APPENDICES

APPENDIX A: AGENCY CORRESPONDENCE LETTERS

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P. O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

REPLY TO
ATTENTION OF

January 20, 2006

Planning Division

Ms. Maricella Constantino
United States Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401

Dear Ms. Constantino:

The U.S. Army Corps of Engineers, Baltimore District (Corps) is updating two existing Integrated Natural Resources Management Plans (INRMPs) for the Delaware National Guard (DEARNG), on their behalf. These INRMPs address natural resources management at the River Road Training Site in New Castle, and the Bethany Beach Training Site in Bethany Beach.

In preparation of the updated INRMP, the Corps will review existing information about natural resources on each facility, revise and augment this information as necessary, and propose appropriate courses of action to improve and protect these resources. The INRMP will be prepared in accordance with appropriate current DOD and National Guard guidance, and will focus on management opportunities in a manner consistent with the mission of each facility. The INRMP will also include a Record of Environmental Consideration in each INRMP, in accordance with the National Environmental Policy Act (NEPA).

In support of this study, the Corps is inviting your participation in the INRMP update process. It is our goal to have an open dialog with your office regarding priorities for natural resources management in Delaware, and in particular at the Bethany Beach and River Road Training Sites.

In addition, the Corps is requesting any information your office may have on the presence of federally protected species of animals and plants listed by Section 7 of the Endangered Species Act (ESA). This request is for the project areas shown in the enclosed figures (Enclosures 1 and 2). A coordination letter has also been sent to the Delaware Department of Natural Resources and Environmental Conservation for information concerning listed species managed under their jurisdiction.

If you have any questions regarding this matter, please contact Ms. Vaso Karanikolis at (410) 962-4995.

Sincerely,

Robert F. Gore
Chief, Planning and Environmental
Services Branch

Enclosures

CF:
PES Reading File

WELLS/nrs/4939/CENAB-PL-E
KARANIKOLIS/CENAB-PL-E
GORE/CENAB-PL-E

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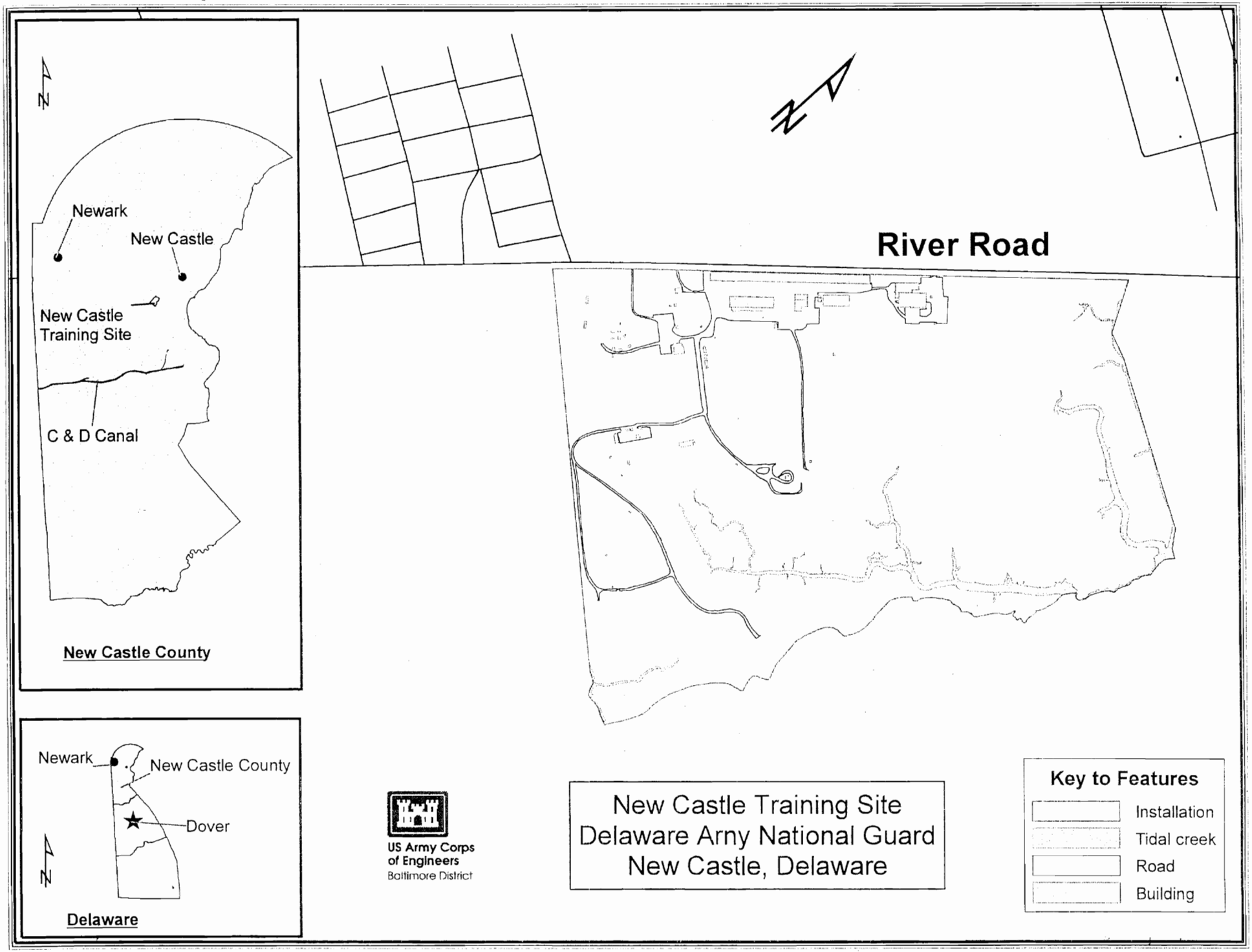
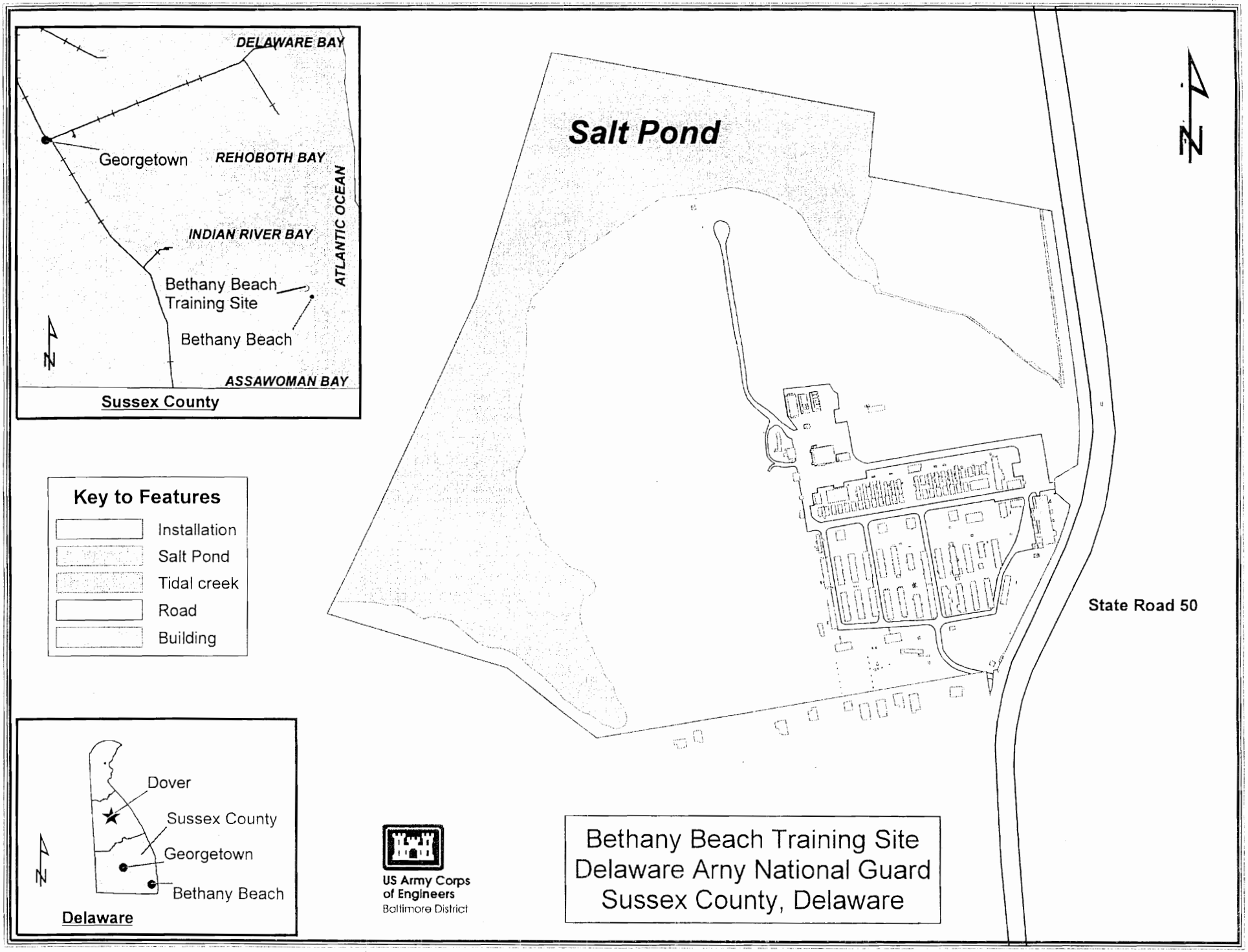


Enclosure 1: Location of River Road Training Site, New Castle, Delaware



Enclosure 2: Location of Bethany Beach Training Site, Bethany Beach, Delaware

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P. O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

REPLY TO
ATTENTION OF

January 20, 2006

Planning Division

Ms. Karen Bennett
Delaware Department of Natural Resources and Environmental Conservation
Aquatic Resources Education Center
4876 Hay Point Landing Road
Smyrna, Delaware 19977

Dear Ms. Bennett:

The U.S. Army Corps of Engineers, Baltimore District (Corps) is updating two existing Integrated Natural Resources Management Plans (INRMPs) for the Delaware National Guard (DEARNG), on their behalf. These INRMPs address natural resources management at the River Road Training Site in New Castle, and the Bethany Beach Training Site in Bethany Beach.

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In addition, the Corps is requesting any information your office may have on the presence of state protected species of animals and plants. This request is for the project areas shown in the enclosed figures (Enclosures 1 and 2). A coordination letter has also been sent to the U.S. Fish & Wildlife Service for information concerning species managed under their jurisdiction.

If you have any questions regarding this matter, please contact Ms. Vaso Karanikolis at (410) 962-4995.

Sincerely,

Robert F. Gore
Chief, Planning and Environmental
Services Branch

Enclosures

CF:
PES Reading File

WELLS/nrs/4939/CENAB-PL-E
KARANIKOLIS/CENAB-PL-E
GORE/CENAB-PL-E

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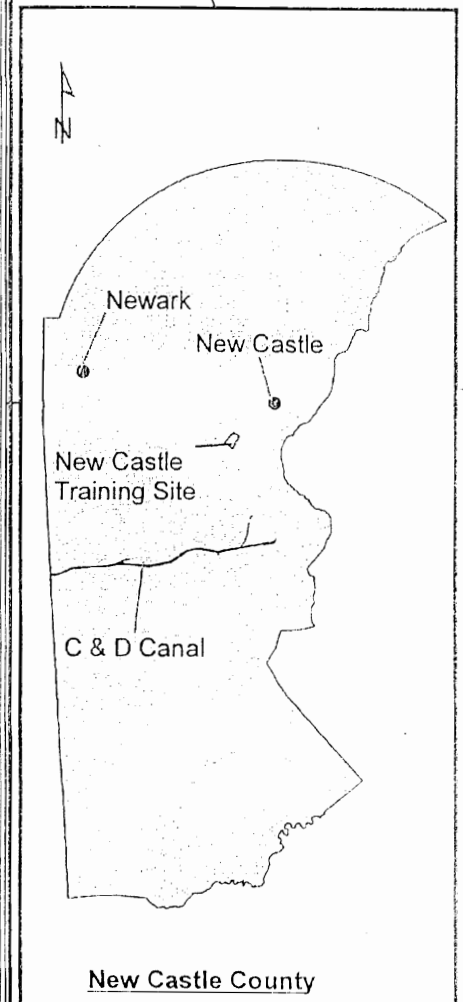
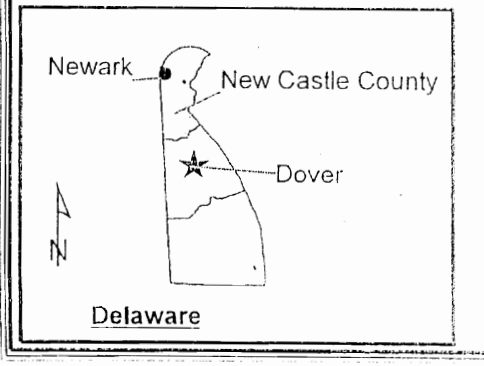
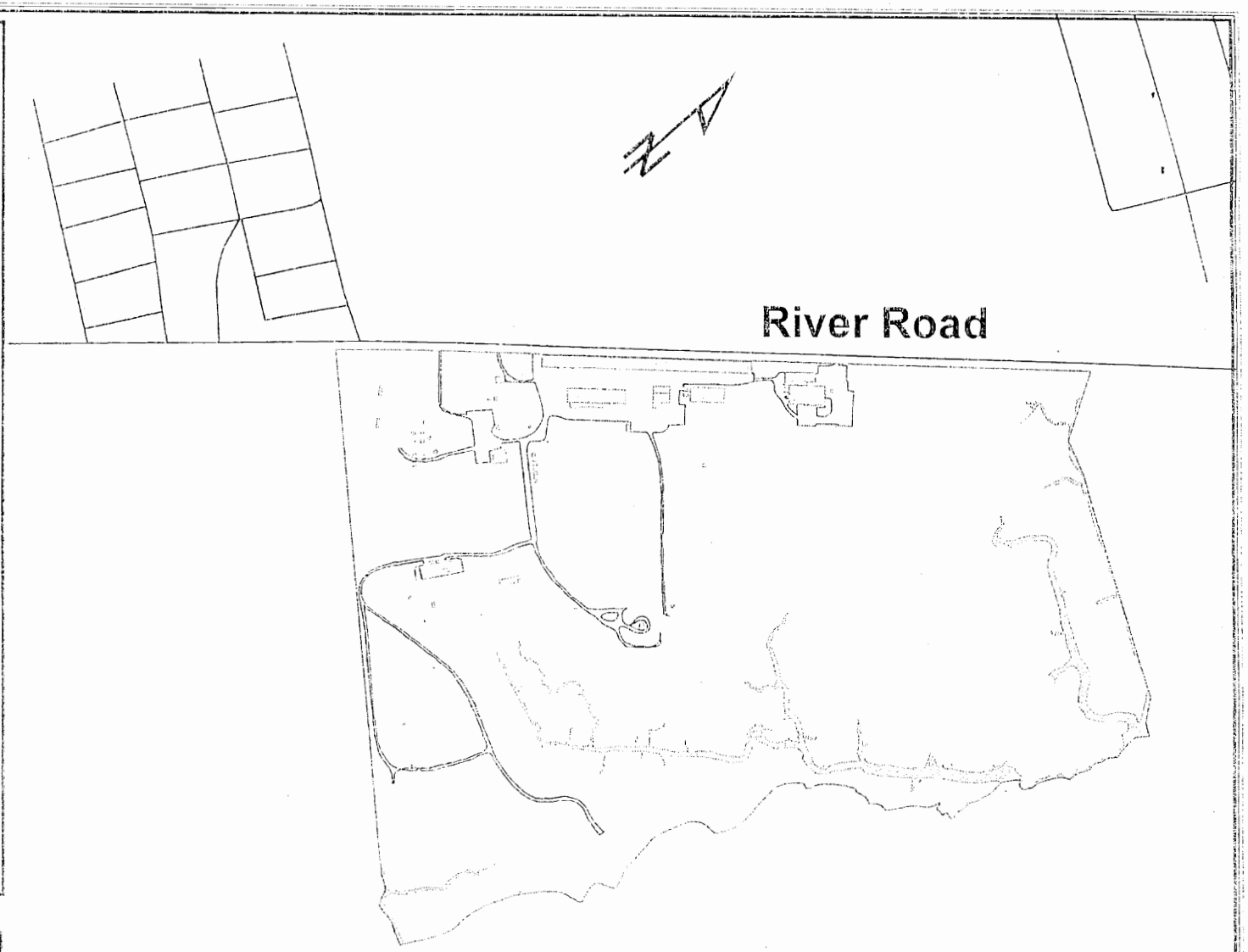




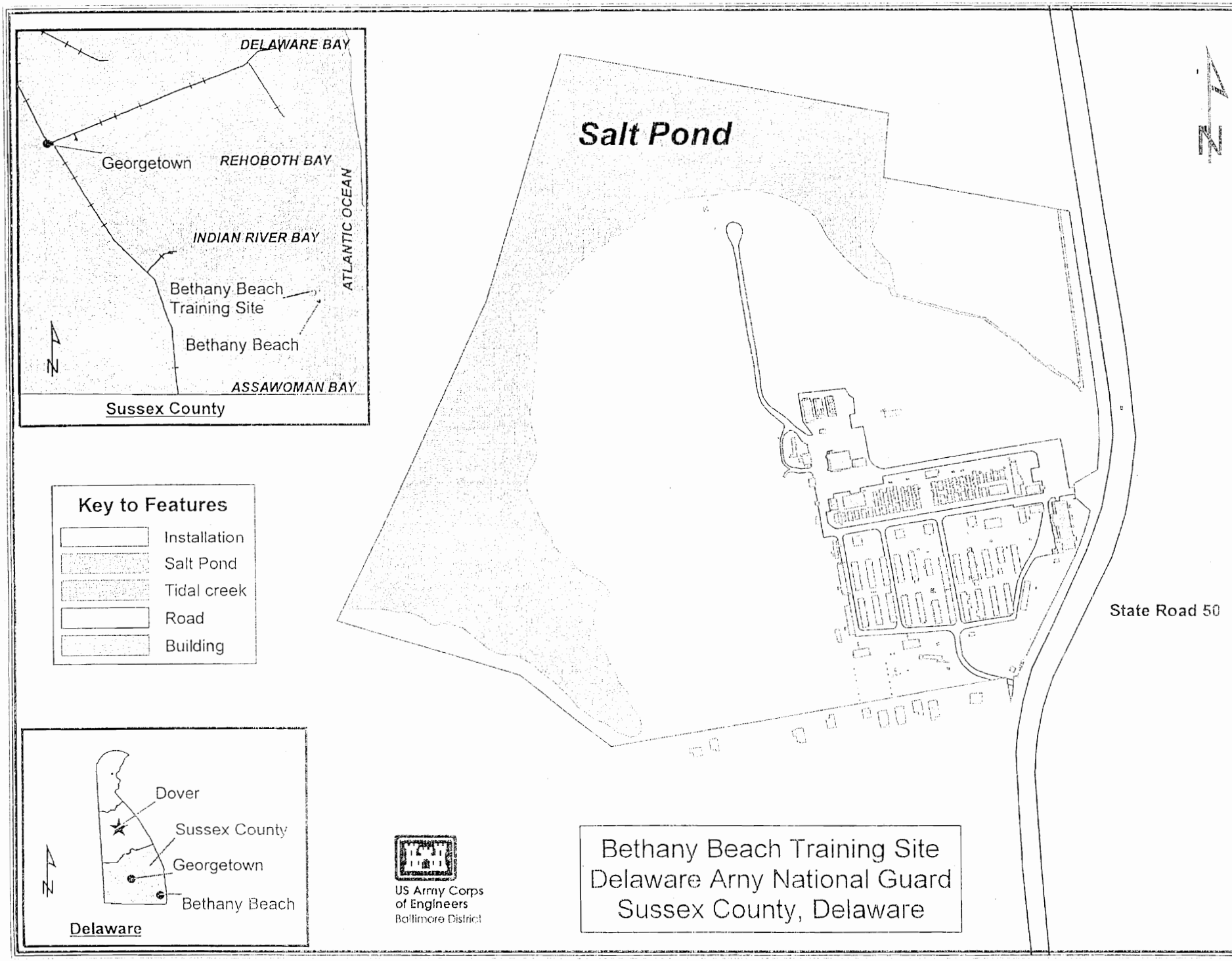


US Army Corps
of Engineers
Baltimore District

New Castle Training Site
Delaware Arny National Guard
New Castle, Delaware

Key to Features
- Installation
- Tidal creek
- Road
- Building

Enclosure 1: Location of River Road Training Site, New Castle, Delaware



Enclosure 2: Location of Bethany Beach Training Site, Bethany Beach, Delaware

VASO - See me on this.

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENTAL CONTROL
DIVISION OF FISH & WILDLIFE
NATURAL HERITAGE & ENDANGERED SPECIES
4876 HAY POINT LANDING ROAD
SMYRNA, DELAWARE 19977
TELEPHONE: (302) 653-2880
FAX: (302) 653-3431

February 28, 2006

Robert F. Gore
Department of the Army
Baltimore District, U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

RE: Integrated Natural Resources Management Plans (INRMPs)
Bethany Beach Training Site (Bethany Beach) and River Road Training Site (New Castle), Delaware
Applicant: Delaware National Guard

Dear Mr. Gore:

Thank you for contacting the Natural Heritage and Endangered Species program about information on rare, threatened and endangered species, unique natural communities, and other significant natural resources as they relate to the above referenced project.

We would like to participate in the process of updating your INRMPs and respectfully request to survey the wetlands and forested resources at these sites. This is especially important at the River Road site as freshwater wetland inventory and protection is one of our management priorities and we have never surveyed this property. Field surveys will enable us to update the Delaware Natural Heritage Inventory database and provide recommendations on resource protection. Please contact our botanist, Bill McAvoy or our community ecologist, Robert Coxe at (302) 653-2880 to discuss the possibility of a site visit.

Bethany Beach Training Site

A review of our database indicates that there are currently no records of state-rare or federally listed plants, animals or natural communities at this project site. We recommend that efforts to avoid impacts to wetlands on the property be employed as this type of habitat is typically used for nesting and foraging by a variety of wildlife species. Maintaining adequate upland buffers (at least 100ft) is important for protecting water quality within the wetlands.

River Road Training Site

There is a large area of tidal freshwater wetland on this property and efforts to avoid impacting this area should be employed. In addition to the many functions freshwater wetlands provide, a large percentage of Delaware species of special concern are found in this type of system. Overall, the loss of freshwater wetlands and degradation due to adjacent land development is of particular concern in Delaware. Therefore, maintaining adequate upland buffers around the wetlands is extremely important.

This property is adjacent to the Ommelanden Hunter Safety Training Center. This property is owned by the State of Delaware, but is accessible to the public. If you require additional information, please contact the center at (302) 323-5336.

This parcel is also part of the Governor Minner's "Green Infrastructure for a Liveable Delaware" (Executive Order Number Sixty-one; http://www.state.de.us/governor/orders/webexecorder61.shtml). This initiative includes a network of ecologically important natural resource lands of special state conservation interest. Green Infrastructure lands were identified through interpretation of the most important known rare species sites, existing protected lands, 1997 statewide aerial photography, and regional ecological evaluations by the USF&W Service, The Nature Conservancy, the Delaware Natural Areas, Natural Heritage, and Open Space Programs. The lands identified as green infrastructure serve to maintain natural ecological processes protect and support native species, air and water resources, sustain agricultural enterprises, and contribute to the health and quality of life for the citizens of Delaware. Because most of the Green Infrastructure lands are privately owned, it is a voluntary initiative that appeals to the stewardship of private landowners.

We are continually updating records on Delaware's rare, threatened and endangered species, unique natural communities and other significant natural resources. If you have any questions, please contact me at (302) 653-2883 ext. 126.

Sincerely,

Edna J. Stetzar

Edna J. Stetzar
Biologist/Environmental Review Coordinator

vnk → HW

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401

March 5, 2006

Mr. Robert F. Gore
Chief, Planning and Environmental Service Branch
U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, MD 21203-1715

RE: INRMP for the Delaware National Guard – River Road Training Site, New Castle County and Bethany Beach Training Site, Sussex County, DE

Dear Mr. Gore:

This responds to your letter, dated January 20, 2006, requesting information on the presence of species which are federally listed or proposed for listing as endangered or threatened within the above referenced project area. We have reviewed the information you enclosed and are providing comments in accordance with section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

The federally threatened bog turtle (*Clemmys muhlenbergii*) may be present within the River Road Training Site located in New Castle County, Delaware. Bog turtles primarily inhabit palustrine wetlands comprised of a muddy bottom or shallow water, and tussocks of vegetation. A survey for bog turtle habitat and bog turtles may be appropriate. These surveys should be conducted at any location the Delaware Natural Heritage and Endangered Species recommends. Upon completion, survey reports should be forwarded to both the Service and the Delaware Natural Heritage and Endangered Species Program for review. If you have not already sent a copy of your request for threatened and endangered species information to the Delaware Natural Heritage and Endangered Species Program please do so. Ms. Holly Niederriter can provide further details regarding the distribution of bog turtles in the state of Delaware, appropriate survey techniques for determining the presence of the species, and a list of qualified bog turtle surveyors. Ms. Niederriter may be contacted at (302) 653-2880 ext 121.

Except for occasional transient individuals, no other federally proposed or listed threatened or endangered species are known to exist within the project area. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available this determination may be reconsidered.

This response relates only to federally protected threatened or endangered species under our jurisdiction. For information on the presence of other rare species, you should contact Edna Stetzar of the Delaware Natural Heritage and Endangered Species Program at (302) 653-2883 ext. 126. You may also obtain information on how to make such a request by visiting the Program website at www.dnrec.state.de.us/nhp.

We appreciate the opportunity to provide information relative to fish and wildlife issues, and thank you for your interests in these resources. If you have any questions or need further assistance, please contact Andy Moser at (410) 573-4537.

Sincerely,

G. A. Mos

Mary J. Ratnaswamy, Ph.D.
Program Supervisor, Threatened and Endangered Species

cc: Holly Niederriter, Delaware Natural Heritage Program, Smyrna, DE

APPENDIX B: PLANNING LEVEL SURVEYS (PLSS)

FLORA PLS

The vegetation community assessments at the RRTS 2005 have identified a total of 130 species of plant on the installation. Of these, 40 were identified within the Palustrine Shrub-Scrub habitat, 20 were located within the Loblolly Pine Palustrine Forested Wetland, nine were identified within the Mixed Successional Forest, 22 were identified within the Mowed Lawn/Landscaping habitat, 25 were in the Estuarine Emergent Tidal Brackish Marsh, three were identified in the *Phragmites* Brackish Tidal Marsh, and one was in the Estuarine Shrub-Scrub hatitat.

		2005 Ecological Community										1999 INRMP Ecological Communities										
Scientific Name	**Common Name**	**PalustrineScrub Shrub Wetland** (includes some former Mixed Succesional Forest and all coastal shrubland)	**Loblolly Pine Forest (Palustrine Forested Wetland)**	**Mixed Successional Forest**	**Lawn/landscaping (including Palustrine Emergent Wetlands)**	**Estuarine Emergent Brackish Marsh** (includes intertidal mudflat, tidal creek & uncosolidated shore)	**Phragmites Brackish Tidal Marsh**	**Estuarine Scrub Shrub Wetland**	**National Plant List Indicator Status**	**Coastal Shrubland**	**Loblolly Pine Forest**	**Mixed Successional Forest**	**Lawn/landscaping**	**Unconsolidated Shore**	**Brackish Tidal Marsh**	**Phragmites Brackish Tidal Marsh**	**Salt marsh/intertidal mudflat**	**Saltwater Shrub wetlands**	**Subtidal uncosolidated bottom (not done in 2004)**	**Tidal Creek**
Acer Rubrum	Red Maple	x	x						FAC		x	x								
Asclepias syriaca	Common Milkweed				x				NI											
Alnus serrulata	Alder								OBL			x								
Amelanchier canadensis	Shadbush, Serviceberry	x							FAC-		x									
Andropogon sp.	Broom-Straw											x	x							
Apocynam cannibinum	Indian Hemp	x							FACU			x	x							
Symphyotrichum [Aster] selbulatis	Annual saltmarsh aster					x			OBL											
Baccharis halimifolia	Groundsel Tree	x	x			x	x	X	FACW	x					x	x		x		
Campsis radicans	Trumpet Creeper									x	x	x								
Calystegia sepium	Hedge Bindweed	x							FAC-											
Carex spp.	Sedge												x							
Coriandrum sativum	Wild Coriander				x				NI											
Cyperus filicinus	Nuttall's Flatsedge				x	x			OBL											
Cyperus flavescens	Yellow Flatsedge												x							
Cyperus spp.	Flatsedge												x							
Diodia virginiana	Virginia Buttonweed				x				FACW				x							
Distichlis spicata	Inland Saltgrass	x			x	X		X	FACW+						x		x			
Eleocharis engelmanni	Engelmann's Spikerush				x				FACW+											
Eleocharis obtusa	Blunt Spikerush				x	x		x	OBL						x					x
Eleocharis palustris	Marsh Spikerush				x				OBL											
Eleocharis parvula	Dwarf Spikerush					x		x	OBL											
Eupatorium spp.	Boneset											x	x							
Euphorbia sp.	Spurge												x							
Euthamia graminifolia	Flat-top goldentop	x	x						FAC				x							
Festuca spp.	Fescue												x							
Helenium flexuosum Raf.	Purple Sneezeweed				x				FAC-											
Hibiscus muchuctos	Marsh hibiscus														x	x		x		
Ilex glabra	Inkberry	x	x						FACW-		x									
Ilex opaca	American Holly		x	x					FACU+		x	x								
Iris spp.	Iris																			
Iva frutescens	Hightide bush	x	x			x	x	X	FACW+						x	x		x		
Juncus canadensis	Canada Rush	x			X				OBL											
Juncus effusus	Common Rush				x				FACW+											
Juncus gerardii	Saltmeadow Rush					x			FACW+											
Juncus romenularus	Black needle rush					X		x	OBL								x			
Juncus tenuis	Poverty Rush	x			X	x			FAC-									x		
Juniperus virginiana	Eastern Red Cedar		x	X					FACU	x		x			x			x		
Kosteletzkya virginica	Virginia Seashore Mallow								OBL											
Limonium nashii	Sea lavender					x		x	OBL								x			
Liquidambar styraciflua	Sweetgum											x								
Lonicera japonica	Japaneese Honeysuckle	x		x					FAC-		x	x	x							
Lythrum lineare	Saltmarsh Loosestrife								OBL											
Lythrum salicaria	Purple Loosestrife	x				x			FACW+											
Ludwigia palustris	Marsh Seedbox				x				OBL											
Mikania scandens	Climbing hempvine					x			FACW+	x		x								
Morella cerifera	Wax Myrtle	X	x	x				x	FAC	x		x								
Morella heterophylla	Evergreen Bayberry									x		x								
Morella pennsylvanica	Northern Bayberry	X	x	x					FAC											
Panicum sp.	Panicgrass												x							
Panicum virgatum	Switch Grass	x							FAC			x								
Parthenocissus quinquefolia	Virginia Creeper	x		x					FACU		x	x	x							
Paspalum spp.	Paspalum	x																		
Paulownia tomentosa	Princess-Tree												x							
Phragmites australes	Phragmites	x			x	x	X	X	FACW		x	x	x		x	x		x		
Phytolacca americana	Pokeweed																	x		

Scientific Name	Common Name	**PalustrineScrub Shrub Wetland** (includes some former Mixed Succesional Forest and all coastal shrubland)	**Loblolly Pine Forest (Palustrine Forested Wetland)**	**Mixed Successional Forest**	**Lawn/landscaping (including Palustrine Emergent Wetlands)**	**Estuarine Emergent Brackish Marsh** (includes intertidal mudflat, tidal creek & uncosolidated shore)	**Phragmites Brackish Tidal Marsh**	**Estuarine Scrub Shrub Wetland**	**National Plant List Indicator Status**	**Coastal Shrubland**	**Loblolly Pine Forest**	**Mixed Successional Forest**	**Lawn/landscaping**	**Unconsolidated Shore**	**Brackish Tidal Marsh**	**Phragmites Brackish Tidal Marsh**	**Salt marsh/intertidal mudflat**	**Saltwater Shrub wetlands**	**Subtidal uncosolidated bottom (not done in 2004)**	**Tidal Creek**
Pinus taeda	Loblolly Pine	**x**	**X**						FAC-		x			x						
Pinus thunbergiana	Jampanese Black Pine												x							
Pluchea odorata	Sweetscent					**x**			NI											
Polygonum hydropiperoides	Swamp smartweed				**x**				OBL											
Polygonum lapathifolium	Curlytop Knotweed												x							
Polygonum punctatum	Dotted smartweed				**x**				OBL											
Polygonum sp.	Smartweed												x		x					
Populus deltoides	Eastern Cottonwood												x							
Prunus serotina	Black Cherry	**x**		**X**					FACU		x	x								
Prunus pennsylvanica	Pin Cherry			**X**					FACU		x	x								
Quercus coccinea	Scarlet Oak	**x**							NI											
Quercus falcata	Southern Red Oak		**x**						FACU-											
Quercus ilicifolia	Scrub Oak	**x**							NI											
Quercus nigra	Water Oak										x									
Quercus phelos	Willow Oak	**x**							FAC+		x	x								
Quercus rubra	Northern Red Oak		**x**						FACU-		x									
Rhus copallina	Winged Sumac			**X**					NI			x								
Rosa multiflora	Multiflora Rose	**x**	**x**						FACU	x			x							
Rubus spp.	Blackberry/Raspberrys	**x**									x	x	x							
Rumex crispus	Curly dock				**x**				FACU				x							
Rumex verticillatus	Swamp Dock	**x**			**x**	**x**			OBL											
Sabatia campanulata	Slender Marsh Pink														x					x
Sabatia stellaris	Annual marsh pink					**x**			FACW+											
Salicornia maritima Wolff & Jefferies (formerly Salicornia europaea)	Slender Glasswort	**x**				**x**		**x**	OBL								x			
Salix nigra	Black Willow											x								
Sambucus canadensis	Elderberry	**x**	**x**						FACW-											
Schoenoplectus americanus (Pers.) Volk. ex Schinz & R. Keller (formerly Scirpus olneyi)	Olney Three Square,					**x**			OBL											
Schoenoplectus pungens (Vahl) Palla var. pungens (formerly Scirpus americanus)	Three square				**x**				OBL											x
Scirpus sp.	Rush											x								x
Senecio tomentosus	Hairy Ragwort	**x**							FACU											
Setaria sp.	Bristlegrass																x	x		x
Seteria pumila (formerly glauca)	Yellow Bristlegrass		**x**			**x**			FAC											
Smilax rotundifolia	Common Briar	**x**	**X**							x	x	x								
Solidago sempervirens	Seaside Goldenrod	**x**			**x**	**x**			FACW											
Solidago spp.	Goldenrod																	x		
Spartina alterniflora	Smooth Cordgrass	**x**				**X**			OBL									x		
Spartina cynosuroides	Big Cordgrass					**x**			OBL											
Spartina patens	Saltmarsh Hay	**x**			**x**	**X**		**X**	FACW+									x		
Taraxacum officinale	Dandelion		**x**						FACU-				x							
Toxicodendron radicans	Poison Ivy	**X**	**x**			**x**			FACU	x	x	x	x							
Trifolium pratense	Red Clover												x							
Typha angustifolia	Narrow-leaved Cattail				**x**				OBL											
Typha latifolia	Broad-leaved Cattail	**x**							OBL											
Vaccinium corymbosum	Highbush Blueberry	**x**	**x**						FACW-		x	x								
Vibernum acerifolium	Mapleleaf Viburnum	**x**							UPL*											
Vibernum dentatum	Southern Arrowwood	**x**							FAC											
Viola primulifolia	Primrose-leaved Violet											x								
Vitis labrusca	Fox Grape	**x**	**x**						FACU											
X = Dominant, x = non-dominant	**COUNT**	**40**	**20**	**9**	**22**	**25**	**3**	**1**		**9**	**18**	**27**	**25**	**1**	**9**	**4**	**5**	**11**	**0**	**5**
	TOTAL Number of Species:	130								114										

FAUNA PLS

Sampling Method

The Corps conducted quarterly observation surveys within representative cover types throughout the installation. These observations were scheduled to provide the most likely chance of seeing the largest variety of plants and wildlife thought to occur within the installation. The quarterly observations were timed and followed standard procedures for avian surveys. Any observed mammals, reptiles and amphibians were noted but not specifically sampled for.

The wildlife observation surveys were conducted in October 2004 (13th through 28th), January 2005 (20th and 21st), May 2005 (24th through 27th) and July 2005 (22nd through 29th). Additional walk through observations were noted during the wetland delineation process in June 2005. The results of the wildlife observation yielded a total of 54 avian species, two herptile species (amphibians and reptiles), two mammal species and six invertebrate species.

Birds

The avian observations yielded rather typical results. Colonial wading bird species, songbirds and terns were observed. Colonial wading bird species are those groups of long-legged birds that aggregate into large groups for breeding and brood rearing. Several of these species are of state conservation concern.

The installation is located in the Atlantic migratory bird flyway, where the marshes of Delaware Bay serve as refuges for migrating and resident birds, including geese, ducks, and shorebirds. The Assawoman Bay Depression Meadow, classified as a Category I Freshwater Wetland by the Delaware Nature Heritage Inventory, is located in the Assawoman Bay Wildlife Management Area, approximately 2.5 miles southwest of the BBTS. This unique wetland area is considered to be one of the most significant coastal plain Depression Meadows on the Delmarva Peninsula. Many state and globally rare species, including the awned meadow beauty (*Rhexia aristosa*) and Hirst's panic grass (*Panicum hirstii*) inhabit the wetland (DNREC, 1991).

Quarterly avian surveys resulted in the observation of three colonial wading bird species. Since the quarterly avian surveys were observational in nature, no species specific detailed survey was conducted. All three wading bird species are state species of conservation concern. All three species (Snowy Egret, Great Egret and Great Blue Heron) were seen flying over the brackish tidal marsh, and loafing and feeding within the estuarine emergent brackish marsh. The Snowy Egret and the Great Egret are extremely rare breeders within the state and the Great Blue Heron is a very rare breeder within the state. No colonial wading birds exhibited breeding behavior during the surveys.

The installation, as well as much of the forested portions of the Middle Atlantic Coastal Plain provides habitat for forest-interior Neotropical migratory bird species. Neotropical migrant birds are those species which winter in tropical regions but nest in the United States. While many of these species may be declining in numbers, they are still considered common occurrences by the

Delaware Natural Heritage Program (DNHP). These species warrant special consideration primarily due to habitat loss and habitat fragmentation. Generally, this group of bird species often requires large areas of unfragmented forest for their successful reproduction.

