands of non-native rugose rose (*Rosa rugosa*).

Dune Shrub Association (Maritime Dune): Found on the more protected parts of dunes and dominated by woody vegetation such as northern bayberry (*Myrica pensylvanica*), poison ivy (*Toxicodendron radicans*), and the non-native rugose rose (*Rosa rugosa*) (Appendix A).

Aquatic Resources

There do not appear to be any fresh water aquatic resources on Napatree. A small tidal creek drains the salt marsh at the western end of the beach. There are numerous saltwater resources surrounding the property. People were observed fishing off Napatree point, searching for clams in the mudflats at the west end, anchoring boats, and swimming along both shorelines.

Flora

A complete list of all plants found at Napatree during the summer 2005 survey can be found in Table 1. Additional information regarding abundance and status in Rhode Island can be found in Appendix B.

A total of 62 plant species were recorded in 2005. Of these, 28 are native, 27 are non-native, and seven are of unknown origin (Table 1). Out of the 27 non-native species, four are considered to be invasive in Rhode Island: Asiatic bittersweet (*Celastrus orbiculatus*), purple loosestrife (*Lythrum salicaria*), multiflora rose (*Rosa multiflora*), and Morrow honeysuckle (*Lonicera morrowii*) (Gould 2001). Fact sheets for several of the most common of these non-native species at Napatree, with recommendations for removal and/or management, can be found in Appendix C. Most of the non-native species (including all of the invasive species) were found at the western end of Napatree, around the old military forts.

One state-listed plant was found in 2005 (Enser 2002b). Several populations of seabeach sandwort (*Honckenya peploides var. robusta*), a species of concern in Rhode Island, were found at the western end of Napatree on sandy or cobbly substrates along the dune edges (Figure 4). Seabeach sandwort is a low, spreading perennial with thick, fleshy (succulent) leaves that is typically found on sand or cobble beaches (Figure 5; Stuckey and Gould 2000). It is susceptible to trampling, and will grow less vigorously or will not grow at all in areas that are heavily disturbed by foot traffic (Stuckey and Gould 2000). The plants found at Napatree were in patches three or more feet in diameter and were either located along rocky edges that are relatively protected from foot traffic, or seemed to be tolerating current levels of foot traffic. An increase or expansion in foot traffic and informal trail-


Figure 4: Occurence locations at Napatree of rare, threatened, or endangered plant and animal species, as listed by the RI Natural Heritage Program (Enser 2002a and 2002b). These species were documented during the summer 2005 inventory. Points on the map are approximate.
Image Source: RIGIS 1997 Orthophotograph
Map produced by Kristen Puryear, November2005
N
W
E
S
Meters
0 37.5 75 150 225 300
Shorebird species
Shorebird species
Seabeach tiger beetle
Piping plover
Seabeach tiger beetle
Piping plover (young)
Seabeach tiger beetle
Seabeach sandwort
Osprey (nest)
Great egret
Northern Harrier (hunting)
Seabeach sandwort
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NOTE: The Natural Heritage Database is the most current and comprehensive information source about the rare biota of Rhode Island. However, such databases are only as complete as the information that has been collected. Data provided here are intended to provide a baseline dataset for element occurrence locations for the specific site of interest. Uses of the data can include: natural resource management, conservation planning, environmental review, biological and ecological research, land acquisition, and economic development. RINHS holds copyright to its databases. The RINHS data license fee does not include the right to publish data or descriptions from RINHS databases. These rights must be purchased on a different basis depending on the rights requested. Contact RINHS for further information.

Table 1: Plant species recorded at Napatree, Watch Hill, Rhode Island during 2005 inventory. Plants are listed by life form, and follow nomenclature found in Gould et al. (1998). Additional information about abundance and distribution can be found in Appendix B.

Taxonomic Group	Common Name	Latin Name	Primary Location
Grasses, Rushes, Sedges (12)			
Native (6)	Beachgrass	*Ammophila breviligulata*	Dunes
	Nutsedge	*Cyperus esculentus*	Dunes
	Salt-meadow Spike Grass	*Distichlis spicata*	Salt marsh edges
	Black Rush	*Juncus gerardii*	Salt marsh edges
	Salt-water Cordgrass	*Spartina alterniflora*	western end, northern side
	Salt-hay Grass	*Spartina patens*	Salt marsh edges
Non-Native (4)	Quack-grass	*Elytrigia repens*	
	Velvet Grass	*Holcus lanatus*	
	Timothy	*Phleum pratense*	
	Common Reed	*Phragmites australis*	Western end wetland
Unknown (2)	Sedge	*Carex sp.*	
	a grass	*Panicum sp.*	
Wildflowers/ Herbaceous (36)			
Native (14)	Milkweed sp.	*Asclepias sp.*	
	Asters	*Aster* spp.	
	Sea Rocket	*Cakile edentula*	
	Coast-blite	*Chenopodium rubrum*	
	Cow-parsnip	*Heracleum lanatum*	
	Seabeach-sandwort**	*Honckenya peploides var. robusta*	
	Beach-pea	*Lathyrus japonicus (maritimus)*	
	Sea-lavendar	*Limonium carolinianum*	salt marsh
	Perennial Saltwort	*Salicornia virginica*	salt marsh
	Common Saltwort	*Salsola kali*	
	Seaside-goldenrod	*Solidago sempervirens*	
	American Germander	*Teucrium canadense*	wrack line
	Narrow-leaved Cattail	*Typha angustifolia*	Fort
	Common Cocklebur	*Xanthium strumarium*	
Non-Native (18)	Dusty Miller	*Artemisia stelleriana*	
	Hairy Bassia	*Bassia hirsuta*	salt marsh
	Ox-eye Daisy	*Chrysanthemum leucanthemum*	Fort
	Jimson-weed	*Datura stramonium*	salt marsh and shores
	Queen Anne's Lace	*Daucus carota*	Fort

Table 1, continued

Taxonomic Group	Common Name	Latin Name	Primary Location
Wildflowers/ Herbaceous (cont.)			
	Deptford Pink	*Dianthus armeria*	
	Cleavers	*Galium aparine*	
	Common St. Johnswort	*Hypericum perforatum*	
	Field-cress	*Lepidium campestre*	West end
	Purple Loosestrife*	*Lythrum salicaria*	Fort
	English Plantain	*Plantago lanceolata*	
	Wild Radish	*Raphanus raphanistrum*	
	Sheep-sorrel	*Rumex acetosella*	
	Curly Dock	*Rumex crispus*	
	European Bittersweet	*Solanum dulcamara*	
	Common Chickweed	*Stellaria media*	West end
	Red Clover	*Trifolium pratense*	
	Common Mullein	*Verbascum thapsus*	West end
Unknown (4)	Common Yarrow	*Achillea millefolium*	
	Wormwood	*Artemisia sp.*	
	Orach	*Atriplex hastata*	salt marsh edges
	Lettuce sp.	*Lactuca sp.*	
Vines (5)			
Native (3)	Hedge-bindweed	*Calystegia sepium*	
	Virginia Creeper	*Parthenocissus quinquefolia*	West end
	Poison Ivy	*Toxicodendron radicans*	West end (very abundant)
Non-Native (1)	Asiatic Bittersweet*	*Celastrus orbiculatus*	West end
	Field-cress	*Lepidium campestre*	West end
	Purple Loosestrife*	*Lythrum salicaria*	Fort
Trees and Shrubs (9)			
Native (5)	Groundsel Tree	*Baccharis halimifolia*	salt marsh
	Marsh-elder	*Iva frutescens*	salt marsh
	Northern Red Cedar	*Juniperus virginiana*	
	Northern Bayberry	*Myrica pensylvanica*	
	White Pine	*Pinus strobus*	dunes
Non-Native (4)	Morrow Honeysuckle*	*Lonicera morrowii*	
	Multiflora Rose*	*Rosa multiflora*	West end and some interior locations
	Rugose Rose	*Rosa rugosa*	throughout
	Red Pine	*Pinus resinosa*	west end dunes, scattered in interior

use could jeopardize the presence of the seabeach sandwort. Future monitoring could help insure that populations of seabeach sandwort remain stable at Napatree.

Two additional plant species listed by the Natural Heritage program have been documented in the past at Napatree[1]. Seabeach knotweed (*Polygonum glaucum*), a state-threatened species, was last observed at Napatree in 2002 (RINHP 2005). It was not found in either a 2004 or this year's survey. We also were not able to find tall wormwood (*Artemisia campestris var. caudate*), a species of concern that was last documented at Napatree in 1986 (RINHP 2005). Additional targeted surveys are recommended in order to update the Natural Heritage database and verify species presence.

Figure 5: Seabeach sandwort (*Honckenya peploides* var. *robusta*) along the edge of a cobble beach at Napatree Point.

Fauna

Mammals

A formal mammal survey was not conducted at Napatree this summer; however records of casual observations exist from this survey as well as from other observers. Signs of white-tailed deer were abundant on the west end of the beach during summer 2005, in both the salt marsh and shrub-dominated areas (Table 2). In addition, an eastern red bat (*Lasiurus borealis*) has occasionally been seen flying over the dunes, and striped skunks (*Mephitis mephitis*) are regularly seen near the parking lot and the western end near Napatree Point (Enser personal communication).

Reptiles and Amphibians

A single smooth green snake (*Liochlorophis vernalis*) was found dead in the salt marsh (Table 2). Puncture wounds suggest that it had been captured and dropped by a bird, so it is unclear where the snake originally came from. Rick Enser (personal communication) reported the unusual sighting of a single box turtle (*Terrapene carolina*) that had washed up onshore several years ago. Green frogs have also been found in the wet areas around the old Fort Mansfield (Enser personal communication).

[1] The Natural Heritage Database is the most current and comprehensive information source about the rare biota of Rhode Island. However, such databases are only as complete as the information that has been collected.

Data provided here are intended to provide a baseline dataset for element occurrence locations for the specific site of interest. Uses of the data can include: natural resource management, conservation planning, environmental review, biological and ecological research, land acquisition, and economic development.

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Table 2: Mammals, reptiles, and amphibians recorded at Napatree during the 2005 survey and previous records. Rhode Island status descriptions are from August et al. (2001).

	Common Name	Latin Name	Rhode Island Status
Mammals (3)	White-tailed Deer	*Odocoileus virginianus*	Common
	Eastern red bat	*Lasiurus borealis*	Common
	Striped skunk	*Mephitis mephitis*	Common
Reptiles & Amphibians (3)	Smooth Green Snake	*Liochlorophis vernalis*	Common
	Eastern box turtle	*Terrapene carolina carolina*	Present
	Green frog	*Rana clamitans melanota*	Common

Birds

A total of 52 species of birds were observed at Napatree between June and November 2005. Twenty-seven of these species were reported to the Rhode Island Rare Bird Alert (RBA) Listserv during this time period; however we were not able to verify these sightings within our limited number of field visits. A complete list of all species recorded, including the source of the observation and the Rhode Island abundance status can be found in Table 3. Of the 52 species recorded, 14 have been designated as rare, threatened, or endangered by the RI Natural Heritage Program or the Federal government: two are listed as federally endangered, one as federally threatened, one as state endangered, one as state threatened, and nine as species of concern (Enser 2002a).

A pair of Osprey (Species of Concern) made use of one of the nesting platforms at Napatree, and adults were seen carrying fish to a chick through July. Piping Plovers (Federally Threatened) were also confirmed to be breeding at Napatree, and three young were seen in the roped off exclosure area on the north side of the beach.

