Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Available for download from http://www.ramsar.org/ris/key_ris_index.htm.

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

1. Name and address of the compiler of this form:

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DD MM YY: 18 12 86 (Designation date)

348 (Site Reference Number)

2. Date this sheet was completed/updated: 2011

3. Country: United States

4. Name of the Ramsar site:

Edwin B. Forsythe National Wildlife Refuge

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):
a) Designation of a new Ramsar site ❑; or
b) Updated information on an existing Ramsar site ✓

6. For RIS updates only, changes to the site since its designation or earlier updatea) Site boundary and area

The Ramsar site boundary and site area are unchanged: ❑

or
If the site boundary has changed:
i) the boundary has been delineated more accurately ❑; or
ii) the boundary has been extended ✓; or
iii) the boundary has been restricted** ❑

and/or

If the site area has changed:
i) the area has been measured more accurately ❑; or
ii) the area has been extended ✓; or
iii) the area has been reduced** ❑

** **Important note**: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

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7. Map of site:
Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:
i) **a hard copy** (required for inclusion of site in the Ramsar List): ✓; (printed from electronic version)

ii) **an electronic format** (e.g. a JPEG or ArcView image) ✓;

iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** ❑.

b) Describe briefly the type of boundary delineation applied:
e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

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8. Geographical coordinates (latitude/longitude, in degrees and minutes):
Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.
39° 26'N to 39° 46'N, 74° 07'W to 74°28'W

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9. General location:
Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.
The area is located along 80.4 kilometers (50 miles) of Atlantic coastline in south-eastern New Jersey in Atlantic, Burlington and Ocean counties. Bounded on the east by the Atlantic Ocean and several shallow bays –Great Bay, Little Bay, Grassy Bay, Barnegat Bay, Manahawkin Bay and Little Egg Harbor Bay that separate the mainland from off-shore barrier islands and spits. Forsythe National Wildlife Refuge (NWR) lies approximately 96 km. (60 miles) southeast of Philadelphia, Pennsylvania, 180 km. (112 mi.) south of New York City, and 10 km. (6 mi.) north of Atlantic City, New Jersey. Refuge headquarters is located in Oceanville, New Jersey.

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10. Elevation: (in metres: average and/or maximum & minimum)
Range from 2 meters (6 ft.) below sea level to 15 meters (50 ft.) above mean sea level (msl) with an average elevation of less than 2 meters above msl.

11. Area: (in hectares)
46,455 acres (18,800 hectares): fee simple title 43,914 acres (17,771 hectares) and easement 2,541 acres (1,028 hectares)

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12. General overview of the site:
Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Edwin B. Forsythe National Wildlife Refuge includes coastal salt meadows, upland fields, woodlands, open bays, and channels. The refuge is made up of the northern Barnegat division and southern Brigantine division. The refuge was established for the protection and management of waterfowl, specifically the northern black duck (*Anas rubripes*) and Atlantic Brant (*Branta bernicla horta*), and rails in the Atlantic Flyway. However, the refuge provides a variety of wildlife and wildlands, available for related activities for the public, such as observing the more than 200 species of birds that use the area each year, including the internationally endangered peregrine falcon (federally de-listed in 1999). The refuge also provides a variety of educational opportunities. Piping plovers, least terns, and black skimmers are three species listed as endangered by the State of New Jersey, with the Piping plover federally listed as threatened (see Section 14, below), that nest on the refuge.

13. Ramsar Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1	2	3	4	5	6	7	8	9
☐	✓	☐	✓	✓	✓	✓	✓	☐

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 2: Threatened and endangered species according to the U.S. Fish & Wildlife Service include the piping plover (*Charadrius melodus*), also vulnerable according to the IUCN Red List; the bald eagle (*Haliaeetus leucocephalus*), the least tern (*Sterna antillarum*) and roseate tern (*Sterna dougallii*). These species are observed on the refuge annually.

Other species with international status include the Canada goose (*Branta canadiensis*) and peregrine falcon (*Falco peregrinus anatum*), CITES Appendix I; Cooper's hawk (*Accipiter cooperii*) and osprey (*Pandion haliaetus*), CITES Appendix II; and the pintail (*Anas acuta*), the green-winged teal (*Anas crecca caroliniensis*) and red fox (*Vulpes vulpes*), CITES Appendix III. The refuge supports all of these species. These species are observed on the refuge annually.