Mammals and Herptiles

The mammal and invertebrate species observed were considered typical species found in a developed yet fragmented forested coastal plain and brackish tidal marsh habitat. The reptiles and amphibian species noted were also very common to the area.

Aquatic Species

A variety of aquatic species have previously been identified at the BBTS. The brackish water tidal creeks on and adjacent to the property provide habitat for killifish species and were observed during the vegetation surveys. The fiddler crab (Uca spp.) and various snail species were observed during the vegetation surveys. Typical salt marsh invertebrate community species may include mud snail (*Illyanassa obsoleta*), saltmarsh snail (*Melampus bidentatus*), ribbed mussel (*Geukensia demissa*), and grass shrimp (Palaemonetes spp.) (Kreamer, 1995).

Wildlife Observed at the BBTS (2005 Quarterly Surveys)

F = fall, W = winter, Sp = spring, S = summer

Scientific Name	Common Name	Time of Year	Previously Identified
AVIAN SPECIES			
Accipiter striatus	Sharp-shinned Hawk		X
Agelaius phoeniceus	Red-winged Blackbird	Sp, S	X
Aix sponsa	Wood Duck		X
Anas platyrhyncos	Mallard	Sp	X
Anas rubripes	American Black Duck		X
Ardea herodias	Great Blue Heron	F	X
Aythya marila	Greater Scaup		X
Branta canadensis	Canada Goose	F, W, Sp, S	X
Bubo virgninianus	Great Horned Owl		X
Bucephala albeola	Bufflehead		X
Butorides striatus	Greenbacked Heron	S	X
Cahartes aura	Turkey Vulture	S	X
Caprimulgus vociferous	Whip-poor-will		X
Cardinalis cardinalis	Northern Cardinal	F, W, Sp, S	X
Carduelis tristis	American Goldfinch	F, WS	X
Carpodacus mexicanus	House Finch		X
Carpodacus purpureus	Purple Finch	S	
Casmerodius albus	Great Egret	F, Sp	X
Catoptrophorus semipalmatus	Willet	Sp	X
Chaetura pelagica	Chimney Swift		X
Charadrius semipalmatus	Semipalmated Sandpiper	Sp	
Charadrius vociferus	Killdeer	W, Sp, S	X
Circus cyaneus	Northern Harrier		X
Colaptes auratus	Yellow shafted [Northern] Flicker	F, WS	X
Colinus virgninianus	Northern Bobwhite		X
Columba livia	Rock Dove		X
Coragyps atratus	Black Vulture	F	X
Corvus brachyrhynchos	American Crow	F, W, Sp, S	X
Corvus ossifragus	Fish Crow	F, W	X
Dendroica coronata	Yellow rumped Warbler	F, W	X
Dendroica magnolia	Magnolia Warbler	F	
Dendroica palmarum	Palm Warbler		X
Dendroica pinus	Pine Warbler	F	X

Dumetella carolinensis	Gray Catbird	Sp, S	X
Egretta thula	Snowy Egret	Sp	
Eremophila alpesris	Horned Lark		X
Goethylpis trichas	Common Yellowthroat	F, WS	X
Haliaeetus leucocephalus	American Bald Eagle	F	
Hirundo rustica	Barn Swallow	Sp, S	X
Iridoprocne bicolor	Tree Swallow	S	X
Junco hyemalis	Dark-eyed Junco	F, W	X
Larus argentatus	Herring Gull	F, W, Sp, S	X
Larus atricilla	Laughing Gull	Sp, S	X
Larus delawarensis	Ring-billed Gull	W, Sp	X
Larus marinus	Greater Black-backed Gull	W	X
Megerly alcyon	Belted Kingfisher	F	X
Meanerpes carolinus	Red-bellied Woodpecker		X
Melospiza georgiana	Swamp Sparrow	W	X
Melospiza melodia	Song Sparrow	F, W	X
Mimus polyglottos	Northern Mockingbird	F	X
Mniotilta varia	Black-and-white Warbler		X
Molothrus ater	Brown-Headed Cowbird	Sp, S	
Pandion haliaetus	Osprey	S	X
Parus atricapillus	Black Capped Chickadee	F	
Parus bicolor	Tufted Titmouse	F	
Parus carolinensis	Carolina Chickadee	F	X
Passer domesticus	House Sparrow		X
Passerculus sandwichensis	Savannah Sparrow	F	X
Phalacrocorax auritus	Double-crested Cormorant	F, Sp, S	X
Picoides pubescens	Downy Woodpecker		X
Pipilo erythrophthalmus	Rufous-sided Towhee		X
Podiceps gresegena	Red-necked Grebe		X
Podilymbus podiceps	Pied-billed Grebe		X
Polioptila caerulea	Bluegray Gnatcatcher		X
Porzana carolina	Sora Rail	F	
Progne subis	Purple Martin		X
Quiscalus major	Boat-tailed Grackle	Sp, S	X
Quiscalus quiscula	Common Grackle	W, Sp, S	X
Rallus longirostris	Clapper Rail		X
Regulus calendula	Ruby Crowned Kinglet	F	
Sialia sialis	Eastern Bluebird		X
Sitta canadensis	Red-breasted Nuthatch	F	X

Spizella passerina	Chipping Sparrow	W	
Spizella pusilla	Field Sparrow		X
Sterna forsteri	Forster's Tern	Sp	X
Sterna hirundo	Common Tern		X
Sturnella magna	Eastern Meadowlark		X
Sturnus vulgaris	European Starling	W, Sp, S	X
Thryothorus ludovicianus	Carolina Wren		X
Tringa malanoleuca	Greater Yellowlegs		X
Troglodytes aedon	House Wren	Sp, S	
Turdus migratorius	American Robin	F, Sp, S	X
Tyrannus tyrannus	Eastern Kingbird		X
Vireo griseus	White-eyed Vireo		X
Zenaida macroura	Mourning Dove	Sp, S	X
	Swallow species (flocks)	F	
HERPTILE SPECIES			
Bufo woodhousii fowleri	Fowlers Toad	Sp	X
Terrapene carolina carolina	Eastern Box Turtle	F	
MAMMAL SPECIES			
Odocoileus virginianus	White-tailed Deer	S	X
Ondatra zibethicus	Muskrat		X
Procyon lotor	Raccoon		X
Sciurus carolinensis	Eastern Gray Squirrel		X
Sylvilagus floridanus	Eastern Cottontail Rabbit	Sp, S	X
INVERTEBRATE SPECIES			
Callinectes sapidus	Blue Crab	S	
Cercyonis pegala	Wood Nymph		X
Danaus plexippus	Monarch Butterfly		X
Enallagma civile	Civil Bluet		X
Erythrodiplax verenice	Seaside Dragonlet		X
Odonata	Dragonfly species	Sp, S	
Magicicada spp.	Cicada	S	
Papilio glaucus	Tiger Swallowtail		X
Papilio Polyxenes	Black Swallowtail		X
Procambarus spp.	Crayfish species	Sp, S	
	Cricket species	Sp, S	
Popillia japonica	Japanese Beetle	Sp, S	

THREATENED AND ENDANGERED SPECIES PLS

Regulations

The Endangered Species Act (ESA) of 1973 (as amended 1982 and 1987), is intended to prevent the further decline of federally-listed endangered and threatened plants and wildlife and to help restore populations of these species and their habitats. The ESA, jointly administered by the Department of Commerce and the Department of the Interior, requires that each federal agency consult with the US Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) to determine whether endangered or threatened species are known to exist, or have critical habitats, at or in the vicinity of the site of a proposed action. To date, no federally listed species have been documented at the RRTS.

The Department of Army and DEARNG must comply with several aspects of the ESA. The ESA requirements imposed on the Department and DEARNG are presented in detail in AR 200-3 and are summarized below:

- To carry out programs for the conservation of listed species.
- To ensure that any actions taken do not jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat.
- To formally consult and confer with USFWS and NMFS to determine if any action may affect, beneficially or adversely, a listed species or critical habitat. Formal consultation is only necessary if an action is determined by the DEARNG and USFWS and/or NMFS to adversely affect a listed species or critical habitat.
- To not "take" listed fish and wildlife species, or remove and/or destroy listed plants. Take, as defined by the ESA, means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Habitat modification can be considered a take if death or injury of wildlife occurs from removing essential habitat components or impairing essential behavior patterns, such as breeding feeding, or sheltering.

The state of Delaware regulates activities related to the importation, transportation, possession, or sale of any endangered species of fish or wildlife (7 Del. C. 1953, § 601; 58 Del. Laws, c. 65.). The DNREC Division of Fish and Wildlife administers permits and licenses for such activities.

Threatened and Endangered Species at the BBTS

No State- or federally-listed threatened or endangered species have been identified at the BBTS. However, several bird species of special concern in the state were observed on or flying over the property. The table below identifies rare species present at the NCRR with a Delaware Natural Heritage Inventory (NHI) ranking of S1, S2, or S3 (see table notes for reference).

Rare, Threatened, and Endangered Species at BBTS

			Ecological Community							
Scientific Name	**Common Name**	**NHI Status** [(1)]	**Flyover**	**Palustrine Scrub-Shrub Wetland** (includes some former Mixed Succesional Forest and all coastal	**Loblolly Pine Forest (Palustrine Forested Wetland)**	**Mixed Successional Forest**	**Lawn/landscaping (including Palustrine Emergent Wetlands)**	**Estuarine Emergent Brackish Marsh** (includes intertidal mudflat, tidal creek & uncosolidated shore)	**Phragmites Brackish Tidal Marsh**	**Estuarine Scrub Shrub Wetland**
Ardea albus	Great Egret	S1B	**X**					**X**		
Ardea herodias	Great Blue Heron	S2B	**X**					**X**		
Calidris semipalmatus	Semi-Palmated Sandpiper	S3N					**X**			
Coragyps atratus	Black Vulture	S2B	**X**							
Egretta thula	Snowy Egret	S1B	**X**					**X**		
Haliaeetus leucocephalus	American Bald Eagle	S2B, S3N	**X**					**X**		
Melospiza georgiana	Swamp Sparrow	S3B, S4N								
Phalacrocorax auritus	Double-crested Cormorant	S1B, SZN	**X**			**X**	**X**			
Porzana carolina	Sora Rail	S2						**X**		
Spizella passerina	Chipping Sparrow	S3N					**X**	**X**		
Sterna forsteri	Forster's Tern	S1B, SZN						**X**		

Source: Avian observations from October 2004 through July 2005. Natural Heritage Indicator (NHI) Status from Delaware Natural Heritage Program.

[(1)] NHI Status

S1 = Extremely rare within the state (typically 5 or fewer occurrences) or because some factor immediately threatens the future existence within the state.

S2 = Very rare within the state (typically 6 to 20 known occurrences). Species is susceptible to becoming extirpated.

S3 = Rare to uncommon (typically 21 to 100 known occurrences). S3 species are not immediately threatened with extirpation, but may be if additional populations are destroyed.

The suffix "N" refers to occurrence as a non-breeder; "B" refers to occurrence during breeding season.

A "Z" qualifier indicates species that regularly migrate through the state, but do not breed or winter in Delaware.

Species Descriptions

Ardea alba - Linnaeus, 1758
Great Egret
Other Related Names: Casmerodius albus (Linnaeus, 1758)

Photo © 2002 www.arttoday.com

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Ciconiiformes	Ardeidae	Ardea

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Ardea alba
Taxonomic Comments: Formerly included in the genus CASMERODIUS (see AOU 1995). Has been included in genus EGRETTA by some authors (AOU 1998).

General Description: A large wading bird with all-white plumage; long black legs and feet; a long neck; and a long, straight, pointed, yellow bill; in breeding plumage, long white plumes extend from back beyond end of tail; average length 99 cm, wingspan 130 cm (NGS 1983).

Diagnostic Characteristics: Differs from most other white herons in larger size (averages 23 cm longer than reddish egret, 38 cm longer than snowy egret), unicolored yellowish bill, and all-black legs and feet. Differs from the white form of the great blue heron in having black legs and feet (vs. yellowish).

Reproduction Comments: Clutch size is 1-6 (usually 3-4) in the north, 2-3 in the south. Incubation lasts 23-25 days, by both sexes. Young fly at about 6 weeks. Nests solitarily or in small to large colonies (Harrison 1979). In Florida, failure of nests was associated with high rainfall (Frederick and Collopy 1989). May lay another clutch if eggs are lost during incubation (Byrd and Johnston 1991).
Ecology Comments
Nonbreeding: may gather in groups but usually forages singly, spreading out over available area.

In Florida, nestlings infected by the nematode EUSTRONGYLIDES IGNOTUS experienced higher mortality rates than did uninfected nestlings (Spalding et al. 1994).
Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: Migratory in north; extensive post-breeding dispersal occurs prior to southward migration (Palmer 1962). Some banded in the U.S. reach northern Colombia (recorded in September and November; Hilty and Brown 1986). Breeders from the U.S. Atlantic coast are thought to winter in the Bahamas and West Indies (see Byrd and Johnston 1991). Migrants from the north are present in Costa Rica October-April (Stiles and Skutch 1989).

Estuarine Habitat(s): Bay/sound, Herbaceous wetland, Lagoon, River mouth/tidal river, Scrub-shrub wetland, Tidal flat/shore

Riverine Habitat(s): Low gradient

Lacustrine Habitat(s): Shallow water

Palustrine Habitat(s): FORESTED WETLAND, HERBACEOUS WETLAND, Riparian, SCRUB-SHRUB WETLAND

Terrestrial Habitat(s): Grassland/herbaceous

Habitat Comments: Marshes, swampy woods, tidal estuaries, lagoons, mangroves, streams, lakes, and ponds; also fields and meadows.

Nests primarily in tall trees, usually with other colonial water birds; in woods or thickets near water. See Spendelow and Patton (1988) for further details and information on geographic variation in nesting habitat. Returns to the same colony sites year after year.

Adult Food Habits: Carnivore, Invertivore, Piscivore

Immature Food Habits: Carnivore, Invertivore, Piscivore

Food Comments: Eats mainly fishes, amphibians, snakes, snails, crustaceans, insects, and small mammals; commonly forages in marshes and shallow water of ponds, also in fields (Palmer 1962).

Adult Phenology: Crepuscular, Diurnal

Immature Phenology: Crepuscular, Diurnal

Phenology Comments: Arrives at roost at sunset or at dark, departs at first light (Palmer 1962). Forages during daylight (Powell 1987).

Colonial Breeder: Y
Length: 99 centimeters
Weight: 935 grams

Global Status: G5
Global Status Last Reviewed: 20Nov1996
Global Status Last Changed: 20Nov1996
Rounded Global Status: G5
Reasons: Secure due primarily to the very large range, though the amount of suitable nesting habitat is relatively restricted.

National Status: N5B,N5N
State Status: Delaware (S1B)

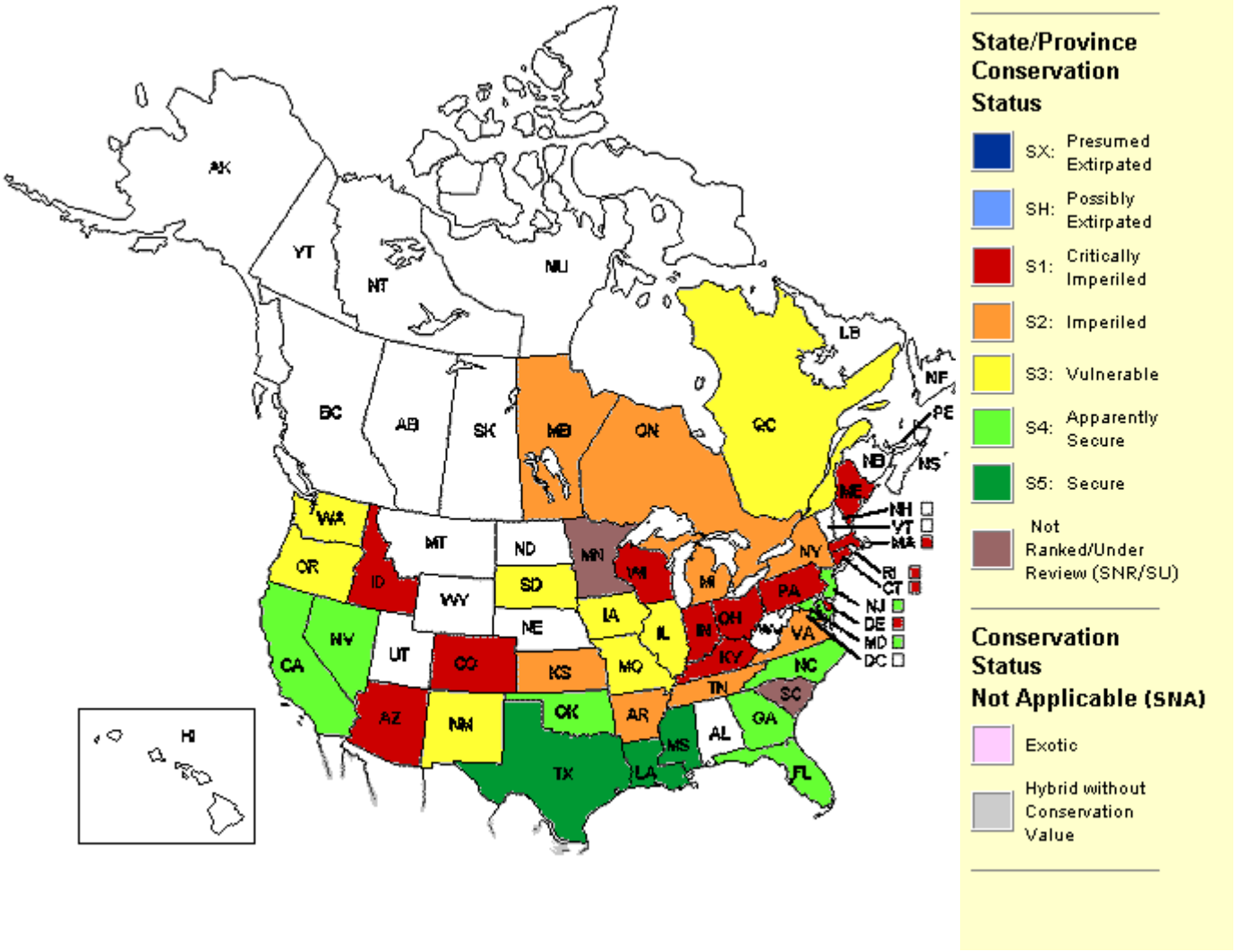
Global Abundance: 100,000 to >1,000,000 individuals

Global Abundance Comments: See Spendelow and Patton (1988) for information on distribution and abundance of coastal U.S. breeding populations.

Estimated Number of Element Occurrences: > 300

Global Short Term Trend Comments: Populations in the south-central U.S. may be benefiting from crayfish aquaculture; bird population increases may be related to favorable foraging opportunities afforded by expanding crayfish aquaculture (Fleury and Sherry 1995).

All information courtesy of NatureServe.org:
http://www.natureserve.org/explorer/servlet/NatureServe?menuselect=none&sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=103493&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=103493&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=103493&selectedIndexes=101799&menuselectfooter=none


State/Province Conservation Status
SX: Presumed Extirpated
SH: Possibly Extirpated
S1: Critically Imperiled
S2: Imperiled
S3: Vulnerable
S4: Apparently Secure
S5: Secure
Not Ranked/Under Review (SNR/SU)
Conservation Status
Not Applicable (SNA)
Exotic
Hybrid without Conservation Value
AK
YT
NT
NU
BC
AB
SK
MB
ON
QC
LB
NF
PE
NB
NS
ME
NH
VT
MA
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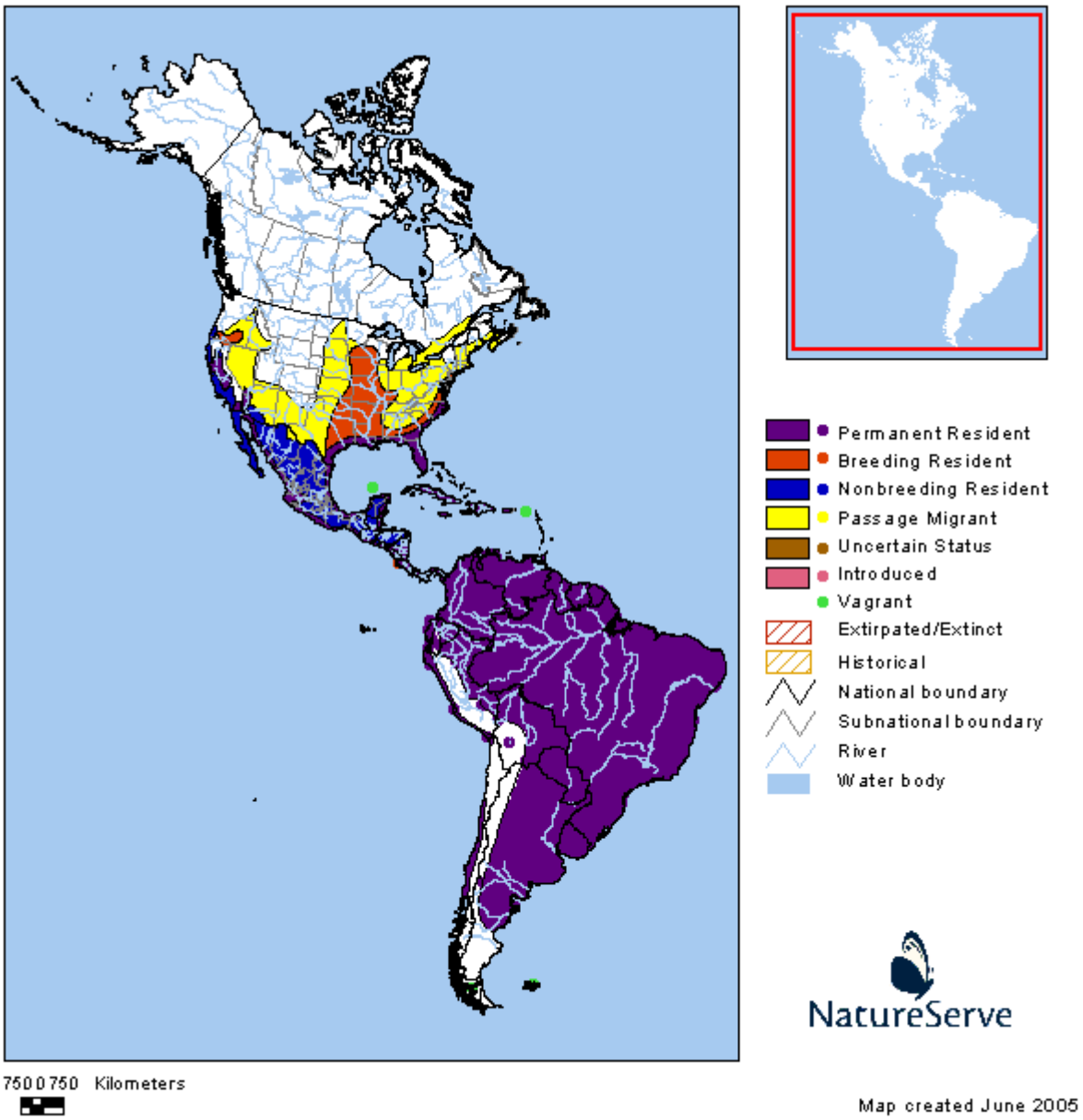
VA
NC
SC
GA
FL
HI

Range Map

Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at [www.natureserve.org/getData/animalData.jsp.](www.natureserve.org/getData/animalData.jsp)



Range Map Compilers: NatureServe, 2002; NatureServe, 2004; WILDSPACETM 2002

Calidris pusilla - (Linnaeus, 1766)
Semipalmated Sandpiper

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Charadriiformes	Scolopacidae	Calidris

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Calidris pusilla
Taxonomic Comments: C. PUSILLA and C. MAURI are often placed in the genus EREUNETES (AOU 1983).

Reproduction Comments: Begins breeding late May or early to mid-June. Usually 4 eggs incubated by both sexes, in turn, 18-21.5 days. Young tended by both parents, can fly at 14-19 days. May have same mate in successive years. Breeding population includes some yearlings. Up to 20 nests per sq km in some areas of northern Alaska.

Ecology Comments:
Average territory size 1 ha on breeding grounds in Manitoba (Gratto et al. 1985). Seen in association with least sandpiper, sanderling, and semipalmated plover. Often in large flocks.

Non-Migrant: N
Locally Migrant: N
Long Distance Migrant: Y

Mobility and Migration Comments: Begins migrating northward in April, passing through U.S. in mid-May; arrives in breeding areas late May-early June. Northward and southward migration through interior North America are primarily east of Rockies, and on Atlantic-Gulf coast.

Southbound migrants from Alaska migrate chiefly across the Great Plains. Southbound migrants from the Canadian arctic (central and eastern breeding range) stop and feed at estuaries in Canadian maritime provinces and northeastern U.S. before flying nonstop to wintering areas in South America. The Bay of Fundy is a very important migration stop (may be used by 1-2 million birds in fall; Mawhinney et al. 1993). Adults depart breeding areas on Victoria Island by the end of July, juveniles depart in early to mid-August. Migrates through Costa Rica mid-August to mid-November and March-early May (Stiles and Skutch 1989).

In spring, western breeders migrate northward apparently through the interior of North America whereas most central and eastern breeders follow an Atlantic route from northern South America to the eastern U.S. at Delaware Bay (some migrate through interior of North America). Spring migrants in interior North America evidently use multiple stopover areas enroute to breeding areas (Skagen and Knopf 1994).

Birds wintering on the north coast of Brazil probably derive from breeding grounds in the eastern Arctic; birds on the western part of the north coast of South America and on the northern part of the Pacific coast likely come from the western sectors of the breeding grounds (Morrison and Ross 1989).

Estuarine Habitat(s): Tidal flat/shore

Palustrine Habitat(s): Riparian, TEMPORARY POOL

Terrestrial Habitat(s): Grassland/herbaceous, Sand/dune, Tundra

Habitat Comments: Nonbreeding: mudflats, sandy beaches, shores of lakes and ponds, and wet meadows (AOU 1983). In northern Alaska, postbreeding habitat was mainly coastal mudflats and slough edges (Smith and Connors 1993). Breeds on grassy or dry shrubby tundra, usually near water. In northern Alaska, favored areas with well-drained ridges for nesting and adjacent wet tundra for feeding (see Johnson and Herter 1989). Often returns to nest in natal area or area of previous nesting (Gratto et al. 1985). The nest is a shallow depression, lined with grasses, moss, and leaves. See also Rodrigues (1994).

Adult Food Habits: Invertivore

Immature Food Habits: Invertivore

Food Comments: Feeds primarily on aquatic insects; also eats mollusks, worms, and crustaceans. In spring at Delaware Bay, consumes large numbers of horseshoe crab eggs (Castro and Myers 1993, Botton et al. 1994). Runs along sand or mud snatching at food, sometimes probes for food with bill.

Adult Phenology: Circadian

Immature Phenology: Circadian

Phenology Comments: See Robert et al. (1989).

Length: 16 centimeters
Weight: 28 grams

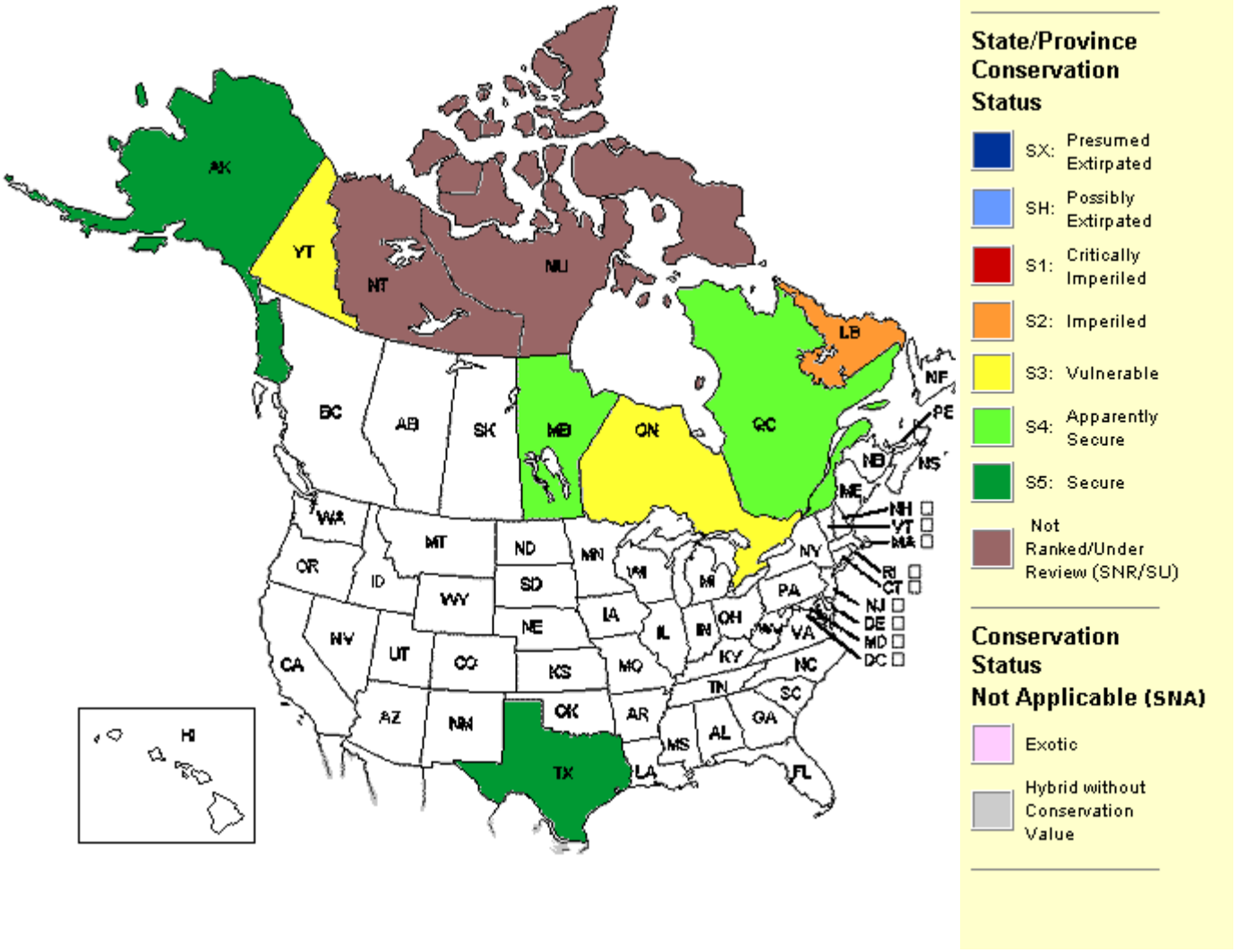
Global Status: G5
Global Status Last Reviewed: 26Nov1996
Global Status Last Changed: 26Nov1996
Rounded Global Status: G5 – Secure

National Status: N5B
State Status: Delaware (S3N)

Global Abundance: >1,000,000 individuals
Global Abundance Comments: Possiby the most abundant shorebird. Morrison et al. (2001) estmiated the total population as 3.5 million (range 2-5 million).

Global Short Term Trend Comments: In spring at Delaware Bay, counts declined from the mid-1980s through the early 1990s (Clark et al. 1993). Morrison (1993/1994) categorized the population trend in Canada as "stable?/decreasing?" Counts of fall migrants in southeastern Canada significantly increased from 1980 to 1985, showed no significant trend from 1974 to 1979 or from 1986 to 1991 (Morrison et al. 1994).

All information courtesy of NatureServe.org:
http://www.natureserve.org/explorer/servlet/NatureServe?menuselect=none&sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=104508&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=104508&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=104508&menuselectfooter=none


State/Province Conservation Status
SX: Presumed Extirpated
SH: Possibly Extirpated
S1: Critically Imperiled
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S4: Apparently Secure
S5: Secure
Not Ranked/Under Review (SNR/SU)
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AK
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ON
QC
LB
NF
PE
NB
NS
ME
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VT
MA
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CT
NY
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NJ
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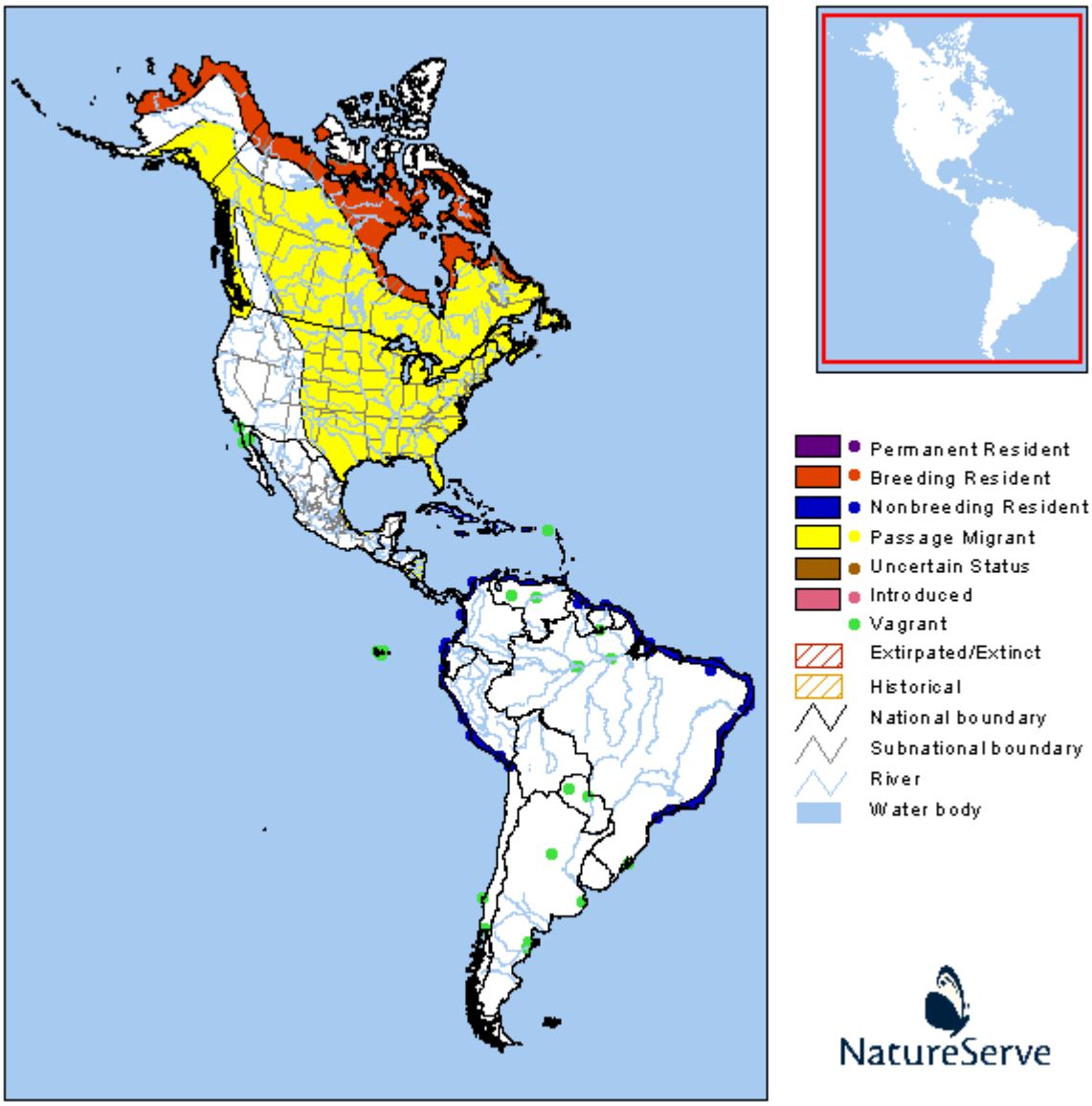
Permanent Resident
Breeding Resident
Nonbreeding Resident
Passage Migrant
Uncertain Status
Introduced
Vagrant
Extirpated/Extinct
Historical
National boundary
Subnational boundary
River
Water body
NatureServe
7500750 Kilometers
Map created June 2005

Ardea herodias - Linnaeus, 1758
Great Blue Heron

© David Blevins

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Ciconiiformes	Ardeidae	Ardea

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Ardea herodias
Taxonomic Comments: Includes great white heron, formerly considered a distinct species, A. OCCIDENTALIS. Some authors consider A. HERODIAS, A. CINEREA, and A. COCOI conspecific (AOU 1983); the three constitute a superspecies (Butler 1992).

Short General Description: A wading bird (heron).

Reproduction Comments: Clutch size is 3-7, averages larger in north than in south. Incubation, by both sexes, lasts 25-29 days. Both parents tend young, which leave nest in 60-90 days. May breed at 2 years.

Nests usually in colonies, a few pairs to 100s; sometimes solitary. Fledging success depends importantly on success of parents in providing sufficient food when nestlings are 2-6 weeks old (Bennett et al. 1995, Auk 112:201-209).

Ecology Comments:
Nonbreeding: usually solitary. May establish feeding territories in winter (Stiles and Skutch 1989).
Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: Y

Mobility and Migration Comments: Migrates to northern breeding range February-early May; departs northerly localities September-October. Disperses in all compass directions after breeding, before southward migration. Southern populations may be quite sedentary. Present in small numbers in Colombia mainly October to mid-April, in Panama mainly September-April (Ridgely and Gwynne 1989, Hilty and Brown 1986).

Estuarine Habitat(s): Bay/sound, Herbaceous wetland, Lagoon, River mouth/tidal river, Scrub-shrub wetland, Tidal flat/shore
Riverine Habitat(s): Low gradient

Lacustrine Habitat(s): Shallow water

Palustrine Habitat(s): FORESTED WETLAND, HERBACEOUS WETLAND, Riparian, TEMPORARY POOL

Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Grassland/herbaceous, Old field

Habitat Comments: Freshwater and brackish marshes, along lakes, rivers, bays, lagoons, ocean beaches, mangroves, fields, and meadows. Nests commonly high in trees in swamps and forested areas, less commonly in bushes, or on ground, rock ledges, and coastal cliffs. Often nests with other herons. See Spendelow and Patton (1988) for further details and discussion of geographic variation in nesting sites. Generally nests close to foraging habitat.

Adult Food Habits: Carnivore, Invertivore, Piscivore

Immature Food Habits: Carnivore, Invertivore, Piscivore

Food Comments: Eats fishes, insects, crustaceans, amphibians and reptiles, mice and shrews, and other animals. Forages mostly while standing in water but also in fields; sometimes drops from air or perch into water (Palmer 1962, Terres 1980).

Adult Phenology: Circadian, Crepuscular, Diurnal

Immature Phenology: Circadian, Crepuscular, Diurnal

Phenology Comments: Generally tends to be mainly crepuscular but also is active in daytime and at night. In coastal region, activity often is related to the tidal cycle, independent of day-night cycle in some areas (Powell 1987). Nocturnal foraging activity occurs in nontidal situations as well as in tidal environments (McNeil et al. 1993).