Song Sparrows were the one of the most common songbird species, and likely one of the only birds to nest in the dunes. Large colonies of tern species (*Sterna* spp.) and American Oystercatchers (*Haematopus palliates*) were observed throughout the summer, flying over the barrier beach and feeding in the wrack lines and mud flats at the western end of Napatree, in particular near the mouth of the small tidal pond. These and other summer resident shorebird species were likely breeding on some of the islands across Little Narragansett Bay (Enser, personal communication).

Napatree is situated along the southern Rhode Island coast, within the Atlantic flyway for migratory birds. As a result many of the species documented at Napatree were migrants, and were not breeding on the property. The large number of shorebirds (such as some plovers and sandpipers) and migrating raptors (hawks and falcons) observed at Napatree mark this barrier beach as an important resting and feeding area for migrating birds. The mudflats and sandy beach areas provide bountiful foraging opportunities for shorebirds, and several raptors, such as Kestrals and Northern Harriers, were seen hunting over the dunes.

Table 3: Birds observed from June-November 2005 at Napatree, Westerly, Rhode Island. Abundance information is from Enser (2002a) and August et al. (2001), and refers to species abundance as either a breeding species or as a migrant/visiting species in Rhode Island. A -- indicates the species is not known to breed in RI. For example, the double-crested cormorant is present as a breeding species and a common migrant. If an adult bird was observed at Napatree with a nest or with young, or if juveniles were seen, it is marked as a "confirmed" breeder at Napatree. The breeding category was left blank if no evidence was found. Common names marked with a * indicate that the species sighting was taken from the Rhode Island Rare Bird Alert Listserv. All other species were observed by Kristen Puryear (RINHS).

Common Name	**Latin Name**	**RI Abundance (Breeding/Migrant)[2]**	**Breeding**
Common Loon*	*Gavia immer*	--/Common	
Double-crested Cormorant	*Phalacrocorax auritus*	Present/Common	Confirmed
Great Egret	*Ardea alba*	Present/Present (State Concern)	
Osprey	*Pandion haliaetus*	Present/Present (State Concern)	Confirmed
Northern Harrier	*Circus cyaneus*	Rare/Present (State Endangered)	
Sharp-shinned Hawk*	*Accipiter striatus*	Historic/Present	
Coopers Hawk*	*Accipiter cooperii*	Rare/Present	
American Kestral	*Falco sparverius*	Present/Present	
Merlin*	*Falco columbarius*	--/Present	
Peregrine Falcon*	*Falco peregrinus*	Rare/Rare (Federal Endangered)	
Sora*	*Porzana carolina*	Rare/Present (State Concern)	
Black-bellied Plover	*Pluvialis squatarola*	--/Present	
American Golden Plover*	*Pluvialis dominica*	--/Rare	
Semipalmated Plover	*Charadrius semipalmatus*	--/Present	
Piping Plover	*Charadrius melodus*	Rare/Rare (Federal Threatened)	Confirmed
American Oystercatcher	*Haematopus palliatus*	Rare/Rare (State Concern)	
Greater Yellowlegs	*Tringa melanoleuca*	--/Present	
Solitary Sandpiper	*Tringa solitaria*	--/Present	
Willet	*Catoptrophorus semipalmatus*	Rare/Present (State Concern)	
Spotted Sandpiper	*Actitis macularia*	Present/Present	
Whimbrel*	*Numenius phaeopus*	--/Present	
Ruddy Turnstone	*Arenaria interpres*	--/Present	
Red Knot*	*Calidrus canutus*	--/Present	
Sanderling	*Calidris alba*	--/Present	

[2] RI abundance descriptions according to August et al. (2001):
Common - species occurs in large numbers, and may be either widespread or locally common.
Present - species can be found in appropriate habitat but is not found in high numbers.
Rare - species is very localized and can only be found in 1-10 nesting locations or, if a transient/migrant, is only seen 1-10 times per decade.
Historic – recently (within 200 years) extirpated as a breeding and/or migratory species.

Table 3, continued

Common Name	Latin Name	RI Abundance[3]	Breeding
Least Sandpiper*	*Calidris minutilla*	--/Present	
White-rumped Sandpiper*	*Calidris fusciollis*	--/Present	
Dunlin*	*Calidris alpina*	--/Present	
Short-billed Dowitcher	*Limnodromus griseus*	--/Present	
Herring Gull	*Larus argentatus*	Common/Common	
Great Black-backed Gull	*Larus marinus*	Present/Common	
Roseate Tern	*Sterna dougallii*	Historic/Rare (Federal Endangered)	
Common Tern	*Sterna hirundo*	Present/Present	
Forster's Tern*	*Sterna forsteri*	--/Rare	
Least Tern	*Sterna antillarum*	Present/Present (State Threatened)	
Black Tern*	*Chlidonias niger*	--/Rare	
Mourning Dove	*Zenaida macroura*	Common/Common	
Ruby-throated Hummingbird	*Archilochus colubris*	Present/Present	
Northern Shrike*	*Lanius excubitor*	--/Rare	
Horned Lark*	*Eremophila alpestris*	Rare/Present (State Concern)	
Tree Swallow	*Tachycineta bicolor*	Present/Present	
Winter Wren*	*Troglodytes troglodytes*	Rare/Rare (State Concern)	
Marsh Wren*	*Cistothorus palustris*	Present/Present (State Concern)	
Gray Catbird	*Dumetella carolinensis*	Common/Common	Confirmed
European Starling	*Sturnus vulgaris*	Common/Common (Non-native)	Confirmed
American Pipit*	*Anthus rubescens*	--/Rare	
Yellow Warbler	*Dendroica petechia*	Present/Present	
Nelson's Sharp-tailed Sparrow*	*Ammodramus nelsoni*	--/Rare	
Seaside Sparrow*	*Ammodramus maritimus*	Rare/Rare (State Concern)	
Song Sparrow	*Melospiza melodia*	Common/Common	Confirmed
Swamp Sparrow*	*Melospiza georgiana*	Present/Present	
White-crowned Sparrow*	*Zonotrichia leucophrys*	--/Rare	
Lapland Longspur*	*Calcarius lapponicus*	--/Rare	

[3] RI abundance descriptions according to August et al. (2001):
Common - species occurs in large numbers, and may be either widespread or locally common.
Present - species can be found in appropriate habitat but is not found in high numbers.
Rare - species is very localized and can only be found in 1-10 nesting locations or, if a transient/migrant, is only seen 1-10 times per decade.
Historic – recently (within 200 years) extirpated as a breeding and/or migratory species.

Invertebrates (Insects and marine invertebrates of note)*****
Note: The written information and corresponding tables on dragonflies, damselflies, and robber flies was researched and submitted by Virginia Brown, RINHS Contractor.

Odonata (Dragonflies and Damselflies) and Asilidae (Robber flies)

During the summer of 2005, four site visits were made to Napatree Point to conduct inventory of robber flies and migrating dragonflies and damselflies. The focus of inventory of these insect groups was primarily on beach species of robber flies and southward bound migrating dragonflies and damselflies.

Robber flies are generally large predatory flies which feed on other insects. Some species are specific to certain terrestrial habitats and therefore can serve as indicators of the presence of high quality or appropriate habitat. Dragonflies and damselflies are predatory insects which inhabit a wide variety of aquatic and wetland types. A small group of species are known to undertake regular spring and fall migrations, with the largest concentrations usually in the late summer and early fall. Because of the geographic position of Napatree Point running southwestward along the Atlantic Ocean, it is the last migration corridor for fall migrants moving south along the Rhode Island coast. A number of species of Odonata are known to migrate southward along Atlantic beaches in late summer and early fall. Spectacular concentrations of these insects have been reported from other coastal locations in Rhode Island, but nothing has been recorded from Napatree Point until this time. Additionally, Napatree Point contains some of the best coastal beach and dune habitat in Rhode Island. This type of habitat supports two species of robber flies that are uncommon to rare in southern New England: *Efferia albibarbis* and *Stichopogon argenteus*. These insects are sensitive to disturbance on beaches and dunes, and their distribution in Rhode Island may be limited by this factor. Searches for these species at other beaches in southern Rhode Island were conducted in 2004, but the barrier beach system at Napatree Point had not been inventoried prior to 2005.

Surveys were conducted on 25 July, 2 August, 1 September, and 18 September 2005. Table 4 lists the 13 species of dragonflies and damselflies recorded at Napatree Point during 2005 surveys, their status in Rhode Island, and their local status at Napatree. Appendix D defines Rhode Island distribution and abundance ranks. The majority of odonate species (9 of 13) were migrants, with 4 of 13 species considered resident in coastal wetlands associated with the barrier beach. Since freshwater ponds do not exist on Napatree Point, most dragonflies and damselflies can not breed there. The four species considered resident are those which inhabit brackish marshes and/or salt ponds.

Dragonfly migrations are observed in high concentrations immediately after the passage of frontal systems from late August through mid to late September. These are similar conditions to those that produce large bird migrations. August and September surveys were conducted just after frontal passages, and two of the three surveys were after passage of low pressure systems with the remnants of Hurricane Katrina and Hurricane Rita. All of the migrants moving over Napatree Point are common to abundant dragonfly species which are regularly found in migratory flights. The most abundant of these is the Common Green Darner (*Anax junius*). Of those species considered to be resident on Napatree Point, the Seaside Dragonlet (*Erythrodiplax berenice*) is the most abundant. It occurs in all coastal Rhode Island townships with brackish marsh habitats. Conversely, the least abundant of the resident species is the Big Bluet (*Enallagma durum*), which is more limited in occurrence in Rhode Island than the previous species.

Table 4: Odonata (dragonflies and damselflies) of Napatree, Westerly, Rhode Island, observed during 2005. Species follow nomenclature found in Paulson and Dunkle (1999).

Latin Name	Common Name	Rhode Island Status	Napatree Status
Anax junius	Common Green Darner	Ubiquitous/Abundant	Abundant/Migrant
Enallagma civile	Familiar Bluet	Ubiquitous/Abundant	Common/Resident
Enallagma durum	Big Bluet	Limited/Uncommon	Uncommon/Resident
Epiaeschna heros	Swamp Darner	Widespread/Common	Uncommon/Migrant
Erythrodiplax berenice	Seaside Dragonlet	Limited/Common	Common/Resident
Ischnura hastata	Citrine Forktail	Widespread/Common	Uncommon/Resident
Libellula pulchella	Twelve-spotted Skimmer	Ubiquitous/Abundant	Common/Migrant
Libellula semifasciata	Painted Skimmer	Ubiquitous/Abundant	Uncommon/Migrant
Pachydiplax longipennis	Blue Dasher	Ubiquitous/Abundant	Common/Migrant
Pantala flavescens	Wandering Glider	Ubiquitous/Common	Common/Migrant
Pantala hymenaea	Spot-winged Glider	Widespread/Common	Common/Migrant
Tramea carolina	Carolina Saddlebags	Widespread/Common	Common/Migrant
Tramea lacerata	Black Saddlebags	Widespread/Common	Common/Migrant

During insect surveys at Napatree Point, three species of robber flies were recorded (Table 5). *Proctacanthus rufus*, a large spectacular robber fly with reddish/orange abdomen, was particularly abundant in the dunes at Napatree Point. Numbers observed here were greater than those seen at any other Rhode Island location. *P. rufus* was observed with prey on the beach at Napatree as well as in the dunes. This species is relatively common in southern New England.

Table 5: Asilidae (Robber flies) of Napatree, Westerly, Rhode Island, observed during 2005. Species follow nomenclature found in Fisher and Wilcox (1997).