Significant vulnerable species include; saltmarsh sharp-tailed sparrow (*Ammodramus caudacutus*), seaside sparrow (*Ammodramus maritimus*), and coastal plain swamp sparrow (*Melospiza georgiana*). The refuge supports all of these species. These species are observed on the refuge annually.

The refuge contains swamp pink (*Helonias bullata*) and seabeach amaranth (*Amaranthus pumilus*). Both of these species are listed as threatened by the U. S. Fish and Wildlife Service. The refuge is within the historical range of Kneiskern's beaked rush (*Rhynchospora knieskernii*) and is suitable for reintroduction of the species, which is listed as threatened by the U. S. Fish and Wildlife Service. The refuge addresses needs of bog asphodel (*Narthecium americanum*), which the U. S. Fish and Wildlife Service considers a candidate species for listing as threatened or endangered.

The refuge supports rare sea-level fen communities. Sea level fens occur at upland-tidal interfaces where fresh ground water seeps emerge, adjacent to estuarine marshes. These fens support six rare plant species, three are listed as endangered by the State of New Jersey.

Criterion 4: Both Brigantine NWR and Barnegat NWR (now divisions of Forsythe NWR) were established primarily for the protection and management of waterfowl, specifically the northern black duck (*Anas rubripes*) and Atlantic Brant (*Branta bernicla horta*), and rails in the Atlantic Flyway. Brant find their major protection on waterfowl refuges, breeding in far northern regions and wintering in a small section of the Atlantic Coast from Massachusetts to South Carolina. During the winter the species is most abundant along the coast of New Jersey. The wintering populations at Forsythe NWR can reach 60,000

birds, nearly one-third of the total winter population. The shallow tidal areas contain extensive beds of sea lettuce (*Ulva lactuca*), a marine alga, and eelgrass (*Zostera marina*), all important waterfowl foods, particularly for Atlantic brant (*Branta. bernicla horta*). Other important migrants at Forsythe include: mallard (*Anas platyrhynchus*); gadwall (*A. strepera*); American widgeon (*A. Americana*); green-winged teal (*A. crecca caroliniensis*); pintail (*A. acuta*); and Canada goose (*Branta canadiensis*). Breeding waterfowl include the mallard, northern black duck, gadwall, blue-winged teal (*Anas discors*). Over 3,000 ducklings are produced annually. Other aquatic and marsh birds are extremely abundant and diverse at Forsythe: e.g., ten species of herons; 37 species of shorebirds. Clapper rails (*Rallus longirostrus*) are abundant in the saltmarshes. Gull and tern colonies are often extensive. The refuge hosts about 25 percent of the New Jersey breed pairs of piping plover.

Criterion 5: The refuge regularly hosts at least 20,000 waterbirds (sea birds, shore birds, wading birds and waterfowl). The refuge was designated a Western Hemisphere Shorebird Reserve Network site of Regional Importance on March 18, 2001. Sites of Regional Importance host at least 20,000 shorebirds annually, or at least 1% of the biogeographic population for a species.

Criterion 6: The refuge supports a minimum of 17% of the wintering Atlantic brant (*Branta bernicla hrota*) population, corresponding to around 30,600 birds and a minimum of 7.5% of the northern black duck (*Anas rubripes*), equivalent to around 30,000 birds based on 2004 USFWS data. The refuge was designated a Western Hemisphere Shorebird Reserve Network site of Regional Importance on March 18, 2001. Sites of Regional Importance host at least 20,000 shorebirds annually, or at least 1% of the biogeographic population for a species.

Criterion 7: The site meets this criterion due to the existence of commercially important clam and oysters. United States of America only owns the lands within the refuge to the mean high water line. The State of New Jersey owns the land below the mean high water line (intertidal or riparian lands) and owns the land below the mean low water line (submerged lands). The refuge tidal wetlands and uplands are a major factor in maintaining the water quality in back bays like Barnegat Bay and Little Egg Harbor. All of Barnegat Bay and Little Egg Harbor are within the Barnegat National Estuary. The Barnegat Bay National Estuary Program (BBNEP) is one of 28 Congressionally designated National Estuary Programs throughout the United States working to improve the health of nationally significant estuaries.