Colonial Breeder: Y
Length: 117 centimeters
Weight: 2576 grams

Global Status: G5
Global Status Last Reviewed: 20Nov1996
Global Status Last Changed: 20Nov1996
Rounded Global Status: G5 - Secure

National Status: N5B,N5N
State Status: Delaware (S2B)

Estimated Number of Element Occurrences: > 300
Global Short Term Trend: Stable (unchanged or within +/- 10% fluctuation in population, range, area occupied, and/or number or condition of occurrences)

Global Short Term Trend Comments: Populations generally are stable or increasing in most areas. See Spendelow and Patton (1988) for status of coastal U.S. breeding populations. Populations in the south-central U.S. may be benefiting from crayfish aquaculture; bird population increases may be related to favorable foraging opportunities afforded by expanding crayfish aquaculture (herons may prey on small fishes often abundant in ponds) (Fleury and Sherry 1995).

Threats: In Illinois, a public viewing area used once a week by humans 229 m from a rookery did not cause any overt responses from nesting birds (DeMauro 1993). See Vos (1984) for information on response to human disturbance in Colorado.

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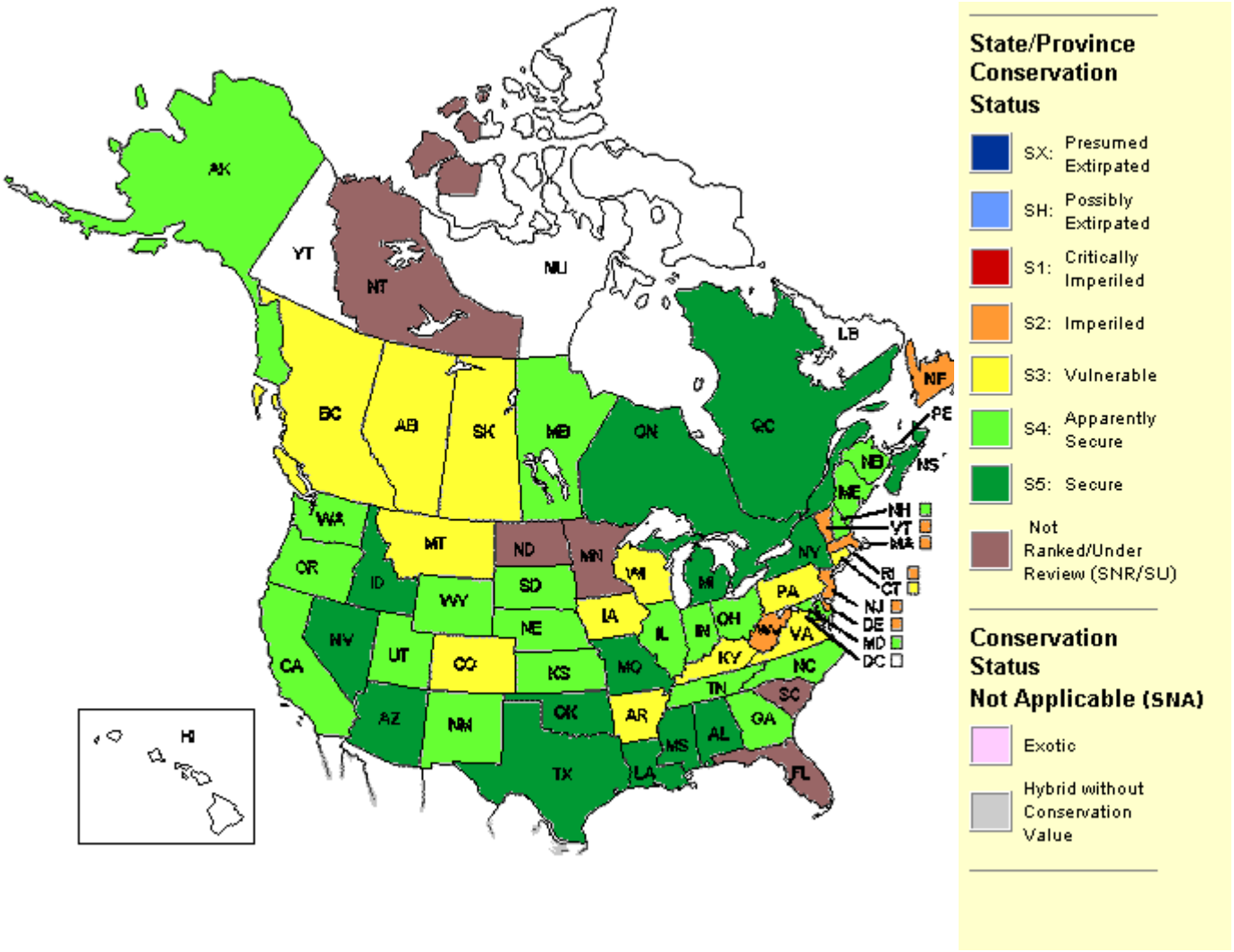
http://www.natureserve.org/explorer/servlet/NatureServe?menuselect=none&sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=100203&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=100203&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=100203&selectedIndexes=101455&selectedIndexes=103857&selectedIndexes=105925&menuselectfooter=none


State/Province Conservation Status
SX: Presumed Extirpated
SH: Possibly Extirpated
S1: Critically Imperiled
S2: Imperiled
S3: Vulnerable
S4: Apparently Secure
S5: Secure
Not Ranked/Under Review (SNR/SU)
Conservation Status
Not Applicable (SNA)
Exotic
Hybrid without Conservation Value
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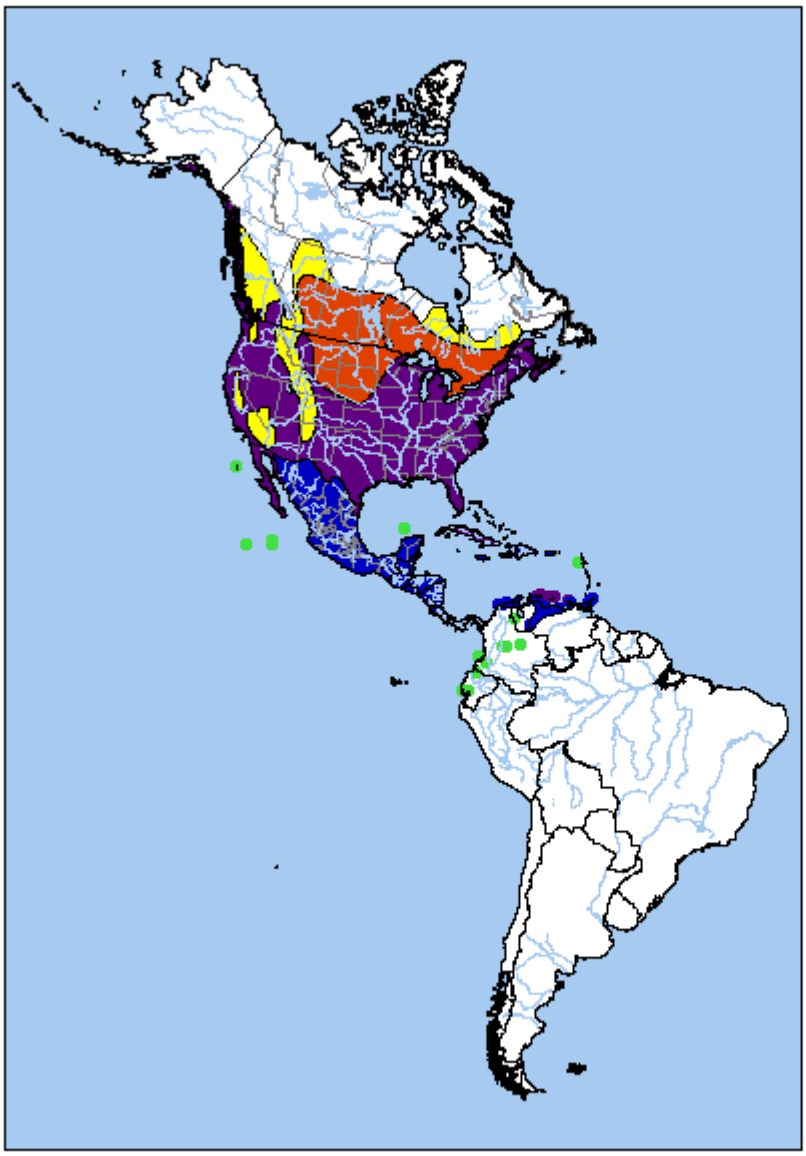

Permanent Resident
Breeding Resident
Nonbreeding Resident
Passage Migrant
Uncertain Status
Introduced
Vagrant
Extirpated/Extinct
Historical
National boundary
Subnational boundary
River
Water body

NatureServe

750 0 750 Kilometers

Map created June 2005

Coragyps atratus - (Bechstein, 1793)
Black Vulture

© Dennis Donohue

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Ciconiiformes	Cathartidae	Coragyps

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Coragyps atratus
Taxonomic Comments: Formerly in order FALCONIFORMES; transferred to CICONIIFORMES by AOU (1997).

General Description: A medium-large bird with blackish plumage, a small grayish unfeathered head, hooked bill, weak talons, short tail, and relatively short, broad wings; in flight, wings show a large white patch at the base of the primaries; average length 64 cm, wingspan 145 cm (NGS 1983).

Diagnostic Characteristics: Differs from the turkey vulture in having conspicuous white patches at the base of the primaries, black (vs. silvery gray) secondaries, a shorter tail, and never a red head. Differs from eagles in smaller head that lacks feathers, smaller overall size, shorter tail, and white areas in plumage confined to base of primaries.

Reproduction Comments: Clutch size usually is 2. Incubation lasts 37-41 days, by both sexes. Young first fly at about 75-80 days, are tended by parents for several months after fledging. May lay replacement clutch 3-4 weeks after first clutch is destroyed. Long-term pair-bond.

Ecology Comments:
Forms large communal roosts at night throughout year; immediate family members maintain close contact throughout the year (Rabenold 1986). Average distance between communal roost and feeding site was 6 km in Maryland/Pennsylvania (Coleman and Fraser 1987). Mean summer home range in Maryland/Pennsylvania 15,962 hectares (n=11), 7729 hectares (n=6) in winter, 14,881 hectares (n=5) year-round (Coleman and Fraser 1989).

Human disturbance and canid predation may be significant causes of nest failure in the eastern U.S. (Coleman and Fraser 1989).

Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: N
Mobility and Migration Comments: Some populations appear to be partly migratory, especially the northernmost ones in the northeastern U.S. and those in Middle America (AOU 1983), though some authors doubt the occurrence of true migration in Central America (Palmer 1988).

Estuarine Habitat(s): Tidal flat/shore

Palustrine Habitat(s): Riparian

Terrestrial Habitat(s): Bare rock/talus/scree, Cliff, Cropland/hedgerow, Desert, Grassland/herbaceous, Sand/dune, Savanna, Shrubland/chaparral, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed

Special Habitat Factors: Fallen log/debris, Standing snag/hollow tree

Habitat Comments: Nearly ubiquitous except in heavily forested regions; more common in lowland than in highland habitats. More abundant toward the coast in eastern North America. Most abundant around human habitation in much of Central and South American range (Palmer 1988).

In Pennsylvania, selected large conifers for mid-winter roost (Wright et al. 1986).

Eggs are laid usually in a thicket or on a cliff ledge, also in cave or other situations (e.g., on bare ground at bottom of stump, in hollow log or tree, among rocks, etc.) (Jackson 1983); also sometimes in high buildings (Lima, Peru) (Palmer 1988). In Maryland/Pennsylvania, nested in areas that were roadless, forested, and undeveloped (Coleman and Fraser 1989).

Adult Food Habits: Carnivore

Immature Food Habits: Carnivore

Food Comments: Eats mostly carrion; sometimes groups kill and eat small vertebrates (sometimes young livestock); major predator of hatchling sea turtles in Costa Rica. May also eat ripe and rotten fruits (e.g., bananas, palm) and vegetables, excrement, garbage, etc. Hunts visually from air; somtimes follows turkey vulture to food.
Adult Phenology: Diurnal

Immature Phenology: Diurnal

Length: 69 centimeters
Weight: 2172 grams

Global Status: G5
Global Status Last Reviewed: 22Nov1996
Global Status Last Changed: 22Nov1996
Rounded Global Status: G5 - Secure

National Status: N5B,N5N
State Status: Delaware (S2B)

Global Short Term Trend Comments: Declines were noted recently in the southeastern U.S. and Mexico (Wilbur 1983).

Global Long Term Trend Comments: Has been extending range northward in the eastern U.S. since the 1950s.

Threats: According to Ehrlich et al. (1992), jeopardized by widespread eggshell thinning resulting from the ingestion of contaminated food.

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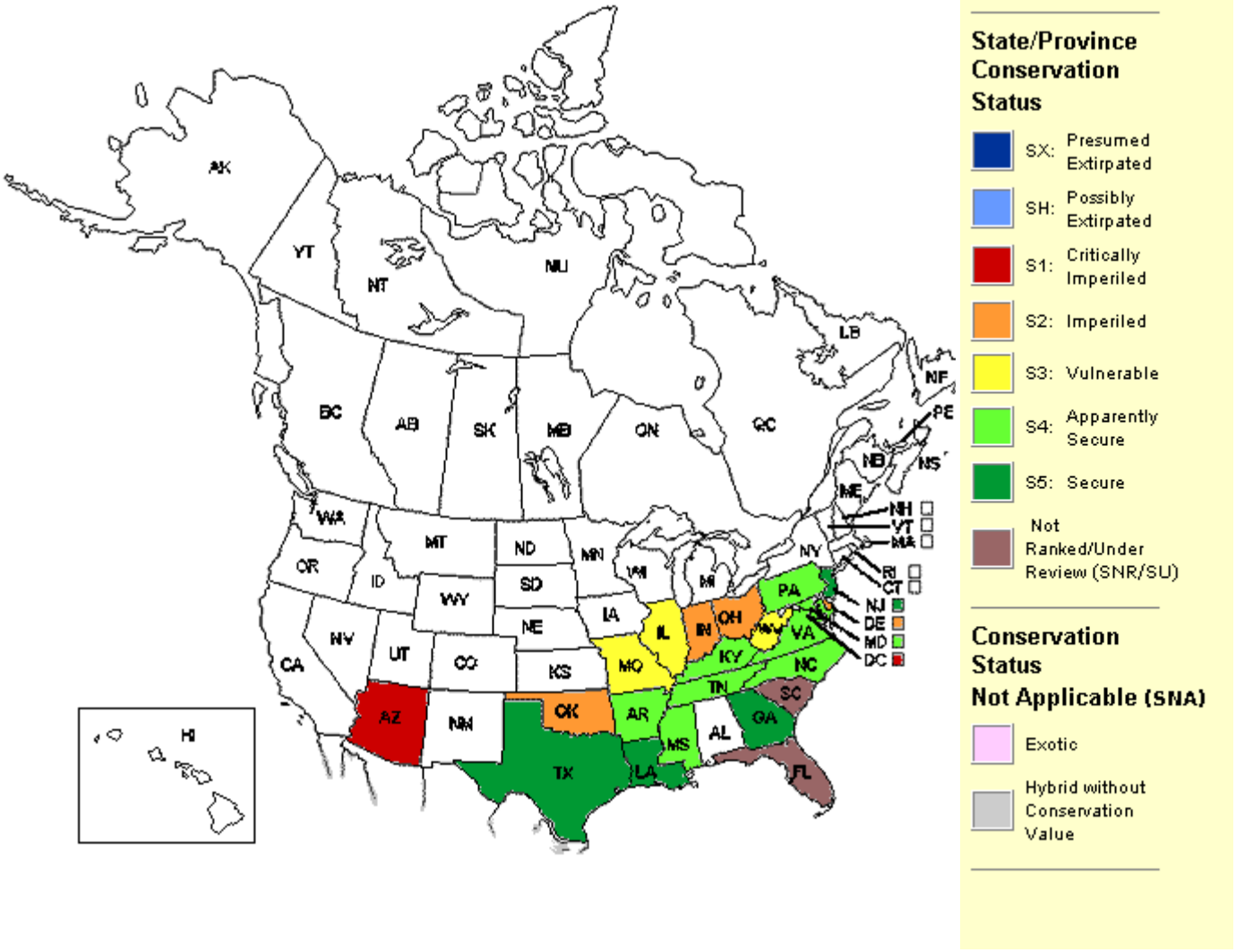
State/Province Conservation Status
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Conservation Status
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Exotic
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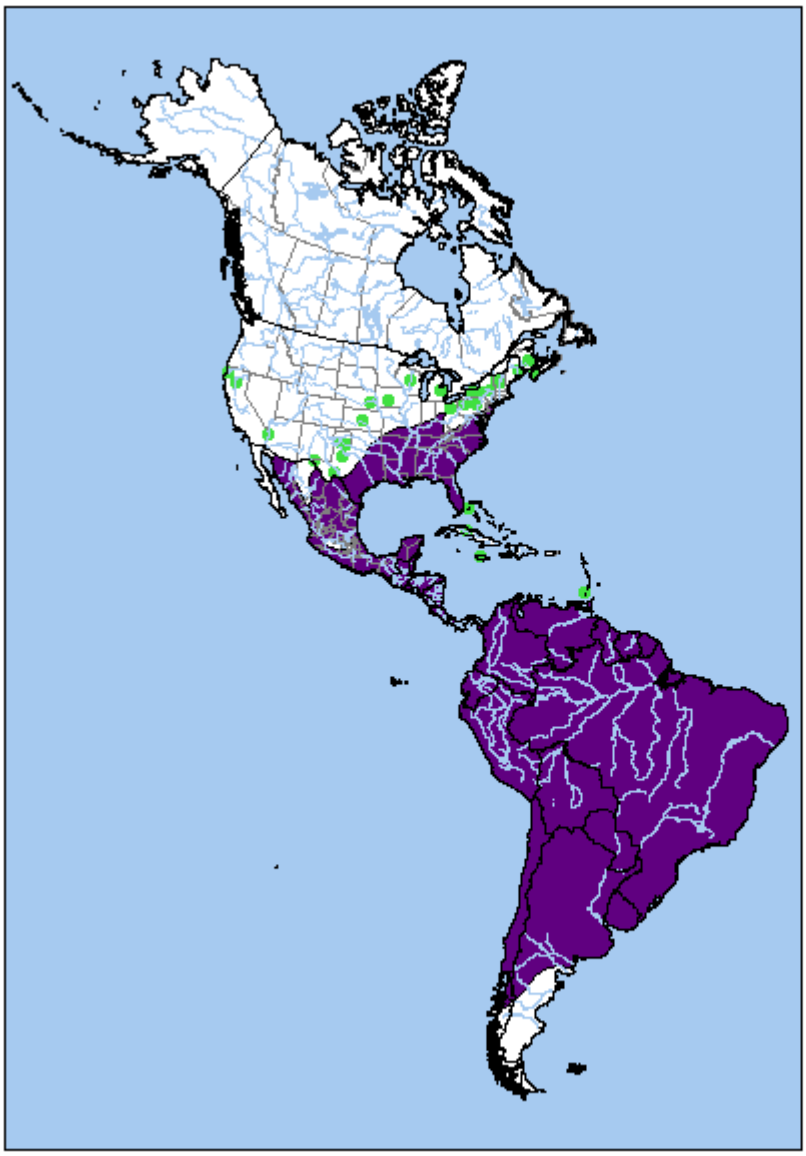

Permanent Resident
Breeding Resident
Nonbreeding Resident
Passage Migrant
Uncertain Status
Introduced
Vagrant
Extirpated/Extinct
Historical
National boundary
Subnational boundary
River
Water body

NatureServe

750 0 750 Kilometers

Map created June 2005

Egretta thula - (Molina, 1782)
Snowy Egret

© Larry Master

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Ciconiiformes	Ardeidae	Egretta

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Egretta thula
Taxonomic Comments: May constitute a superspecies with E. GARZETTA, E. GULARIS, and E. DIMORPHA (AOU 1998). Frequently placed in genus LEUCOPHOYX (AOU 1983).

Short General Description: A large wading bird (egret).

General Description: A small white wading bird with a slim, pointed, black bill; long legs are all black or black with yellow-green on the back side (juveniles); toes yellow; breeding adult has long plumes on head, neck, and back; lores yellow, turning red in adults during breeding season; average length 61 cm,

wingspan 104 cm.

Diagnostic Characteristics: Differs from great egret in being much smaller (length 61 cm vs. 99 cm) and in having a black bill rather than a yellow one. Differs from immature little blue heron in having predominantly dark legs (vs. dull yellow), a slimmer mostly black bill (vs. two-toned with gray base and dark tip), and usually paler wing tips. Differs from cattle egret in being larger (length 61 cm vs. 51 cm), slim rather than stocky, and in having a black bill (vs. yellow or red-orange) and predominantly dark legs (vs. yellow or dusky-red). Differs from rare white-phase adult reddish egret in having yellow toes and lacking a two-toned pink-and-black bill.

Reproduction Comments: Eggs are laid usually April to May or June in north; nests in Trinidad May-October, May-August in Costa Rica. Clutch size usually is 4-5 in north, 2-4 in south. Incubation lasts 18 days or longer, by both sexes. Young leave nest at 20-25 days. May first breed at one year. Often nests in large colonies.

Ecology Comments:
Usually occurs in loose groups. Roosts usually communally.

Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: Migratory in north. Northern birds winter largely in Middle America (Stiles and Skutch 1989).

Estuarine Habitat(s): Bay/sound, Herbaceous wetland, Lagoon, River mouth/tidal river, Scrub-shrub wetland, Tidal flat/shore

Riverine Habitat(s): Low gradient

Lacustrine Habitat(s): Shallow water

Palustrine Habitat(s): FORESTED WETLAND, HERBACEOUS WETLAND, Riparian
Habitat Comments: Marshes, lakes, ponds, lagoons, mangroves, and shallow coastal habitats.

Nests in trees or shrubs or, in some areas, on ground or in marsh vegetation. Often nests with other colonial water birds. Nests over water or ground. See references in Spendelow and Patton (1988) for further details.

Adult Food Habits: Carnivore, Invertivore, Piscivore

Immature Food Habits: Carnivore, Invertivore, Piscivore
Food Comments: Eats small fishes, frogs, lizards, snakes, crustaceans, worms, snails, and insects; forages actively in shallow water, sometimes in fields. (Palmer 1962). May forage in coordinated groups in coastal areas (Costa Rica, Stiles and Skutch 1989).

Adult Phenology: Crepuscular, Diurnal

Immature Phenology: Crepuscular, Diurnal

Phenology Comments: Forages during daylight (Powell 1987).

Colonial Breeder: Y

Length: 61 centimeters
Weight: 371 grams

Global Status: G5
Global Status Last Reviewed: 20Nov1996
Global Status Last Changed: 20Nov1996
Rounded Global Status: G5 - Secure
Reasons: Very large range (U.S. to southern South America), relatively secure on a global level; threatened in some areas by loss/degradation of wetland habitat.

National Status: N5B,N5N
State Status: Delaware (S1B)

Global Abundance: Unknown
Global Abundance Comments: Inadequate data on numbers at the breeding sites make it difficult to judge abundance.
Estimated Number of Element Occurrences: > 300
Global Short Term Trend Comments: Populations in the south-central U.S. may be benefiting from crayfish aquaculture; bird population increases may be related to favorable foraging opportunities afforded by expanding crayfish aquaculture (Fleury and Sherry 1995).
Global Protection: Unknown whether any occurrences are appropriately protected and managed

Global Protection Needs: Protect breeding sites and foraging areas.
Degree of Threat: B
Threats: Threats include clearing of flood plain forests, loss and degradation of wetlands. Reduced reproductive success in Idaho was attributed to DDE residues accumulated in the nonbreeding season in Mexico (Findholt 1984).
Other Considerations: Colonial nesting behavior increases risk.
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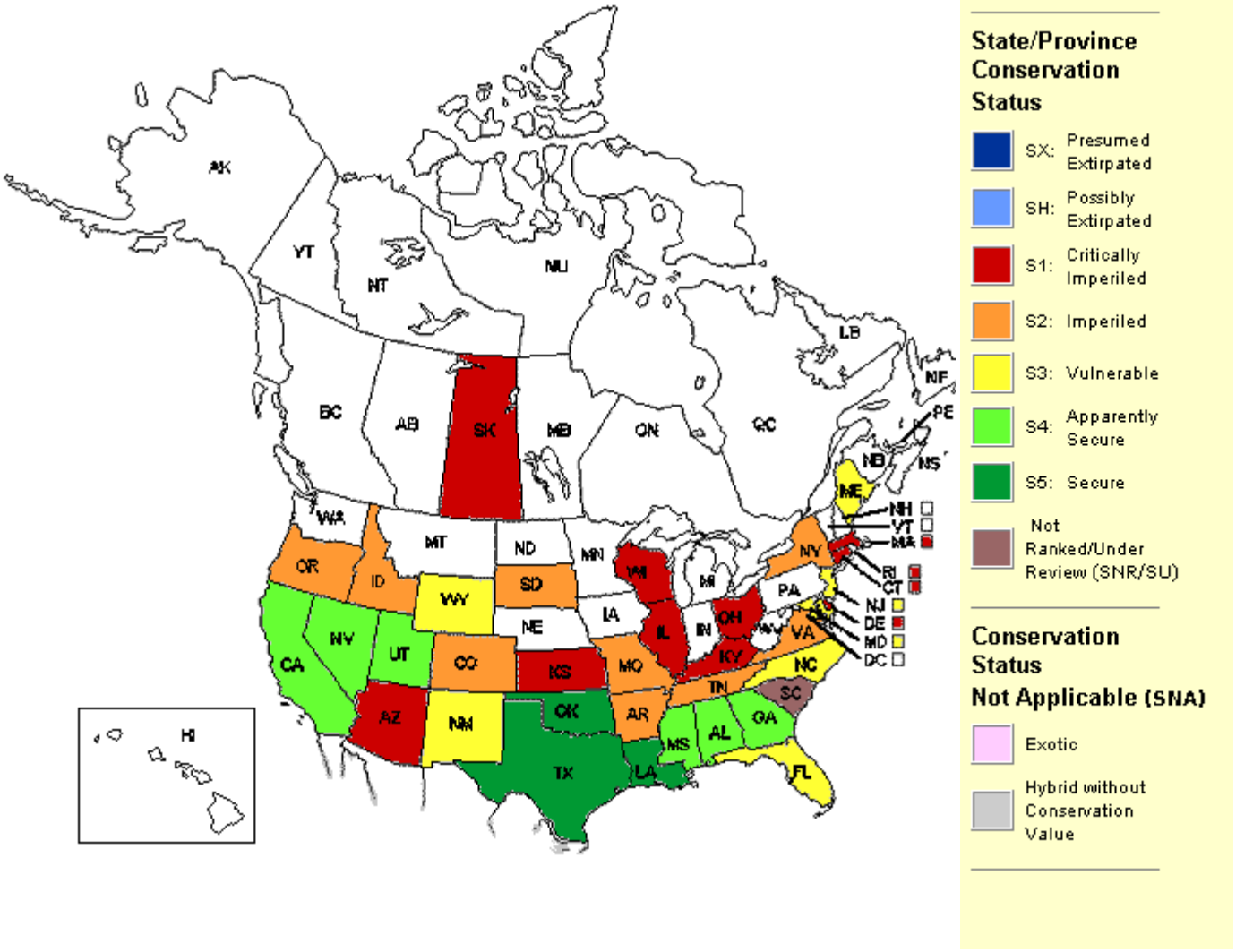
State/Province Conservation Status
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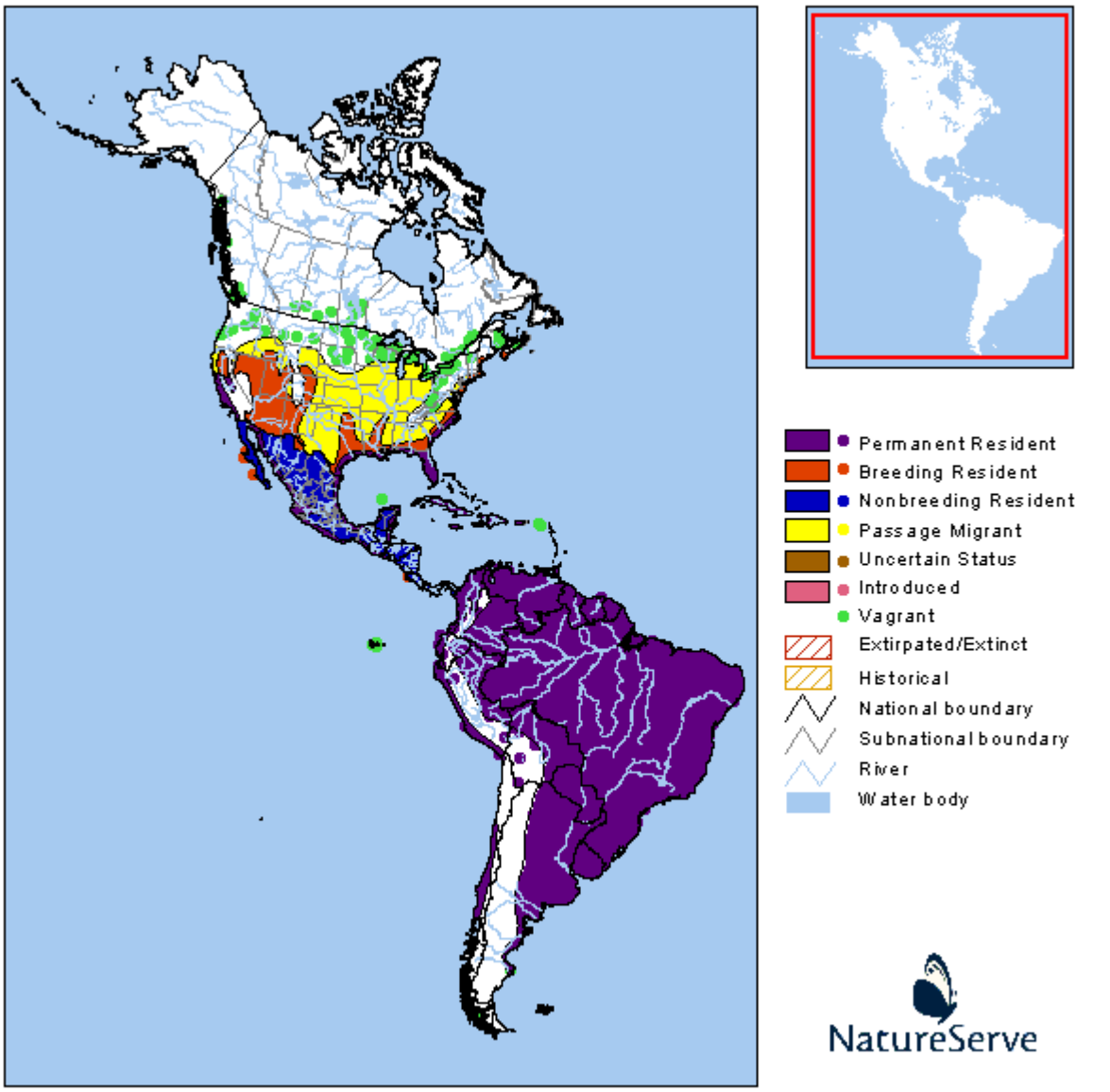
Permanent Resident
Breeding Resident
Nonbreeding Resident
Passage Migrant
Uncertain Status
Introduced
Vagrant
Extirpated/Extinct
Historical
National boundary
Subnational boundary
River
Water body
NatureServe
7500750 Kilometers
Map created June 2005

Haliaeetus leucocephalus - (Linnaeus, 1766)
Bald Eagle

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Falconiformes	Accipitridae	Haliaeetus

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Haliaeetus leucocephalus
Taxonomic Comments: The two subspecies, H. L. LEUCOCEPHALUS (southern U.S. and Baja California) and H. L. ALASCANUS (northern U.S. and Canada) intergrade broadly in the central and northern U.S. Constitutes a superspecies with H. ALBICILLA (AOU 1998).

Short General Description: Bald eagle. Mature adults have a white head and tail.

General Description: Adults have a white head, white tail, and a large bright yellow bill; elsewhere the plumage is dark. Immatures are dark with variable amounts of light splotching on the body, underwing

coverts, flight feathers, and tail base; averages 79-94 cm long, 178-229 cm wingspan (NGS 1983).

Diagnostic Characteristics: Adults differ from other eagles in having both a white head and white tail (head of white-tailed eagle may look white at a distance). Bald eagle has a proportionately larger head and bill than does the golden eagle, in the immatures of which the white is confined to the base of the primaries and the base of the tail. Bald eagle lacks the long wedge-shaped tail of Steller's sea-eagle. Bald eagle's neck is shorter and tail is longer than in white-tailed eagle.

Reproduction Comments: Clutch size is 1-3 (usually 2). Incubation lasts about 5 weeks, by both sexes. Second hatched young often dies. Young first fly at 10-12.5 weeks, cared for by adults and may remain around nest for several weeks after fledging. Generally first breeds at about 5-6 years. Adults may not lay every year.

Ecology Comments:
Commonly roosts communally, especially in winter. See Curnutt (1992) for information on the dynamics of a year-round communal roost in southern Florida.

In Montana, the introduction of shrimp (MYSIS RELICTA) had a cascading effect through the food chain, ultimately causing displacement of bald eagles (Spencer et al. 1991).

Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: Most eagles that breed in Canada and the northern U.S. move south for winter. Migrates widely over most of North America (AOU 1983); moves generally E-SE across Canada and the Great Lakes region to the northeast coast of the U.S. In the northern Chesapeake Bay region, radio-tagged northern migrants arrived in late fall (mean date 21 December) and departed in early spring (mean date 27 March); radio-tagged southern migrants arrived throughout April-August and departed June-October (Buehler et al. 1991). See Palmer (1988) for fairly detailed review of seasonal movements in various regions.

Defended territories are relatively small; fourteen in Alaska varied from 11-45 hectares and averaged 23 ha (Hensel and Troyer 1964), and territory radius around active nests averaged 0.6 km in Minnesota (Mahaffy and Frenzel 1987). Feeding home ranges surrounding active nests are undoubtedly much larger, depending on proximity to food sources and abundance of food. Minimum home range of breeding birds in Saskatchewan was 7 square kilometers (Gerrard et al. 1992); on the Columbia River, Oregon, breeding home ranges averaged 21.6 square kilometers (Garrett et al. 1993).

Winter home ranges can be very large, especially for nonbreeding birds. An immature wintered in Arizona over an area of >40,000 square kilometers and spent the summer in the Northwest Territories over a summer range of >55,000 square kilometers (Grubb et al. 1994). Maximum distance between feeding area and night roost site was less than 16 km in winter in Missouri (Griffin et al. 1982). In north-central Arizona, February-April home range of immatures averaged 400 square kilometers; birds moved frequently and roosted singly or in small groups (Grubb et al. 1989).

Marine Habitat(s): Near shore

Estuarine Habitat(s): Bay/sound, Lagoon, River mouth/tidal river, Tidal flat/shore

Riverine Habitat(s): BIG RIVER, MEDIUM RIVER

Lacustrine Habitat(s): Deep water, Shallow water

Palustrine Habitat(s): FORESTED WETLAND, Riparian

Terrestrial Habitat(s): Cliff, Forest - Conifer, Forest - Hardwood, Forest - Mixed, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed

Special Habitat Factors: Standing snag/hollow tree

Habitat Comments: Breeding habitat most commonly includes areas close to (within 4km) coastal areas, bays, rivers, lakes, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, and seabirds (Andrew and Mosher 1982, Green 1985, Campbell et al. 1990). Preferentially roosts in conifers or other sheltered sites in winter in some areas; typically selects the larger, more accessible trees (Buehler et al. 1991, 1992). Perching in deciduous and coniferous trees is equally common in other areas (e.g., Bowerman et al. 1993). Communal roost sites used by two or more eagles are common, and some may be used by 100 or more eagles during periods of high use. Winter roost sites vary in their proximity to food resources (up to 33 km) and may be determined to some extent by a preference for a warmer microclimate at these sites. Available data indicate that energy conservation may or may not be an important factor in roost-site selection (Buehler et al. 1991). In Saskatchewan lakes, density was positively correlated with abundance of large fishes (Dzus and Gerrard 1993). In winter, may associate with waterfowl concentrations or congregate in areas with abundant dead fish (Griffin et al. 1982); often roosts communally at night in trees that are used in successive years. Wintering areas are commonly associated with open water though in some areas eagles use habitats with little or no open water if other food resources (e.g. rabbit or deer carrion) are readily available. Avoids areas with nearby human activity (boat traffic, pedestrians) and development (buildings) (Buehler et al. 1991). BREEDING: Usually nests in tall trees or on cliffs near water. Nest trees include pines, spruce, firs, cottonwoods, oaks, populars, and beech. Ground nesting has been reported on the Aleutian Islands in Alaska, in Canada's Northwest Territories, and in Ohio, Michigan, and Texas. Nests located on cliffs and rock pinnacles have been reported historically in California, Kansas, Nevada, New Mexico and Utah, but currently are known to occur only in Alaska and Arizona. Same nest may be used year after year, or may alternate between two nest sites in successive years. In British Columbia, nests with overhead canopy of foliage were most successful (Palmer 1988). See Livingston et al. (1990) for model of nesting habitat in Maine, Wood et al. (1989) for characteristics of nesting habitat in Florida (most nests in live pine trees). In Oregon, most nests were within 1.6 km of water, usually in largest tree in stand (Anthony and Isaacs 1989). In Colorado and Wyoming, forest stands containing nest trees varied from old-growth ponderosa pine to narrow strips of riparian vegetation surrounded by rangeland (Kralovec et al. 1992).

Adult Food Habits: Carnivore, Piscivore

Immature Food Habits: Carnivore, Piscivore

Food Comments: Feeds opportunistically on fishes, injured waterfowl and seabirds, various mammals, and carrion (Terres 1980). See Haywood and Ohmart (1986), Kralovec et al. (1992), Brown (1993), and Grubb (1995) for diet of inland breeding populations in Arizona, Colorado, and Wyoming. Hunts live prey, scavenges, and pirates food from other birds (e.g., osprey) and, in Alaska, sea otter (Watt et al. 1995, Condor 97:588-590). See Palmer (1988) for further information on hunting methods. In the Columbia River estuary, tidal flats and water less than 4 m deep were important foraging habitats (Watson et al. 1991). See Caton et al. (1992) for information on foraging perches used in Montana. Sheep carcasses were significant food sources in winter in Oregon (Marr et al. 1995, Wilson Bulletin 107:251-257).

Adult Phenology: Crepuscular, Diurnal

Immature Phenology: Crepuscular, Diurnal

Phenology Comments: In the Columbia River estuary, foraging activity was most common at low tide and first daylight (Watson et al. 1991). In Arizona, foraging activity during the breeding season peaked at 0800-1000 and 1600-1900 MST (Grubb 1995).