Latin Name	Habitat Type	Napatree Status
Diogmites basalis	Grassy fields, sand dunes	Uncommon
Efferia albibarbis	Sand beaches	Common
Proctacanthus rufus	Sandy plains, barrens, dunes	Abundant

Efferia albibarbis was another common robber fly species at Napatree Point. It is considered a coastal beach specialist, and lives in sand dunes and on sandy beaches. *E. albibarbis* is widespread on the beaches of Narragansett Bay, but more limited in occurrence on Block Island sound. It is uncommon to rare within the larger context of southern New England. A second beach specialist expected in our area, *Stichopogon argenteus*, was not found at Napatree Point. There is abundant suitable habitat at this site for this species, so its absence from the beach here is puzzling. However, *S. argenteus* has been found at only four Rhode Island beaches, despite surveys at nearly a dozen other coastal locations with appropriate habitat.

E. albibarbis and *S. argenteus* are generally found on the active beach front of the coast, as well as in dunes and dune blow-outs. These species may be sensitive to trampling and other intensive uses of beaches and dunes, including vehicle use.

Lepidoptera (Butterflies)

Four species of butterflies were detected during other invertebrate surveys (Table 6). In September, hundreds of Monarch butterflies (*Danaus plexippus*) were seen feeding on seaside goldenrod and were likely congregating as part of a migratory event. All of the butterfly species found during our survey are considered common in Rhode Island and can be found in a wide variety of habitats; however at Napatree all seemed to be concentrated over the vegetated dunes. The only non-native species is the cabbage white (*Pieris rapae*), a butterfly introduced from Europe (Brock and Kaufman 2003).

Table 6: Other invertebrate species (including marine invertebrates) recorded in 2005 at Napatree, Westerly, Rhode Island. Tiger beetle species names follow nomenclature found in Sikes (2004).

	Latin Name	**Common Name**	**Habitat/location**
Lepidoptera: Butterflies	*Vanessa cardui*	Painted Lady	possibly migrating
	Vanessa atalanta	Red Admiral	over dunes
	Pieris rapae	Cabbage White	over dunes
	Danaus plexippus	Monarch	large numbers, migrating, feeding on seaside goldenrod
Coleoptera: Tiger beetles	*Cicindela hirticollis* Say	Seabeach Tiger Beetle*	sandy beach areas, mostly in western end
Marine Invertebrates	*Carcinus maenas*	Green Crab	shells in wrack, live at Napatree point
	Hemigrapsus sanguineus	Japanese Shore Crab	shells in wrack, live at Napatree point
	Libinia emarginata	Common Spider Crab	shells in wrack
	Limulus polyphemus	Atlantic Horseshoe Crab	live in saltwater tidal pond, shells in wrack

*Species of Concern in Rhode Island (Enser 2002a).

Tiger Beetles (Cicindela spp).

Tiger beetles are fast-moving predatory ground beetles that live in burrows dug into soil or sand, both as larvae and adults (Leonard and Bell 1999). For this reason, different species often have specific habitat and substrate requirements and can serve as positive indicators of good quality, specialized, or undisturbed habitat.

The sand beaches, sand dunes, mud flats and salt marsh at Napatree provide potential habitat for four or five species of tiger beetles found in New England (Leonard and Bell 1999, Sikes 2004). Because these species are habitat specialists and require environmental conditions that are generally found in fragile or disappearing coastal habitats, they are all listed as either federally threatened, state threatened, or rare (species of concern) in Rhode Island (Enser 2002a, Sikes 2004). For these reasons, tiger beetles were inventoried as a part of other invertebrate monitoring efforts at Napatree during the summer of 2005. In particular we surveyed for *Cicindela hirticollis* Say (seabeach tiger beetle) and *C. marginata* (salt marsh tiger beetle).

Only *C. hirticollis* was found on the property (Table 6). This species is considered a species of concern in Rhode Island (Enser 2002a) and is only found on wet sand beaches with sand dunes and either fresh water or salt water nearby (Leonard and Bell 1999). Sikes (2004) suggests that

the population of this species is currently lower than it was historically, and contributes this in part to loss of habitat. Because tiger beetles use burrows in the sand for egg laying and larval development, disturbance or compaction of the beach or dunes from trampling or vehicles could threaten their burrows. In addition, it takes 2 years for this species to emerge as an adult capable of reproducing, so its habitat needs to be relatively undisturbed over several years to support a viable population (Leonard and Bell 1999). It is interesting to note that the area at Napatree with the densest population of adult seabeach tiger beetles was the area on the north side of the beach that had been roped off for nesting piping plovers this spring and summer. The ropes discouraged people and dogs from using that portion of the beach and may have simultaneously provided favorable and protected conditions for larval and adult tiger beetle development.

Napatree may also provide habitat for the salt marsh tiger beetle *C. marginata*, a fast moving, elusive, and rare species that is often found in the same habitat as *C. hirticollis* (Leonard and Bell 1999). The protected mud flats and salt marsh on Napatree's west end provide good potential habitat for this species, however none were found. Further surveys are needed during the adult flying time of this insect (late April through July) in order to confirm its presence.

Non-Native Marine Invertebrates

Green Crab (*Carcinus maenas*): The familiar and common Green Crab was introduced to the Atlantic seashore from Europe sometime around the late 1700's (Bertness 1999). It has since expanded its range north to Canada and south to the Chesapeake Bay, becoming one of the most dominant marine invertebrates of the intertidal zone (Bertness 1999). In 1998 it was designated as an aquatic nuisance species by the Aquatic Nuisance Species Task Force (ANSTF), because of its significant negative impact on native marine plant and animal populations as well as commercially valuable shellfish populations (ANSTF 2002). A management plan was developed to address this issue; however it is primarily focused on eradicating newly developed populations. Green Crab populations within the heart of its range (such as at Napatree) are less likely to be eradicated, however the ANSTF suggests there may be ways to reduce local impacts on commercially valuable shellfish species (ANSTF 2002). A copy of the Green Crab management plan can be found at the following web page: http://www.anstaskforce.gov/GreenCrabManagementPlan.pdf .

Green Crabs are abundant along the coast of Rhode Island and were found along all of the rocky shorelines of Napatree Point (Table 6). They appear to be well established and reproducing.

Japanese Shore Crab (*Hemigrapsus sanguineous*): A more recent invader, the Japanese Shore Crab has rapidly expanded to become another of the dominant marine invertebrates found along the Atlantic seashore (USGS 2002). The Japanese Shore Crab is native to shorelines along the western Pacific Ocean and the Japanese archipelago, and was likely introduced to the western Atlantic coast by transport in the ballast water of ships (USGS 2002). It was first found in New Jersey in 1988 and has since expanded north into Maine and south into North Carolina. This species is tolerant of a range of environmental conditions, the larvae float and are capable of rapid spread, it consumes a wide variety of foods, and it competes with other species for habitat resources; all of which make it a threat to native and commercially valuable species wherever it has become established (USGS 2002). Additional information can be found at the following web page: http://cars.er.usgs.gov/hemigrapsus.pdf, or in Appendix E.

Japanese Shore Crabs were found living among the rocks in the intertidal zone at the western end of Napatree Point (Figure 6, Table 6). They appear to be established and reproducing at the site at this time.

Figure 6: Japanese Shore Crab (*Hemigrapsus sanguineus*) found at west end of barrier beach, in rocky intertidal zone.

Soils

The barrier beach at Napatree Point is composed of two soil types. The perimeter areas consist of beach sand, gravel, and cobbles that form dunes, escarpments, and tidally exposed flats with varying slopes (Rector 1981). These soils are regularly disturbed by tides and erosion from storms. The interior portion of the barrier beach is dominated by Udipsamments, which are sandy areas that have been stabilized by vegetation, except in areas regularly disturbed by vehicle or foot traffic (Rector 1981). The homes and roads that had been established on the barrier beach until the hurricane of 1938 were built on the Udipsamment soils. Both soil types are droughty and do not support rapid tree growth.

Abiotic Condition

Napatree is a barrier beach that is in a constant state of change from shifting sand and shorelines. Because houses and cottages were not rebuilt on Napatree after the last major hurricane, many of these natural processes are now unimpeded, and the abiotic condition of the beach is fairly good. Dune erosion is occurring most heavily at the eastern end of the beach, which receives the most human traffic. Dune grass replanting projects and signs directing people to avoid replanted trails are protecting the natural condition of some areas better than others (see Management Comments section, below).

Ecological Processes

The barrier beach system is shaped largely by environmental factors such as wind, salt spray, ocean tides, waves, and storm events. As a result the shape, extent, and natural condition of Napatree is in a constant state of change dictated by both natural disturbance and the adaptations of the plants and animals that make up the various natural communities. Management activities that support or aim at restoring these natural changes and processes, such as beach grass planting and the removal of non-native invasive species, will allow these ecological processes to continue and therefore protect the system as a whole.

Anthropogenic Disturbances

In 1899 the military built Fort Mansfield, consisting of three batteries and associated buildings, at the west end of Napatree. Historic records of this construction document that a swamp near the batteries was filled with sand (Barnes 2005), which likely has had a permanent impact on the hydrology and vegetation of the filled area. Since that time, a series of beach communities were constructed (houses, hotels, roads, and wharves) and then destroyed by successive hurricanes and winter storms. After a major hurricane in 1938, additional development on the barrier beach stopped (Barnes 2005). Fill and vegetation disturbance during the years of development and human habitation likely have had an impact on plant and animal communities at Napatree. The non-native invasive plant species found at the western point of the beach are likely a legacy of the continued disturbance and perhaps intentional planting that took place during the last 100 years.

Napatree beaches are a very popular destination for tourists and residents in the summer. People visit the beach to anchor their boats, swim, sunbathe, fish, and walk their dogs. As a result a series of trails have been maintained by regular foot traffic, especially by people who cross the dunes between the southern and northern stretches of beach. The regular foot traffic destroys dune vegetation and prevents re-growth which keeps the trails visible, and in return encourages continued use. Many trails are redundant and could be minimized. Others cross directly under one of the Osprey nest platforms and may disturb any attempts to breed. Many people walk their dogs without a leash and allow them to run through dune vegetation, further trampling delicate plants that help stabilize the sand dunes. Unleashed dogs may also scare birds or trample the nests of federally threatened bird species such as the piping plover. In addition, many dog owners were observed not picking up after their dogs; dog feces can be found all along dune trails and on sandy parts of the beach where they could pose health risks to humans.

Sharing the same beach: bird tracks and domestic dog tracks in the sand.

Trash is regularly seen on the beaches, but appears to be getting picked up by someone on a fairly regular basis.

Threats

Invasive Species

Non-native invasive plant species such as purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), and Asiatic bittersweet (*Celastrus orbiculatus*) exist in small patches at the western end of Napatree, near the old forts. Lack of fresh water will prevent the purple loosestrife from spreading; however common reed and Asiatic bittersweet have the potential to colonize much larger areas at Napatree point, out-competing native species and decreasing habitat quality. One non-native invasive plant species that poses a potential threat to Rhode Island coastlines is Asiatic sand sedge (*Carex kobomugi*). This plant was not found at Napatree, but because of its potential threat, management strategies are discussed in Management Comments and Monitoring Needs, below.

Additional information about the dominant non-native species at Napatree can be found in Appendix C.

Dogs

Despite rules to the contrary, many dog owners do not leash their dogs and/or do not pick up dog waste at Napatree. Dogs that are permitted to run loose often stray off trails and into sensitive vegetation which can disrupt nesting birds such as the Federally Threatened piping plover, compact sandy areas where tiger beetles burrow (such as the seabeach tiger beetle, a Species of Concern), harm native plant species such as dune grass, and ultimately contribute to dune erosion (Figure 7). Loose dogs may also pose a hazard to adults and children if the animal is aggressive. In addition, dog waste is pervasive on the beach, predominantly where the dunegrass meets the sandy beach line and along trail edges. The occurrences of dog waste seem to decrease with distance from the east end of the beach, likely due to heavier human use at the east end. Dog waste poses a potential health hazard to beachgoers and swimmers and can reduce the scenic enjoyment of the beach.