Criterion 8: The site is an important fish nursery for fin and shellfish. Primary productivity of the wetlands is critical to maintaining the basis of the food chain and associated exchange of nutrients of a tidal estuary. The low and high tidal marshes within the refuge are a key to maintaining the tidal estuary ecosystem function. There are six (6) aquatic Federal Trust species affected by the refuge: alewife (*Alosa psuedoharengus*), American eel (*Angilla rostrata*), American Shad (*Alosa sapidissima*), blueback herring (*Alosa aestvalis*), hickory shad (*Alosa mediocris*), and striped bass (*Morone americanus*). Wetlands and waters within the refuge acquisition boundary support 167 finfish species, 35 macroinvertebrate species and 2 shellfish species.

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15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region: Estuarine intertidal wetlands of the Mid-Atlantic Coast.

b) biogeographic regionalisation scheme (include reference citation): Cowardin, L. M., V. Carter and F. C. Golet. 1979. Classification of Wetlands and Deepwater Habitats of the United States. 131pp.

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16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

The coastal plain of New Jersey throughout the general region of the refuge consists of geologically recent beaches, dunes, swamps and marshes overlying gently sloping to nearly level unconsolidated beds of sand, gravel, clay and marl. Normal tidal amplitude averages about 1.4 meter (4.5 ft.). Winters average 2°C while summers average 24°C. The growing season spans 245 days with an average annual coastal precipitation of 108.204cm.

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

The Mullica River, one of the major drainages in the region, traverses the refuge (Brigantine Division) and a number of lesser rivers and streams flow into the shallow bays just eastward of the mainland refuge boundaries. The Mullica River and the rivers traversing the Barnegat Division of the refuge flow out of the New Jersey National Pinelands Reserve, which is a UNESCO Biosphere Reserve west of the Garden StateParkway. There has been very substantial development between the Garden State Parkway and refuge over the last three decades.

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

The Forsythe NWR forms part of the estuary where the Mullica River flows into the Atlantic Ocean. The tidal estuary provides ecological processes that sustain a myriad of wetland dependant organisms.

19. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines.*

a) presence:

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp Ts • U • Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance: H>F>G>J>E>Ss>Tp>W>Xf>N>M>6>9

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Major habitats on the refuge are coastal salt marshes and meadows; upland fields; brushlands and woodlands; freshwater impoundments; open bay and channels; and sand beaches and dunes. Little Beach Island and Holgate Wilderness Areas contain mostly saltmarshes, sandy beaches and dunes, with typical barrier island landforms and vegetation. Mudflats and tidal channels are rich in invertebrates, especially commercially important clams and oysters.

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Regularly and irregularly flooded salt marshes and meadows, dominated by saltmarsh cordgrass (*Spartina alterniflora)* and/or saltmarsh hay (*S. patens*) by far occupy the most acreage on the refuge –aproximately 10,500 ha. Bays and tidal flats are next in total extent, about 1,800 ha. The shallow tidal areas contain extensive beds of sea lettuce (*Ulva lactuca*), benthic macroalgae, and eelgrass (*Zostera marina*), all important waterfowl foods, particularly for wintering Atlantic brant (*Branta bernicla horta*). Where freshwater exerts an influence, reed grass (*Phragmites australis*), cattail (*Typha latifolia*) and bulrushes (*Scirpus spp.*) commonly occur.

Upland vegetation is primarily pitch pine (*Pinus rigida*), blackjack oak (*Quercus marilandica*), holly (*Ilex opaca*), and shrub oak (*Q. ilicifolia*). Bottomland swamps contain mostly red maple (*Acer rubrum*), and also Atlantic white cedar (*Chamaecyparis thyoides*), sweetbay (*Magnolia virginiana*) and black gum (*Nyssa sylvatica*), with blueberries (*Vaccinium spp.*), sweet pepperbush (*Clethra alnifolia*) and clammy azalea (*Rhododendron viscosum*) in the shrub layer. Little Beach Island and Holgate Wilderness Areas contain mostly saltmarshes, sandy beaches and dunes, with typical barrier island landforms and vegetation (*Ammophila breviligulata, Myrica pensylvanica*, etc.) Part of the upland habitat is grassland. Aquatic food plants have been introduced into the impoundments.