Length: 94 centimeters
Weight: 5244 grams

Global Status: G5
Global Status Last Reviewed: 11Mar2005
Global Status Last Changed: 11Mar2005
Rounded Global Status: G5 - Secure
Reasons: Widespread distribution in North America; large numbers of occurrences, many of high quality, particularly in Alaska and British Columbia, but suffered great decline in southern and eastern part of range earlier this century; still susceptible to a number of threats, particularly environmental contaminants and excessive disturbance by humans; recent rangewide improvement in numbers and the protection offered by governments prevent it from being ranked any higher.

National Status: N5B,N5N
State Status: Delaware (S2B,S3N)

Management Requirements: Recovery has been assisted by intensive management that included systematic monitoring, enhanced protection, captive breeding, relocation of wild birds, and publicity (Matthews and Moseley 1990).

Knight and Knight (1984) recommended a 450 m buffer between a human in a canoe and a feeding eagle. For northern Chesapeake Bay, Buehler et al. (1991) recommended a 1360-m-wide shoreline management zone that extends 1400 m inland to encompass nonbreeding roost sites and provide a buffer from human disturbance. Another study recommended a 250-m buffer between a human on land and an eagle in a shoreline tree. A 500-m buffer around the nest may be adequate (see Fraser et al. 1985). In Michigan, 75% of all alert and flight responses to human activity occurred when activity was within 500 m and 200 m, respectively; vehicles and pedestrians elicited the highest response frequencies. Anthony and Isaacs (1989) made recommendations for Oregon: size of areas for nest-site management should be 50-250 ha, with size and shape depending on surrounding vegetation, topography, and eagle behavior; human

activities within 800 m of nests should be restricted from 1 January to 31 August; clearcut logging, road building, hiking trails, and boat launch facilities should not be allowed within 400 m of nests. In Arizona, pedestrians were the most disturbing human activity; eagles were more often flushed from perches than from nests and were most easily disturbed when foraging; eagle response to disturbance frequencies were 64% at distances less than 216 m, 45% at 216-583 m, and 24% at distances greater than 583 m (Grubb and King 1991). Along northern Chesapeake Bay, flush distances because of approaching boats averaged 204 m in winter, 176 m in summer (Buehler et al. 1991, which see for further information on the effects of human activity).

In the Columbia River estuary, management of eagle foraging habitats should emphasize protection and enhancement of tidal flats (Watson et al. 1991).

See Busch (1988) for a discussion of management activities in the southwestern U.S., Lefranc and Glinski (1988) for management recommendations.

Supplemental feeding can be used in efforts to replace diminished supplies of natural foods, provide food free of environmental contaminants, provide essential nutrients, enhance survival of subadults, manipulate distribution of populations, increase nesting success, support released captive-bred birds, and/or afford opportunities for public viewing and education; potential disadvantages of supplemental feeding include prohibitive costs, the loss of natural and cautious behavior, dependence on these food supplies which may alter migration patterns, and increased potential for disease transmission (Knight and Anderson 1990).

See Grubb (1980) for information on construction and use of an artificial nest structure.
Monitoring Requirements: See Fraser et al. (1983) for information on scheduling reproductive surveys. See Britten et al. (1995) for information on satellite telemetry.

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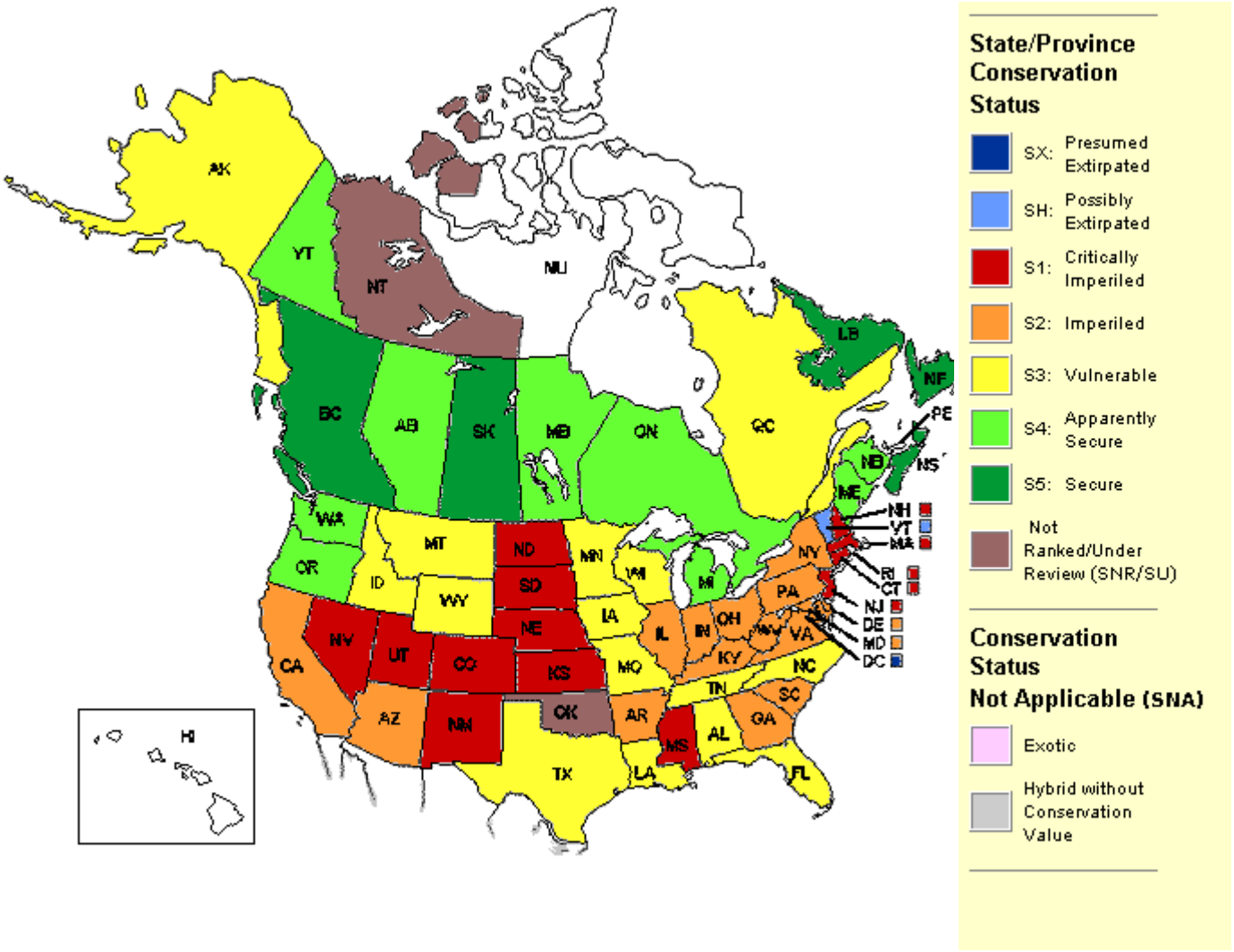
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SH: Possibly Extirpated
S1: Critically Imperiled
S2: Imperiled
S3: Vulnerable
S4: Apparently Secure
S5: Secure
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Conservation Status
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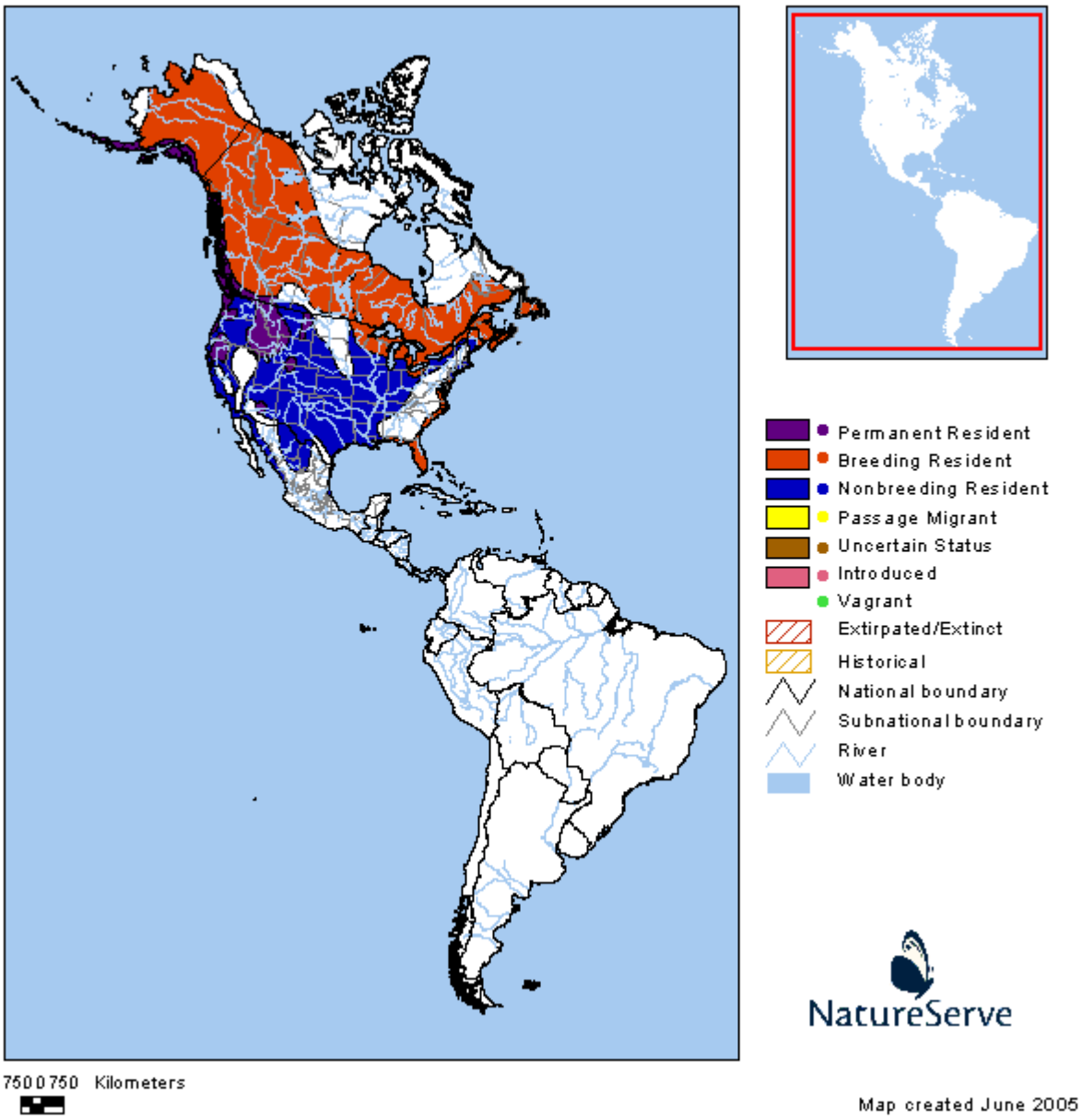
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Breeding Resident
Nonbreeding Resident
Passage Migrant
Uncertain Status
Introduced
Vagrant
Extirpated/Extinct
Historical
National boundary
Subnational boundary
River
Water body
NatureServe
750 0 750 Kilometers
Map created June 2005

Melospiza georgiana - (Latham, 1790)
Swamp Sparrow

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Passeriformes	Emberizidae	Melospiza

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Melospiza georgiana
Taxonomic Comments: Inland and coastal populations along mid-Atlantic coast show marked morphological and life history differences; M. G. NIGRESCENS regarded as a well-marked subspecies by Greenberg and Droege (1990). Greenberg et al. (1998) examined mitochondrial DNA differentiation between NIGRESCENS, GEORGIANA, and EPICRYPTA and found low levels of genetic variation and no evidence of geographic structure.

Reproduction Comments: Clutch size 2-6 (usually 4-5 in most areas). Usually 2 broods per year. Incubation 12-15 days, by female. Young leave nest at 9-13 days.

Non-Migrant: N

Locally Migrant: N
Long Distance Migrant: Y
Mobility and Migration Comments: Arrives in nesting areas in Canada and northern U.S. usually in March-April (Terres 1980); subspecies NIGRESCENS arrives in coastal mid-Atlantic breeding areas in mid-May, apparently departs by September-October (Greenberg and Droege 1990).

Estuarine Habitat(s): Herbaceous wetland

Palustrine Habitat(s): Bog/fen, FORESTED WETLAND, HERBACEOUS WETLAND, Riparian, SCRUB-SHRUB WETLAND

Terrestrial Habitat(s): Grassland/herbaceous, Old field, Shrubland/chaparral

Habitat Comments:
BREEDING: Marshes, wet brushy fields, meadows, lakeshores, stream borders, swamps, pine barrens shrub-sedge bogs; also brackish marshes along mid-Atlantic coast (Greenberg and Droege 1990). Nests in tussock of grass, sedge, or in low bush, commonly over water.

NON-BREEDING: In migration and winter also in weedy fields, brush, thickets, scrub, and forest edge (AOU 1998).
Adult Food Habits: Granivore, Invertivore
Immature Food Habits: Granivore, Invertivore
Food Comments: Eats insects and seeds; often forages in shallow water (Terres 1980).
Adult Phenology: Diurnal
Immature Phenology: Diurnal
Length: 15 centimeters
Weight: 17 grams

Global Status: G5
Global Status Last Reviewed: 04Dec1996
Global Status Last Changed: 04Dec1996
Rounded Global Status: G5 - Secure

National Status: N5B,N5N
State Status: Delaware (S3B,S4N)

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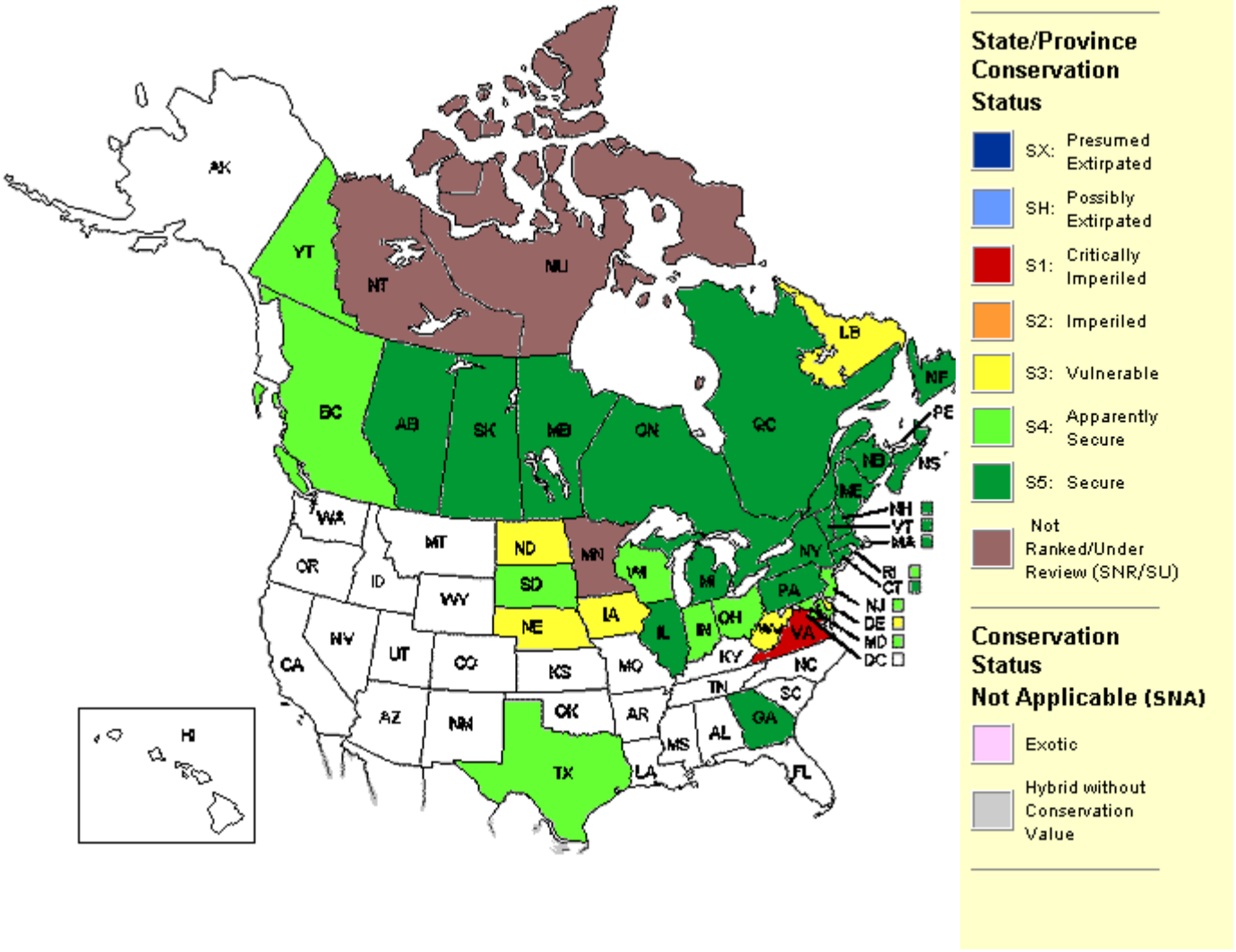
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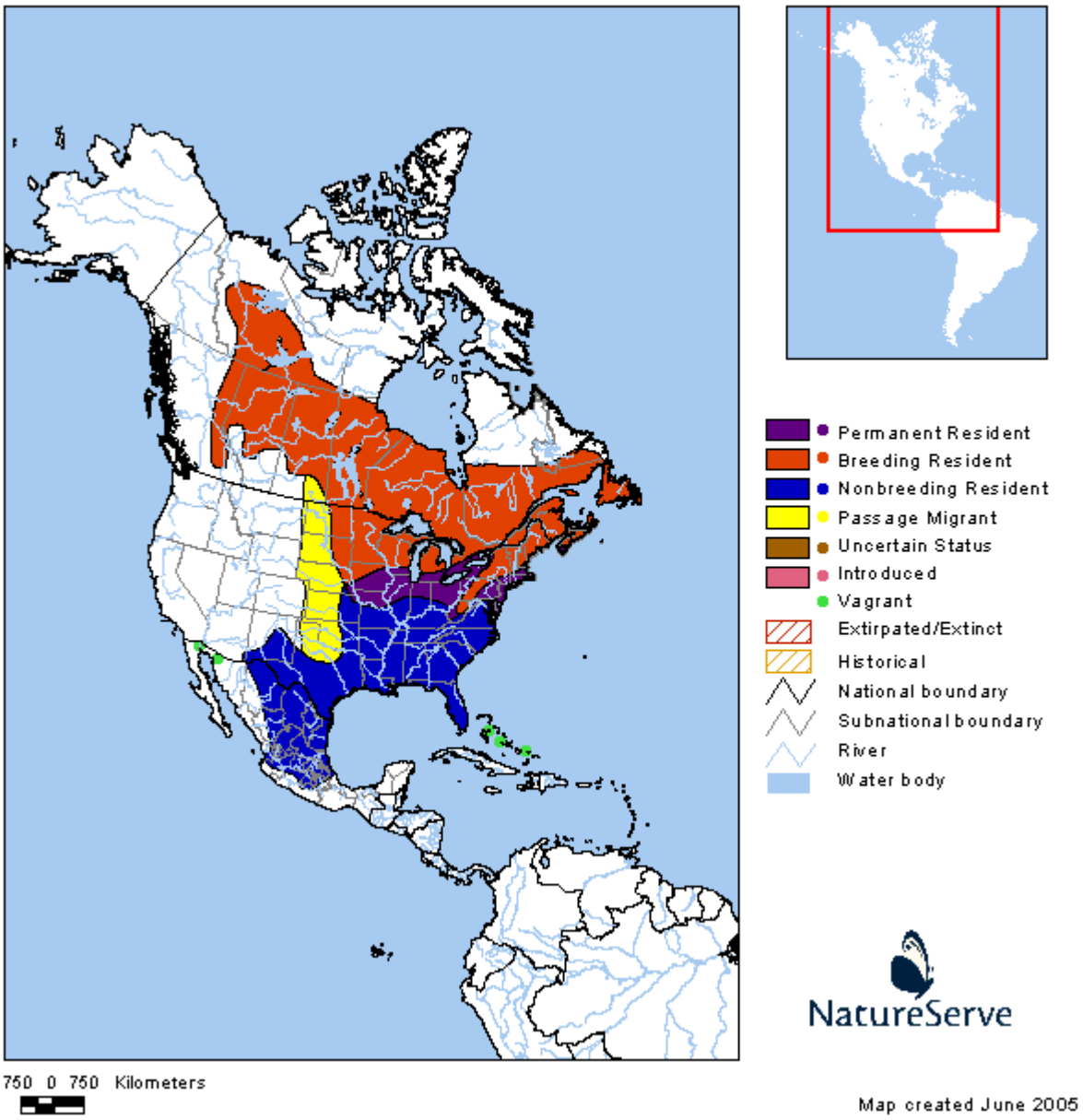
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NatureServe
750 0 750 Kilometers
Map created June 2005

Phalacrocorax auritus - (Lesson, 1831)
Double-Crested Cormorant

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Pelecaniformes	Phalacrocoracidae	Phalacrocorax

Genus Size: D - Medium to large genus (21+ species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Phalacrocorax auritus
Taxonomic Comments: See Siegel-Causey (1988) for analysis of relationships within family. Siegel-Causey (1988) proposed removing this species from the genus PHALACROCORAX and placing it in the

genus HYPOLEUCUS; DeBenedictus (1989) concluded that the taxonomic ranks of many groups recognized by Siegel-Causey (1988) are inflated and inconsistent with other taxonomic data.

Reproduction Comments: Time of nesting varies geographically, with local variations, and among different years a particular colony. Nesting begins in winter in Florida, as late as early June in southern Alaska. Clutch size usually one to seven (average typically three or four). Incubation 24-33 days (average around 28-30), by both sexes in turn. Hatching success was 54-75% in three studies. Survival from hatching to fledging was 72-95% in two studies. First flight to water at about 35-42 days. Independent at about 9-10 weeks. Usually first breeds at three years, sometimes at two years, rarely at one year. Renesting following loss of clutch is fairly common. Nest in relatively dense colonies; nests only 0.6 - 2.0 meters apart (Hatch and Weseloh 1999). New colonies may be abandoned within a few years, but once well established, likely to persist (Hatch and Weseloh 1999). See Johnsgard (1993) for further information.

Ecology Comments:
Typically forages within about 20 km of roost site (Johnsgard 1993). No available information on interannual fidelity to colony; median distance of breeding birds to their natal site was < 25 kilometres (Dolbeer 1991). Increased sea surface temperatures, such as those associated with El Nino events, were correlated with decreases in nesting populations in Washington (Wilson 1991). Vigorously defends eggs and young against avian predators (Ehrlich et al. 1992), though large gulls, crows, and ravens are significant predators on eggs and young in some areas.

Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: Northern coastal and especially interior populations migrate southward for nonbreeding season; migratory tendency is stronger on east coast than on west coast. Usually follows river valleys, coastlines, and water courses. Migrates day or night (Palmer 1962). East of the Rockies, migrates southward from northern latitudes in October-November, northward in April-May; breeders from the central and eastern parts of Canada and the northern U.S. winter mainly in the southern U.S. between Texas and Florida, with considerable overlap of different breeding populations on the wintering grounds; there is little intermixing of birds from east and west of the Rockies (Dolbeer 1991).

Marine Habitat(s): Near shore

Estuarine Habitat(s): Bay/sound, Lagoon, River mouth/tidal river, Tidal flat/shore

Riverine Habitat(s): BIG RIVER, Low gradient

Lacustrine Habitat(s): Deep water

Palustrine Habitat(s): FORESTED WETLAND, Riparian

Terrestrial Habitat(s): Bare rock/talus/scree, Cliff

Special Habitat Factors: Standing snag/hollow tree

Habitat Comments: Lakes, ponds, rivers, lagoons, swamps, coastal bays, marine islands, and seacoasts; usually within sight of land. Nests on the ground or in trees in freshwater situations, and on coastal cliffs (usually high sloping areas with good visibility). See Spendelow and Patton (1988) for further details on nesting sites in different geographic areas.

Adult Food Habits: Piscivore

Immature Food Habits: Piscivore

Food Comments: Feeds opportunistically on fishes (usually less than 13 cm long); dives from surface of water; usually feeds in water < 15 m deep. Accused of reducing sport fish populations in New York, but this contention has not been documented (Carroll 1988). Eats mostly schooling fishes (in marine waters, mainly slow-moving species of bottom and mid-water), sometimes aquatic invertebrates and rarely small vertebrates other than fishes. Sometimes forages in compact flocks.

Adult Phenology: Crepuscular, Diurnal

Immature Phenology: Crepuscular, Diurnal

Colonial Breeder: Y
Length: 81 centimeters
Weight: 1818 grams

Global Status: G5
Global Status Last Reviewed: 20Nov1996
Global Status Last Changed: 20Nov1996
Rounded Global Status: G5 - Secure
Reasons: Large breeding range in North America; rapidly increasing populations

National Status: N5B,N5N
State Status: Delaware (S1B)

Global Abundance: 100,000 to >1,000,000 individuals

Global Abundance Comments: Widespread and increasing. In 1994, estimated at least 372,000 nesting pairs throughout North America (Tyson et al. 1997). Relative abundance recorded on North American Breeding Bird Survey (BBS) survey-wide 1966-1996 was 0.76 birds per route. Highest relative abundance recorded in Minnesota (2.64 birds per route; Sauer et al. 1997). In winter, survey-wide Christmas Bird Count (CBC) shows 11.96 birds per 100 survey hours, 1959-1988. Highest CBC relative abundance recorded in North Carolina during the same period (170.64 birds per 100 survey hours; Sauer et al. 1996). High winter densities also occur in southern Florida, northern South Carolina, and along the lower Colorado River valley in the southwestern U.S. (Root 1988).

Estimated Number of Element Occurrences: > 300

Estimated Number of Element Occurrences Comments: In 1994, 852 colonies throughout North America (Tyson et al. 1997); number of defined occurrences may be somewhat lower.

Global Short Term Trend: Increasing (increase of >10%)

Global Short Term Trend Comments: From 1973 to 1993, Great Lakes population increased over 300-fold to over 38,000 pairs; a historic high (Weseloh and Collier 1999). Along St. Lawrence River, have increased from 12,000 pairs in 1979 to 22,000 pairs in 1990 (QBW 1999). Now increasing almost everywhere. Although BBS and other roadside surveys are not the most appropriate census method for colonial-nesting water birds trend data still provides useful information. Survey-wide increase according to BBS 1966-1996 (6.8 percent annual change; P = 0.00; n = 327). Greatest percent increase in central region (22.7 percent annual change; P = 0.00; n = 77) for same period. No significant decreases for periods 1966-1999, 1966-1979, or 1980-1996 (Sauer et al. 1997). In winter, CBC 1959-1988 indicates survey-wide increase (7.3 percent annual change; P less than 0.01; n = 790; Sauer et al. 1996).
Global Long Term Trend: Increase (increase of >25%)

Global Long Term Trend Comments: Declined in the 1960s and subsequently recovered. Largest decline in the Great Lakes population largely due to effects of DDT. Great Lakes population decreased by 86 percent from approximately 900 in the early 1950s to a mere 125 in 1973. Disappeared as a nesting bird on Lakes Michigan and Superior and only about ten pairs remained on Lake Ontario (Weseloh and Collier 1999).

Global Protection: Many to very many (13 to >40) occurrences appropriately protected and managed

Global Protection Comments: Likely protected by numerous managed areas given the widespread range. Placed on the state lists of threatened and endangered wildlife in Wisconsin and Illinois. In 1972, added to the list of species protected by the 1918 Migratory Bird Treaty Act (USFWS 1999a).

Degree of Threat: C

Threats: PERSECUTION: Has long been hunted for both eggs and meat. Persecuted because thought to compete with fishermen. Hunted illegally; in June of 1998, over 800 birds were shot in eastern Lake Ontario and 20 were shot in 1994 on Four Brothers Island, New York. Also hunted legally; in Quebec, Canada, a government-sponsored control program involves shooting adults, destroying nests, and spraying eggs with an oily substance that asphyxiates the embryos (QBW 1999). U.S. Fish and Wildlife Service permits the lethal take of cormorants, without a permit, on catfish and bait fish farms in 12 southeastern states and Minnesota, where economic impacts have been well-documented and non-lethal control has proven ineffective (USFWS 1999a). PESTICIDES: Contamination by organochlorine pesticides greatly reduced reproductive success during the 1950s and 1960s significantly reducing populations along the Great Lakes and in other areas (Anderson et al. 1969, cited in INRIN 1999; Weseloh et al. 1983, cited in USFWS 1999b). Eggshell thinning due to exposure to DDE, DDT, and PCB's widely reported during this period (INRIN 1999, USFWS 1999a). By the early 1970s, eggshells from the Great Lakes region were nearly 30% thinner than normal (Weseloh and Collier 1999). Contamination caused reproductive failure, and chicks that hatched sometimes had crossed bills, club feet, and eye and skeletal deformities (USFWS 1999a). Deformities resulting from the ingestion of PCBs have been noted in the vicinity of Green Bay,

Wisconsin (Ehrlich et al. 1992). Populations increased in New England beginning 1970 after the use of these pesticides was banned; did not increase in other areas until the 1980s (USFWS 1999b).

PREDATION: Predation of eggs and young by crows and ravens (CORVUS spp.) and gulls (LARUS spp.; INRIN 1999). Verbeek (1982) reports that crows were responsible for the destruction of 22 percent of eggs (first clutch) in British Columbia. Also, temporary food shortages may be a possible limiting factors. HABITAT: Nesting habitat may become an important limiting factor (USFWS 1999a). See also Spendelow and Patton 1988; Carroll 1988; Johnsgard 1993; Markham, 1978 COSEWIC report; Hyslop and Kennedy 1992; Chapdelaine and Brousseau 1992; Vermeer and Sealy 1984; Lensink 1984; Buckley and Buckley 1984).

Other Considerations: Considered a nuisance species by fisherman. Can feed heavily on small fish being raised commercially on minnow farms for bait, or for human consumption at fish farms or aquacultural sites. Game fish, however, appear to be minor components of the diet in Great Lakes region (Belyea et al. 1997, Bur et al. 1997, Ross and Johnson 1997). Also, in some locations within the Great Lakes basin have propensity for killing the trees in which they nest and roost and are competing with other colonial nesting water and wading birds for the same island nesting sites. There is heightened concern when this competition jeopardizes the reproductive success of rare, threatened, or endangered plant and animal species (USFWS 1999a).

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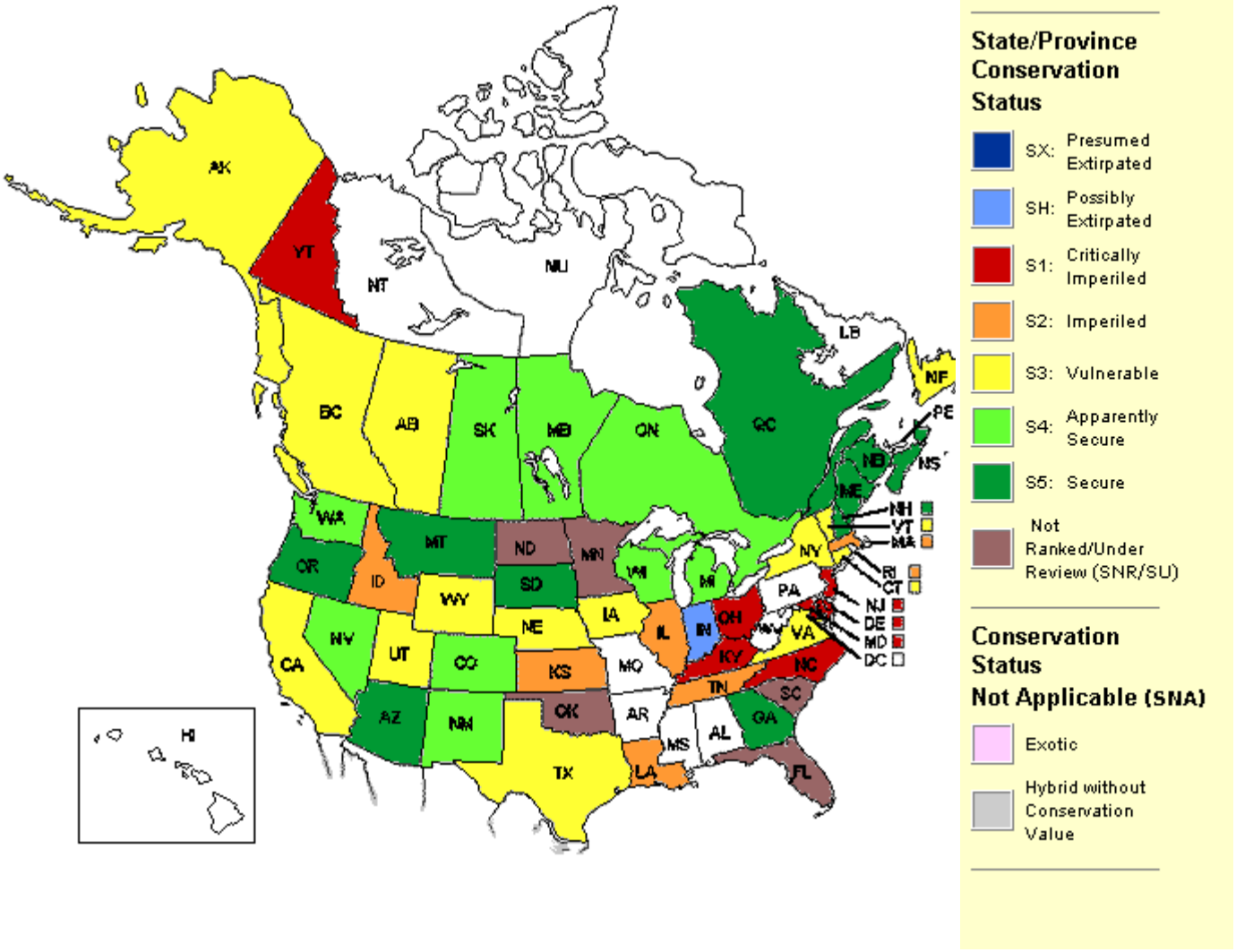
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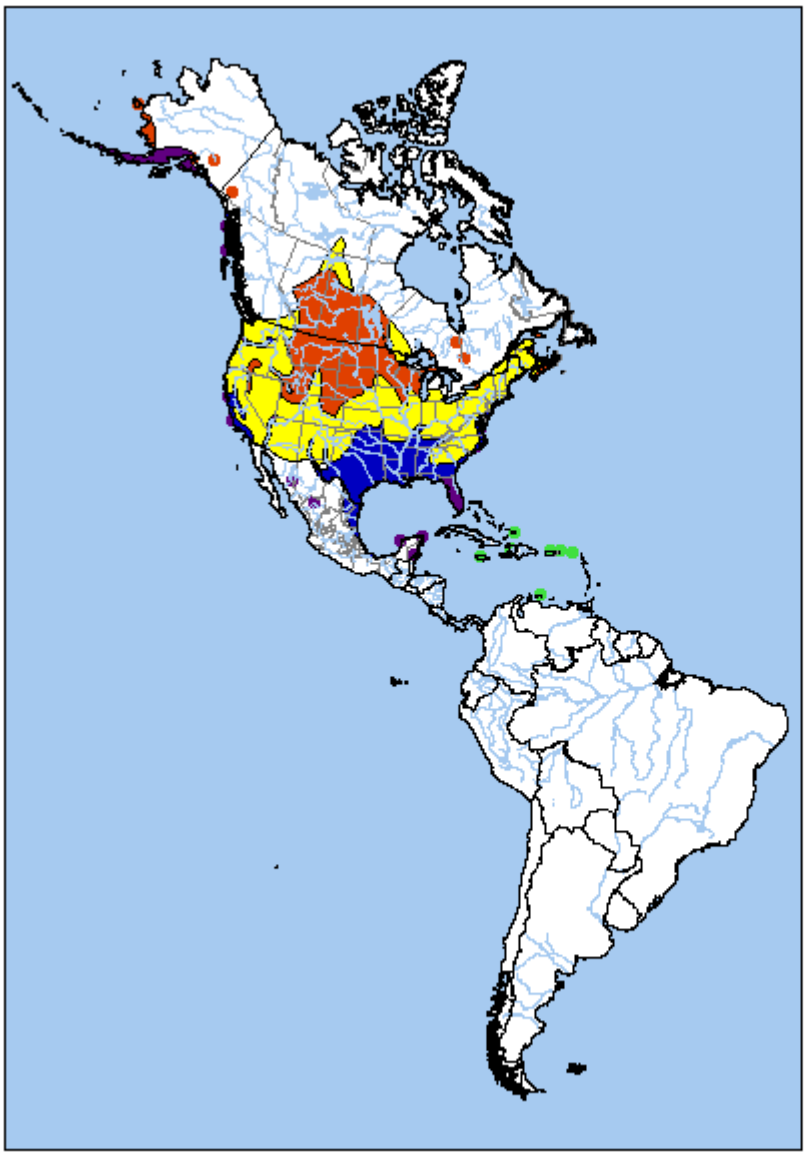

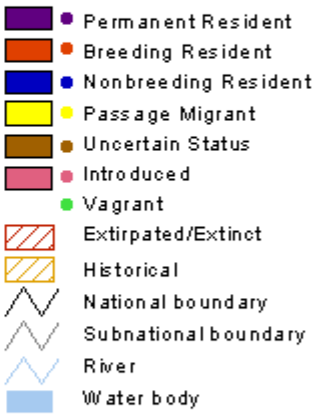

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Map created June 2005

Porzana carolina - (Linnaeus, 1758)
Sora

© Dick Cannings

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Gruiformes	Rallidae	Porzana

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Porzana Carolina

Reproduction Comments: Clutch size is 6-18 (commonly 10-12). Incubation, by both sexes, lasts 18-20 days. In the upper Midwest, most hatch in late May or early June. Young are tended by both parents, leave nest within 1-2 days but may return at night for brooding. Cornell Nest Record Program data indicate a nest success rate of 0.53 (Conway et al. 1994). Females may lay eggs in the nests of conspecifics; females may be able to recognize eggs that are not their own (see Sorenson 1995, Condor 97:819-821).

Ecology Comments:
BREEDING: Home range size averaged 0.19 ha during brood-rearing (Johnson and Dinsmore 1985). NON-BREEDING: Roosts communally. Home range averaged 0.78 hectares in Arizona during winter (Conway 1990).

Non-Migrant: N
Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: Arrives in northern breeding areas April-May, departs by September-October (Bent 1926). May make local migrations in Pacific states, generally extensive migrations elswhere. Migrants arrive in Costa Rica mostly in October, depart by late February or March (Stiles and Skutch 1989). Migration flights are mostly at night (Cogswell 1977).