Figure 7: Dogs are often allowed to run loose on the beach at Napatree, posing threats to native vegetation, dune stabilization, and wildlife.

Dune Erosion

Sand dunes form in response to, and are shaped by, wind, sand movement, and vegetation (Bertness 1999). Vegetation such as sea rocket (*Cakile edentula*), beach grass (*Ammophila breviligulata*), and beach pea (*Lathyrus japonicus*) help stabilize dunes with their uniquely adapted root systems and pioneering growth habits. Dune blowouts can occur if wind and sand movement (dune growth) exceed vegetation growth (Bertness 1999). For this reason, dunes are highly vulnerable to human activities that impact vegetation, such as trampling by foot or by vehicle. Numerous trails across the dunes and heavy summer beach use by boaters and other visitors have caused and/or enhanced dune erosion at Napatree. Dune face erosion is more prominent on the eastern end of the beach, where use is heavier (Figure 8). Dune erosion as a result of human use is limited to trail areas, the east end beach access point, and some areas along the edge of where the dune grass grows.

Figure 8: Example of dune erosion at the eastern end of Napatree beach (Summer 2005).

Management Comments and Monitoring Needs

Invasive Species

Non-native Rose Bushes: Two non-native species of rose, multiflora rose (*Rosa multiflora*) and rugose rose (*Rosa rugosa*), are common invasive species at Napatree. Both have become naturalized in Rhode Island, meaning they are capable of reproducing and spreading on their own. Rugose rose is especially well-adapted to growing in coastal areas impacted by salt spray, and has thus earned the alternative common name of salt-spray rose (Stuckey and Gould 2000). At Napatree this species is found throughout the dunes and western point. This species has reached an abundance level at Napatree that does not make it a good candidate for successful removal. Fortunately, however, with time rugose rose may be replaced by native vegetation such as northern bayberry, a successional habit that is generally atypical of non-native invasive species (Stuckey and Gould 2000). Care should be taken, however, not to allow rugose or multiflora rose to spread into disturbed areas. Dune planting projects will help prevent colonization by this and other non-native invasive plant species.

Asiatic Sand Sedge: One non-native invasive plant species that was not found at Napatree during the 2005 survey is Asiatic sand sedge (*Carex kobomugi*). This plant has been found to date in Charlestown, Rhode Island and has the potential to spread along coastal dunes and beaches (Gould, personal communication). It has the capability of out-competing native beach and dune vegetation including Beachgrass (*Ammophila breviligulata*). Non-native species invasions have a higher potential for successful control if caught and treated in the early stages or at the leading edge of establishment, prior to infestation. Because this species is relatively new to Rhode Island, and because of its potential threat to native vegetation, a vigilant response to any sightings of this species is highly recommended. Periodic monitoring for Asiatic sand sedge is also recommended. Additional information and photographs of Asiatic sand sedge can be found at the following website: http://www.nps.gov/plants/alien/fact/cako1.htm, and in Appendix C.

Dogs

Chapter 76 of the Town of Westerly's Code of Ordinances states:

> "Dogs are allowed on public beaches from October 1 to March 31, but must be on a lead and all droppings must be picked up and removed from the beach by the individual walking or having control of the dog."

Because of the threats dogs pose to plants, wildlife, habitat, and even human health (described above), it is recommended that additional steps be taken to enforce this ordinance at Napatree. Steps could include 1) additional signage, 2) periodic visits to the beach by an enforcement officer, and/or 3) posted signs reminding dog owners to pick up after their pets, along with a plastic bag dispenser and trash can.

Trail Management and Dune Erosion

Both the northern and southern sides of the barrier beach are attractive to beach visitors and boaters. As a result trails and short-cuts connecting the two sides have been regularly used for years, causing the removal of vegetation and in some cases dune erosion along dune faces. In order to simultaneously support human enjoyment of the beach and maintain stable dunes, fragile vegetation, and suitable habitat for wildlife, a plan and strategies for managing, closing, or maintaining trails is recommended.

During our 2005 survey of Napatree we were able to make some observations about trail use, trail conditions, and trail distribution. The majority of the trails appear to be used by beach-goers crossing between the northern and southern beaches. There are also a series of east-west trails that parallel the dunes and can be accessed by these north-south trails. We made the following observations regarding beach trails at Napatree:

-Some trails receive more use than others, as indicated by the width of the trail, the size of the trail entrance, and the number of trails that intersect them.
-Many trails are redundant: they are within 100 feet of each other, they fork off into smaller trails, and/or they originate from the same point and then diverge.
-Some trails travel near or through ecologically sensitive areas (such as bird nesting areas) where people or dogs may disrupt wildlife.

To address each of these observations, the following suggestions are made regarding future trail management, with specific reference to trails marked in Figure 9:

1) Redundant trails, especially those that appear to be receiving less use and are located within close proximity to other more "popular" trails, could be re-vegetated and shut off without sacrificing convenient access to the other side of the beach (Figure 9). Redundant trails that would be good candidates for closure are those located between trails marked "Keep" in Figure 9.
   Examples: -All trails between #1 and #4 (including #2 and #3) could be closed in lieu of maintaining trails #1 and #4, which also access the salt marsh and mud flats.
   -All smaller trails between #4 and #5 could be closed without reducing access to anchored boats on the north beach.
   -Trail #11 could be closed, given its close proximity to trails #10 and #12, which both appear to be well-used.
2) Trails that lie near areas that represent important wildlife habitat could be closed so as to reduce disturbance and stress on wildlife (Figure 9).
   Examples: -Trail #8 lies directly beneath one of the telephone poles that supports an Osprey nesting platform. No Ospreys were observed using it in 2005. It is also less than 200 feet away from another well-used trail (#9) which could provide the same benefits of access, with less potential for wildlife disturbance.
   -Trails between trails #4 and #5 are less-often used and have entrances on the north beach very close to the piping plover nesting area (2005) as well as good habitat for the seabeach tiger beetle, a species of concern.
3) Trails that regularly receive the most use, in particular those on the east end of the beach and ones used by boaters, could be maintained in a way that reduces their overall impact on vegetation and dune stability (Figure 9).
   Examples: -Trail #15 is wide, well-used, and has a sign describing beach ecology placed at one end. However the edges and end points of the trail have experienced a higher degree of erosion and wear, and are "growing". The edges of the trail could be better defined with wooden fencing (often used for dune stabilization projects), signage, or a boardwalk that extends the length of the trail.
   -Boaters who anchor off the northern beach but walk over the dunes to use the southern beach could be encouraged to use one trail if it was made easier to access with a boardwalk or management technique similar to the example above. One of the trails toward the center of the property, such as #6 or #7, could be a good candidate.

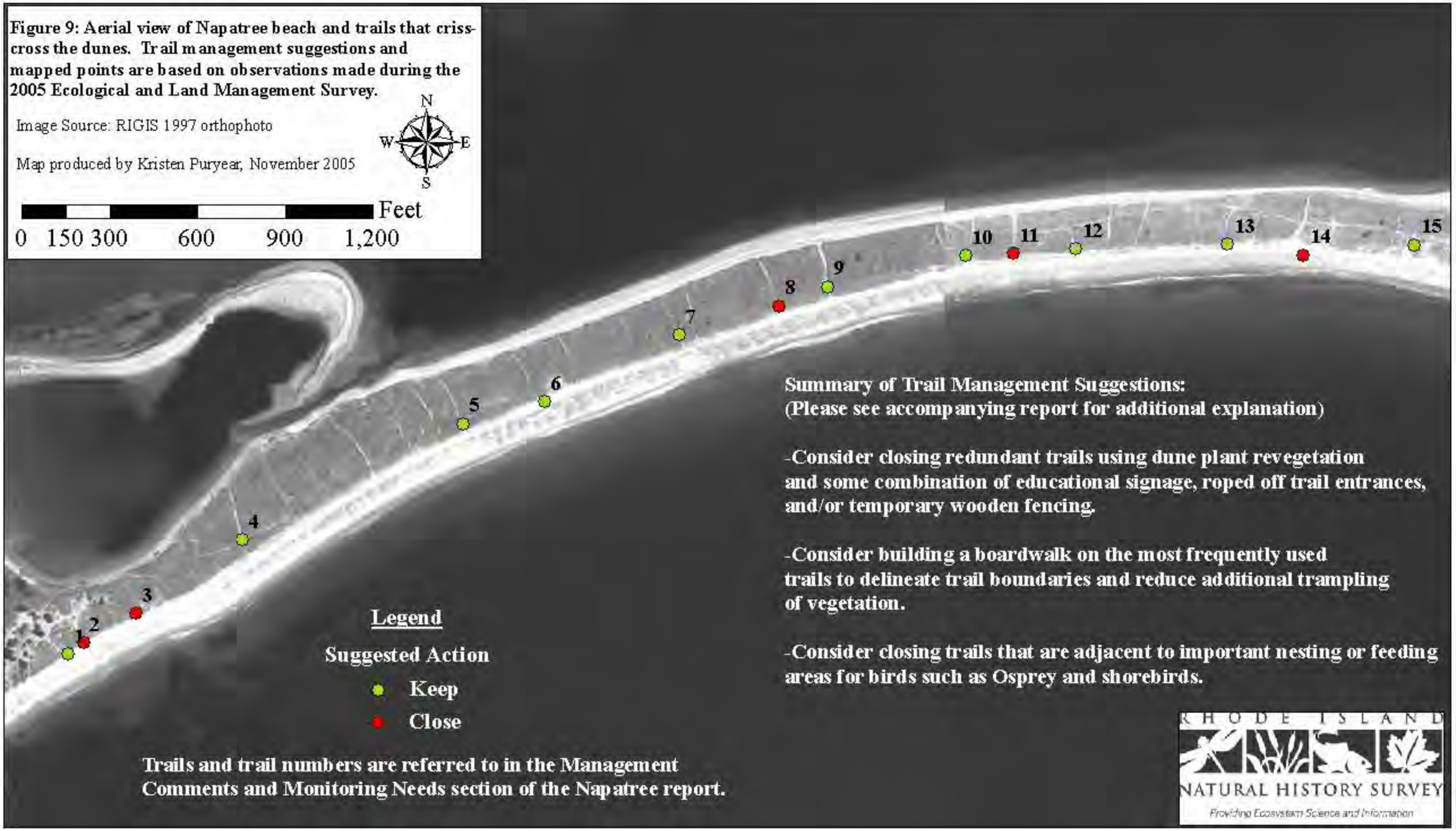
Figure 9: Aerial view of Napatree beach and trails that criss-cross the dunes. Trail management suggestions and mapped points are based on observations made during the 2005 Ecological and Land Management Survey.
Image Source: RIGIS 1997 orthophoto
Map produced by Kristen Puryear, November 2005
N
W
E
S
Feet
0 150 300 600 900 1,200
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Legend
Suggested Action
Keep
Close
Trails and trail numbers are referred to in the Management Comments and Monitoring Needs section of the Napatree report.
Summary of Trail Management Suggestions:
(Please see accompanying report for additional explanation)
-Consider closing redundant trails using dune plant revegetation and some combination of educational signage, roped off trail entrances, and/or temporary wooden fencing.
-Consider building a boardwalk on the most frequently used trails to delineate trail boundaries and reduce additional trampling of vegetation.
-Consider closing trails that are adjacent to important nesting or feeding areas for birds such as Osprey and shorebirds.
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Prior dune restoration projects at Napatree have successfully closed off a few trails at the eastern end of the beach (Figure 10). A combination of roped off trail entrances, dune grass revegetation, and two or three signs advertising trail closure seem to be the most effective at discouraging trail use, and would be recommended if additional trail closures are to occur.