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Over 292 species of birds have been observed on the refuge, at least 200 of them commonly. Also occurring here are some 38 species of mammals, with Eastern cottontail rabbit (*Sylvilagus floridanus*), muskrat (*Ondatra zibethicus*), racoon (*Procyon lotor*) and red fox (*Vulpes vulpes*) being especially common. Eight species of amphibians and eleven reptilian species inhabit the area, including the northern diamondback terrapin (*Malaclemys t. terrapin*), which is prominent on the refuge and listed as decreasing in numbers by the State of New Jersey Department of Environmental Protection.

Both Brigantine NWR and Barnegat NWR (now divisions of Forsythe NWR) were established primarily for the protection and management of waterfowl in the Atlantic Flyway, with special emphasis on Atlantic brant and northern black duck (*Anas rubripes*). Atlantic brant concentrate along the New Jersey coast in the winter. Several state endangered and threatened species also occur and breed here, including least tern (*Sterna antillarum*), black skimmer (*Rynchops niger*), osprey (*Pandion haliaetus*), and peregrine falcon (*Falco peregrinus anatum*).

23. Social and cultural values:

The area is valuable as a site for public education about wetland conservation and management, recreation, and enriching the local economy. It is a premier birding site in North America. The refuge has 300,000 visitors per year. The refuge is key to protecting and maintaining what is left of coastal natural habitat in Ocean, Burlington and Atlantic Counties. In 2006 non-resident refuge visitors spent $1.8 million and resident refuge visitors spend about $991,000. Total final demand associated with refuge recreational visitor spending amounted to $4.4 million. This is the total monetary value of economic activity generated by refuge recreational visitors. In turn, this final demand generated 41 jobs, $1.4 million in job income, and $714,500 in total tax revenue. Non-resident visitors provided a $2.9 million stimulus to the local economy.

24. Land tenure/ownership:

a) within the Ramsar site:
The United States of America owns the refuge and the U.S. Fish and Wildlife Service manages it as a unit of the National Wildlife Refuge system. The State of New Jersey retains rights to areas below the mean high water line (intertidal or riparian areas) and to areas below the mean low water line (submerged lands).

b) in the surrounding area: The State of New Jersey does own a substantial amount of the surrounding area as wildlife management areas or in forests or parks.

25. Current land (including water) use:

(a) within the Ramsar site:
Major management practices at Forsythe NWR are directed toward protecting and improving the wetlands environment for waterfowl, especially Atlantic brant and northern black duck populations, rails, shorebirds and other wildlife as breeding, migration and wintering habitat, and to maintain existing habitat to benefit rare or endangered plant and animal species. Over 2,700 hectares (6,603 acres) are managed as wilderness. Environmental education, wildlife-oriented recreation, and scientific research are also primary management objectives. Predominant public uses managed by the refuge include waterfowl hunting, saltwater fishing, clamming and crabbing, fur-trapping, wildlife observation and boating. Hunting and trapping are strictly controlled in accordance with federal and state regulations. Public access is restricted within areas of the refuge.

(b) in the surroundings/catchment:
Most of the land in the catchment area north of the Mullica River and west of the Garden State Parkway is undeveloped because of New Jersey Pinelands land use regulations and because a substantial amount of that area is state wildlife management areas or state forests or parks. A substantial amount of the land east of Garden State Parkway is developed. In many areas housing developments abut the refuge boundary. The area population increased by 13.8 percent from 1995 to 2005, compared with a 7.7 percent increase for the state of New Jersey and a 11.4 percent increase for the U.S. as a whole.

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

(a) within the Ramsar site:
The estuarine waters are being degraded due to nutrient inflows from developed areas along the Garden State Parkway and U. S. Route 9 corridor. Estuarine water quality is being degraded due to greater variation in freshwater inflows. Development results in greater pulses surface water inflows during rain events, and less baseline groundwater inflows, because precipitation has less chance of infiltrating into the ground.

(b) in the surrounding area:
Over the past 30 years burgeoning human development and population growth, especially in eastern Ocean County and eastern Atlantic County, have placed considerable strain on the ecosystems of the adjacent marshlands and uplands, resulting in a reduction in baseline subsurface and surface water flows, and increase id rain event surface water flows, habitat loss, fragmentation and degradation. These pressures will have significant adverse impacts on both refuge habitat and wildlife values through changes in water and air quality, loss of surrounding habitat and edges, and direct disturbance.

Sea level rise will eliminate some tidal marshes in the refuge because there is no undeveloped land upland form the tidal marshes.