Estuarine Habitat(s): Herbaceous wetland, Scrub-shrub wetland

Palustrine Habitat(s): Bog/fen, FORESTED WETLAND, HERBACEOUS WETLAND, Riparian, SCRUB-SHRUB WETLAND

Habitat Comments: Primarily shallow freshwater emergent wetlands (e.g., marshes of cattail, sedge, blue-joint, or bulrush), less frequently in bogs, fens, wet meadows, and flooded fields, sometimes foraging on open mudflats adjacent to marshy habitat. Also occurs locally in swamps, along slough borders, and in mangroves. Can use very small marshes (e.g., 4 nests have been found in a half-acre marsh) (see Brewer et al. 1991). Nonbreeding: also in coastal salt marshes; roosts in cattails or other dense vegetation. In northern wetlands and midle-southern Atlantic coastal wetlands, wild rice provides habitat during migration (Fannucchi et al. 1986).

Nests about 15 cm above water level in marsh vegetation, often near open water. Nest is anchored to emergent plants or sometimes placed on top of a mound (Cogswell 1977). In Michigan, nests most often were over water 10-15 cm deep (see Brewer et al. 1991).

Adult Food Habits: Granivore, Herbivore, Invertivore

Immature Food Habits: Granivore, Herbivore, Invertivore

Food Comments: Eats mollusks, insects, seeds of marsh plants, duckweed (Terres 1980). Seeds, especially those of sedge and bulrush, may comprise the bulk of the diet. Often forages along edges (e.g., between vegetation types or along the edge of open water).

Adult Phenology: Circadian

Immature Phenology: Circadian

Phenology Comments: Leaves dense cover mostly in early morning and evening.

Length: 22 centimeters

Global Status: G5
Global Status Last Reviewed: 25Nov1996
Global Status Last Changed: 25Nov1996
Rounded Global Status: G5 – Secure

National Status: N5B,N5N
State Status: Delaware (S2)

Management Requirements: Eddleman et al. (1988) provided the following information on managing waterfowl areas in a way that is compatible with the conservation of inland rails. Wetlands of the greatest importance to rallids (other than gallinules and coots) are shallower and have greater percentage cover by emergent vegetation than those typically managed for waterfowl. Dewatering in northern breeding areas should occur before April 15 to avoid disruption of rail nest initiation. Gradual dewatering (and presumably presence of topographic diversity) provides the maximum amount of favorable foraging area (edge between moist soil and marsh). Amount of nesting cover (emergent perennial vegetation) should be maximized. To provide rail habitat every year, different impoundments should be flooded in different years.

For autumn migration, shallow flooding should commence in late summer in middle latitudes (vs. late autumn or winter for waterfowl), and habitat should include various shallow water depths, robust cover, and short-stemmed seed-producing plants. Flooding too deeply and too early, and deep winter flooding, lead to loss of robust plant cover.

In spring, areas that have annual grasses and smartweeds should be shallowly flooded (< 15 cm), with some areas flooded to depth of up to 50 cm. Drawdowns are most favorable when they concentrate invertebrate prey. These conditions also provide excellent habitat for dabbling ducks such as blue-winged teal and northern shoveler. Land leveling, which reduces topographic diversity and favorable rail foraging habitat (edge) should be avoided.

Rice harvest should be managed in such a way as to minimize nest destruction and disturbance of soras (Eddleman et al. 1988).

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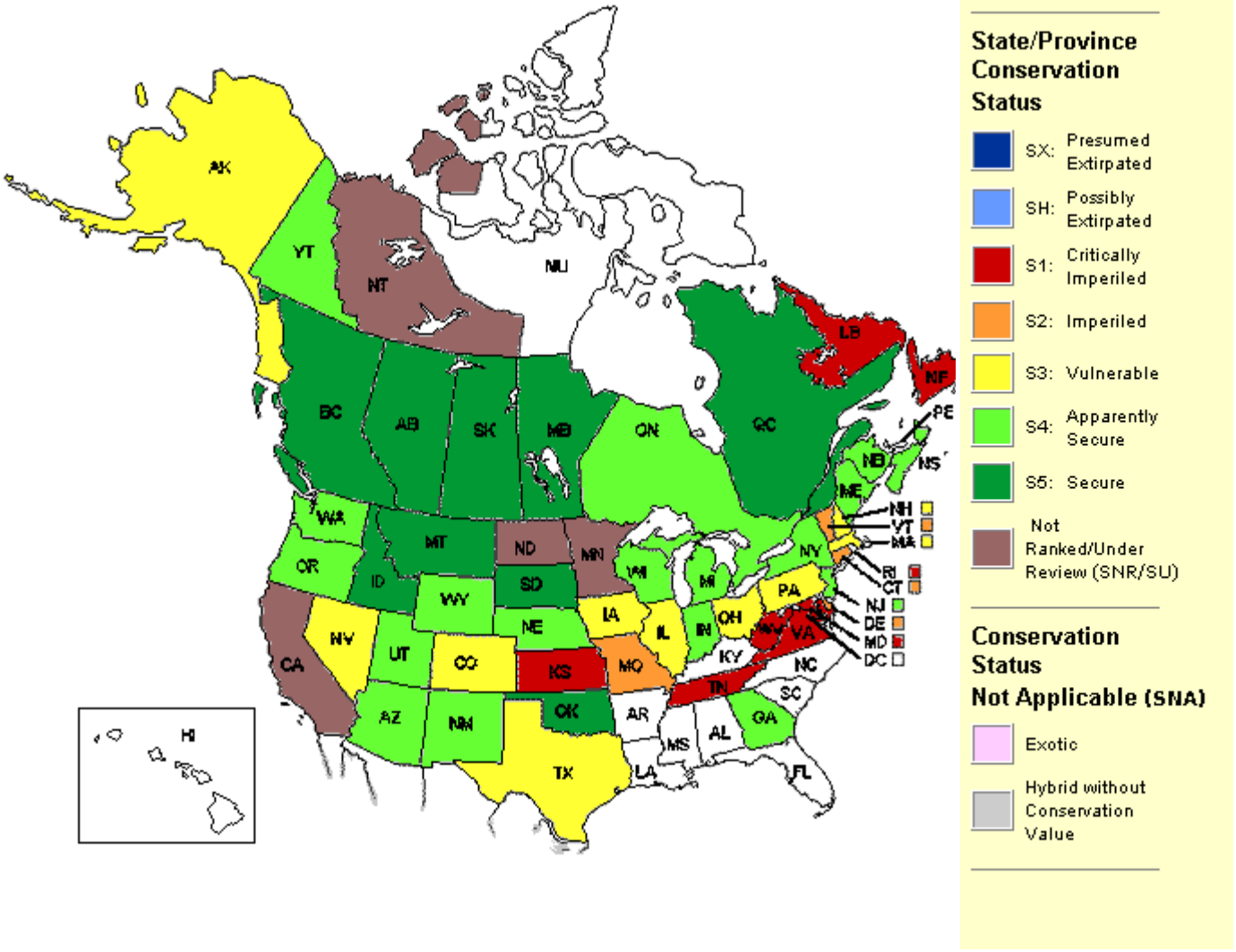
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S3: Vulnerable
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S5: Secure
Not Ranked/Under Review (SNR/SU)
Conservation Status
Not Applicable (SNA)
Exotic
Hybrid without Conservation Value
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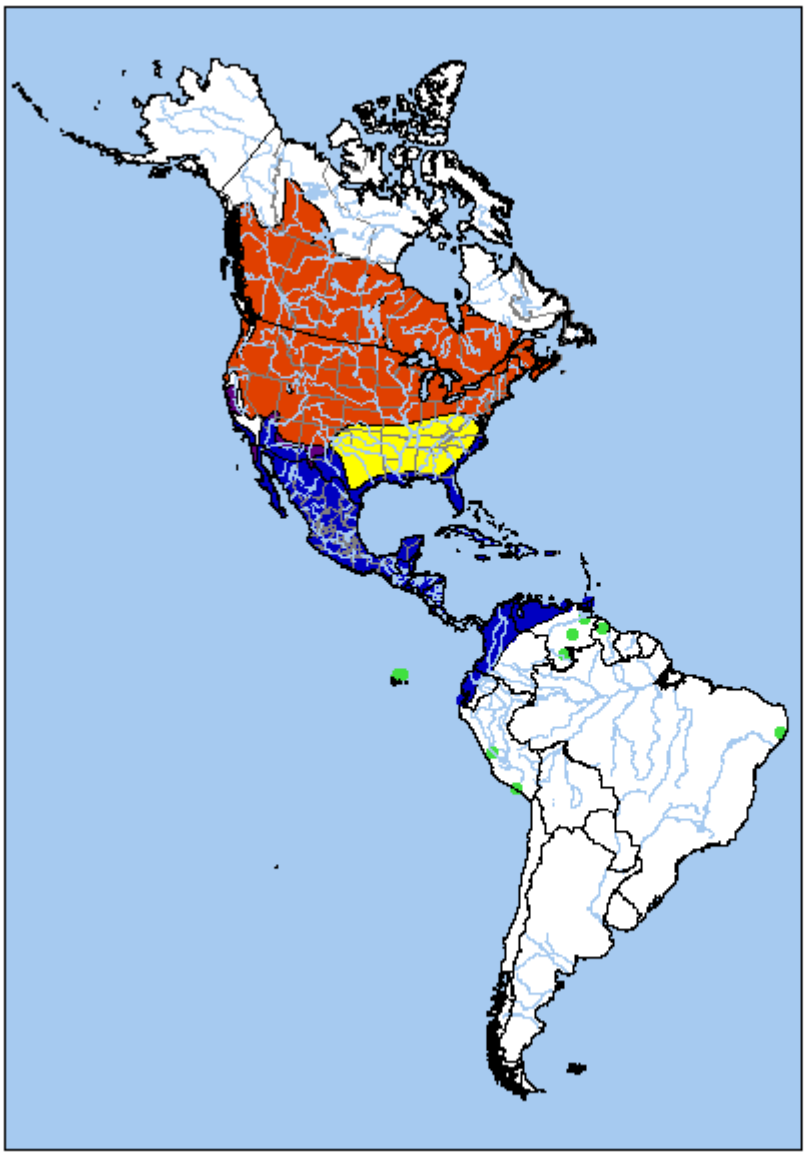


Permanent Resident
Breeding Resident
Nonbreeding Resident
Passage Migrant
Uncertain Status
Introduced
Vagrant
Extirpated/Extinct
Historical
National boundary
Subnational boundary
River
Water body

NatureServe

750 0 750 Kilometers

Map created June 2005

Spizella passerina – (Bechstein, 1798)
Chipping Sparrow

© Robert Royse

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Passeriformes	Emberizidae	Spizella

Genus Size: C - Small genus (6-20 species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Spizella passerina
Taxonomic Comments: Zink and Dittmann (1993) studied restriction site variation in mtDNA across the range of S. PASSERINA and found no detectable geographic variation in haplotypes, despite the sampling of three named subspecies. They also presented a hypothesis for evolution in the genus SPIZELLA. See Dodge et al. (1995) for a comparison of phylogenies derived from two molecular data sets for the genus SPIZELLA; among other results, monophyly of SPIZELLA including the American tree sparrow was supported.

Short General Description: A small bird (sparrow).

Reproduction Comments: Clutch size 3-5 (usually 4). Incubation 11-14 days. There may be 2 broods per year. Both parents tend altricial young, which leave nest in 9-12 days.

Non-Migrant: Y

Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: Breeding populations in Canada and northern U.S. are long-distance migrants, winter south to southern Mexico; migrates to northern part of nesting range in April-May (Terres 1980). Central American breeders are sedentary.

Terrestrial Habitat(s): Cropland/hedgerow, Grassland/herbaceous, Savanna, Suburban/orchard, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed

Habitat Comments: Open woodlands, woodland edges, edges of lakes and streams, grassy fields, parks, farm yards, and orchards.
BREEDING: Usually nests in trees and shrubs, usually within 1-6 m of ground but may be higher.

Adult Food Habits: Granivore, Invertivore

Immature Food Habits: Granivore, Invertivore

Food Comments: Feeds on seeds (e.g., grasses, clover, ragweed, knotweed) spiders, and insects (e.g., weevils, beetles, caterpillars, grasshoppers). Mainly forages on the ground, but also in foliage.

Adult Phenology: Diurnal

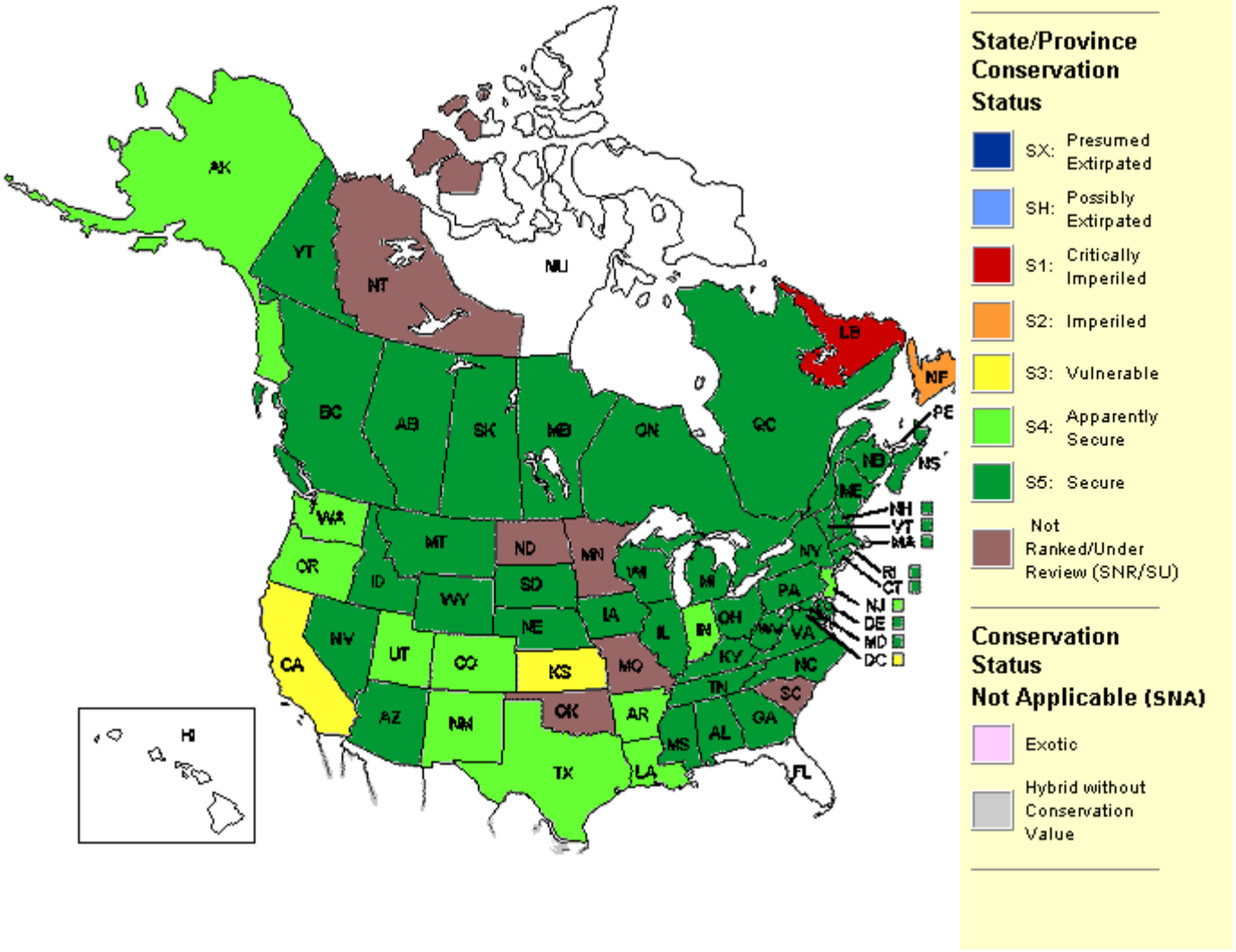
Immature Phenology: Diurnal

Length: 14 centimeters

Global Status: G5
Global Status Last Reviewed: 04Dec1996
Global Status Last Changed: 04Dec1996
Rounded Global Status: G5 - Secure

National Status: N5B, N5N
State Status: Delaware (S3N,S5B)

All information courtesy of NatureServe.org:
http://www.natureserve.org/explorer/servlet/NatureServe?menuselect=none&sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=102429&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=102429&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=102429&menuselectfooter=none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HI
State/Province Conservation Status
SX: Presumed Extirpated
SH: Possibly Extirpated
S1: Critically Imperiled
S2: Imperiled
S3: Vulnerable
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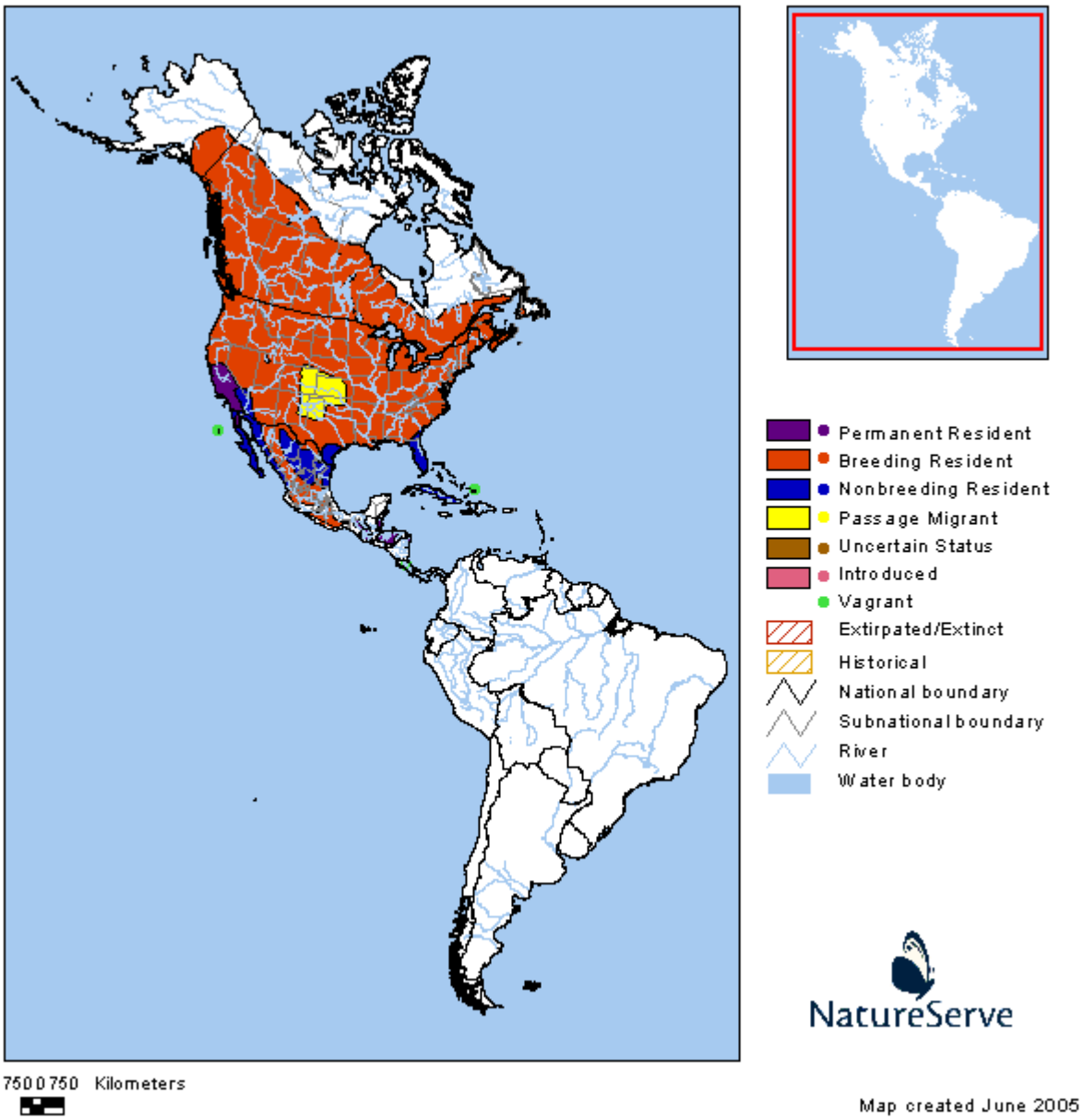
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National boundary
Subnational boundary
River
Water body
NatureServe
750 0 750 Kilometers
Map created June 2005

Sterna forsteri – (Nuttall, 1834)
Forster's Tern

© Dennis Donohue

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Charadriiformes	Laridae	Sterna

Genus Size: D - Medium to large genus (21+ species)
Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: Sterna forsteri

Reproduction Comments: Along the U.S. mid-Atlantic coast, lays eggs from late May to mid-June. Both sexes incubate usually 3-4 eggs for about 23-24 days. Semi-precocial young are tended by both adults until capable of flight, fledge at 3-4 weeks, remain with parents well into the fall (Byrd and Johnston 1991). Often renests if first nest is lost to tidal flooding. Nests in loose colonies or singly. Colony size along the Atlantic coast is less than 500, up to several thousand in Louisiana (Spendelow and Patton 1988).

Ecology Comments:
Breeding: Forage up to 3.2 kilometers from nest (Van Rossem 1933). Nonbreeding: singly or in small loose groups.

Non-Migrant: N
Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: Migrates primarily through interior North America. Migratory status in the western Gulf of Mexico? Birds from Atlantic coast breeding population apparently disperse northward, at least to New England, prior to fall migration (AOU 1983).

Marine Habitat(s): Near shore

Estuarine Habitat(s): Bay/sound, Herbaceous wetland, Lagoon, River mouth/tidal river, Tidal flat/shore

Riverine Habitat(s): BIG RIVER, MEDIUM RIVER

Lacustrine Habitat(s): Deep water, Shallow water

Palustrine Habitat(s): HERBACEOUS WETLAND, Riparian

Terrestrial Habitat(s): Sand/dune

Habitat Comments: Freshwater and salt marshes, in migration and winter also seacoasts, bays, estuaries, rivers and lakes (AOU 1983). Nests on inland lakes and marshes, or on salt marshes (especially on wrack) along the coast. Along the Gulf Coast, commonly nests on dredged material as well as on wrack in salt marshes. At San Francisco Bay, California, commonly nests on old dikes or dredged-material islets in salt evaporation ponds. Nests on floating mass of marsh plants, on muskrat house, or old grebe's nest, or in a depression lined with grasses and pieces of shells. Human-made nesting platforms made of bundles of PHRAGMITES or TYPHA on floating base of styrofoam and wood or tires were readily used for nesting in Wisconsin (see Spendelow and Patton 1988). See Spendelow and Patton (1988) for further information on freshwater nesting habitats. See Cuthbert and Louis (1993) for information on nesting habitat in Minnesota.

Adult Food Habits: Invertivore, Piscivore

Immature Food Habits: Invertivore, Piscivore

Food Comments: Catches flying insects (e.g., dragonflies, caddisflies) or snatches up insects (e.g., dead beetles) off the surface of the water while in flight; dives into water for fishes (Terres 1980).

Adult Phenology: Diurnal

Immature Phenology: Diurnal

Colonial Breeder: Y

Length: 37 centimeters
Weight: 158 grams

Global Status: G5
Global Status Last Reviewed: 27Nov1996
Global Status Last Changed: 27Nov1996
Rounded Global Status: G5 - Secure

National Status: N5B, N5N
State Status: Delaware (S1B)

Global Abundance: 10,000 - 100,000 individuals

Global Abundance Comments: The 1982 breeding population from New York to Virginia was estimated at 4600 birds. Most of the Gulf Coast breeding population (about 23,000) occurs in Louisiana. About 8000 birds nested along the Pacific coast in the late 1970s, mostly in the San Francisco Bay area.
Estimated Number of Element Occurrences: 81 to >300

Global Short Term Trend Comments: Population trend in the southeastern U.S., where probably more than half the world's population breeds, is not well known (Clapp and Buckley 1984). See Spendelow and Patton (1988) for further details and for information on an increase in the breeding population in the U.S. Great Lakes area in the early 1980s.

Global Long Term Trend Comments: Population in Minnesota declined by about 60% between 1942 and the mid-1980s (Cuthbert and Louis 1993).

Threats: Threats include human disturbance and development of nesting areas, loss of nests to natural flooding, and possibly predation by laughing gulls (Byrd and Johnston 1991).

All information courtesy of NatureServe.org:
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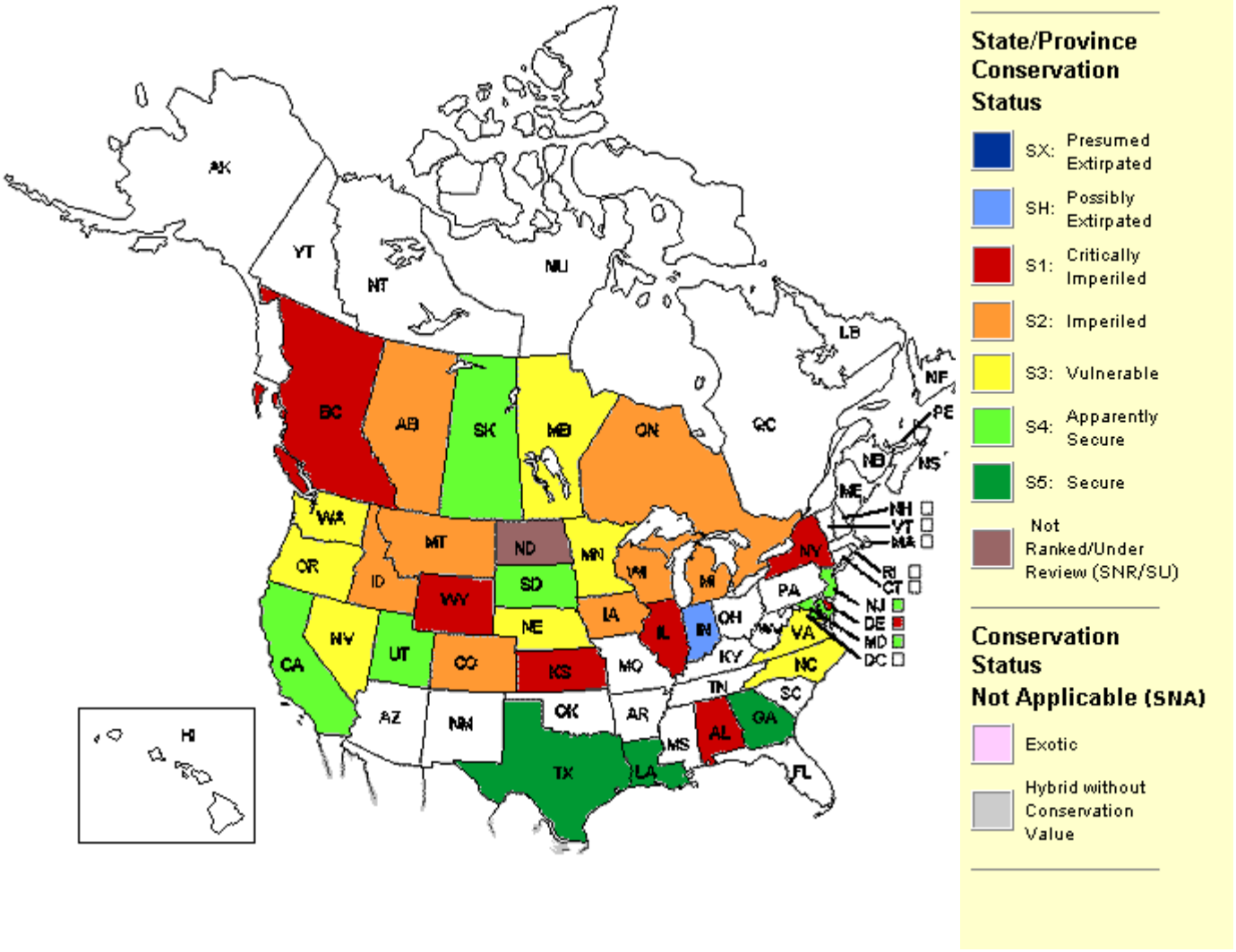
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State/Province Conservation Status
SX: Presumed Extirpated
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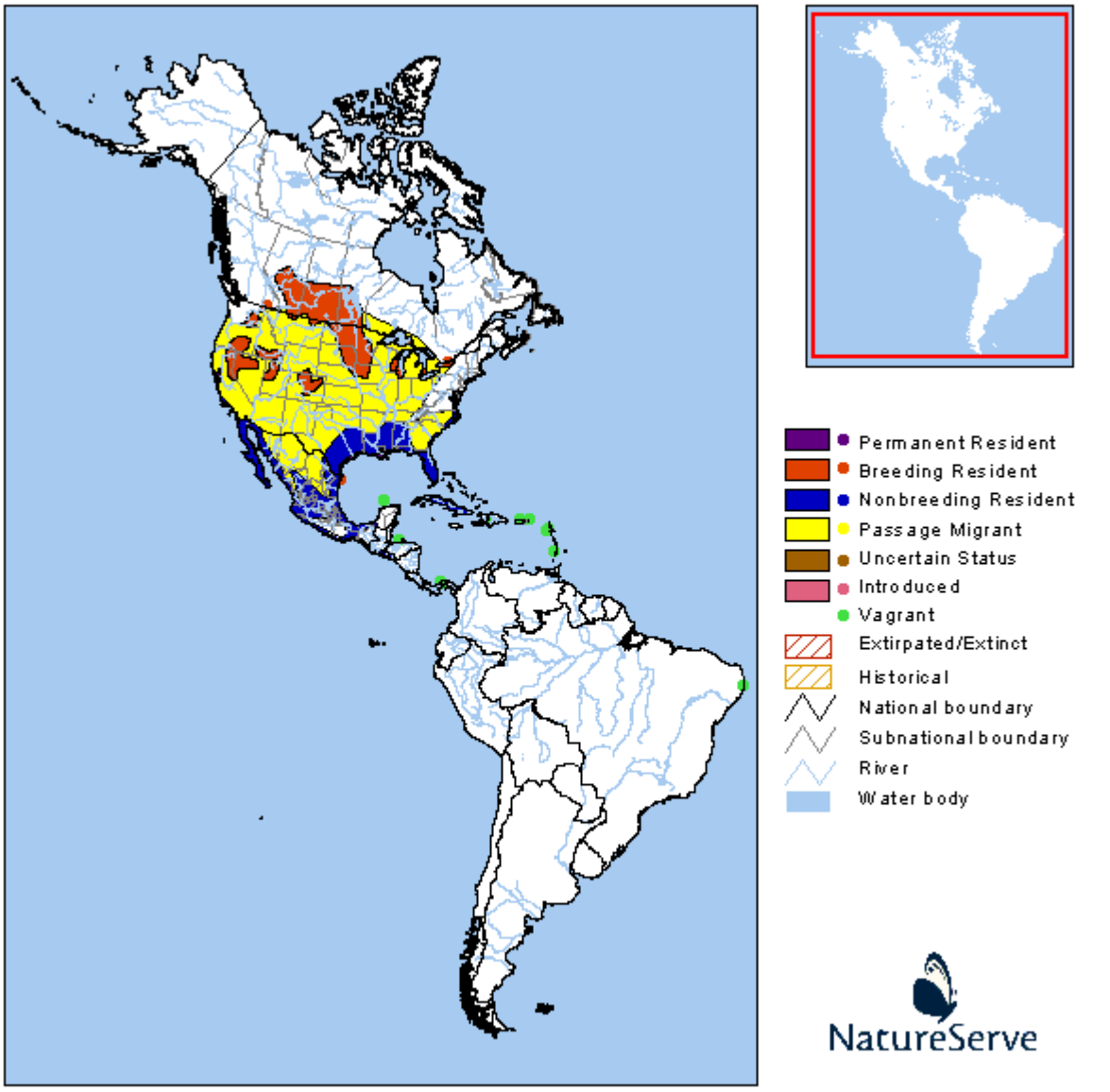
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Passage Migrant
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Historical
National boundary
Subnational boundary
River
Water body
NatureServe
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Map created June 2005

VEGETATION COMMUNITIES PLS

Historical Context of Vegetation at the BBTS

Information on the historic vegetation at the BBTS is limited. However some early reports indicate that the area was characterized by sandy and marsh-like conditions prior to agricultural development in the late 1800s (Jones, 1995). Given these conditions, the vegetation of the area probably consisted of plants in either of two major community types: salt marsh or coastal dune woodland. In low-lying, tidally-influenced areas on the installation, a salt marsh community would have thrived, dominated by smooth cordgrass (*Spartina alterniflora*), saltmeadow cordgrass (*Spartina patens*), and including other species such as groundsel tree (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), and swamp rose mallow (*Hibiscus moscheutos*). The overall area of marsh may have also been larger than it is today, since fill material has been added to the many areas of the installation east of Salt Pond.

The areas of higher elevation would have supported the type of coastal dune woodland species typical of the outer coastal plain region. Species such as eastern red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), loblolly pine (*Pinus taeda*), black cherry (*Prunus serotina*), and sassafras (*Sassafras albidum*) would have dominated the canopy. A diverse understory community may also have included bayberry (*Morella cerifera*), beach plum (*Prunus maritima*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*). Although these communities may have been influenced by human activities over many centuries, the greatest impact to the land was clearing and draining it for agricultural cultivation. The popularity of the area in the late 1800s eventually led to the development of land that had been previously considered unsuitable for farming. Prior to DEARNG occupation in 1927, agriculture was the major land use at the installation (Jones, 1995).

Vegetation Community Mapping Process

The previous INRMP (2001) included a field survey and mapping of vegetation communities at the BBTS. The vegetation communities were separated into three cover classes: 1) Terrestrial (upland), 2) Palustrine and 3) Estuarine, based on the Cowardin (Cowardin, et al., 1979) wetland classification system, which had been developed for the National Wetland Inventory. The study team at that time determined that the Cowardin system had applicability at the BBTS due to the abundance of wetlands there. Vegetation communities were delineated in the field and mapped based largely on cover type. Vegetation sampling was conducted across multiple cover types. While certain cover types were unique (i.e. mowed grass/landscape & mowed grass/shrubland) they were grouped together based on the extent of mowing. Other cover types such as impervious surface (road), intertidal unconsolidated shore, or tidal creek (deep water) were not sampled because they contained no vegetation.

In 2005, the vegetation communities at the RRTS were re-assessed. The Corps study team delineated and mapped these areas in the same fashion as the original mapping. Additionally, the mapped vegetation communities were compared to the Delaware Gap Analysis Project land cover data set, updated in March 2002, for consistency. Nominally, the minimum mapping unit

(MMU) is 2 hectares and the scale is 1:100,000 for the land cover map. However, the data was further modified to a MMU of 30 meter pixel and a scale of 1:24,000. This data set used the National Vegetation Classification System (NVCS) as the basis for the classification. The basic unit is the Map Class, and for vegetated classes is delineated to dominant canopy species, most of the classes ended as aggregates of alliances based on ecological similarities. This data set also provides information on the relationship of each Map Class to the Anderson et al. (1976, USGS) Level I or LL code, the National Land Cover Data (MRLC 1999) code and the Delaware Gap wildlife habitat codes.

Vegetation Change Summary

The 2001 analysis yielded 12 cover types at the BBTS: the Terrestrial cover class consisted of five cover types; the Palustrine cover class consisted of one cover type; and the Estuarine cover class consisted of six cover types. The Terrestrial cover class covered approximately 42 percent (42 acres) of the total training site (approximately 100 acres). The Palustrine cover class accounted for approximately 6 percent (6 acres) of the total training site. The Estuarine cover class covered approximately 52 percent (52 acres) of the total training site.

The 2005 analysis yielded 11 cover types at the BBTS: the Terrestrial cover class consisted of three cover types; the Palustrine cover class consisted of three cover types; and the Estuarine cover class consisted of five cover types. The Terrestrial cover class accounted for approximately 37 acres (37 percent of the total acreage); the Palustrine cover class covered approximately 12 acres (12 percent), and the Estuarine cover class covered approximately 52 acres (52 percent). The terrestrial portions of the BBTS are primarily developed with buildings, impervious surfaces, or lawn. The undeveloped portion of the site accounts for approximately 67 acres (67 percent of the total acreage), with the majority of that land (64 acres) being wetlands.

Over the last five years, the vegetation communities at the BBTS have remained relatively unchanged. Small portions of the Loblolly Pine Forest and Emergent Brackish Marsh vegetation communities have become Palustrine Scrub-Shrub Wetland, and small portions of Mowed Lawn/Landscaping have become Palustrine Emergent Wetlands. It should be noted that, for the 2005 analysis, the Terrestrial Coastal Shrubland vegetation community has been reclassified as Estuarine Scrub-Shrub Wetland, because the entire area exhibiting this vegetation type meets the U.S. Army Corps of Engineers criteria as jurisdictional wetland. There were no other significant changes to the vegetation communities at the Bethany Beach Training Site.

Existing Vegetation Communities

The existing vegetative cover at the BBTS has been mapped and classified into ecological communities using the Cowardin system (Cowardin et al., 1979). These communities are primarily defined by the type of vegetation present or the absence of vegetation altogether. Topography, soils, hydrology, and tidal regime also influence community classification. Three ecological systems are present at the installation: terrestrial, palustrine, and estuarine.

VEGETATION COMMUNITIES AT THE BETHANY BEACH TRAINING SITE

Community types at the BBTS are identified in Figure 5-1, and plant species found therein are further discussed in the Flora PLS in Appendix B. The following subsections present a general description of vegetative cover, divided by terrestrial and estuarine subsystems and community types.

Vegetation Community Coverage at the BBTS

Vegetation Community	Calculated Area[1] Acres	Hectares	Percent of Installation
TERRESTRIAL			
Mixed Successional Forest	<1	<1	<1
Mowed Lawn/Landscaping	29	12	29
Roads and Buildings	7	3	7
	36	**15**	**36**
PALUSTRINE			
Loblolly Pine Forest	5	2	5
Palustrine Emergent Wetland	<1	<1	1
Palustrine Scrub-Shrub Wetland	6	3	6
	12	**6**	**12**
ESTUARINE			
Estuarine Emergent Brackish Tidal Marsh	17	7	17
Estuarine Scrub-Shrub Wetland	<1	<1	<1
Phragmites Brackish Tidal Marsh	4	2	4
Subtidal Unconsolidated Bottom	29	12	29
Tidal Creek	<1	<1	<1
	48	**22**	**48**
TOTALS	**96**	**43**	**96**

[1] Area calculations are based on the land cover mapping found in this report. The percent area calculations are based on a total area for BBTS of approximately 100 acres.

Terrestrial Vegetation

The terrestrial system consists of uplands habitats that have well-drained, dry to mesic (never hydric) soils. Vegetative cover in this system is never predominantly hydrophytic, even if the soil surface is occasionally or seasonally flooded or saturated (Reschke, 1990). Ecological communities in the terrestrial system occupy approximately 36 acres of the installation. These communities include Mixed Successional Forest. The mowed Grass/Landscaping community, and buildings and roads terrestrial habitats are addressed separately in Section 5.2.3.