Figure 10: An example of revegetation efforts and signage that have helped reduce traffic on a trail across the dunes (Left). A sign that has not been as successful in closing off a trail for restoration (Right).

Trash

Trash gets left on the beach, and may wash up onshore or with tides. While we did observe that individual beach visitors removed some larger pieces of trash over the course of the summer, much gets left tangled in the wrack line or at the edge of dune vegetation. Several studies have documented the impact of this detritus on shorebirds, which eat and/or feed bits of plastic and other trash items to young, inadvertently causing young birds to starve. Annual or semi-annual beach clean-ups in the spring and summer are recommended in order to reduce the accumulation of trash on the beach, maintain the scenic qualities of Napatree, and protect wildlife.

Adjacent Conservation Land

Although there is not any conservation land immediately adjacent to Napatree, there are several nearby parcels of land and beaches that are designated as open space. These include a beach and inland property owned by the Misquamicut Country Club, Misquamicut State Beach, Westerly Beach, and a stretch of shoreline owned by the Weekapaug District (RIGIS 2005). Ninigret Conservation Area (a Department of Environmental Management Wildlife Management Area) is approximately nine miles east along the southern Rhode Island coastline (RIGIS 2005).

Inventory Needs

Additional targeted surveys for rare, threatened, or endangered species that were not detected in the 2005 survey are recommended, especially if there are any significant changes in land-use or resource management at Napatree. This would include surveys for species including the salt marsh tiger beetle (*Cicindela marginata*), tall wormwood (*Artemisia campestris var. caudata*), and seabeach knotweed (*Polygonum glaucum*).

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Appendix A

Photographs of some natural community types on the Napatree barrier beach

Appendix A: Photographs of some natural community types on the Napatree barrier beach, Watch Hill, Westerly, Rhode Island.

Marine intertidal mudflat and border of *low salt marsh*. People were seen digging for clams here, and many shorebird species such as piping plovers were observed feeding at the edge. This area is located at the western end of Napatree, around the tidal salt pond.

Marine intertidal sand/gravel beach located at the mouth of the salt water pond at the western end of Napatree. This photo, taken at low tide, shows several sand/gravel bars and islands that serve as important feeding and resting areas for shorebirds and colonies of migrating birds.

Low and high salt marshes at the west end of Napatree. Note the marsh elder (*Iva frutescens*) in the foreground, marking a *salt shrub* community at the edge of the salt marsh.

Low and high salt marsh at edge of salt pond in west end. Note patch of salt marsh cordgrass (*Spartina alterniflora*) in left of photo, where it is inundated by the high tide, and salt hay grass (*Spartina patens*) in center and right of photo.

An opening along the beach that surrounds the saltwater pond on the west end of Napatree. Plants such as orach (*Atriplex patula*) and sea rocket (*Cakile edentula*), typical of a *maritime beach strand* community can be found here. There were also several seabeach tiger beetles (*Cicindela hirticollis*) found here.

Beach grass dune associaton (foreground) and *dune shrub association* (background) on western tip of Napatree. The shrub area is dominated by the non-native rugosa rose (*Rosa rugosa*), poison ivy (*Toxicodendron radicans*), and northern bayberry (*Myrica pensylvanica*).

Appendix B
2005 Plant Inventory Report for Napatree

2005 Plant Inventory Report for Napatree, Watch Hill, RI

Species	Common Name	Habit:[1]	RI Status:	Abundance:
Family: **Anacardiaceae (Sumac family)**				
Toxicodendron radicans	Common Poison Ivy, Cow-itch, Poison Mercury, "Poison Oak" (RI Colloq.)	NWVS	1	IV
Synonyms: Rhus radicans L. [F50]; Rhus radicans L. var. radicans [S93]; Toxicodendron radicans (L.) Kuntze [USDA82]; Toxicodendron radicans (L.) Kuntze ssp. radicans [K94]				
Family: **Apiaceae (Carrot family)**				
Daucus carota	Queen Anne's Lace, Wild Carrot, Devil's-plague, Bird's-nest	IBF	4	IV
Heracleum lanatum	Cow-parsnip, Masterwort	NPF	1	III
Synonyms: Heracleum maximum Bartr. [F50; K94; S93]				
Family: **Asteraceae (Sunflowers, Tournesols)**				
Achillea millefolium	Common Yarrow, Milfoil	NIPF	1 or 4 (origin unclear)	IV
Synonyms: Achillea millefolium L. var. millefolium [K94]				
Artemisia stelleriana	Dusty Miller, Old Woman, Beach-wormwood	IPF	4	III
Aster spp.	Aster			
Baccharis halimifolia	Groundsel-tree, Sea-myrtle, Consumption-weed	NS	1	III

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Species	Common Name	Habit: [1]	RI Status:	Abundance:
Family: **Asteraceae (Sunflowers, Tournesols)**				
Chrysanthemum leucanthemum	Ox-eye Daisy, White Daisy, Marguerite, Whiteweed	IPF	4	IV
Synonyms: Chrysanthemum leucanthemum L. var. leucanthemum [S93]; Chrysanthemum leucanthemum L. var. pinnatifidum Lecoq & Lamotte. [F50; S93]; Leucanthemum vulgare Lam. [K94; USDA82]				
Iva frutescens	Marsh-elder, Hightide-bush, Highwater-shrub	NP$EH	1	III
Synonyms: Iva frutescens L. ssp. oraria (Bartlett) R. C. Jackson [K94]				
Solidago sempervirens	Seaside-goldenrod	NP$F	1	III
Xanthium strumarium	Common Cocklebur, Clotbur, Sea-burdock	NAF	4	III
Synonyms: Xanthium echinatum Murr. [F50; S93]; Xanthium italicum Moretti [F50; S93]; Xanthium pensylvanicaum Wallr. [F50; S93]				
Family: **Brassicaceae (Mustard family)**				
Cakile edentula	Sea-rocket	NA$F	1	III
Synonyms: Cakile edentula (Bigelow) Hook. ssp. edentula var. edentula [K94]				
Lepidium campestre	Cow-cress, Field-cress	IABF	4	III
Synonyms: Lepidium campestre (L.) Ait. f. [K94]				
Raphanus raphanistrum	Wild Radish, Jointed Charlock	IAF	4	IV
Family: **Caprifoliaceae (Chèvrefeuilles, Honeysuckle)**				
Lonicera morrowii	Morrow's Fly-honeysuckle	IS	4*	IV
Synonyms: Lonicera morrowi Gray [F50]				
Family: **Caryophyllaceae (Cariophyllacées, Pinks)**				
Dianthus armeria	Deptford-pink	IABF	4	III

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Species	Common Name	Habit: [1]	RI Status:	Abundance:
Family: **Caryophyllaceae (Cariophyllacées, Pinks)**				
Honckenya peploides var. robusta	Seabeach-sandwort, Sea-purslane, Sea-chickweed	NPF	1	II
Synonyms: Arenaria peploides L. var. robusta Fern. [F50; S93]; Honckenya peploides (L.) Ehrh. ssp. robusta (Fern.) Hulten [K94; USDA82]				
Stellaria media	Common Chickweed	IAPF	4	IV
Synonyms: Stellaria media (L.) Cyrillo [K94]				
Family: **Celastraceae (Bittersweet family)**				
Celastrus orbiculatus	Asiatic or Oriental Bittersweet	IWV	4*	IV
Synonyms: Celastrus orbiculata Thunb. [K94; USDA82]				
Family: **Chenopodiaceae (Goosefoot family)**				
Atriplex hastata	(halberd-leaved) Orach, Spearscale	NIAF	1 or 4 (origin unclear)	III
Synonyms: Atriplex patula L. [USDA82]; Atriplex patula L. var. hastata (L.) A. Gray [F50; S93]; Atriplx prostrata Boucher ex DC. [K94]				
Bassia hirsuta	Hairy Bassia	IAF	4	III
Chenopodium rubrum	Coast-blite, Alkali-blite	NAF	1	III
Synonyms: Including var. humile (Hooker) S. Watson				
Salicornia virginica	Perennial Saltwort, Leadgrass, Woody Glasswort	NPE$H	1	III
Synonyms: Salicornia perennis Miller [MT97]; Sarcocornia pernnis (P. Mill.) A. J. Scott [K94]				
Salsola kali	Common Saltwort, Barilla-plant	NAF	1	III
Synonyms: Salsola caroliniana Walt. [K94]; Salsola kali L. var. caroliniana (Walter) Nutt. [F50; S93]; Salsola kali L. var. kali [S93]				
Family: **Clusiaceae (St John's wort family)**				
Hypericum perforatum	Common St. John's-wort	IPF	4	IV

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Species	Common Name	Habit: [1]	RI Status:	Abundance:
Family: **Convolvulaceae (Morning-glory family)**				
Calystegia sepium	Hedge-bindweed, Wild Morning-glory	NIPFV	1 or 4 (origin unclear)	III
Synonyms: Calystegia sepium (L.) R. Br. ssp. angulata Brummitt & ssp. sepium [K94; USDA82]; Convolvulus sepium L. var. sepium [S93] & var. repens (L.) Gray [F50; S93]; forma malachophyllus Fern. [F50]				
Family: **Cupressaceae (Cypress family)**				
Juniperus virginiana	Northern or Eastern Red Cedar	NT	1	IV
Synonyms: Juniperus virginiana L. var. creba Fernald & Griscom [F50; GC91; S93]				
Family: **Cyperaceae (Foins Coupants, Laîches, Rouches,**				
Carex sp.	Sedges			
Cyperus esculentus	Yellow Nutgrass or Nutsedge, Chufa, Galingale	NPG	1	III
Family: **Fabaceae (Legume family)**				
Lathyrus japonicus (maritimus)	Beach-pea	NPF	1	III
Synonyms: Lathyrus japonicus Willd. [USDA82]; Lathyrus japonicus Willd. var. pellitus Fern. [F50; K94; S93]				
Trifolium pratense	Red Clover	IPBF	4	IV
Synonyms: Trifolium pratense L. var. pratense [S93]; Trifolium pratense L. var. sativum (Mill) Schreb. [F50]				
Family: **Juncaceae (Joncs, Rushes)**				
Juncus gerardii	Black Grass, Black Rush, Saltmarsh-rush	NPG	1	III
Synonyms: Juncus gerardii Loisel. var. gerardii & var. pedicellatus Fern. [K94; S93]; Juncus gerardi Loisel. var. gerardi & var. pedicellatus Fern. [F50]				
Family: **Lamiaceae (Mint Family)**				
Teucrium canadense	American Germander, Wood-sage	NPEF	1	III

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Species	Common Name	Habit: [1]	RI Status:	Abundance:
Family: **Lythraceae (Loosestrife family)**				
Lythrum salicaria	Purple Loosestrife	IPH	4*	III
Synonyms: Lythrum salicaria L. var. salicaria [S93]				
Family: **Myricaceae (Wax-myrtle family)**				
Myrica pensylvanica	Northern Bayberry, Candleberry	NS	1	IV
Synonyms: Myrica pensylvanica Loisel. [F50; K94; S93; USDA82]; Myrica pensylvanica Loisel. ex Duhamel [MT97]				
Family: **Pinaceae (Pine family)**				
Pinus resinosa	Red Pine, Norway Pine	NT	2	III
Synonyms: Pinus resinosa Soland. [K94]				
Pinus strobus	Eastern or Northern White Pine	NT	1	IV
Family: **Plantaginaceae (Plantain family)**				
Plantago lanceolata	Ribgrass, Ripplegrass, English Plantain, Buckhorn	IPBAF	4	IV
Synonyms: Plantago lanceolata L. var. lanceolata [S93] & var. sphaerostachya Mert. & Koch [F50; S93]				
Family: **Plumbaginaceae (Leadwort or Sea-lavender fa**				
Limonium carolinianum	Sea-lavender, Marsh-rosemary	NPF	1	III
Synonyms: Limonium nashii Small [F50, S93, & USDA82 list as a sep. sp.]				
Family: **Poaceae (Grasses)**				
Ammophila breviligulata	Beachgrass	NPG	1	III
Distichlis spicata	Seashore or Salt-meadow Spike-grass, Salt-grass, Alkali-grass	NPEG	1	III
Synonyms: Distichlis spicata (L.) Greene [K94; S93]				