27. Conservation measures taken:

Edwin B. Forsythe NWR was established and renamed in 1984 through the merging of Brigantine NWR (established in 1939) and Barnegat NWR (established in 1967) under the provisions of the Migratory Bird Conservaton Act. In 1975, under the Wilderness Act of 1964, 2,702 hectares (6,603 acres) were designated wilderness. Most of the wilderness is pristine saltmarsh. Since the Ramsar site designation in 1986, the refuge has increased to about 43,000 acres in fee simple ownership.

In June 2004 the Comprehensive Conservation Plan (CCP), required by the National Wildlife Refuge System Improvement Act of 1997, was approved. Open marsh water management (OMWM) (ditching and impounding) is conducted over large areas of refuge marshlands to control mosquito larvae and to create beneficial waterfowl habitat. OMWM reduces the need for pesticide use on the refuge for mosquito larvae control and reduces the need for pesticide use on and off the refuge for adult mosquito control. Water levels in the large freshwater impoundments are manipulated for shorebirds and waterfowl to provide the most favourable conditions on a seasonal basis. Forest management consists of both controlled burning and replanting, such as the re-establishment of Atlantic white cedar into its historical habitat. Herbicides, e.g., Rodeo, are used along the dikes and in the impoundments to control weedy plants, particularly phragmites (*Phragmites australis*). Some grassland is regularly mowed or burned to maintain nesting habitat for upland nesting waterfowl and for grassland birds. Pest control practices include water management, biological control and pesticides. Some upland areas have been planted in native warm season perennial grasses.

Plans completed and currently implemented include Annual Habitat Work Plan, Integrated Pest Management Plan, Prescribed Burn Plan, and Plant Fish and Wildlife Inventory Plan.

28. Conservation measures proposed but not yet implemented:
e.g. management plan in preparation; official proposal as a legally protected area, etc.
Management plans in preparation include Habitat Management Plan, Wildlife Population Management Plan, Priority Wildlife Dependant Recreation Plan, and Wilderness Management Plan.

29. Current scientific research and facilities:
e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Research studies are encouraged on the refuge and have been conducted on a variety of subjects for many years. Some of the investigations include: northern black duck and Atlantic brant winter survival and habitat use; impacts of tidal marsh vegetation overgrazed by snow geese; impacts of open marsh water management on northern black ducks and other marsh bird populations; mating strategies and larval habitats of the greenhead fly (*Tabanus nigrovittatus*); laughing gull (*Larus atricilla*) behavior; air quality monitoring; effects of groundwater withdrawal, and others.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:
e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

The Refuge has a visitor center, refuge information leaflets and a species list. There is an 8-mile long automobile tour route in the Brigantine Division. The refuge provides environmental education opportunities.

31. Current recreation and tourism:
State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Forsythe NWR is a major public-use facility and one of the most heavily-visited wildlife refuges in the U.S., receiving 300,000 visitors annually. The refuge offers excellent bird-watching opportunities, nature trails, a self-guiding auto tour route, boating (both motorized and non-motorized), bicycle routes, and numerous interpretive exhibits, demonstrations, and lectures used for environmental education purposes. Hunting and trapping are strictly controlled in accordance with federal and state regulations.

32. Jurisdiction:
Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

U.S. Department of the Interior, U.S. Fish and Wildlife Service

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

U.S. Department of the Interior, U.S. Fish and Wildlife Service

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34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

Annual Narrative Reports of the Edwin B. Forsythe National Wildlife Refuge (1984) (Barnegat and Brigantine Divisions).

Edwin B. Forsythe National Wildlife Refuge Comprehensive Conservation Plan. U.S. fish and Wildlife Service Region 5. June 2004

Leck, C. 1975. Birds of New Jersey. Rutgers University Press, New Brunswick, New Jersey, pp.18-39. Lewis, J.V. and H.B. Kummel. 19115. The Geology of New Jersey. Geological Survey of New Jersey, Bull 14. 146 pp.

Refuge Leaflet 40 of the U.S. Fish and Wildlife Service, Department of the Interior.

Banking on Nature 2006 – The Economic Benefit to Local Communities of Natural Wildlife Refuge

Visitation, U.S. Fish and Wildlife Service. November 2007

Mapping New Jersey Coastal Conservation and Restoration Targets. Center for Remote Sensing and Spatial Analysis, Rutgers University. 2007