Mixed Successional Forest: This community occurs on about one percent of the land at the BBTS, and is primarily located at the southern end of the airstrip. The dominant species of the mixed successional forest are black cherry (*Prunus serotina*), northern bayberry, evergreen bayberry (*Morella heterophylla*), winged sumac (*Rhus copallina*), and trumpet creeper (*Campsis radicans*).

Palustrine Vegetation

The palustrine system includes all non-tidal wetlands dominated by trees, shrubs, emergent plants, or emergent mosses or lichens, and all wetlands of these types that occur in tidal areas where salinity from ocean derived salts is below 0.5 parts per thousand (ppt) (Mitsch and Gosselink, 1993).

Loblolly Pine (*Pinus taeda*) Palustrine Forested (PFO) Wetland: These pine forests, which occupy approximately 5 acres at the BBTS, are found adjacent to the saltwater shrub wetland community in the northern and western regions of the installation. This forest community is tolerant of wetland conditions and occurs at the BBTS on soils that are classified as tidal marsh, although it also occurs frequently on drier soils. Loblolly pine is a common species of the piedmont and coastal plain regions of the southeastern United States, ranging from southern New Jersey to Florida and west to eastern Texas (Petrides, 1958). This southern tree grows to heights of 80 to 100 feet and diameters of 1 to 2 feet. Loblolly pines of various ages dominate this community, but red maple (*Acer rubrum*), water oak (*Quercus nigra*), American holly (*Ilex opaca*), and poison ivy are also present.

Palustrine Emergent (PEM) Wetland: This vegetation type is found predominantly at the wet edge of the mowed lawn, where freshwater, in the form of stormwater, begins to collect before its descent into the tidal marsh. Dominant vegetation includes blunt spikerush (*Eleocharis obtusa*), dotted smartweed (*Polyganum punctatum*), and salt grass (*Distichlis spicata*), with Canadian rush (*Juncus canadensis*), pathrush (*Juncus tenuis*), the occasional narrowleaf cattail (*Typha angustifolia*), and other associated wetland species. This vegetation type accounts for just under 1 acre, or 1 percent of the installation.

Palustrine Shrub-Scrub (PSS) Wetland: This vegetation type is found on disturbed soils near the jogging track/helipad, high enough in the landscape to be out of the influence of saltwater. Dominant species include bayberries (*Morella cerifera, Morella pennsylvanica*) and groundsel tree (*Baccharis halimifolia*), with the occasional loblolly pine sapling, poison ivy, phragmites, or multiflora rose. This vegetation type covers approximately 6 acres, or 6 percent of the BBTS.

Photo: Palustrine Forested Wetland (background)

Photo: Palustrine Emergent Wetland (foreground)

Photo: Palustrine Shrub-Scrub Wetland (on Left), and Mowed Lawn (on Right)

Estuarine Vegetation

The estuarine system consists of deepwater tidal habitats and adjacent tidal wetlands that are saline, but where salinity is less than 30 parts per thousand. These areas have access to ocean water, although access is typically restricted by surrounding land and salinity is somewhat diluted by freshwater from upland areas (Mitsch and Gosselink, 1993). At BBTS, the communities of the estuarine system include the following: brackish tidal marsh, intertidal unconsolidated shore, *Phragmites* brackish tidal marsh, salt marsh/intertidal mudflat, saltwater shrub wetland, subtidal unconsolidated bottom, and tidal creek.

Estuarine Emergent Brackish Tidal Marsh: Approximately seventeen percent of the BBTS is classified as Estuarine Emergent Brackish Tidal Marsh. This community represents a transitional zone between the strongly saline environment of Salt Pond to the less saline saltwater shrub community. Salt marsh vegetation at the site includes species such as smooth cordgrass, saltmeadow cordgrass, spike grass (*Distichlis spicata*), and black grass (*Juncus gerardii*). Mudflats are interspersed throughout the salt marsh.

Estuarine Shrub-Scrub (ESS) Wetland: This community consists of species such as northern bayberry (*Morella pensylvanica*), groundsel-tree, multiflora rose (*Rosa multiflora*), and poison ivy (*Toxicodendron radicans*). This community occupies about one percent of the installation and is found on a relatively narrow strip of land just north of the cantonment area, between salt marsh and mowed grass communities.

Phragmites-Dominated Brackish Tidal (EEM) Wetland: This marsh community is dominated by dense stands of *Phragmites* and occupies about four percent of the BBTS in the south-central portion of the property. Other species present in this community include groundsel tree, swamp rose mallow, and marsh elder.

Subtidal Unconsolidated Bottom: This community classification includes all underwater habitats associated with Salt Pond and contributes 29 percent of the installation's area. No formal ecological surveys of this community have been conducted. The sandy bottom of Salt Pond is generally two to three feet below the water surface and no deeper than eight feet.

Tidal Creek: Less than one percent of the area at the BBTS is occupied by the tidal creek community, which serve as the primary hydrologic link between inland marsh communities and Salt Pond. These narrow waterways provide important, and relatively secluded, habitat for birds and aquatic life.

Photo: Estuarine Emergent Brackish Tidal Marsh near Salt Pond

Photo: Estuarine Emergent Brackish Tidal Marsh and Estuarine Shrub-Scrub Marsh at High Tide

Photo: Estuarine Shrub-Scrub Wetland (background), Estuarine Emergent Brackish Tidal Marsh (center), and *Phragmites* Estuarine Emergent BTM (foreground)

Photo: *Phragmites* Brackish Tidal Marsh

Photo: Tidal Creek Vegetation Community

Turf and Landscaped Areas

Areas dominated by mowed grass comprise approximately 29 percent of the installation, located primarily in the central and southeastern portions of the property (Figure 5-1). The predominant species of the mowed community are fescues (*Festuca* spp.), crabgrass (*Digitaria serotina*), Virginia buttonweed (*Diodia virginiana*), and panic grass (*Panicum* sp.), as well as a variety of sedges. Trees such as Japanese black pine (*Pinus thunbergiana*) landscape the perimeter of the installation, while species such as princess tree (*Paulownia tomentosa*) and eastern cottonwood (*Populus deltoides*) are found in the open, mowed areas near buildings.

The remaining area (approximately 7 acres) in the terrestrial system is occupied by roads and buildings, which are concentrated on the southeastern third of the BBTS. These developed areas occupy approximately seven percent of the land at the BBTS. Roads and buildings are classified

along with ecological communities at the installation for mapping purposes, although they do not actually constitute a recognized ecological community.

Photo: Beach (Unconsolidated Shore) and Mowed Lawn

WETLANDS PLS

Clean Water Act

Section 404 of the CWA also establishes a program to control the discharge of dredge or fill materials into waters of the United States (including wetlands). Other activities that have the potential to impact wetlands are also regulated under Section 404. The US Army Corps of Engineers (Corps) has jurisdiction over activities in waters and wetlands and administers the federal permit program. The Corps does not regulate adjacent buffer zones. Pre-approved general or nationwide permits may be available for specific minor activities in wetlands. State regulations related to wetlands are discussed below.

The Wetlands Act of Delaware

The Wetland Act of Delaware (7 Del. C. 1953, § 6601; 59 Del. Laws, c.213 § 1.) was established in 1973 to provide a legal basis for the preservation and protection of the state's coastal wetlands, as defined in § 6603. The Wetlands Act requires permits for activities such as dredging, filling, bulkheading, and construction of any kind in those wetlands, which are issued by the Department of Natural Resources and Environmental Control.

2005 Wetland Delineation at the BBTS

In conjunction with this INRMP, the Corps updated the wetland survey conducted by Wetlands Research Associates, Inc. (WRA) in 1992, and a Planning Level Wetlands Survey conducted by the U.S. Army Corps of Engineers, Waterways Experiment Station (WES) in 2000. Wetland investigations were conducted using pertinent published data and by performing wetland delineations on 22 and 23 June 2005.

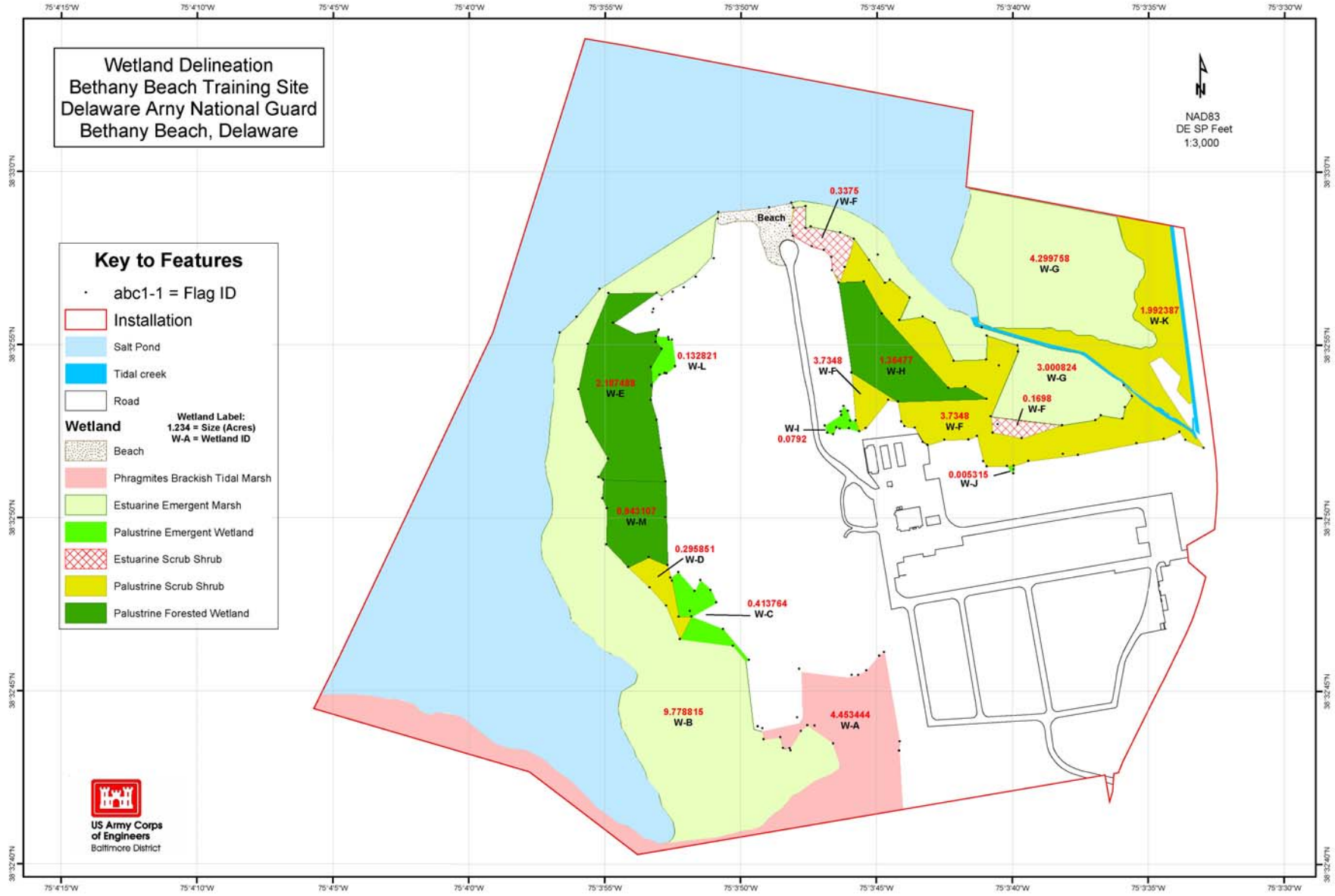
Wetland sites within the BBTS were delineated based on standard wetland delineation methodology. The wetland sites were differentiated and assigned "site letters" based on their cover class, dominant vegetative cover and landscape position. Wetland sites are lettered from A to M. Within the Palustrine (P) cover class the wetland types ranged from emergent (EM) to scrub-shrub (SS) to forest (FO). Within the estuarine (E) cover class the delineated wetland types were emergent (EM) and scrub-shrub (SS). The table below shows the type and size of jurisdictional wetlands at BBTS. There are approximately 33 wetland acres, comprising both palustrine (15 acres) and estuarine (18 acres) wetland types.

Wetlands Located on the BBTS

Wetland Identification	Wetland Type	Wetland Size (acres)
W-A	PEM	4.45
W-B	EEM	9.78
W-C	PEM	0.41
W-D	PSS	0.30
W-E	PFO	2.19
W-F	PSS/ESS	4.24
W-G	EEM	7.30
W-H	PFO	1.36
W-I	PEM	0.01
W-J	PEM	0.005
W-K	PSS	1.99
W-L	PEM	0.13
W-M	PFO	0.94

The figure below shows these updated wetland boundaries at the installation. DEARNG activities are not presently conducted in these areas, nor do they plan to be in the future. The ecological communities associated with wetlands at the BBTS are discussed in the Vegetation PLS above.

Wetland data sheets are provided after the figure. These sheets were prepared as part of the delineation process to document dominant plants, non-dominant plants, hydrological conditions, and soils at each wetland location. These sheets are used as justification for the presence or absence of wetland criteria at these sites.



WETLANDS AT THE BETHANY BEACH TRAINING SITE

Wetland Data Sheets

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center		Date 22 June 2005
Applicant / Owner United States Army – Delaware National Guard		County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?	YES	Community ID Upland Reference (fill)
Is the site significantly disturbed (Atypical Situation)?	YES	Transect ID Wetland Polygons C, D, E, F, H, I, J, K AND L. (Flags LLP1)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Pinus taeda	TREE	FAC-	*9 Amelanchier canadensis*	SHRUB	FAC
2 Morella cerifera/ pennsylvanica	SHRUB	FAC	*10 Acer rubrum*	TREE	FAC
3 Toxicodendron radicans	HERB	FACU	*11 Juniperus virginiana*	TREE	FACU
4 Smilax rotundifolia	HERB	FAC	*12 Prunus serotina*	TREE	FACU
5			*13 Viburnum dentatum*	SHRUB	FAC
6			*14 Lonicera japonica*	HERB	FAC-
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 50%

Remarks

This area meets the basic rule for hydrophytic vegetation. The historic tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons. This “upland fill” reference was taken in the loblolly pine parcel, on the apparent highest elevation between upland and wetland edges.

HYDROLOGY

☐ Recorded Data (Describe in Remarks)

☐ Stream, Lake, or Tide Gauge

☐ Aerial Photographs

☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	N/A	(in)
Depth to Free Water in Pit	N/A	(in)
Depth to Saturated Soil	N/A	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

☐ Inundated

☐ Saturated in Upper 12 Inches

☐ Water Marks

☐ Drift Lines

☐ Sediment Deposits

☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

☐ Oxidized Root Channels in Upper 12 Inches

☐ Water-Stained Leaves

☐ Local Soil Survey Data

☐ FAC-Neutral Test

☐ Other (Explain in Remarks)

SOILS

Upland Reference

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSS/LLP S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8	A	2.5 YR 3/2	None	None	Loamy sand, vertical & horizontal oxidized root channels
8-16	B	10 YR 5/3	5 YR 5/8	Along horizontal & vertical roots	Sand; NO VERTICAL STREAKING
16+	B	10 YR 5/3	5 YR 5/8		HARD PAN

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location does not meet the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	NO	Is this Sampling Point Within a Wetland? NO
Wetland Hydrology Present?	NO	
Hydric Soils Present?	NO	

Remarks

The three wetland criteria are NOT met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center			Date 22 June 2005
Applicant / Owner United States Army – Delaware National Guard			County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)			State Delaware
Do Normal Circumstances exist on the site?	YES		Community ID PSS Wetland
Is the site significantly disturbed (Atypical Situation)?	YES		Transect ID Wetland Polygon D (MSSW1)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO		Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Baccharis halimifolia	SHRUB	FACW	*9 Iva frutescens*	SHRUB	FACW+
2 Morella cerifera/ pennsylvanica	SHRUB	FAC	*10 Pinus taeda*	TREE	FAC-
3 Spartina patens	HERB	FACW+	*11 Lonicera japonica*	HERB	FAC-
4 Solidago sempervirens	HERB	FACW	*12 Smilax rotundifolia*	HERB	FAC
5			*13 Sambucus canadensis*	SHRUB	FACW-
6			*14 Vaccinium corymbosum*	SHRUB	FACW-
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons.

HYDROLOGY

☐ Recorded Data (Describe in Remarks)

☐ Stream, Lake, or Tide Gauge

☐ Aerial Photographs

☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	N/A	(in)
Depth to Free Water in Pit	N/A	(in)
Depth to Saturated Soil	N/A	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

☐ Inundated

☐ Saturated in Upper 12 Inches

☐ Water Marks

☐ Drift Lines

☐ Sediment Deposits

☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

☑ Oxidized Root Channels in Upper 12 Inches

☐ Water-Stained Leaves

☐ Local Soil Survey Data

☑ FAC-Neutral Test

☐ Other (Explain in Remarks)

SOILS

Wetland Polygon D

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	Ap	N3/	None	None	Silty clay loam; roots few, fine; oxidized root channels
6-9	E	N4/	NONE	NONE	SAND
9-16	E2	2.5 Y 7/2	10 YR 5/8	Few, distinct	Sand; vertical streaking (dark gray, N3); few fine root channels

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center		Date 22 June 2005
Applicant / Owner United States Army – Delaware National Guard		County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?	YES	Community ID PEM Wetland
Is the site significantly disturbed (Atypical Situation)?	YES	Transect ID Wetland Polygon C (PEM2)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Typha angustifolia	HERB	OBL	*9 Spartina patens*	HERB	FACW+
2 Eleocharis obtusa	HERB	OBL	*10 Solidago sempervirens*	HERB	FACW
3 Phragmites australis	HERB	FACW	11 *Juncus canadensis*	HERB	OBL
4 Distichlis spicata	HERB	FACW+	12 *Schoenoplectus americanus*	HERB	OBL
5 *Polygonum punctatum*	HERB	OBL	13 *Rumex verticillatus*	HERB	OBL
6			14 *Cyperus filicinus*	HERB	OBL
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons.

HYDROLOGY

☐ Recorded Data (Describe in Remarks)

☐ Stream, Lake, or Tide Gauge

☐ Aerial Photographs

☑ Other (observed standing water in spring and fall)

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	N/A	(in)
Depth to Free Water in Pit	N/A	(in)
Depth to Saturated Soil	N/A	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

☐ Inundated

☐ Saturated in Upper 12 Inches

☐ Water Marks

☐ Drift Lines

☐ Sediment Deposits

☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

☑ Oxidized Root Channels in Upper 12 Inches

☐ Water-Stained Leaves

☐ Local Soil Survey Data

☐ FAC-Neutral Test

☐ Other (Explain in Remarks)

SOILS

Wetland Polygon C

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A1	N3/	None	None	Silty clay loam; roots few, fine; oxidized root channels
6-9	A2	N4/	NONE	NONE	SAND
9-16	B	2.5 Y 7/2	10 YR 5/8	Few, distinct	Sand; vertical streaking (dark gray, N3); few fine root channels

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center			Date 22 June 2005
Applicant / Owner United States Army – Delaware National Guard			County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)			State Delaware
Do Normal Circumstances exist on the site?	YES		Community ID PSS Wetland
Is the site significantly disturbed (Atypical Situation)?	YES		Transect ID Wetland Polygon E (MSSW2)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO		Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Morella cerifera/ pennsylvanica	SHRUB	FAC	*9 Ilex glabra*	SHRUB	FACW-
2 Viburnum dentatum	SHRUB	FAC	*10 Baccharis halimifolia*	SHRUB	FACW
3 Amelanchier canadensis	SHRUB	FAC	*11 Prunus serotina*	TREE	FACU
4 Pinus taeda	TREE	FAC-	*12 Phragmites australis*	HERB	FACW
5 Smilax rotundifolia	HERB	FAC	*13 Sambucus (nigra) canadensis*	SHRUB	FACW-
6 Toxicodendron radicans	HERB	FACU	*14 Vaccinium corymbosum*	SHRUB	FACW-
7			*15 Acer rubrum*	TREE	FAC
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 66%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons.

HYDROLOGY

☐ Recorded Data (Describe in Remarks)

☐ Stream, Lake, or Tide Gauge

☐ Aerial Photographs

☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	N/A	(in)
Depth to Free Water in Pit	N/A	(in)
Depth to Saturated Soil	N/A	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

☐ Inundated

☐ Saturated in Upper 12 Inches

☐ Water Marks

☐ Drift Lines

☐ Sediment Deposits

☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

☐ Oxidized Root Channels in Upper 12 Inches

☐ Water-Stained Leaves

☐ Local Soil Survey Data

☑ FAC-Neutral Test

☐ Other (Explain in Remarks)

SOILS

Wetland Polygon E

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10 YR 2/2	NONE	NONE	Sandy Loam; subangular blocky; roots varied size & common
6-16	B	10 YR 7/3	7.5 YR 5/8	Common, distinct	Loamy Sand; dark vertical streaking (10 YR 2/2) throughout
					Hardpan at about 14 inches

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center			Date 22 June 2005
Applicant / Owner United States Army – Delaware National Guard			County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)			State Delaware
Do Normal Circumstances exist on the site?	YES		Community ID PEM Wetland
Is the site significantly disturbed (Atypical Situation)?	YES		Transect ID Wetland Polygon L (PEM1)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO		Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Juncus canadensis	HERB	OBL	*9 Morella cerifera/ pennsylvanica*	SHRUB	FAC
2 Juncus tenuis	HERB	FAC-	*10 Smilax rotundifolia*	HERB	FAC
3 Apocynum cannabinum	HERB	FAC	*11 Asclepias syriaca*	TREE	NI
4 Rumex verticillatus	HERB	OBL	*12 Helenium flexuosum*	HERB	FAC-
5 Polygonum punctatum	HERB	OBL	*13 Coriandrum sativum*	HERB	NI
6			*14 Juncus effusus*	HERB	FACW+
7			*15 Polygonum hydropiperoides*	HERB	OBL
8			16 Diodea virginiana	HERB	FACW

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 80%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons.

HYDROLOGY

☐ Recorded Data (Describe in Remarks)

☐ Stream, Lake, or Tide Gauge

☐ Aerial Photographs

☑ Other (standing water observed in spring & fall)

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	N/A	(in)
Depth to Free Water in Pit	N/A	(in)
Depth to Saturated Soil	N/A	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

☐ Inundated

☐ Saturated in Upper 12 Inches

☐ Water Marks

☐ Drift Lines

☑ Sediment Deposits

☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

☐ Oxidized Root Channels in Upper 12 Inches

☐ Water-Stained Leaves

☐ Local Soil Survey Data

☑ FAC-Neutral Test

☐ Other (Explain in Remarks)

SOILS

Wetland Polygon L

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10 YR 2/2	NONE	NONE	Sandy Loam; subangular blocky; roots varied size & common
6-16	B	10 YR 7/3	7.5 YR 5/8	Common, distinct	Loamy Sand; dark vertical streaking (10 YR 2/2) throughout
					Hardpan at about 14 inches

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center		Date 22 June 2005
Applicant / Owner United States Army – Delaware National Guard		County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?	YES	Community ID Estuarine Emergent Wetland
Is the site significantly disturbed (Atypical Situation)?	YES	Transect ID Wetland Polygon A (P)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Phragmites australis	HERB	FACW	*9 Iva frutescens*	SHRUB	FACW+
2			*10 Baccharis halimifolia*	SHRUB	FACW
3			*11 Lythrum salicaria*	HERB	FACW+
4			*12 Toxicodendron radicans*	HERB	FACU
5			*13*		
6			*14*		
7			*15*		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons.

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☑ Other (standing water observed in summer, spring & fall)
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	0	(in)
Depth to Free Water in Pit	0	(in)
Depth to Saturated Soil	0-6	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☑ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Wetland Polygon A

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? YES		
PROFILE DESCRIPTION (n/a)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A		NONE	NONE	Sandy Clay Loam; oxidized root channels; many large and small phrag roots (tubers/rhizomes)
6-16+	B	10Y 5/1	NONE	NONE	Loamy Sand; gleyed; soil saturated; water leaving pore space

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☑ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils. This wetland polygon is differentiated by the dominance of Phragmites from the dominance of OBL/FACW species in Wetland Polygon B. The wetland boundary is abrupt along the fill material and road, the dominant vegetation in the larger tidal marsh wetland is OBL and FACW species, and both wetland polygons have a peraquic moisture regime. Therefore, no soil profile is required.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center		Date 22 June 2005
Applicant / Owner United States Army – Delaware National Guard		County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?	YES	Community ID Estuarine Emergent Wetland
Is the site significantly disturbed (Atypical Situation)?	NO	Transect ID Wetland Polygon B and G (TM1 and TM2)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Spartina alterniflora	HERB	OBL	*9 Iva frutescens*	SHRUB	FACW+
2 Spartina patens	HERB	FACW+	*10 Baccharis halimifolia*	SHRUB	FACW
3 Distichlis spicata	HERB	FACW+	*11 Juncus gerardii*	HERB	FACW+
4 Juncus roemerianus	HERB	OBL	*12 Symphyotrichum subulatum*	HERB	OBL
5			*13 Limonium nashii*	HERB	OBL
6			*14 Sabatia stellaris*	HERB	FACW+
7			*15 Salicornia maritime*	HERB	OBL
8			16 *Phragmites australis*	HERB	FACW

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100%

Remarks

This area meets the basic rule for hydrophytic vegetation. Historic tidal marsh adjacent to wetland B and G was filled to accommodate a runway. Other non-dominate species include: *Eleocharis obtusa* (OBL), *E. pavula* (OBL), *Schoenoplectus americanus* (OBL), *Solidago sempervirens* (FACW+), *Pluchea odorata* (NI), and *Mikania scandens* (FACW+).

HYDROLOGY

☐ Recorded Data (Describe in Remarks)

☐ Stream, Lake, or Tide Gauge

☐ Aerial Photographs

☑ Other (standing water observed during multiple high/low tide cycles throughout the year)

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	0-6	(in)
Depth to Free Water in Pit		(in)
Depth to Saturated Soil	0	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

☑ Inundated

☑ Saturated in Upper 12 Inches

☐ Water Marks

☑ Drift Lines

☐ Sediment Deposits

☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

☐ Oxidized Root Channels in Upper 12 Inches

☐ Water-Stained Leaves

☐ Local Soil Survey Data

☐ FAC-Neutral Test

☐ Other (Explain in Remarks)

SOILS

Wetland Polygon B and G

Map Unit Name (Series and Phase): Tidal Marsh, salty	Drainage Class: Very Poorly Drained
Taxonomy (Subgroup):	Field Observations Confirm Mapped Type? YES

PROFILE DESCRIPTION (n/a)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☑ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils. This wetland polygon is differentiated by the dominance of OBL/FACW+ species as compared to the Phragmites dominated Wetland Polygon A. The wetland boundary is abrupt along the fill material and road, the dominate vegetation is OBL and FACW species, and has a peraquic moisture regime. Therefore, no soil profile is required.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center		Date 23 June 2005
Applicant / Owner United States Army – Delaware National Guard		County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?	YES	Community ID Estuarine Scrub Shrub Wetland
Is the site significantly disturbed (Atypical Situation)?	NO	Transect ID Wetland Polygons F (PIB/SSW3-1 to3-19)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Iva frutescens	SHRUB	FACW+	*9 Morella cerifera/ pennsylvanica*	SHRUB	FAC
2 Baccharis halimifolia	SHRUB	FACW	*10 Eleocharis obtusa*	HERB	OBL
3 Distichlis spicata	HERB	FACW+	*11 E. pavula*	HERB	OBL
4 Spartina patens	HERB	FACW+	*12*		
5 Phragmites australis	HERB	FACW	*13*		
6			*14*		
7			*15*		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100%

Remarks
This area meets the basic rule for hydrophytic vegetation. The historic tidal marsh was filled to accommodate a runway.

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☑ Other (standing water observed during multiple high/low tide cycles throughout the year)
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water		(in)
Depth to Free Water in Pit	10-12	(in)
Depth to Saturated Soil	0	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☑ Drift Lines
- ☐ Sediment Deposits
- ☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Wetland Polygon F

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW3 S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	O	2.5 YR 5/1	NONE	NONE	Fine, well decomposed organic material; roots
2-4	A	2.5 Y 6/3	7/5 YR 5/8	Common, distinct	Loamy sand; soft masses
4-16	B	2.5 Y 6/1	NONE	NONE	Loamy sand; some clay masses; fine roots; dark vertical streaking (5 PB 4)

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☑ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Bethany Beach Training Center		Date 23 June 2005
Applicant / Owner	United States Army – Delaware National Guard		County Sussex County
Investigator	CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?		YES	Community ID PSS Wetland
Is the site significantly disturbed (Atypical Situation)?		YES	Transect ID Wetland Polygon H
Is the area a potential Problem Area? (If needed, explain on reverse)		NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Morella cerifera/pennsylvanica	SHRUB	FAC	*9 Smilax rotundifolia*	HERB	FAC
2 Pinus taeda	TREE	FAC-	*10 Ilex glabra*	SHRUB	FACW-
3 Phragmites australis	HERB	FACW	*11 Solidago sempervirens*	HERB	FACW+
4 Toxicodendron radicans	HERB	FACU	*12*		
5 Baccharis halimifolia	SHRUB	FACW	*13*		
6			*14*		
7			*15*		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 60%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons.

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☑ Other (standing water observed during multiple high/low tide cycles throughout the year)
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water		(in)
Depth to Free Water in Pit	10-12	(in)
Depth to Saturated Soil	0	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Wetland Polygon H

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW3 S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	O	2.5 YR 5/1	NONE	NONE	Fine, well decomposed organic material; roots
2-4	A	2.5 Y 6/3	7/5 YR 5/8	Common, distinct	Loamy sand; soft masses
4-16	B	2.5 Y 6/1	NONE	NONE	Loamy sand; some clay masses; fine roots; dark vertical streaking (5 PB 4)

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Bethany Beach Training Center		Date 23 June 2005
Applicant / Owner	United States Army – Delaware National Guard		County Sussex County
Investigator	CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?		YES	Community ID PSS Wetland
Is the site significantly disturbed (Atypical Situation)?		YES	Transect ID Wetland Polygon K
Is the area a potential Problem Area? (If needed, explain on reverse)		NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Morella cerifera/ pennsylvanica	SHRUB	FAC	*9 Solidago sempervirens*	HERB	FACW+
2 Baccharis halimifolia	SHRUB	FACW	*10 Prunus pennsylvanica*	SHRUB	FACU-
3 Toxicodendron radicans	HERB	FACU	*11 Rosa multiflora*	HERB	FACU
4 Phragmites australis	HERB	FACW	*12*		
5			*13*		
6			*14*		
7			*15*		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 75%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons.

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☑ Other (standing water observed during multiple high/low tide cycles throughout the year)
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water		(in)
Depth to Free Water in Pit	10-12	(in)
Depth to Saturated Soil	0	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Wetland Polygon K

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW3 S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	O	2.5 YR 5/1	NONE	NONE	Fine, well decomposed organic material; roots
2-4	A	2.5 Y 6/3	7/5 YR 5/8	Common, distinct	Loamy sand; soft masses
4-16	B	2.5 Y 6/1	NONE	NONE	Loamy sand; some clay masses; fine roots; dark vertical streaking (5 PB 4)

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Bethany Beach Training Center		Date 23 June 2005
Applicant / Owner	United States Army – Delaware National Guard		County Sussex County
Investigator	CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?		YES	Community ID PEM Wetland
Is the site significantly disturbed (Atypical Situation)?		YES	Transect ID Wetland Polygon J
Is the area a potential Problem Area? (If needed, explain on reverse)		NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Eleocharis palustris	HERB	OBL	*9 Solidago sempervirens*	HERB	FACW+
2 Schoenoplectus pungens	HERB	OBL	*10 Juncus effuses*	HERB	FACW+
3			*11 Juncus canadensis*	HERB	OBL
4			*12*		
5			*13*		
6			*14*		
7			*15*		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons. This wetland is an extension of W-J via a shallow swale.

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☑ Other (standing water observed during multiple high/low tide cycles throughout the year)
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water		(in)
Depth to Free Water in Pit	10-12	(in)
Depth to Saturated Soil	0	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Wetland Polygon J

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW3 S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	O	2.5 YR 5/1	NONE	NONE	Fine, well decomposed organic material; roots
2-4	A	2.5 Y 6/3	7/5 YR 5/8	Common, distinct	Loamy sand; soft masses
4-16	B	2.5 Y 6/1	NONE	NONE	Loamy sand; some clay masses; fine roots; dark vertical streaking (5 PB 4)

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Bethany Beach Training Center		Date 23 June 2005
Applicant / Owner	United States Army – Delaware National Guard		County Sussex County
Investigator	CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?		YES	Community ID PEM Wetland
Is the site significantly disturbed (Atypical Situation)?		YES	Transect ID Wetland Polygon I
Is the area a potential Problem Area? (If needed, explain on reverse)		NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Ludwigia palustris	HERB	OBL	*9 Juncus tenuis*	HERB	FAC-
2 Eleocharis engelmanni	HERB	FACW+	*10 Polygonum punctatum*	HERB	OBL
3 Eleocharis Obtusa	HERB	OBL	*11*		
4			*12*		
5			*13*		
6			*14*		
7			*15*		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100%

Remarks

This area meets the basic rule for hydrophytic vegetation. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons. This wetland is an extension of W-J via a shallow swale, probably ditch water back-up. Area in mowed landscape

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☑ Other (standing water observed during multiple high/low tide cycles throughout the year)
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	2	(in)
Depth to Free Water in Pit		(in)
Depth to Saturated Soil		(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☑ Sediment Deposits
- ☑ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Wetland Polygon I

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW3 S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	O	2.5 YR 5/1	NONE	NONE	Fine, well decomposed organic material; roots
2-4	A	2.5 Y 6/3	7/5 YR 5/8	Common, distinct	Loamy sand; soft masses
4-16	B	2.5 Y 6/1	NONE	NONE	Loamy sand; some clay masses; fine roots; dark vertical streaking (5 PB 4)

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils when W-K (MSSW S-1) soils are assumed. Unable to penetrate sharpshooter past 2-3 inches in fill material. Compacted gravel material present. This wetland polygon is an extension from the larger scrub shrub wetland into the mowed landscape..

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met. .

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Bethany Beach Training Center		Date 22 June 2005
Applicant / Owner United States Army – Delaware National Guard		County Sussex County
Investigator CENAB-PL-P (K. Luebke, C. Spaur)		State Delaware
Do Normal Circumstances exist on the site?	YES	Community ID PSS Wetland
Is the site significantly disturbed (Atypical Situation)?	YES	Transect ID Wetland Polygon M (LLP2)
Is the area a potential Problem Area? (If needed, explain on reverse)	NO	Plot ID -

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1 Pinus taeda	TREE	FAC-	*9 Toxicodendron radicans*	HERB	FACU
2 Smilax rotundifolia	HERB	FAC	*10 Baccharis halimifolia*	SHRUB	FACW
3			*11 Iva frutescens*	SHRUB	FACW+
4			*12 Phragmites australis*	HERB	FACW
5			*13*		
6			*14*		
7			*15*		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 50%

Remarks

This area meets the basic rule for hydrophytic vegetation based on the non-dominant FACW prevelance. The tidal marsh was filled to accommodate a runway, hence there is a well defined linear toe of slope along the tidal marsh edge. There is approximately a moderately abrupt 2 foot elevation change between the top of the fill to the tidal marsh polygons.

HYDROLOGY

☐ Recorded Data (Describe in Remarks)

☐ Stream, Lake, or Tide Gauge

☐ Aerial Photographs

☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	N/A	(in)
Depth to Free Water in Pit	N/A	(in)
Depth to Saturated Soil	N/A	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

☐ Inundated

☐ Saturated in Upper 12 Inches

☐ Water Marks

☐ Drift Lines

☐ Sediment Deposits

☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

☑ Oxidized Root Channels in Upper 12 Inches

☐ Water-Stained Leaves

☐ Local Soil Survey Data

☑ FAC-Neutral Test

☐ Other (Explain in Remarks)

SOILS

Wetland Polygon M

Map Unit Name (Series and Phase): Tidal Marsh, salty				Drainage Class: Very Poorly Drained	
Taxonomy (Subgroup):			Field Observations Confirm Mapped Type? NO		
PROFILE DESCRIPTION (MSSW S-1)					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	2.5 YR 6/3	10 YR 7/6	Few, distinct	Sand; oxidized root channels
4-6	Ap	n/a	n/a	NONE	Concreted organic pan
6-18	B	5 Y 2.5/1 (N3/)	NONE	NONE	Sand; very fine roots in upper ½; very dark gray; vertical organic streaking, greasy stain.

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☑ Organic Streaking in Sandy Soils
- ☑ Listed on Local Hydric Soils List
- ☑ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

This location meets the basic rules for hydric soils.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	YES	
Hydric Soils Present?	YES	

Remarks

The three wetland criteria are met.

SURFACE WATER PLS

The BBTS lies within the Indian River Bay watershed, in the Inland Bays/Atlantic Ocean drainage basin, as defined by the Delaware Department of Natural Resources and Environmental Control (DNREC) Division of Water Resources (DNREC, 1998a). The larger scale watershed definition used by the US Environmental Protection Agency (USEPA) considers the same region to be in the Chincoteague watershed (USGS cataloging unit 02060010), which includes the Indian River Bay and ten other major surface waters along the Delaware and Maryland coasts. Salt Pond forms the western and most of the northern boundary of the BBTS and is the site's most significant surface water feature.