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Species	Common Name	Habit: [1]	RI Status:	Abundance:
Family: **Poaceae (Grasses)**				
Elytrigia repens	Witch-grass, Couch-grass, Quack-grass, Quick-grass	IPG	4	III
Synonyms: Agropyron repens (L.) P. Beauv. [F50; USDA82]; Agropyron repens (L.) P. Beauv. var. repens [S93] and var. subulatum (Schreb.) Reichenb. [F50; S93]; Elytrigia repens (L.) Desv. ex B. D. Jackson var. repens [K94]				
Holcus lanatus	Common Velvet-grass	IPG	4	IV
Panicum sp.				
Phleum pratense	Meadow- or Common Timothy, Herds' Grass	IPG	4	IV
Synonyms: Phleum pratense L. ssp. nodosum (L.) Arcang. [K94]; Phleum pratense L. ssp. pratense [K94]; Phleum pratense L. var. pratense [S93] & var. nodosum (L.) Hudson [F50; S93; USDA82]				
Phragmites australis	Common or Tall Reed, Phragmites, Reed Grass, Phrag, Pampas Grass (RI Colloq.)	NPEG	1*	IV
Synonyms: Phragmites australis (Cav.) Trin. ex Steud. [K94; USDA82]; Phragmites communis Trin. var. berlandieri (Fourn.) Fern. [F50; S93]				
Spartina alterniflora	Salt-water or Smooth Cord-grass	NPEG	1	III
Synonyms: Spartina alterniflora Loisel var. alterniflora [S93]; Spartina alterniflora Loisel var. glabra (Muhl.) Fern. [F05] & var. pilosa (Merr.) Fern. [F50; S93; USDA82]; S. a. var. glabra (Muhl. ex Bigel.) Fern. [USDA82]				
Spartina patens	Salt-hay Grassn Salt-meadow Grass or Cordgrass, High-water Grass	NPG	1	III
Synonyms: Spartina patens (Aiton) Muhl. var. monogyna (M.A. Curtis) Fern. [F50; S93; USDA82] and var. patens [S93]				
Family: **Polygonaceae (Buckwheat family)**				
Rumex acetosella	Sheep-sorrel, Common or Red Sorrel	IPF	4	IV
Rumex crispus	Curly or Yellow Dock	IPF	4	IV

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Species	Common Name	Habit: [1]	RI Status:	Abundance:
Family: **Rosaceae (Roses)**				
Rosa multiflora	Multiflora-rose	IS	4*	IV
Synonyms: Rosa multiflora Thunb. ex Murr. [K94]; Rosa multiflora Thunb. var. multiflora [S93]				
Rosa rugosa	Rugose, Wrinkled, Beach-, or Japanese Rose, Saltspray Rose	IS	4*	IV
Rubus sp.	Dewberry, Blackberry			
Family: **Rubiaceae (Madder family)**				
Galium aparine	Cleavers, Goosegrass, Bedstraw	NAF	1	IV
Family: **Scrophulariaceae (Figwort family)**				
Verbascum thapsus	Common Mullein, Flannel-plant, Quaker-rouge	IBF	4	IV
Family: **Solanaceae (Potato family)**				
Datura stramonium	Jimson-weed, Thorn-apple	INAF [orig. unclear]	2 or 4	III
Synonyms: Datura stramonium L. var. stramonium [S93] & var. tatula (L.) Torr. [F50; S93]				
Solanum dulcamara	European Bittersweet, Climbing Nightshade	IPF	4	IV
Synonyms: Solanum dulcamara L. var. dulcamara [K94; S93] & var. villosissimum Desv. [F50; K94; S93]				
Family: **Typhaceae (Cattail family)**				
Typha angustifolia	Narrow-leaved Cattail, Cat-o'-nine-tails	NPEF	1	III

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Species	Common Name	Habit: [1]	RI Status:	Abundance:
Family: **Vitaceae (Grapevine family)**				
Parthenocissus quinquefolia	Virginia Creeper, Woodbine	NWV	1	IV
Synonyms: Parthenocissus quinquefolia (L.) Planchon forma hirsuta (Donn) Fern. [F50]				

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Explanation of Headings

Habit

N = Native	G = Grasslike	$ = Succulent
I = Introduced	S = Shrub	/ = Floating
A = Annual	T = Tree	-- = Saprophytic
B = Biennial	W = Woody	+ = Parasitic
P = Perennial	H = Partly Woody	E = Emergent
F = Herbaceous	V = Vine	Z = Submerged

In many cases codes are combined to indicate a variable growth form

Abundance

I Status undetermined: needs more study.
II Rare: only species listed by the Rhode Island Natural Heritage Program
III Present (from common to fairly common to uncommon).
IV Ubiquitous (widespread and abundant. Considered to be typical representatives of the Rhode Island flora, generally found in all or nearly all municipalities).
H "Historical" (native species known to have been extirpated in Rhode Island).
-- Used only with a "6" Status category; because we do not believe the plant to be in Rhode Island, we do not assign it an Abundance code.

RI Status

1 Native to Rhode Island.
2 Native to North America, naturalized in Rhode Island.
3 Native to North America, with little evidence of full naturalization in Rhode Island.
a) Species which persist at former cultivation sites, but do not reproduce and spread.
b) Species which spread vegetatively, or sprout from seeds at dump sites, but not fully naturalized.
c) Species which may be reproducing and spreading but on a very limited basis at this point in time.
4 Native to other continents, naturalized in Rhode Island.
* = Invasive Exotic
5 Native to other continents, with little evidence of full naturalization in Rhode Island (a, b, c same as listed under 3).
6 Species included in Palmatier's 1952 list of Rhode Island flora, Seymour's 1993 "The Flora of New England," or in the "Flora of North America" 1993 (Volume 2, 2nd printing), but for which we have been unable to locate any other literature references (beyond generalized range descriptions), herbarium specimens, or field evidence that these plants are part of the state's flora.
7 Species which have been reported by field notes but for which there are no herbarium specimens or other formal documentation.

[1] RI Status and Abundance Data from "Vascular Flora of Rhode Island." Explanation of headings and codes located on last page of Appendix.

Appendix C

Fact sheets for some non-native plant species found at Napatree in Westerly, Rhode Island during the summer 2005 survey

Asiatic bittersweet (*Celastrus orbiculatus*) (Maine Invasive Plant Factsheet)
Multiflora rose (*Rosa multiflora*) (Maine Invasive Plant Factsheet)
Morrow honeysuckle (*Lonicera morrowii*) (Maine Invasive Plant Factsheet)
Asiatic sand sedge (*Carex kobomugi*) (Virginia Native Plant Society & DCR)

MAINE INVASIVE PLANT FACT SHEET

Asiatic Bittersweet

Celastrus orbiculata
(Staff-tree Family)

Description:
Asiatic bittersweet is a deciduous vine which climbs by means of twining about a support. The branches are round, hairless, light to dark brown, and have noticeable lenticels. The outer surface of its roots is characteristically bright orange. Leaves are alternate in arrangement and variable in shape. They are typically oval with a pointed tip and range from 1 to 5 inches in length. Flowers are small, greenish-yellow, and grow in clusters from the axils of the leaves. The fruits are pea-sized capsules which change in color from green to bright yellow as they mature. When the fruit is ripe the capsule splits open revealing a bright red berry within. It has been recorded to grow to heights in excess of 50 feet in the south. Asiatic bittersweet closely resembles our native American bittersweet (*Celastrus scandens*). The two can be distinguished by examining the locations of the flowering clusters or fruits on the stems. American bittersweet's flowers and fruits are always found occurring in terminal clusters, while Asiatic bittersweet's flowers are found occurring in the leaf axils. For accurate identification contact a natural resource professional.

Habitat:
Asiatic bittersweet can grow in a variety of habitats ranging from floodplain forests to dry rocky slopes. It has an affinity for forest edges where it has the greatest opportunity to twine around and grow over other plants while receiving lots of light. It is commonly found along fence rows, roadsides, powerlines, and in abandoned fields. It is also successful in open woods, including tree plantations. It is dispersed by birds who eat the bright red fruits in winter. It is also dispersed by humans who use dry fruiting stems in flower arrangements, and then dispose of them on compost and brush piles.

Asiatic bittersweet (*Celastrus orbiculata*)

Illustration from Britton & Browns Illustrated Flora of the Northern United States and Canada, 2nd ed.

Threats to Native Habitats:
Asiatic bittersweet poses a serious threat to other species and to whole habitats due to its aggressive habitat of twining around and growing over other vegetation. This plant has a high reproductive rate, long range dispersal mechanisms, and the ability to root sucker. The vines can strangle tree and shrub stems. All types of plants, even entire plant communities, can be over-topped and shaded out by the vine's rapid growth. Nearly pure stands of this vine are sometimes found in affected areas. Recently it has been discovered colonizing sand dunes in Connecticut and Rhode Island.

Distribution:
Asiatic bittersweet is native to east Asia. It is thought to have been introduced to eastern North America in the mid 1800's for use as an ornamental. In some states it has been planted for highway

This fact sheet was prepared by the Maine Natural Areas Program, #93 State House Station, Augusta, ME, 04333-0093 and was funded through a grant from the Maine Outdoor Heritage Fund.

Distribution:
landscaping and for wildlife food and cover. It has escaped into the wild in the majority of the states where it is cultivated. In Maine, Asiatic bittersweet has been documented in five counties. It probably occurs in more, but has been under collected due to a general lack of interest in weedy species.

Control:
Small patches can be hand pulled. Care should be taken to remove the entire root to prevent resprouting. Low patches have been successfully removed by cutting the vine and treating the regrowth with a triclopyr herbicide. Control is more successful in taller patches when cut stems are immediately painted with triclopyr or glyphosate. This plant has a substantial seedbank, and complete eradication may depend on repeating control methods for several years.

References:

Checklist of the Vascular Plants of Maine, Third Revision. Josselyn Botanical Society of Maine. Maine Agricultural and Forest Experiment Station, Orono, ME. 1995.

Element Stewardship Abstract for Celastrus orbiculata**.** Dreyer, G.D. The Nature Conservancy in collaboration with the International Network of Natural Heritage Programs and Conservation Data Centers. 1987. Natural Heritage Databases. Arlington,VA.

Invasive Exotic Fact Sheet: Asiatic Bittersweet. The Nature Conservancy of Vermont. Montpelier, VT. 1998.

Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Gleason, H.A. and Cronquist, A**.** New York Botanical Garden, New York. 910 pp. 1991.

For more information or for a more extensive list of references on invasive species contact:

Maine Natural Areas Program
Department of Conservation
#93 State House Station
Augusta, ME 04333-0093
(207-287-8044)

This fact sheet was prepared by the Maine Natural Areas Program, #93 State House Station, Augusta, ME, 04333-0093 and was funded through a grant from the Maine Outdoor Heritage Fund.

MAINE INVASIVE PLANT FACT SHEET

Multiflora Rose, Rambler Rose

Rosa multiflora
(Rose Family)

Multiflora rose (*Rosa multiflora*)

Illustration From Newcomb's Wildflower Guide, reprinted with permission of Little, Brown and Company (Inc.).