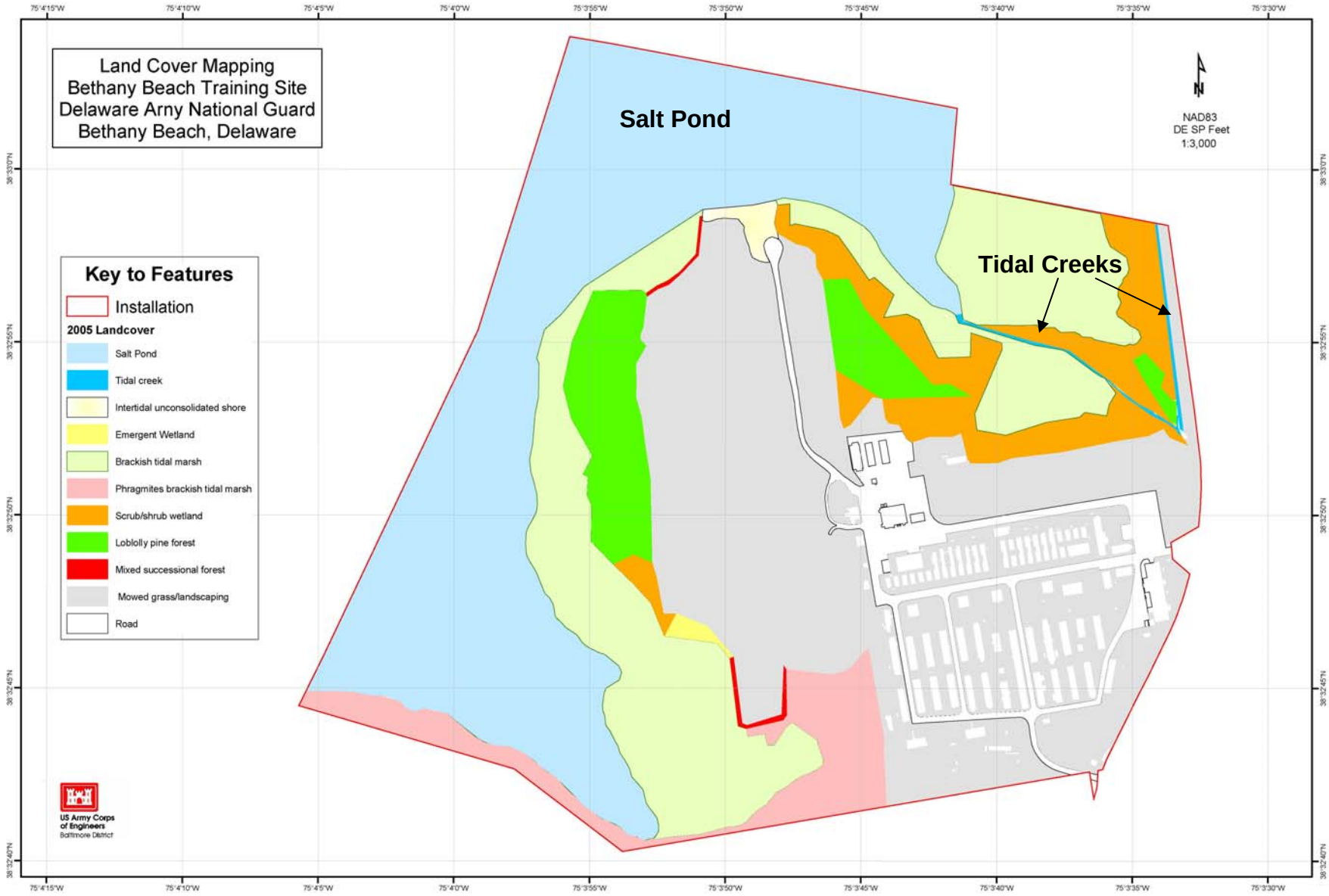
The surface waters at and in the vicinity of the BBTS include the 230-acre saltwater pond, known as Salt Pond, the unnamed tidal creeks feeding the pond, and the salt marsh at the pond's perimeter. The Salt Pond receives restricted flow through Bethany Beach and Assawoman Canals to the west. Surface water on the southwest portion of the facility typically drains into the intertidal wetlands adjacent to Salt Pond. Surface water on the remainder of the facility drains either directly into Salt Pond or into an unnamed tributary that feeds into Salt Pond

The BBTS is highly influenced by the dynamics of the estuarine system. Tidal creeks are significant surface features that connect the property to the Indian River Bay and Atlantic Ocean. The ecological communities associated with these creeks are discussed in the Vegetation PLS.

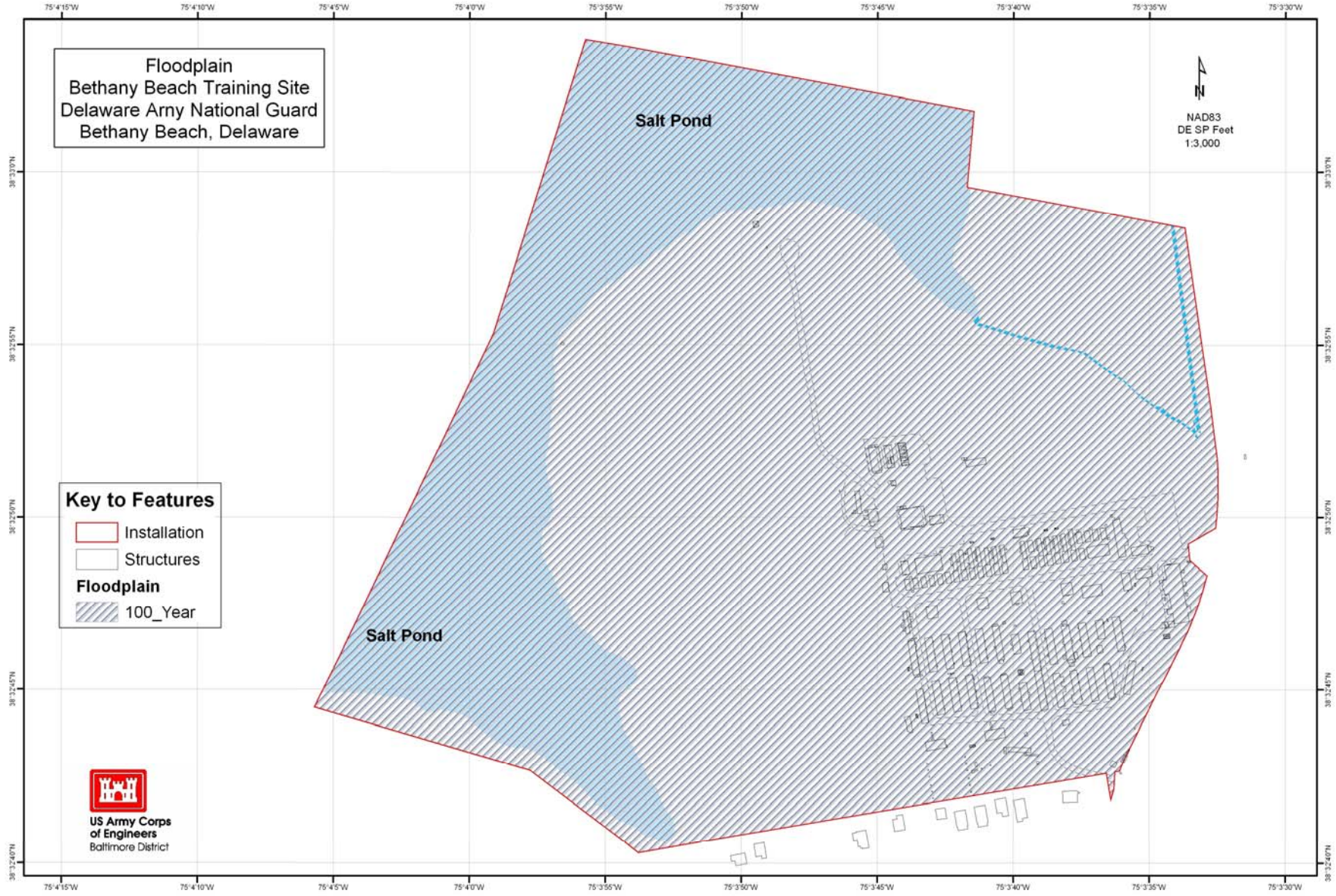
Clean Water Act and Related State Regulations

The Federal Water Pollution Control Act (FWPCA) of 1972 (33 USC 1251 *et seq*.), as amended by the Clean Water Act (CWA) and the Water Quality Act of 1987, forms the legal framework to support maintenance and restoration of water quality. The FWPCA establishes the National Pollutant Discharge Elimination System (NPDES) as the regulatory mechanism to achieve water quality goals by regulating pollutant discharge to navigable streams, rivers, and lakes. The WQA places emphasis on best management practices, monitoring and control of toxic constituents in wastewater, permitting of outfalls composed entirely of stormwater, and regulations governing sewage sludge disposal. The RRTS has prepared a Stormwater Pollution Prevention Plan (SWP3) in accordance with the regulatory requirement of the Army National Guard Environmental Compliance Assessment System (ECAS Requirement 2-15). The SWP3 addresses the requirement stating that stormwater discharge should be uncontaminated and periodically monitored, although the discharge is not covered by an NPDES permit.

State policy regarding water resources is addressed in Chapter 39 of the Delaware State Code (44 Del. Laws, c. 212, § 2; 7 Del. C. 1953, § 3901; 54 Del. Laws, c. 188, § 2; 55 Del. Laws, c. 456, § 1.). The development, use, and preservation of water resources in the state of Delaware fall under the jurisdiction of Soil and Water Conservation Districts administered by DNREC.



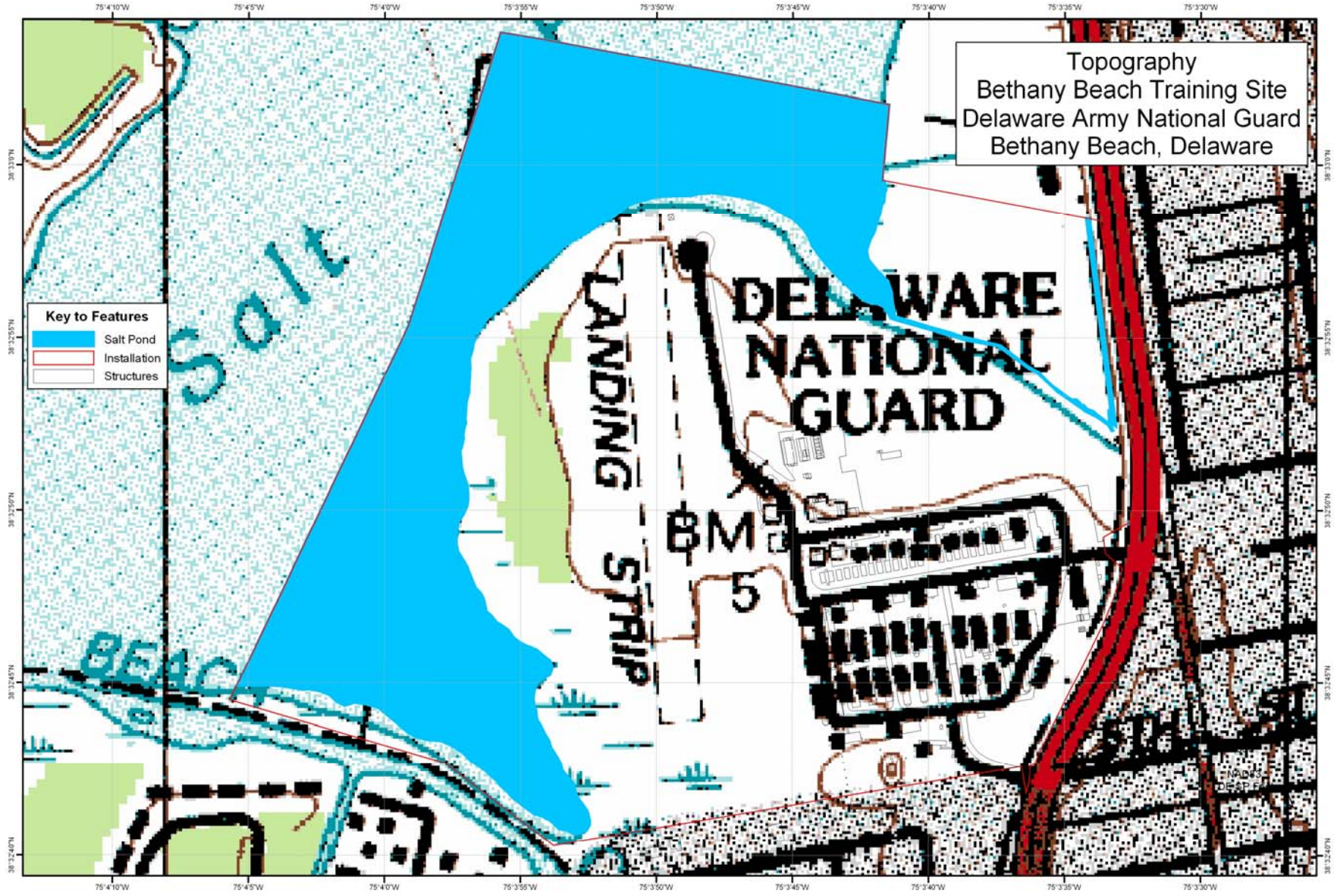
SURFACE WATERS AT THE BETHANY BEACH TRAINING SITE



FLOODPLAIN AT THE BETHANY BEACH TRAINING SITE

TOPOGRAPHY PLS

Because the BBTS is located on the Delaware coastal plain, behind the Atlantic dunes, the terrain at the BBTS is relatively flat and has an average elevation of 8 feet above Mean Sea Level (MSL). From the entrance on Delaware Route 1, the elevation decreases to MSL in the north and west directions, where Salt Pond is located. The areas surrounding Salt Pond are at less than 5 feet above MSL, and are characterized by tidal marsh communities.



TOPOGRAPHY AT THE BETHANY BEACH TRAINING SITE

SOILS PLS

Geological Context of Soils at the BBTS

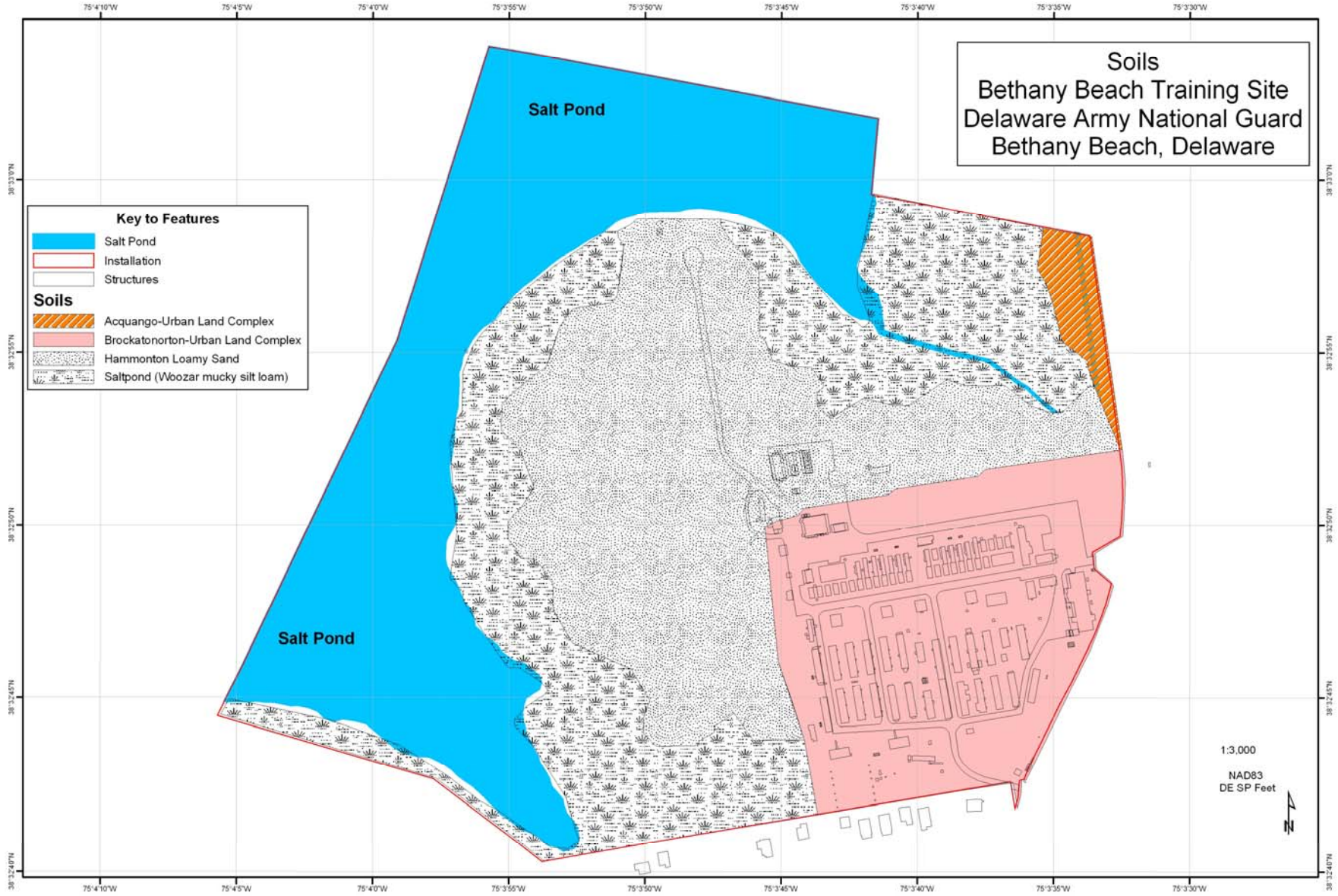
The BBTS lies within the Atlantic Coastal Plain geologic province, which consists of a seaward-thickening wedge of semi-consolidated to unconsolidated sediments above a crystalline basement. Surficial deposits at the site consist of Holocene sand, silt, and clayey silt, which compromise the marshes and modern barrier island system. These sediments are underlain by deposits of the Columbia Group of Quaternary age, which consist of fine to course sand and gravel with variable amounts of silt and clayey silt, usually occurring as lenses. Deposits of the Bethany Formation of Tertiary (upper-Miocene) age are found intermittently beneath the Columbia sediments. The Bethany deposits typically lie 100 feet below the subsurface, and consist of gray to bluish-gray, fine to course sand and gravel. The remainder of the Tertiary section is comprised of the Manokin Formation, the Saint Mary's Formation, and the Choptank Formation (DEARNG, 1995).

Soils at the BBTS

Based on the Natural Resources Conservation Service soil surveys and mapping conducted at the RRTS during 1995, four soil series occur on the BBTS. None of these soils were previously identified in the 1974 edition of the USDA Soil Conservation Service (SCS 1974) Soil Survey Manual: Saltpond silt loam, Acquango-Urban Land Complex, and Hammonton loamy sand were all previously mapped as Tidal Marsh (Tm), and Brockatonorton-Urban Land Complex was previously mapped as Fill Land (Ft).

Soils at the BBTS

Soil Unit Name	Slopes (percent)	Drainage Class	Prime Farmland (Federal or State)	Hydric	Acres on the BBTS
Acquango-Urban Land Complex	0 to 2	Excessively Drained	No	No	1.5
Brockatonorton-Urban Land Complex	0 to 2	Moderately Well-Drained	No	No	18.7
Hammonton Loamy Sand	0 to 2	Moderately Well-Drained	No	Yes	26.5
Saltpond Silt Loam	0 to 2	Poorly Drained	No	Yes	23.3
Source: USDA Soil Data Mart, http://soildatamart.nrcs.usda.gov/Report.aspx?Survey=DE005&UseState=DE					



SOILS AT THE BETHANY BEACH TRAINING SITE

Hydric Soils

Two soil mapping units designated as hydric are found on the RRTS: Hammonton Loamy Sand and Saltpond Silt Loam. In addition, although it is not a hydric soil, per se, the Acquango-Urban Land Complex and Brockatonorton-Urban Land Complex have hydric inclusions (approximately 15 percent of each mapped unit), particularly where they occurs in tidal marshes. Hydric soils are soils that are saturated, flooded, or ponded for long enough during the growing season to develop anaerobic (oxygen- deficient) conditions in their upper part. Anaerobic soil conditions are conducive to the establishment of vegetation that is adapted for growth underoxygen-deficient conditions and is typically found in wetlands (hydrophytic vegetation).

Approximately 50 acres (49.8 percent) of the BBTS lies on hydric soils, and another 20 acres lies on soils with potential hydric inclusions. Whether or not the hydric soils are located in jurisdictional wetlands, they represent potential engineering, construction and management constraints. Hydric soils are generally characterized as either having a slow permeability or poor to very poor drainage class. The presence of hydric soils is one of three criteria (hydric soils, hydrophytic vegetation, wetland hydrology) used to determine the presence of USACE jurisdictional wetlands (USDA, 1970). By regulatory wetland definition, all of the BBTS wetlands identified during the wetland delineation occur on hydric soils even though those soils may not have mapped as such in the past.

Hydric Soils on the BBTS

SOIL UNIT NAME	SLOPES (PERCENT)	DRAINAGE CLASS	ACRES ON THE BBTS
Hammonton Loamy Sand	0 to 2	Moderately Well-Drained	26.5
Saltpond Silt Loam	0 to 2	Poorly Drained	23.3
Soils With Potential Hydric Inclusions			
Acquango-Urban Land Complex	0 to 2	Excessively Drained	1.5
Brockatonorton-Urban Land Complex	0 to 2	Moderately Well-Drained	18.7
TOTAL ACREAGE			**49.8**

Prime Farmland Soils

None of the soils at the BBTS is listed as a Prime Farmland Soil or Soil of Statewide Importance.

Highly Erodible Soils

All soils at the BBTS are considered highly erodible. The USDA defined these soils as having a severe erosion hazard based on presumed use for timbering. The definition of moderate erosion hazard is, “erosion control measures are needed on skid and logging roads during and immediately after the harvesting of wood products.” Generally, these soils are sandy or silty. Their erodibility makes them unsuited for many activities, including any activities that would involve intense or repeated use of the erodible area (e.g. footpaths, unpaved roads, earthmoving).

Highly Erodible Soils at the BBTS

Soil Unit Name	Slopes (percent)	Soil Limitation Due to Erodibility	Acres on the BBTS
Acquango-Urban Land Complex	0 to 2	Severe	1.5
Brockatonorton-Urban Land Complex	0 to 2	Severe	18.7
Hammonton Loamy Sand	0 to 2	Severe	26.5
Saltpond Silt Loam	0 to 2	Severe	23.3
Source: USDA Soil Data Mart, http://soildatamart.nrcs.usda.gov/Report.aspx?Survey=DE005&UseState=DE			

Official Soil Series Descriptions

LOCATION ACQUANGO MD
Established Series
GPD
11/2002

ACQUANGO SERIES

The Acquango series consists of very deep, excessively drained soils. They formed in sandy aeolian and marine sediments. They are located on backshore and dune areas of barrier islands along the mid-Atlantic Coastal Plain. Permeability is very rapid. Slopes range from 0 to 30 percent. Mean annual temperature is 57 degrees F., and mean annual precipitation is 44 inches.

TAXONOMIC CLASS: Mixed, mesic Typic Udipsamments

TYPICAL PEDON: Acquango sand on an 8 percent slope on a barrier island dune. (colors are for moist soil)

A-- 0 to 3 inches; light gray (2.5Y 7/2) sand; single grain; loose; few very fine and fine roots; moderately acid; very slightly saline; clear wavy boundary. (1 to 6 inches thick)

C1-- 3 to 20 inches; pale yellow (5Y 7/3) sand; single grain; loose; common 1/32 to 1/16 inch striations of black (N 2/) sand; moderately acid; very slightly saline; abrupt wavy boundary. (10 to 30 inches thick).

C2-- 20 to 26 inches; black (10YR 2/1) sand; single grain; loose; slightly acid; nonsaline; abrupt wavy boundary. (0 to 8 inches thick).

C3-- 26 to 72 inches; very pale brown (10YR 7/3) sand; single grain; loose; neutral; nonsaline.

TYPE LOCATION: Worcester County, Maryland; approximately 3 miles south of the Assateague Island entrance on the park road, 500 feet east of the road on a vegetated dune. 38 degrees, 10 minutes, 0 seconds N Latitude, 75 degrees, 9 minutes, 0 seconds W Longitude.

RANGE IN CHARACTERISTICS: The thickness of the A and C horizons is greater than 72 inches. Fine gravels range from 0 to 5 percent in the substratum. Reaction ranges from very strongly acid to mildly alkaline. Salinity ranges from nonsaline to slightly saline throughout the soil profile. Shell fragment content ranges from 0 to 15 percent.

The A horizon has hue of 10YR or 2.5Y, value of 5 through 8, and chroma of 2 through 4. It is sand, coarse sand, or fine sand.

The C horizon has hue of 5Y through 10YR, value of 2 through 8, and chroma of 2 through 6. It is sand, coarse sand, or fine sand.

COMPETING SERIES: These are the Abscota, Biltmore, Caesar, Chute, Dabney, Hodge, Oakville, Penwood, Perks, Pinegrove, Plainfield, Sarpy, Spessaro, Suncock, Tyner, Westport, and Windsor soils in the same family. Acquango soils differ from all these soils in being very slightly to moderately saline within the profile; and in being formed by the natural migration of barrier islands.

GEOGRAPHIC SETTING: The Acquango soils are located on nearly level to steep dunes on mid-Atlantic coastal barrier islands. The slopes range from 0 to 30 percent. These soils formed in sandy aeolian and marine sediments. Mean annual temperature ranges from 52 to 58 degrees F. The mean annual precipitation ranges from 38 to 48 inches. Elevations are generally below 25 feet.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Broadkill, Matunuck, Pawcatuck, Transquaking, and Westbrook soils. Broadkill and Matunuck are mineral soils which occur in adjacent or back bay tidal marshes. Pawcatuck, Transquaking, and Westbrook soils are organic soils which occur in adjacent or back bay tidal marshes. All of these soils are flooded daily by tidal action.

DRAINAGE AND PERMEABILITY: Excessively drained. Runoff is very slow to slow. Permeability is very rapid. Flooding is occasional for very brief periods, mainly during coastal storm events.

USE AND VEGETATION: Some areas are cleared and managed to maintain an adequate dune line for protection and for recreational purposes. Most areas are in a natural vegetated condition for wildlife. Native vegetation includes American beachgrass, sea rocket, seaside goldenrod, bayberry, salt myrtle, and shore juniper.

DISTRIBUTION AND EXTENT: The mid-Atlantic shoreline and coastal barrier islands of Maryland, Delaware, and New Jersey. This series is of small extent.

MLRA OFFICE RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Worcester County, Maryland, 1995.

REMARKS: This soil was formerly included in the Coastal Beaches miscellaneous area.

Diagnostic horizons and features recognized in this pedon are:

a. Ochric epipedon: the zone from 0 to 3 inches.
b. Mixed mineralogy: X-ray diffraction analyses indicate greater than 10 percent weatherable minerals such as amphiboles, pyroxenes, and feldspars. Sample number: S92MD047-012/3.

LOCATION BROCKATONORTON MD
Established Series
GPD
11/2002

BROCKATONORTON SERIES

The Brockatonorton series consists of very deep, moderately well drained soils. They formed in sandy aeolian and marine sediments. They are located in back dune areas of barrier islands along the mid-Atlantic Coastal Plain. Permeability is rapid. Slopes range from 0 to 5 percent. Mean annual temperature is 57 degrees F., and mean annual precipitation is 44 inches.

TAXONOMIC CLASS: Mixed, mesic Aquic Udipsamments

TYPICAL PEDON: Brockatonorton sand on an undulating 1 percent slope in a back dune area of a barrier island. (colors are for moist soil)

A-- 0 to 3 inches; light gray (2.5Y 7/2) sand; single grain; loose; very strongly acid; nonsaline; clear wavy boundary. (1 to 6 inches thick)

C-- 3 to 24 inches; pale yellow (5Y 7/3) sand; single grain; loose; common 1/32 to 1/16 inch layers of black (N 2/) sand; very strongly acid; nonsaline; abrupt wavy boundary. (19 to 30 inches thick)

Cg1-- 24 to 50 inches; gray (5Y 6/1) sand; single grain; loose; very strongly acid; nonsaline; clear, wavy boundary. (12 to 24 inches thick).

Oeb-- 50 to 60 inches; dark brown (7.5YR 3/2) mucky peat; hemic soil material; fiber content is one-fourth by volume after rubbing; 10 percent soft wood fragments; common medium gray (5Y 5/1) sand lenses evidencing iron depletion; neutral; very slightly saline; abrupt, smooth boundary. (2 to 16 inches thick)

Cg2-- 60 to 72 inches; gray (5Y 5/1) sand; single grain; loose; few very fine and fine dead roots; neutral; very slightly saline.

TYPE LOCATION: Worcester County, Maryland; approximately 2 miles south of the Assateague Island entrance on the park road, 50 feet east of the road in a vegetated back dune area. 38 degrees, 13 minutes, 0 seconds N Latitude, 75 degrees, 9 minutes, 0 seconds W Longitude.

RANGE IN CHARACTERISTICS: The thickness of the A and C horizons ranges from 36 to 58 inches. Fine gravels range from 0 to 5 percent in the substratum. Reaction ranges from moderately acid to mildly alkaline. Salinity ranges from nonsaline to moderately saline throughout the soil profile.

The A horizon has hue of 2.5Y or 10YR, value of 5 through 8, and chroma of 2 through 4. It is sand, coarse sand, or fine sand.

The C horizon has hue of 5Y or 2.5Y, value of 5 through 8, and chroma of 3 through 6. It is sand, coarse sand, or fine sand. Areas of iron depletion frequently occurs in this horizon.

The O horizon has a hue of 10YR through 5YR, value of 2 through 4, and chroma of 0 through 2. It is mucky peat. Some pedons have thin layers of muck. Soft wood fragments range from 5 to 50 percent of the soil volume. The buried surface layer occasionally is found below 72 inches in some pedons.

The Cg horizon has reduced colors with hue of 5Y or 2.5Y, value of 4 through 7, and chroma of 1 or 2. It is sand or loamy sand.

COMPETING SERIES: These are the Algansee, Altmar, Brems, Deerfield, Elnora, Morocco, Ottokee, Partridge, Tedrow, and Zaborosky soil series in the same family. Brockatanorton soils differ from all these soils in having a buried histic epipedon, being very slightly to moderately saline within the profile, and in being formed by the natural migration of barrier islands.

GEOGRAPHIC SETTING: The Brockatonorton soils are located on nearly level to gently undulating back dune areas on mid-Atlantic coastal barrier islands. The slopes range from 0 to 5 percent. These soils formed in sandy aeolian and marine sediments. Mean annual temperature ranges from 52 to 58 degrees F. The mean annual precipitation ranges from 38 to 48 inches. Elevations are generally below 20 feet.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Broadkill, Hooksan, Matunuck, Pawcatuck, Transquaking, and Westbrook soils. Hooksan soils are excessively drained and are located at higher elevations on the dunes. Broadkill, Matunuck, Pawcatuck, Transquaking, and Westbrook soils occur at lower elevations adjacent to or within back bay tidal marshes and are flooded daily by tidal action.

DRAINAGE AND PERMEABILITY: Moderately well drained. Runoff is very slow to slow. Permeability is very rapid to rapid. A seasonal high water table ranging from 20 to 40 inches is present throughout the year. This water table may be tidally influenced.

USE AND VEGETATION: Few areas are cleared and used for recreational purposes such as campsites. Most areas are in a natural vegetated condition for wildlife. Native vegetation includes sea rocket, seaside goldenrod, bayberry, salt myrtle, and shore juniper. In some places there are small areas of pine trees.

DISTRIBUTION AND EXTENT: The mid-Atlantic shoreline and coastal barrier islands of Maryland, Delaware, and New Jersey. This series is of small extent.

MLRA OFFICE RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Worcester County, Maryland, 1995 within Chincoteague Bay.

REMARKS: This soil was formerly included in the Coastal Beaches miscellaneous area.

Diagnostic horizons and features recognized in this pedon are:
a. Ochric epipedon: the zone from 0 to 3 inches.
b. Buried histic epipedon: the zone from 50 to 60 inches.
c. Reduced horizons: the zone from 24 to 72 inches.
d. Mixed mineralogy: X-ray diffraction analyses indicates greater than 10 percent weatherable minerals such as amphiboles, pyroxenes, and feldspars. Sample number S92MD047-012/3.

National Cooperative Soil Survey
U.S.A.

LOCATION HAMMONTON NJ+DE MD
Established Series
SCK/Rev. JAK
11/2002

HAMMONTON SERIES

MLRA(s): 149A, 153C, 153D
MLRA Office Responsible: Raleigh, North Carolina
Depth Class: Very deep
Drainage Class (Agricultural): Moderately well drained
Internal Free Water Occurrence: Moderately deep and common
Flooding Frequency and Duration: None
Ponding Frequency and Duration: None
Index Surface Runoff: Negligible to very low
Permeability: Moderate or moderately rapid
Shrink-Swell Potential: Low
Landscape: Northern Atlantic Coastal Plain
Landform: Low hill, flat, and depression
Geomorphic Component: Base slope, dip
Hillslope Profile Position: Lower backslope, footslope, and toeslope
Parent Material: Fluviomarine deposits
Slope: 0 to 15 percent
Elevation (type location): 15 feet
Frost Free Period (type location): 195 days
Mean Annual Air Temperature (type location): 56 degrees F.
Mean Annual Precipitation (type location): 45 inches

TAXONOMIC CLASS: Coarse-loamy, siliceous, semiactive, mesic Aquic Hapludults

TYPICAL PEDON: Hammonton loamy sand (in an area of Hammonton loamy sand, 0 to 5 percent slopes), cultivated. (Colors are for moist soil.)

Ap--0 to 8 inches; very dark grayish brown (2.5Y 3/2) loamy sand, dark grayish brown (2.5Y 4/2) dry; weak medium granular structure; very friable; nonsticky, nonplastic; many fine roots; very strongly acid; abrupt smooth boundary. (2 to 12 inches thick)

E--8 to 19 inches; yellowish brown (10YR 5/4) loamy sand; weak fine granular structure; very friable; nonsticky, nonplastic; many fine roots; very strongly acid; gradual wavy boundary. (0 to 12 inches thick)

Bt--19 to 36 inches; yellowish brown (10YR 5/6) sandy loam; weak fine subangular blocky structure; friable; slightly sticky, nonplastic; common fine roots; few faint clay films on faces of peds or lining pebble niches; clay bridging common in upper part decreasing with depth; common medium prominent light gray (5Y 7/2) irregularly shaped iron depletions with clear

boundaries in the matrix and common medium distinct brownish yellow (10YR 6/8) irregularly shaped masses of oxidized iron with diffuse boundaries throughout; 3 percent, by volume rounded quartzite pebbles; very strongly acid; gradual wavy boundary. (10 to 24 inches thick)

C--36 to 80 inches; brownish yellow (10YR 6/6) sand; single grain; loose; nonsticky, nonplastic; few fine roots; few medium prominent light gray (5Y 7/2) irregularly shaped iron depletions with clear boundaries in the matrix and few medium faint brownish yellow (10YR 6/8) irregularly shaped masses of oxidized iron with diffuse boundaries throughout; 5 percent, by volume rounded quartzite pebbles; very strongly acid.

TYPE LOCATION: Atlantic County, New Jersey; near Corbin City, about 150 feet northeast of Aetna Road, 0.5 miles northwest of junction with Carl Road; USGS Tuckahoe, NJ topographic quadrangle; lat. 39 degrees 18 minutes 3 seconds N. and long. 74 degrees 46 minutes 3 seconds W.

RANGE IN CHARACTERISTICS:
Depth to top of Argillic horizon: 5 to 19 inches
Depth to base of Argillic horizon: 15 to 45 inches
Depth to Bedrock: Greater than 72 inches
Depth to Seasonal High Water Table: 18 to 42 inches, December to May
Rock Fragments: 0 to 20 percent, by volume in the A and B horizons and 0 to 40 percent in the C horizon, mostly quartzite pebbles
Soil Reaction: Extremely acid to strongly acid, throughout the profile, unless limed
Other Features: Pedons in wooded areas typically have a microsequence of an A, E, and Bh horizon (micro-podzol). Total thickness of the A, E, and Bh horizons is less than 6 inches and individual horizons are less than 2 inches thick.

RANGE OF INDIVIDUAL HORIZONS:
O horizon (if it occurs):
Color--hue of 5YR to 10YR, value of 2 to 4, and chroma of 1 to 4
Texture--highly decomposed to slightly decomposed plant material

A horizon (if it occurs is 2 to 6 inches thick):
Color--hue of 10YR to 5Y, value of 3 or 4, chroma of 1 to 4, or is neutral with value of 3 to 6
Texture--loamy sand or sandy loam

Ap horizon:
Color--hue of 10YR to 5Y, value of 3 to 6, chroma of 2 to 4, or is neutral with value of 3 to 6
Texture--loamy sand or sandy loam

BE or E horizon:
Color--hue of 10YR to 5Y, value of 4 to 7, chroma of 2 to 8
Texture--loamy sand or sandy loam

Bh horizon (if it occurs):
Color--hue of 5YR to 10YR, value of 4 to 6, chroma of 3 to 6
Texture--loamy sand or sandy loam

Bt horizon
Color--hue of 7.5YR to 5Y, value of 4 to 7, chroma of 3 to 8
Texture--commonly sandy loam (Some pedons have thin subhorizons of sandy clay loam or loamy sand.)
Redoximorphic Features--iron depletions in shades of olive, gray, or white and masses of oxidized iron in shades of red, brown, yellow, or olive

Btg horizon (if it occurs):
Color--hue of 7.5YR to 5Y, value of 4 to 7, chroma of 1 or 2, or is neutral with value of 4 to 7
Texture--dominantly sandy loam (Some pedons have thin subhorizons of sandy clay loam or loamy sand.)
Redoximorphic Features--iron depletions in shades of olive, gray, or white and masses of oxidized iron in shades of red, brown, yellow, or olive

BC horizon (if it occurs):
Color--hue of 7.5YR to 5Y, value of 4 to 8, chroma of 3 to 8
Texture--loamy sand or sandy loam (Some pedons have thin subhorizons of sandy clay loam.)

BCg horizon (if it occurs):
Color--hue of 7.5YR to 5Y, value of 4 to 8, chroma of 1 or 2, or is neutral with value of 4 to 8
Texture--loamy sand or sandy loam (Some pedons have thin subhorizons of sandy clay loam.)

C horizon:
Color--hue of 7.5YR to 5Y, value of 5 to 8, chroma of 3 to 8
Texture (above 40 inches)--loamy sand or sand (Some pedons have thin strata of sandy clay loam.)
Texture (below 40 inches)--sand, coarse sand, loamy coarse sand, loamy sand, sandy loam, loam, or sandy clay loam
Redoximorphic Features--iron depletions in shades of olive, gray, or white and masses of oxidized iron in shades of red, brown, yellow, or olive

Cg horizon (if it occurs):
Color--hue of 7.5YR to 5Y, value of 5 to 8, chroma of 1 or 2, or is neutral with value of 4 to 8
Texture (above 40 inches)--commonly loamy sand or sand (Some pedons have thin strata of sandy clay loam)
Texture (below 40 inches)--commonly sand, loamy sand, sandy loam, loam, or sandy clay loam (Some pedons have thin strata of sandy clay)
Redoximorphic Features--iron depletions in shades of olive, gray, or white and masses of oxidized iron in shades of red, brown, yellow, or olive

COMPETING SERIES: None

GEOGRAPHIC SETTING:
Landscape: Northern Atlantic Coastal Plain
Landform: Low hill, flat, and depression
Geomorphic Component: Base slope, dip
Hillslope Profile Position: Lower backslope, footslope, and toeslope
Parent Material: Fluviomarine deposits
Slope: 0 to 15 percent
Elevation: 10 to 120 feet
Frost Free Period: 180 to 215 days
Mean Annual Air Temperature: 50 to 57 degrees F.
Mean Annual Precipitation: 40 to 48 inches

GEOGRAPHICALLY ASSOCIATED SOILS:
Downer soils-have a seasonal high water table at a depth of more than 72 inches (well drained); on slightly higher landforms
Evesboro soils--have a seasonal high water table at a depth of more than 72 inches (excessively drained), without an argillic horizon; on higher landforms
Fort Mott soils-have a seasonal high water table at a depth of more than 72 inches (well drained), have a sandy surface layers 20 to 40 inches thick; on higher landforms
Galloway soils--have sandy texture throughout, without an argillic horizon; on similar landforms
Sassafras soils--have a seasonal high water table at a depth of more than 72 inches (well drained), with a fine-loamy particle-size control section; on higher landforms
Woodstown soils--have a fine-loamy particle-size control section, on similar Landforms

DRAINAGE AND PERMEABILITY:
Depth Class: Very deep
Drainage Class (Agricultural): Moderately well drained
Internal Free Water Occurrence: Moderately deep (20 to 40 inches) and common (3 to 6 months)
Flooding Frequency and Duration: None
Ponding Frequency and Duration: None
Index Surface Runoff: Negligible to very low
Permeability: Moderate or moderately rapid
Shrink-Swell Potential: Low

USE AND VEGETATION:
Use: Cleared areas are used for production of fruit, vegetables, row crops, and nursery stock.
Vegetation: Native vegetation is a mixed hardwood forest containing scattered pitch pine, shortleaf pine, and Virginia pine.