Description:
Multiflora rose is a robust perennial shrub with thorny arching stems. It has alternately arranged compound leaves mostly with 7 or 9 leaflets. It forms large clusters of fragrant white or pink flowers which bloom from June to July. Like other roses, it forms small red pulpy fruits called hips which may be eaten by birds. It reproduces from seeds or by rooting at the tip of arching stems that touch the ground. It can be distinguished from native roses by its long arching stems and numerous small white flowers or hips depending on the season. To verify identification of this plant contact a natural resources professional.

Habitat:
Multiflora rose prefers old fields, fence rows, powerlines, roadsides, and forest edges. In other parts of its range it is successful in the understory of hardwood forests. It tolerates both moist and relatively dry conditions.

Threats to Native Habitats:
Multiflora rose is an aggressive colonizer of open unplowed land, and is highly successful on forest edges. This prolific seed producer can create extremely dense, impenetrable thickets that crowd out other vegetation and inhibit regeneration of native plants. Associated vegetation of multiflora rose thickets is often limited to a few tree stems which have managed to overtop the rose before the thicket developed. Dense stands of multiflora rose can slow down forest regeneration. Where the species is abundant it can become a dominant component of a forest understory. Anyone who has attempted to traverse a thicket of this plant would have few kind words for it, as its interweaving, abundantly thorned branches snag on clothes and hair and can be quite painful. Large populations are sometimes associated with former plantings, but the plant has naturalized throughout much of the United States and continues to be spread with the help of birds.

Distribution:
Multiflora rose is native to eastern Asia. It was brought to North America in the later part of the nineteenth century to be used in horticultural plantings. Since then it has been widely planted for a variety of reasons, including wildlife food and cover, erosion control, and as a living fence to border properties or pen livestock. Its use was historically advocated by the Soil Conservation Service and by some state conservation departments. Multiflora rose is now naturalized (established and reproducing in the wild) throughout much of the United States. In Maine, it is documented from Oxford, Waldo, and York Counties, but likely occurs in more.

Control:
The best method of controlling multiflora rose is to prevent it from becoming established in the first

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Control:

place. It should be removed as soon as possible if it is found colonizing an area. Repeated mowing, at least six cuts per year near the ground for two or more years, can work to eliminate light infestations. In areas where thickets have formed it may be necessary to use a bulldozer to remove the plants. Coarse mechanical removal by bulldozer or otherwise must be followed by removal of root sprouts or new growth from the seedbank if re-infestation is to be prevented. The herbicides Glyphosate and Triclopyr are also effective. Use a 2% solution of Glyphosate or Triclopyr mixed with a 0.5% surfactant and thoroughly wet the leaves. To aid in the absorption of the herbicide apply when temperatures are greater than 65 degrees F. Herbicides can also be used in combination with mechanical treatments or as follow up to a burn. Consult a licensed herbicide applicator before applying herbicides over large areas.

References:

Checklist of the Vascular Plants of Maine, Third Revision. Josselyn Botanical Society of Maine. Maine Agricultural and Forest Experiment Station, Orono, ME. 1995.

Element Stewardship Abstract for Rosa multiflora**.** Eckardt, N. The Nature Conservancy in collaboration with the International Network of Natural Heritage Programs and Conservation Data Centers. 1987. Natural Heritage Databases. Arlington,VA.

Exotic Plant Guidelines, Smith, C.L. Department of Environmental and Natural Resources, Division of Parks and Recreation, Raleigh, North Carolina. 1998.

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Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Gleason, H.A. and Cronquist, A**.** New York Botanical Garden, New York. 910 pp. 1991.

For more information or for a more extensive list of references on invasive species contact:

Maine Natural Areas Program
Department of Conservation
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This fact sheet was prepared by the Maine Natural Areas Program, #93 State House Station, Augusta, ME, 04333-0093 and was funded through a grant from the Maine Outdoor Heritage Fund.

MAINE INVASIVE PLANT FACT SHEET

Shrubby Honeysuckles

Tartarian Honeysuckle
Morrow Honeysuckle
Belle's Honeysuckle
Lonicera spp.
(Honeysuckle Family)

Shrub honeysuckles (Lonicera spp.)

Illustration from Britton & Browns Illustrated Flora of the Northern United States and Canada, 2nd ed.

Description:
Bush honeysuckles are upright deciduous shrubs that grow from a few to 16 feet in height. The branches are widely spreading, with the older ones being hollow. The oval to oblong leaves are from 1 to 2 ½ inches long and are arranged in pairs on the stem. The flowers are tubular and occur in pairs. The fruit is a many seeded red, orange, or yellow berry. Tartarian honeysuckle has hairless leaves and flowers that are pink or white, and that do not turn yellow with age. Morrow honeysuckle has fuzzy or downy leaves and white flowers that turn yellow with age. Hybrid honeysuckle is a cross between Tartarian and Morrow honeysuckle and generally has features common to both but is capable of growing substantially taller. Care should be taken not to mistake the common native fly-honeysuckle (*Lonicera canadensis*) for these non-natives. The native fly-honeysuckle can be distinguished from non-natives by its pith. The native honysuckle has solid pith; non-native honeysuckles have hollow pith (cut stem lenghthwise to see).

Habitat:
Bush honeysuckles can be aggressive colonizers of abandoned agricultural fields, hedgerows, and edges of forests and wetlands, but they can also be found in forests, especially where there has been disturbance and the soils are limey. They prefer open locations but can tolerate moderate shade and can grow in soils ranging from moist to very dry.

Threats to Native Habitats:
Shrub honeysuckles can rapidly invade and degrade native plant communities. They form a dense layer that shades the ground interfering with the growth of many native woody and herbaceous species including rare plants. The ground under a honeysuckle thicket is often void of other vegetation. Shrub honeysuckles leaf out earlier than native species and they retain their leaves longer into the fall, giving them a competitive edge. Their success on high pH, dry exposed substrates has made them a threat to some of the northeast's unique limestone plant communities. The fruit of these shrubs is eaten by common birds which help spread the seed into new locations and make the shrub even more difficult to control.

Distribution:
Tartarian honeysuckle is native to central and eastern Russia where it is found in a wide range of habitats and can tolerate desiccating winds , near drought conditions, and temperatures ranging from –50 to +110 degrees F. Morrow honeysuckle is native to Japan where it also is known from a wide

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range of habitats and lives in a climate similar to the Atlantic coast of the U.S. Generally, Tartarian honeysuckle is found in dry exposed sites and Morrow honeysuckle is found in wetter sites. Each of the honeysuckles listed is highly invasive. Shrub honeysuckles are now naturalized (established and reproducing in the wild) throughout much of the northeastern United States. As recently as the 1980's they were promoted for their wildlife values, ornamental use, and for soil stabilization. In Maine, shrub honeysuckles have been documented in every county except Franklin and Piscataquis.

Control:

The best method of control is to prevent non-native shrubby honeysuckles from becoming established. These plants should be removed as soon as possible if they are found colonizing an area. Small infestations can be cleared by hand using a shovel or hoe, provided the entire root is removed. Larger colonies have been controlled by various combinations of repeated treatments of mechanical control, burning, or applying a glyphosate herbicide. If cutting is included as part of a treatment it should be done in early spring and in late summer or early fall. Cutting of plants results in resprouting, but is effective in temporarily reducing seed production. Seedlings are easily pulled. Treatment by prescribed burning is most effective if conducted during the growing season. Control methods may need to be repeated for three to five years to inhibit resprouting and to exhaust the seedbank.

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For more information or for a more extensive list of references on invasive species contact:

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Asiatic Sand Sedge

Carex kobomugi Ohwi
Sedge family (Cyperaceae)

NATIVE RANGE: Coastal areas of northeastern Asia

DESCRIPTION: Asiatic sand sedge is a perennial adapted to coastal beaches and dunes and possibly the only Carex species found in upper beach habitat along the U.S. Atlantic Coast. The mature sedge is a coarse and stout member of the genus that forms extensive colonies through cord-like rhizomes that extend many feet under the sand and produce new shoots. Flowering and fruiting occurs April through June and individual plants have either male or female flowers. As with many other members of the genus Carex, the flowers are numerous, subtended by scales, and arranged in spikes at the end of a flowering stalk that is triangular in cross section. A papery sac or perigynium encloses the female flowers, each of which develops into a single-seeded fruit, called an achene.

Because flowering culms are evident for a relatively brief period during the spring, and some colonies and new infestations may spread extensively without flowering, it is useful to learn to recognize the plant in its sterile form. Asiatic sand sedge may be confused with at least two colonial, rhizomatous native grass species - American beach grass (*Ammophila breviligulata*) and beach panic grass (*Panicum amarum*). Leaves of Asiatic sand sedge are longer tapering than those of the above grasses, have a yellow-green rather than bluish-green cast, and small teeth along the margin that are easily felt or seen with the help of magnification. These differences become more obvious when observed in the field. Several species of another sedge genus, Cyperus, sometimes grow on dunes and on wash flats and strongly resemble Carex when not in flower. However, these Cyperus species flower from late summer to fall, have leaves without serrated margins and, unlike Asiatic sand sedge, are weakly to non-rhizomatous.

ECOLOGICAL THREAT: Asiatic sand sedge invades wash flat habitat occupied by the federally listed plant, seabeach amaranth (*Amaranthus pumilus*), which is a poor competitor against it. On established, vegetated sand dunes, Asiatic sand sedge can out-compete native dune-binding grasses, like American beach grass and sea oats (*Uniola*

paniculata). Dunes dominated by Asiatic sand sedge are also more vulnerable to wind blowouts and storm erosion. There is evidence to suggest that fewer native plant species, and fewer individuals, occur on dunes dominated by Asiatic sand sedge than on comparable dunes dominated by the native American beach grass.

DISTRIBUTION IN THE UNITED STATES: Asiatic sand sedge occurs in maritime areas from Massachusetts to North Carolina.

HABITAT IN THE UNITED STATES: Asiatic sand sedge grows on primary dunes and on upper parts of ocean beach wash flats that have recently been disturbed by ocean storms. Like American beach grass, it appears to create more habitat for itself by trapping wind-blown sand to form dunes. Sand burial appears to stimulate the growth of rhizomes.

BACKGROUND: Asiatic sand sedge was first observed in the United States, at Island Beach, New Jersey in 1929. Specimens were collected on the Virginia part of the Delmarva (Delaware-Maryland-Virginia) Peninsula as early as the 1940s. Although the circumstances of its introduction are unclear, sand sedge was apparently introduced intentionally for use as a sand binder in erosion-prone areas and may have spread accidentally as a result of its use as a packing material in ship cargo.

BIOLOGY & SPREAD: Once established, Asiatic sand sedge spreads primarily by vegetative means, through production of rhizomes. Sexual reproduction, which requires both male and female plants to be present, is not necessary for a colony to expand locally. Expansion of a colony was observed at Island Beach, New Jersey, despite the absence of any seedlings. Long-distance dispersal of Asiatic sand sedge is uncertain but it is likely that its seeds are tolerant of salt water immersion and carried by ocean currents and storm surges. Plant fragments may be dispersed by ocean currents, and may remain viable after extended salt-water immersion, but this has not been confirmed. Some observation suggests that inundation by storm surges can kill growing plants. In newly forming colonies, sexual reproduction may be somewhat limited, since plants of the opposite sex may not occur nearby. Pollen may be carried long distances by the wind. Much research is needed to gain a better understanding of modes of dispersal and establishment of Asiatic sand sedge.

MANAGEMENT OPTIONS: Various mechanical and chemical methods have been used successfully in managing Asiatic sand sedge. Regardless of method, it is important to avoid breaking underground parts and leaving them untreated and to conduct follow-up monitoring and treatment if needed. Mapping infestations with a Global Positioning System (GPS) prior to treatment is very helpful for relocating sites, especially in sandy natural areas like beaches with few permanent landmarks. Cooperation and coordination among coastal area land managers should lead to more effective control.

Because Asiatic sand sedge is capable of forming extensive colonies, early detection and treatment of infestations is critical for effective management. The potential for considerable long-distance dispersal of seeds necessitates routine monitoring and possible follow up treatments, even after it is believed to be eradicated. Because of the likelihood

of leaving viable below-ground parts after an excavation, it is important to revisit the site in subsequent years to ensure that an infestation has been eradicated.

Manual. Excavation of individual plants by digging and hand-pulling is feasible and has been successful when used to control small infestations (e.g., fewer than 200 shoots). This method may not be economically or logistically feasible on larger control projects. Excavation generally involves digging with a shovel under and around each individual plant shoot to expose and loosen the roots. Individual shoots are often connected to other shoots by cordlike rhizomes that are about ¼ inch thick and often of considerable length. Once shoot and roots are loose, all rhizomes need to be gently excavated by hand, following them through the sand to minimize breaking. Rhizome parts left buried are likely to grow into new plants. Because the tips of new tillers (shoots) can be sharp enough to puncture skin, it is important to wear thick gloves when handling below-ground parts. Plants should be removed from the beach and disposed of in habitat unsuitable for the sedge (e.g., lawns), spread out to dry, or composted in black plastic until dead.

Chemical. Larger colonies of Asiatic sand sedge that have formed considerable dunes are probably most effectively controlled using chemical herbicides. A 2% glyphosate (e.g. Roundup, Rodeo, etc.) and water solution applied to the leaves during the growing season has provided effective control. One or two treatments in the same season followed by spot treatments are usually needed. Mid-summer (June through July in Maryland and New Jersey) treatments are just as effective as fall (October in Maryland) applications and allow for same season monitoring and re-treatment. Because rhizomes can be extensive, follow-up monitoring and treatment are necessary for several seasons to ensure long-term control.

Good coverage of herbicide is needed but can be difficult because of the plant's narrow leaves. To help track application and to minimize misapplication and waste, a colorant can be added to the spray solution. Herbicide applications should be made when the chance of rain is low for at least six hours after application and when winds are minimal (e.g., 0-7 mph), to minimize drift of herbicide to non-target areas. Herbicide users should read and follow all label instructions and, when possible, mix chemicals where a spill containment and/or clean-up facility is available instead of on site. Transport of herbicide is likely to be more rapid through sand than in other soils, and microbial activity that can break down herbicides is likely to be low in beach sand. When it is necessary to mix herbicide on the beach or dunes, it is recommended to mix over a waterproof basin set on top of a waterproof tarp.

For more information on the management of Asiatic sand sedge, please contact:
-Chris Lea, Assateague Island National Seashore, Berlin, MD (chris_lea@nps.gov).
-Greg McLaughlin, New Jersey Division of Parks and Forestry, Office of Natural Lands Management, Trenton, NJ (gmclaugh@dep.state.nj.us).
-Virginia Natural Heritage Program/Virginia Native Plant Society fact sheet http://www.dcr.state.va.us/dnh/fscako.pdf

SUGGESTED ALTERNATIVE PLANTS: Asiatic sand sedge was originally introduced as a dune stabilizer, although it is apparently less effective in this role than native species, such as American beach grass (*Ammophila breviligulata*), which occurs throughout the North American range of Asiatic sand sedge. In the southernmost part of this range, sea oats (*Uniola paniculata*) is the dominant native dune binding grass.

Dune Restoration and Planting. Once successful control of Asiatic sand sedge has been achieved, establishing native vegetation is an integral part of dune restoration. Native species such as American beachgrass (*Ammophila breviligulata*) and sea oats (*Uniola paniculata*) should be planted to protect vulnerable dunes from storm damage and blowouts and to prevent re-colonization by Asiatic sand sedge. American beachgrass establishes itself well on primary foredunes were shifting sands are common and should be planted during late winter to early spring. In primary backdune areas and places where sands are usually more stable, consideration should be given to planting species such as seaside goldenrod (*Solidago sempervirens*), beach panic grass (*Panicum amarum*), dune panic grass (*Panicum amarulum*), and sea-rocket (*Cakile edentula*), in combination with American beachgrass and sea oats.

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Virginia Department of Conservation and Recreation and Virginia Native Plant Society. Date unknown. (Fact Sheet) Invasive alien plants of Virginia: Asiatic Sand Sedge (*Carex kobomugi*) Ohwi.

Appendix D: Definition of Rhode Island Odonata status categories**.**

Distribution rank:

1. **Ubiquitous**: a species found in 30 or more townships
2. **Widespread**: a species found in 18-29 townships
3. **Limited:** a species found in 7-17 townships
4. **Restricted**: a species found in 6 or fewer townships

Abundance rank:

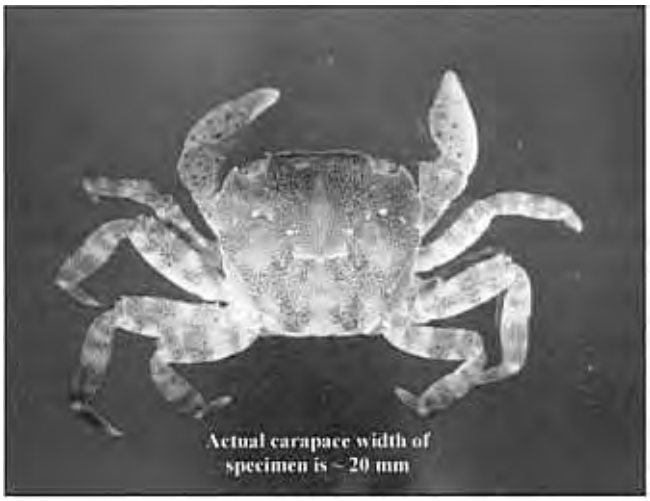
1. **Abundant**: 200 or more specimens (damselflies), 150 or more specimens (dragonflies) and/or more than 2 sites per township
2. **Common:** 71-199 specimens (damselflies), 75-149 specimens (dragonflies) and/or 2 sites per township
3. **Uncommon:** 10-70 specimens (damselflies), 10-74 specimens (dragonflies) and/or fewer than 2 sites per township
4. **Rare**: fewer than 10 specimens (dragonflies and damselflies)

Appendix E
Fact Sheet on the Japanese Shore Crab (*Hemigrapsus sanguineus*)
(USGS 2002)

NONINDIGENOUS SPECIES INFORMATION BULLETIN: Asian shore crab, Japanese shore crab, Pacific crab, *Hemigrapsus sanguineus* (De Haan) (Arthropoda: Grapsidae)

IDENTIFICATION: The Asian shore crab has a square-shaped shell with 3 spines on each side of the carapace. The carapace color ranges from green to purple to orange-brown to red. It has light and dark bands along its legs and red spots on its claws. Male crabs have a distinctive fleshy, bulb-like structure at the base of the moveable finger on the claws. This species is small with adults ranging from 35 mm (1.5 in) to 42 mm (1.65 in) in carapace width.

NATIVE RANGE: *Hemigrapsus sanguineus* is indigenous to the western Pacific Ocean from Russia, along the Korean and Chinese coasts to Hong Kong, and the Japanese archipelago.



Asian Shore Crab (*Hemigrapsus sanguineus*)
(Specimen courtesy of Susan Park, University of Delaware)

LIFE HISTORY: This species is an opportunistic omnivore, feeding on macroalgae, salt marsh grass, larval and juvenile fish, and small invertebrates such as amphipods, gastropods, bivalves, barnacles, and polychaetes. The Asian shore crab is highly reproductive with a breeding season from May to September, twice the length of native crabs. The females are capable of producing 50,000 eggs per clutch with 3-4 clutches per breeding season. The larvae are suspended in the water for approximately one month before developing into juvenile crabs. Because of this, the larvae have the ability to be transported over great distances, a possible means of new introductions.

HABITAT: This versatile crab inhabits any shallow hard-bottom intertidal or sometimes subtidal habitat. They can live on artificial structures and on mussel beds and oyster reefs. They also tend to aggregate at high densities under rocks where they overlap habitats with native crab species. *Hemigrapsus* can tolerate wide ranges of salinity and temperature as well as damp conditions in the upper intertidal regions.

NONINDIGENOUS OCCURRENCES: *Hemigrapsus* was first recorded in the United States at Townsend Inlet, Cape May County, New Jersey in 1988. This species is now well established and exceptionally abundant along the Atlantic intertidal coastline of the United States from Maine to North Carolina. It is actively breeding

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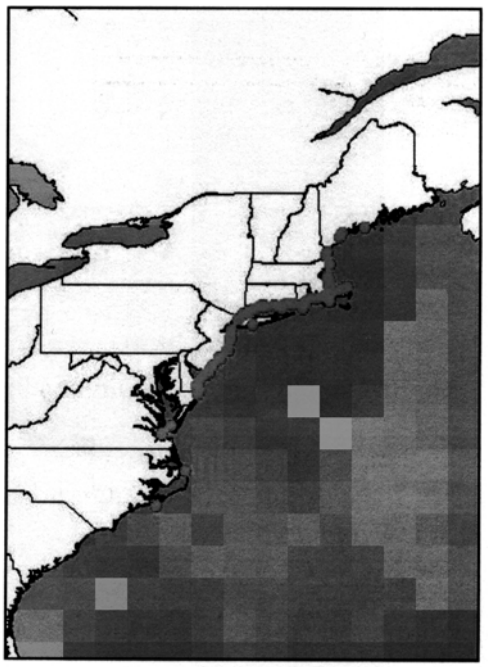
June 18, 2002
No. 2002-005

and expanding its population within its nonnative range. Because the species is tolerant of a wide range of environmental conditions, it is likely that the invasion will continue along the US coastline.

MEANS OF INTRODUCTION: It is not known how this species was introduced to the United States Atlantic coast, but many speculate that adults or larvae were brought by incoming ships of global trade via ballast water discharge.

IMPACTS: Because this species has a very broad diet, it has the potential to affect populations of native species such as crabs, fish, and shellfish by disrupting the food web. It also occupies habitats very similar to our native mud crabs, possibly overwhelming and dominating their habitat. This potential impact on native species populations may be a result of direct predation or competition for a food source. *Hemigrapsus* may compete with larger species, like the blue crab, rock crab, lobster, and the nonnative green crab. Recent trends show numbers of shore crabs are steadily increasing while native crab populations are declining. These opportunistic omnivores may also pose threats to coastline ecosystems and aquaculture operations. There are still many questions to be answered by scientists about impacts this species may pose to biodiversity in those ecosystems affected.



Hemigrapsus sanguineus locations in the United States

CONTROL AND MANAGEMENT: Preliminary evidence shows that rockfish and seagulls may prey upon *Hemigrapsus*. Parasites, which help control populations of *Hemigrapsus* in its native range, are not present along the US Atlantic coast. The shore crab may continue to expand its range along the US Atlantic coastline until it reaches its salinity and temperature tolerance levels. Scientists are monitoring changes in native species, tracking the shore crab's spread along the coastline, and conducting experiments to increase their knowledge of basic biology and ecology of this species. Ballast water management is also being researched to reduce or eradicate new introductions from occurring.

If you have collected or observed this species, or know of someone who has, please call the **Nonindigenous Aquatic Species Toll-Free Hotline, 1-877-STOP-ANS** and report the information. Or, report it using our website, **http://nas.er.usgs.gov/.**

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