DISTRIBUTION AND EXTENT:
Distribution: New Jersey, Delaware, and Maryland
Extent: Moderate

MLRA OFFICE RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Atlantic County, New Jersey, 1972

REMARKS: Hammonton series were previously included in the Woodstown or Dragston series.

Diagnostic horizons and other diagnostic soil characteristics recognized in this pedon are:
Ochric epipedon--the zone from the surface to a depth of 19 inches (Ap and E horizon)
Argillic horizon--the zone from 19 to 36 inches (Bt horizon)
Aquic conditions--the zone from 19 inches to a depth of 80 inches is periodically saturated (endosaturation)

ADDITIONAL DATA: The following pedons are available from the NRCS-Survey Laboratory, Lincoln, NE: S91DE-005-011 and S61NJ-005-001.

Database Information:
OSD Data Mapunit ID: To be developed
Typical Pedon Data Mapunit ID: 407392 (Gloucester County, NJ)
OSD User Pedon ID: To be developed

TABULAR SERIES DATA:

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NJ0019	HAMMONTON	0-5	50-57	180-215	40-48	10-120
NJ0064	HAMMONTON	0-5	50-57	180-215	40-48	10-120

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NJ0019	NONE		1.5-3.5	APPARENT	DEC-MAY	60-60	---
NJ0064	NONE		1.5-3.5	PERCHED	DEC-MAY	60-60	---

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NJ0019	0-18	LS	0- 0	85-100	2- 7	3- 6
NJ0019	0-18	SL	0- 0	85-100	5-10	5- 10
NJ0019	18-36	SL GR-SL	0- 0	70-100	10-18	3- 6
NJ0019	36-60	SR GRV-S SCL	0- 0	45-100	2-22	1- 7
NJ0064	0-18	LS	0- 0	85-100	2- 7	-
NJ0064	0-18	SL	0- 0	85-100	5-10	-
NJ0064	18-36	SL GR-SL	0- 0	70-100	10-18	-

NJ0064	36-45	SR S GR-S		0- 0	50-100	2- 5	-
NJ0064	45-60	C SC		0- 0	95-100	35-60	-

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NJ0019	0-18	3.5- 5.5	.5-2.	0- 0	6.0- 20	LOW
NJ0019	0-18	3.5- 5.5	1.-3.	0- 0	2.0- 6.0	LOW
NJ0019	18-36	4.5- 5.5	0.-.5	0- 0	2.0- 6.0	LOW
NJ0019	36-60	4.5- 5.5	0.-.5	0- 0	0.6- 20	LOW
NJ0064	0-18	3.5- 5.5	1.-3.	0- 0	6.0- 20	LOW
NJ0064	0-18	3.5- 5.5	2.-4.	0- 0	2.0- 6.0	LOW
NJ0064	18-36	4.5- 5.5	0.-0.	0- 0	2.0- 6.0	LOW
NJ0064	36-45	4.5- 5.5	0.-0.	0- 0	6.0- 20	LOW
NJ0064	45-60	4.5- 5.5	0.-0.	0- 0	0.00- 0.2	MODERATE

LOCATION SALTPOND DE
Tentative Series
PSK
11/2002

SALTPOND SERIES

MLRA(s): 153D
MLRA Office Responsible: Raleigh, North Carolina
Depth Class: Very deep
Drainage Class (Agricultural): Poorly drained
Internal Free Water Occurance: Very shallow, persistent
Index Surface Runoff: Negligible
Permeability: Very rapid
Landscape: Coastal plain, barrier islands
Landform: Low-lying dunes and dunes on washover fans
Geomorphic Component: Dips and rises
Parent Material: Sandy alluvial and eolian derived marine sediments
Slope: 0 to 2 percent
Elevation: 1 foot
Mean Annual Air Temperature (Type Location): 56 degrees F.
Mean Annual Precipitation (Type Location): 44 inches

TAXONOMIC CLASS: Sandy, mixed, mesic Haplic Sulfaquents

TYPICAL PEDON: SALTPOND mucky sand on a smooth 1 percent slope. (Colors are for a moist soil, unless noted.)

A--0 to 4 inches; very dark gray (2.5Y 3/1) mucky sand, single grain structure; loose; few medium common fine roots; presence of hydrogen sulfide gas; slightly acid; slightly saline; clear wavy boundary. (1 to 6 inches thick)

Cg1--4 to 16 inches; gray (2.5Y 6/1) sand, single grain structure; loose; few fine roots; very dark grayish brown (2.5Y 3/2) organic stains; presence of hydrogen sulfide gas; neutral; moderately saline; gradual wavy boundary.

Cg2--16 to 27 inches; light gray (10YR 7/1) sand; single grain loose; few fine roots; few fine distinct brownish yellow (10YR 6/6) iron accumulations with clear boundaries throughout; presence of hydrogen sulfide gas; neutral; moderately saline; clear wavy boundary.

Cg3--27 to 35 inches; light gray (5Y 7/1) sand; massive; friable; few fine roots; common medium distinct light olive brown (2.5Y 5/6) iron accumulations with clear boundaries throughout and few fine distinct brown (10YR 5/3) organic coats; presence of hydrogen sulfide gas; neutral; moderately saline; abrupt wavy boundary.

Cg4--35 to 53 inches; light greenish gray (5GY 7/1) coarse sand; single grain; loose; common medium distinct light yellowish brown (2.5Y 6/3) mottles with clear boundaries in the matrix; 5 percent, by volume, fine rounded gravel; neutral; moderately saline; clear wavy boundary.

Cg5--53 to 72 inches; gray (5Y 5/1) sand; single grain; loose; 0.25 inch thick stratified bands of black (N 2/0) mineral grains; few fine faint light gray (5Y 7/2) mottles with clear boundaries in the matrix; neutral; moderately saline. (combined thickness 60 to 72 inches)

TYPE LOCATION: Sussex County, Delaware; Approximately 1 mile north of Fenwick Island, 150 feet west of US 1 on a sparsely vegetated dune over wash fan. Adjacent to Assawoman Bay. USGS Assawoman Bay, Delaware topographic quadrangle; 38 degrees, 29 minutes, 59.18 seconds N. Latitude, 75 degrees, 03 minutes, 21.40 seconds W. Longitude, NAD 83.

RANGE IN CHARACTERISTICS:
Depth to Bedrock: Greater than 72 inches
Depth to buried A or O horizons (if they occur): More than 25 inches
Depth to Seasonal High Water Table: 0 to 10 inches, tidally influenced
Rock Fragments: 0 to 5 percent, by volume in the A horizon and 0 to 20 percent in C horizon, mostly rounded quartzite and chert gravel
Soil Reaction: Neutral to slightly acid
Salinity: slightly to strongly saline

RANGE OF INDIVIDUAL HORIZONS:
O Horizon (if it occurs)
Color--hue of 7.5 YR to 2.5Y, value 2 to 4, chroma 1 to 3
Texture--mucky peat or peat

A horizon:
Color--hue of 10YR or 2.5Y, value of 2 to 4, chroma of 1 to 4
Texture--sand, loamy sand, or sandy loam and their mucky analogs

Cg horizon:
Color--hue of 10YR to 5GY, value of 4 to 7, chroma of 1 or 2, or is neutral with value of 4 to 7
Texture--sand, loamy sand, or sandy loam
Redoximorphic Features--iron depletions in shades of olive, gray, or white and iron accumulations in shades of red, brown, yellow, or olive

Ab horizon (if it occurs):
Color--hue 10YR or 2.5Y, value 2 to 4, chroma 1 to 3
Texture--sand, loamy sand, sandy loam, or loam and their mucky analogs

Buried O horizon (if it occurs):
Color--hue 7.5YR, value 2 to 4, chroma 1 to 3
Texture--mucky peat or peat

COMPETING SERIES: None

GEOGRAPHIC SETTING:
Landscape: Coastal plain, barrier islands
Landform: Low-lying dunes and dunes on washover fans
Elevation: 0 to 2 feet
Parent Material: Sandy alluvial and eolian derived marine sediments
Mean Annual Air Temperature: 54 to 58 degrees F.
Mean Annual Precipitation: 43 to 46 inches
Frost Free Period: 175 to 200 days

GEOGRAPHICALLY ASSOCIATED SOILS:
Acquango soils--do not have a seasonal high water table above 72 inches; on higher dune positions
Appoquinimink soils--formed in high N value estuarine silts over organic material 16 inches or more thick; on lower tidal marsh positions that are tidally flooded twice daily
Brockatonorton soils--do not have a seasonal high water table above 20 inches; on higher dune positions
Broadkill soils--formed in high N value estuarine silts; on lower tidal marsh positions that are tidally flooded twice daily
Hooksan soils--do not have a seasonal high water table above 72 inches; on higher dune positions
Mispillian soils--formed in organic material 16 to 51 inches thick and high N value estuarine silts; on lower tidal marsh positions that are tidally flooded twice daily
Pawcatuck soils--formed in organic material 16 to 51 inches; on lower tidal marsh positions that are tidally flooded twice daily
Purnell soils--formed in organic material 8 to 16 inches; on lower tidal marsh positions that are tidally flooded twice daily
Transquaking soils--formed in organic material 51 or more inches thick; on lower tidal marsh positions that are tidally flooded twice daily

DRAINAGE AND PERMEABILITY:
Drainage Class (Agricultural): Poorly drained
Index Surface Runoff: Negligible
Internal Free Water Occurrence: Very Shallow (0 to 10 inches) persistent (present 6 to 12 months) very rapid

USE AND VEGETATION:
Major Uses--Few areas are cleared and used for recreational purposes such as campsites. Most areas are in a natural vegetated condition for wildlife.
Dominant Vegetation--Includes sea rocket (Cakile edentula), seaside goldenrod (Solidago sempervires), bayberry (Morella caroliniensis) salt myrtle (Leiophyllum buxifolium), groundsel-tree (Baccharis halimifolia) pine and shore juniper (Juniperus virginiana). In lower lying positions salt hay grass (Spartina patens), smooth cord grass (Spartina alterniflora), and black needle rush (Juncus roemerianus) can be found.

DISTRIBUTION AND EXTENT: Distribution: Coastal Plain of Delaware and possibly Maryland

Extent: Small; 2,000 to 5,000 acres

MLRA OFFICE RESPONSIBLE: Morgantown, West Virginia

SERIES PROPOSED: Sussex County, Delaware, 2001

REMARKS: Recommended names are Saltpond or Rehoboth. Saltpond soils were previous mapped as coastal beaches and tidal marsh. Diagnostic horizons and other diagnostic soil characteristics recognized in this pedon are:

Ochric epipedon--the zone from the surface of the soil to a depth of 4 inches (A horizon).
Aquic conditions--the zone from 0 inches to a depth of 72 inches is persistently saturated (endosaturation)
Sulfidic material--the zone from 0 inches to 35
Series control section--the zone from 0 to 60 inches

ADDITIONAL DATA: None available.

National Cooperative Soil Survey
U.S.A.

APPENDIX C: GLOSSARY

GLOSSARY

Annual Training (AT) - A two week active duty training period for the National Guard and Reserve.

Aquatic Macroinvertebrate - Insects and other invertebrate animals found in lakes, streams, ponds, marshes and other surface waters.

Biodiversity - The variety of life and its processes, including living organisms, the differences among them, and the communities and ecosystems in which they occur.

Canopy - The uppermost layer of branches and foliage of forest or a single tree.

Ecosystem - A community of organisms interacting together and their physical environment.

Floodplain - The almost level land forming the floor on either side of a stream in a valley, often subject to flooding.

Hydric Soil - A soil that is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. The concept of hydric soils includes soils developed under sufficiently wet conditions to support the growth and regeneration of hydrophytic vegetation.

Hydrophyte - A plant adapted to growing in water, waterlogged soil, or on a substrate that becomes inundated on a regular basis.

Inactive Duty Training (IDT) - Authorized training performed by a member of a Reserve component not on active duty or active duty for training and consisting of regularly scheduled unit training assemblies, additional training assemblies, periods of appropriate duty or equivalent training, and any special additional duties authorized for Reserve component personnel by the Secretary concerned, and performed by them in connection with the prescribed activities of the organization in which they are assigned with or without pay.

Integrated Training Area Management (ITAM) - Military program developed by the Army to integrate training and other mission requirements for land use with sound natural resources management of the land.

Land Condition Trent Analysis (LCTA) - An inventory and monitoring program used to identify training-related impacts to natural and cultural resources.

Land Rehabilitation and Maintenance (LRAM) - A preventive and corrective land rehabilitation and maintenance procedure that reduces the long-term impacts of training and testing on an installation. It mitigates training and testing effects by combining preventive and corrective land rehabilitation, repair, and/or maintenance practices.

Marsh - Type of wetland community characterized by poorly drained mineral soils and by plant life dominated by grasses. The latter characteristic distinguishes a marsh from a swamp (q.v.), whose plant life is dominated by trees.

Mesic - Of, or adapted to, a temperate, moderately moist habitat; neither xeric (dry) nor hydric (wet).

Predation - In animal behavior, the pursuit, capture, and killing of animals for food.

Sediments - Deposits into lakes, wetlands, streams (and overbanks), estuaries, reservoirs, fjords, shallow coastal seas and other bodies of marine or fresh water derived from bedrocks, soils, and organic remains within the drainage basin, though fine particles can also be blown in by winds from distant natural, urban, and industrial sources.

Training Requirements Integration (TRI) - A decision support procedure that integrates all requirements for land use with natural and cultural resources management processes.

Watershed - The complete area from which runoff drains to feed a stream or body of water.

Wetland - An area where saturation or repeated inundation of water is the determining factor in the nature of the soils, as well as the plants and animals living there. Included in the term are marshes, swamps, bogs, fens, bay heads, wet meadows, potholes, sloughs, bayous, river flood plains, estuaries, and lake margins.

APPENDIX D: ACRONYMS

ACRONYMS

AR	Army Regulations
AT	Annual Training
BASH	Bird Air Strike Hazard
BBTS	Bethany Beach Training Site
CEQ	Council on Environmental Quality
COMPAS	Coastal Ocean Management, Planning, and Assessment Systems
CSDGM	Content Standard for Digital Geospatial Metadata
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DA	Department of the Army
DCMP	Delaware Coastal Management Program
DEANG	Delaware Air National Guard
DEARNG	Delaware Army National Guard
DNREC	Delaware Department of Natural Resources and Environmental Control
DoD	Department of Defense
EA	Environmental Assessment
ECAS	Army National Guard Environmental Compliance Assessment System
EELC	Executive Environmental Leadership Council
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FWPCA	Federal Water Pollution Control Act
GIS	Geographic Information System
GPS	Global Positioning System
GUI	Graphical User Interface
IDT	Inactive Duty Training
INRMP	Integrated Natural Resources Management Plan
ITAM	Integrated Training Area Management
LAN	Local Area Network
MSL	Mean Sea Level
NDWRP	Northern Delaware Wetlands Rehabilitation Program
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NGB-AEN	Engineering Directorate of the National Guard Bureau
NGB-ARE	Environmental Resources Branch of the National Guard Bureau
NGB-ARO	Operations Directorate of the National Guard Bureau
NHI	Delaware Natural Heritage Inventory
NHP	Delaware Natural Heritage Program
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
	ppt parts per thousand
ROPES	Rugged Outdoor Pursuit Education System
SWP3	Stormwater Pollution Prevention Plan

T&E	Threatened and Endangered Species
TSSDS	Tri-services Spatial Data Standards
USDA	United States Department of Agriculture
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	United States Geologic Survey

APPENDIX E: REFERENCES

REFERENCES

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APPENDIX F: WORK PLANS 2012

OBJECTIVE 1.1: Reduce Invasive and Noxious Species

PROJECT 1.1.1: Develop and implement a program to remove invasive plants (e.g., Phragmites, poison ivy) from forests and wetland edges using a combination of selective herbicide application and mechanical removal by January 2010.

Priority: Medium
Estimated Cost: $500
Start Date: December 2009
End Date: January 2010
Responsible Point of Contact: Environmental Program Manager
Program Interaction: NGB Conservation
Staffing Requirements: DEARNG, Volunteers
Cooperative Agreements: None
Funding Approved: No
Potential Funding Sources: Environmental Program Management, installation maintenance funds

Project 1.1.1 includes the development and implementation of a program to control of invasive plants in forested communities and along wetland edges at the BBTS, particularly *Phragmites* along forest and wetland edges, and poison ivy within the forest interior (refer to species factsheets in Appendix H). It is anticipated that the program will employ a combination of selective herbicide application and physical removal, and that all herbicide applications will be conducted by a DOD certified applicator in accordance with the NGB Regional Pest Management Plan. Potential sources of labor for this effort include DEARNG soldiers on weekend training, volunteer groups such as Boy Scouts, and grounds maintenance staff.

OBJECTIVE 1.2: Reforest the Southern End of the Former Air Strip

PROJECT 1.2.1: Plant loblolly pine seedlings and native grasses and flowers in designated reforestation site by January 2008.

Priority: Medium
Estimated Cost: $100
Start Date: January 2007
End Date: January 2008
Responsible Point of Contact: Environmental Program Manager
Program Interaction: NGB Conservation
Staffing Requirements: DEARNG, volunteers
Cooperative Agreements: None identified at this time
Funding Approved: No
Potential Funding Sources: Environmental Program Management, installation maintenance funds

Project 1.2.1 involves the reforestation of the southern end of the former air strip at the BBTS. This site has previously been identified for environmental enhancement in order to improve aesthetics and biodiversity at the BBTS, and provide tactical concealment for training activities. This area consists of approximately 0.75 acre.

The Delaware Forest Service offers loblolly pine seedlings in bulk for $0.20 each[1]. It is anticipated that approximately 500 loblolly pine seedlings will be required for this project. The Forest Service is also available to provide technical information, including how and when to plant the seedlings, and appropriate planting intervals. Planting a seed mixture of native grasses will help prevent invasive species from becoming established. Optimal timing and proper maintenance procedures for plantings should be determined with the assistance of the Forest Service. Potential sources of labor for this reforestation effort include DEARNG soldiers on weekend training, volunteers such as Boy Scouts, and the BBTS grounds maintenance staff.

PROJECT 1.2.2: Evaluate the survival rates of the reforestation site by November 2009. Replant or reseed area as necessary.

Priority: Medium
Estimated Cost: $0
Start Date: April 2009
End Date: November 2009
Responsible Point of Contact: Environmental Program Manager or Facilities Manager
Program Interaction: NGB Conservation
Staffing Requirements: DEARNG
Cooperative Agreements: None identified at this time
Funding Approved: N/A
Potential Funding Sources: N/A

Project 1.2.2 is a follow-on project for Project 1.2.1, and involves the evaluation of the success of the reforestation effort. It is anticipated that the Environmental Program Manager or a Facilities Manager will perform the evaluation and any reseeding or replanting necessary.

OBJECTIVE 1.3: Modify Landscaping at BBTS to Incorporate Native Plants

PROJECT 1.3.1: Review native landscaping materials, such as ***Delaware Native Plants*** *for Landscaping and Restoration* (available from the Delaware Native Plant Society at: http://www.delawarenativeplants.org/dnps-natplantsbook.htm) by January 2007, and devise a list of acceptable native plants for landscaping at BBTS by July 2007.

Priority: Low
Estimated Cost: $0
Start Date: July 2006
End Date: July 2007
Responsible Point of Contact: Environmental Program Manager
Program Interaction: NGB Conservation

[1] http://www.state.de.us/deptagri/forestry/conser.shtml#Reforestation

Staffing Requirements: DEARNG
Cooperative Agreements: None identified at this time
Funding Approved: No
Potential Funding Sources: N/A

This project involves the review of available native landscaping information and the selection of native plants for landscaping at the BBTS. These areas are landscaped with a mixture of native and non-native plants. Replacing non-native species with native plants provides an aesthetically pleasing landscape with reduced need for water, fertilizer, and other care. Information on sources of native plants for landscaping may be obtained through the Delaware Native Plant Society, the US Fish and Wildlife Service, and the Alliance for the Chesapeake Bay.

PROJECT 1.3.2: Identify landscaping needs outside barracks, classrooms, and vacation trailers by January 2008. Identify native plantings suitable for these identified areas, and install by January 2009.

Priority: Low
Estimated Cost**:** $3,000
Start Date: July 2007
End Date: January 2009
Responsible Point of Contact: Environmental Program Manager
Program Interaction: NGB Conservation
Staffing Requirements: DEARNG, Grounds Maintenance staff, volunteers
Cooperative Agreements: None identified at this time
Funding Approved: No
Potential Funding Sources: Installation maintenance funds

This project follows directly on the completion of Project 1.3.1, and involves the installation of native species around the barracks, classrooms, and vacation trailers at the BBTS. Plants identified as suitable in Project 1.3.1 should be selected and planted in these locations.

OBJECTIVE 2.1: Monitor the Health of Non-Game Wildlife Species Populations

PROJECT 2.1.1: Install osprey nesting platforms in the salt marsh community adjacent to Salt Pond by December 2008.

Priority: Medium
Estimated Cost: $150
Start Date: January 2008
End Date: December 2008
Responsible Point of Contact: Environmental Program Manager
Program Interaction: Outdoor Recreation Program
Staffing Requirements: DEARNG staff, volunteers
Cooperative Agreements: None identified at this time
Funding Approved: No

Potential Funding Sources: Environmental Program Management, Natural Resources Program

Project 2.1.1 entails the installation of osprey nesting platforms in the open marsh areas at the BBTS. Platforms should be installed by DEARNG staff with the assistance of volunteers such as Boy Scout groups. Information on ospreys, their nesting requirements, and the construction of nesting platforms is provided in Appendix G. Material for the platforms costs about $50 each, and three platforms should be installed: one on the north side, one on the west side, and one on the south side of the installation.

PROJECT 2.1.2: Develop cooperative agreements with local colleges or universities, Delaware DNREC, or USFWS for wildlife population and habitat quality monitoring at the BBTS by December 2008.

Priority: Low
Estimated Cost: $0
Start Date: January 2008
End Date: December 2008
Responsible Point of Contact: Environmental Program Manager
Program Interaction: None
Staffing Requirements: DEARNG
Cooperative Agreements: None currently in place
Funding Approved: No
Potential Funding Sources: N/A

This project involves the development and approval of cooperative agreements with other environmental resources specialists who have a vested interest in the study of native ecosystems in Delaware. These specialists include professors and graduate students at various colleges and universities, wildlife and vegetation managers for DNREC, and wildlife specialists at the USFWS. Cooperative agreements with these specialists would benefit them by allowing access to the BBTS for monitoring, regulatory, and/or research purposes, and would benefit DEARNG by providing updated data on wildlife, habitat quality, and species diversity. The details of the cooperative agreement (e.g., timing, responsibilities, activities) would be established between the DEARNG Environmental Office and the school or agency, based on the goals and objectives of each party.

OBJECTVE 3.1: Improve Awareness of DEARNG's Commitment to Natural Resources Conservation

PROJECT 3.1.1: Develop educational outreach materials by June 2009 to foster awareness of natural resources program goals at BBTS.

Priority: Low
Estimated Cost: $300
Start Date: January 2009
End Date: June 2009
Responsible Point of Contact: Environmental Program Manager

Program Interaction: NGB Conservation
Staffing Requirements: DEARNG, print shop
Cooperative Agreements: None identified at this time
Funding Approved: No
Potential Funding Sources: Outdoor Recreation revenues

Project 3.1.1 involves the development of educational outreach materials regarding natural resources and conservation at the BBTS. These materials would be developed by the DEARNG Environmental Office, and would most likely take the form of color pamphlets or brochures about the installation's vegetation and wildlife, including color photographs, species of interest, and conservation goals and projects. These educational materials would be made available to visitors through the outdoor recreation program. The estimated cost includes the cost of approximately 300 color copies at $1 each.

OBJECTIVE 3.2: Improve Visitor's Appreciation of the Natural World

PROJECT 3.2.1: Improve wildlife viewing opportunities by developing a bird checklist for the BBTS by June 2008. Provide interested visitors with bird checklist, field guides, and binoculars for use while at the BBTS.

Priority: Low
Estimated Cost: $250
Start Date: January 2008
End Date: June 2008
Responsible Point of Contact: Environmental Program Manager
Program Interaction: NGB Conservation
Staffing Requirements: DEARNG, Billeting Office staff, volunteers
Cooperative Agreements: None identified at this time
Funding Approved: No
Potential Funding Sources: Outdoor Recreation revenues

Project 3.1.1 is designed to enhance BBTS visitors' appreciation of the natural environment. Under this project a bird identification checklist should be developed to improve wildlife viewing opportunities at the BBTS and educate staff and visitors about the value of wildlife at the installation. The checklist should emphasize the common coastal birds, but also include some of the rare birds previously identified at or flying over the installation. The estimated cost includes the purchase of two pairs of binoculars and bird identification aids, such as Peterson's *A Field Guide to the Birds of Eastern and Central North America* (binoculars cost approximately $65.00 each and bird field guides cost approximately $16.00 each). A lending program for these items should be incorporated into the outdoor recreation program.

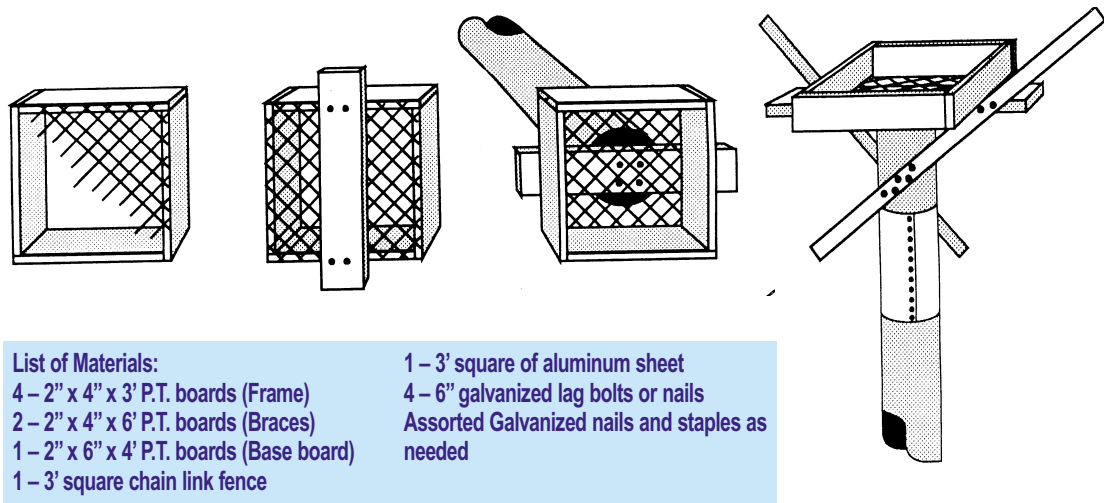
Planned Projects Updated 2021 (Subject to Funding Availability)

Program/ Management Area	Objectives and Projects to Achieve Objectives	Time Frame	Method[1]	Status
Geographic Information System (GIS)	**Objective 1a:** Maintain Current GIS Data			
	Update GIS layers.	Estimated 2024	IH / C	Ongoing
Fish and Wildlife Management Program	**Objective 2a:** Improve Wildlife Monitoring Program			
	Evaluate possibility of water fowl monitoring program.	2020	IH	
Threatened and Endangered Species Program	**Objective 3a:** Support Endangered Bats			
	Evaluate possibility and feasibility of conducting a bat survey.	2020	IH	Completed- Per DNREC No survey needed
	Upon completion of the bat survey, determine if additional action is necessary to control white-nose syndrome.	Dependent on Bat Survey		
Wetlands Management Program	**Objective 4a:** Preserve Wetlands Habitat			
	Evaluate status of *Phragmites* encroachment in southern tidal marsh area annually. If necessary, evaluate effectiveness of controlled burns to mitigate *Phragmites*.	Annually	IH	Ongoing
	Implement *Phragmites* control actions as needed.	As Needed		
	Continue to manage noxious weeds at BBTS per the IPMP.	Seasonally	IH	Ongoing
	Evaluate possibility of shoreline protection and stabilization project.	By 2025	IH	
	Objective 4b: Collect Data to Restore and Protect Tidal Marshes			
	Monitor wetlands at BBTS.	By 2025	C	
Grounds Maintenance Program	**Objective 5a:** Reduce Invasive and Noxious Species at BBTS			
	Continue to implement the IPMP to remove invasive plants.	Seasonally	IH	Ongoing
Forest Management Program	**Objective 6a:** Preserve Forested Habitat			
	Evaluate status of *Phragmites* encroachment along perimeter of the loblolly pine forest areas annually.	Annually	IH	Ongoing
	If deemed necessary, evaluate effectiveness of controlled burns to mitigate *Phragmites*.	Dependent on Evaluation	IH	
	Evaluate status of poison ivy in the forest interior.	2021	IH	
	Evaluate potential for reforestation of the southern end of the former air strip.	By 2025	IH	
Honey Bee and Pollinator Program	**Objective 7a:** Support Honey Bee Population & Enhance Pollinator Habitat			
	Continue to institute pollinator program and maintain hives.	Seasonally	IH	Ongoing
	Establish a pollinator plot with native species, such as milkweed.	Annually	IH	Ongoing
	Evaluate and replenish bee hives if necessary.	Seasonally	IH	Ongoing
Environmental Awareness Program	**Objective 8a:** Educate Staff on Environmental Awareness			
	Continue to provide annual Environmental Awareness training.	Annually	IH	Ongoing

[1] Probable method of conducting project: C = Contract; IH = In-House

APPENDIX G: OSPREY NESTING PLATFORMS

How to build a platform



List of Materials:
- 4 – 2" x 4" x 3' P.T. boards (Frame)
- 2 – 2" x 4" x 6' P.T. boards (Braces)
- 1 – 2" x 6" x 4' P.T. boards (Base board)
- 1 – 3' square chain link fence
- 1 – 3' square of aluminum sheet
- 4 – 6" galvanized lag bolts or nails
- Assorted Galvanized nails and staples as needed

STEP #1: Nail the four frame boards together.
STEP #2: Staple the chain link fence to the top of the platform frame.
STEP #3: Nail the base board across the middle of the platform frame.
STEP #4: Turn the entire platform over so that the base board is on the bottom. Mount the platform on the top of the pole using the 6-inch nails, before the pole is placed upright.
STEP #5: Mount the brace boards on opposite sides of the platform, with one end attached to the pole and the other end attached to the base board, extending a few feet above the platform.
STEP #6: Wrap the sheet of aluminum around the pole so that it will be at least 10 feet above ground level after the pole is planted. (This acts as a guard against raccoons climbing the pole into the nest.)
STEP #7: Install the pole at the chosen location. To help attract ospreys to the platform, place a few sticks (no longer than 3/4 inches in diameter and 18 inches long) within it.

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Osprey Platforms

What is an osprey?

The osprey (Pandion haliaetus) is a large, fish-eating hawk that is found on every continent of the world except Antarctica. They are generally found along the seacoasts, bays and large unfrozen rivers and lakes. Northern populations migrate to warmer climates in the winter. Around the world, the osprey population has suffered because of hunting, egg collecting, and the abuse of pesticides like DDT which can weaken egg shells. At one time considered a "threatened" species in this country, the osprey has made a comeback. In Florida, ospreys are currently designated as a Species of Special Concern in Monroe County and are protected by several state and federal laws. Because of its position at the top of the food chain, the osprey is considered to be an "indicator" species, whose health and success directly reflects the status of the overall coastal environment.

How will I know one when I see one?

Adults are almost eagle size, about 21 to 24 inches tall with a wingspan of 54 to 72 inches. They are dark brown, with a white underside and a mostly white head. Because of their size and dark brown body with a partially white head, ospreys are often mistaken for adult bald eagles. They can be distinguished by two main features – eagles don't have a white underside and they don't have an ospreys "mask", a dark brown streak that runs from the eyes across the cheeks to the sides of the neck. In flight, ospreys are easily distinguishable by the white underparts, the long wings with a conspicuous bend at the wrist, and barred brown and white tail and flight features.

In hunting for fish, its primary prey, the osprey hovers over the water and then dramatically dives in feet first. The bird then splashes up out of the water, pauses to shake the water from its feathers, and (if successful) carries the fish "torpedo-style" back to its perch or nest. To help in its quest for food, the osprey has developed a couple of unique physical features. The lower surface, or pads, of the toes are covered with rough spicules, while help it hold slippery fish. Also, it is the only hawk that has a reversible outer toe as in owls; this enables it to grasp its prey with to toes in front and two toes in the back.

Platform design

Once a suitable location is determined, you will need to make arrangements to have a utility pole or something similar erected, preferably to a height of 30 to 40 feet. This is what the platform will sit upon. Utility companies often will sell and install old poles, for a price. In Lee County, those interested can contact Florida Power and Light Company or the Lee County Electric Cooperative (LCEC) It is also essential to contact your local city or county building department to find out if a building permit is required to erect a platform.

One suggested design for a platform to be mounted on a utility pole is included in this brochure. Variations in design or materials are certainly possible. Remember that this platform will be exposed to the elements, so all wood should be pressure treated, and the platform should be examined after a few years to determine its condition.

In addition to this design, particularly in areas that are not suitable to heavy equipment, a design known as the "Sanibel Tripod" can be used. Essentially, this is similar to a three-legged tepee that can be transported to a site and erected manually by four or five adults. For more information on this alternative design, or for membership information, please contact The International Osprey Foundation at P.O. Box 250, Sanibel, Florida 33957-0250.

How and where do they nest?

Osprey nest in Florida from about December to May. They mate for life and very territorial, with some pairs returning to the same nest for decades. The nests are built of sticks, but often include seaweed, bones, driftwood, and other material from marshes and sites not far from the water, with a tall snag relatively separated from surrounding growth. If the ospreys decided that the snag of dead tree (for example) looks promising, they will hover over it and drop sticks until they catch. More sticks will be added until they become intertwined.

The search for tall, semi-isolated sites has often led to ospreys nesting on man-made structures, including antennas, channel markers, chimneys, windmills and utility poles. In utilizing these structures, ospreys have demonstrated an ability to successfully interact in the presence of human activity. Of course, they also have created an occasional nuisance. To aid in the reestablishment of ospreys in many areas, and sometimes to keep them off man-made structures, nesting platforms have been erected. These platforms have proven to be beneficial, providing a stable base for nests and better nest survival.

How can I put up a platform?

If you are interested in establishing a nest platform for ospreys on your property, you must ask yourself one important question – "Am I willing to live with a large wild bird which may make noise, eats and discard fish, and make a mess from its nest or a nearby perch?" If that is acceptable to you, you must then ask whether your neighbors will mind. There's no point in creating a confrontational situation that may eventually lead to the harassment of these protected birds.

The next step in to determine if ospreys would be interested in nesting on your property. Remember, they prefer areas near water, so far inland areas may not be appropriate. On Sanibel Island which is a barrier island on the Gulf of Mexico, ospreys nests are found in the middle of the island and on the bay side. However, very few are located on the gulf side. If there are no ospreys currently nesting anywhere near your property that may be an indication that the site is undesirable. Even if ospreys currently nest nearby, a new platform may not be used. Ospreys are very territorial and the size of the territories varies greatly. Once you have decided that ospreys might nest on your property, choosing a suitable location is the next step. Ideally, it should be near water and away from tall trees and buildings. Adjacent trees or structures that rise above the nest will inhibit use of the platform.

Summary

When your platform is up, you will be assisting the survival of a very important indicator species. Don't be surprised, however, if the platform is not used right away, or within the next few years or even ever. Only ospreys know what they are looking for in a home site. Also, it is possible that other birds such as crows or vultures will use the platform as a perch. Some species such as Great Horned Owls have been known to move in after a nest is established. Again, there are no guarantees, but if ospreys should choose to use the platform you provide, you will enjoy the presence of this magnificent raptor.

APPENDIX H: INVASIVE SPECIES FACTSHEETS

Common Reed (*Phragmites australis*) Fact Sheet

Common reed is a tall grass that inhabits wet areas like brackish and freshwater marshes, riverbanks, lakeshores, ditches and dredge spoil areas. Native and introduced forms of Phragmites occur in the United States. Researchers believe that introduced European forms are the aggressive invasives that have replaced much of our native reed. Common reed threatens by displacing native plants and forming monocultures in otherwise biologically diverse natural wetlands. It spreads by seed and strong vegetative growth and is very difficult to control once established. http://www.invasive.org/eastern/midatlantic/phau.html

Seed Head:

Joseph McCauley, U.S. Fish and Wildlife Service, www.forestryimages.org

Plant Habit:

Bernd Blossey, Cornell University, www.forestryimages.org

Poison Ivy (*Toxicodendron radicans*) Fact Sheet

Poison ivy is a woody vine with 2-4 in (5-10 cm) leaflets in groups of three. Poison ivy clings to tree trunks and other vertical surfaces with hairlike aerial rootlets which grow out of the stem. If a climbing surface isn't available, poison-ivy will grow as a free-standing shrub that looks a lot like its relative poison oak (*T. pubescens*). The attractive white berries are 1/4 in (0.6 cm) in diameter. These hang in clusters and are relished by birds. The leaves of poison-ivy turn shades of red and purple in fall. *Toxicodendron radicans* is native throughout North America east of the Rockies where it grows almost anywhere, in forests, swamps and fields.

Vine, showing aerial rootlets:

James H. Miller, USDA Forest Service, www.forestryimages.org

Fruit:

James H. Miller, USDA Forest Service, www.forestryimages.org

Leaves:

Ted Bodner, Southern Weed Science Society, www.forestryimages.org

Aspect, showing leaves and flowers:

Charles T. Bryson, USDA Agricultural Research Service, www.forestryimages.org