

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

**THREATENED AND ENDANGERED SPECIES
HABITAT EVALUATION
FOR
OYSTER CREEK GENERATING STATION
TOWNSHIP OF LACEY
OCEAN COUNTY, NEW JERSEY**

Prepared for:

Amergen Energy Co., LLC
P.O. Box 388
Route 9 South
Forked River, New Jersey 08731

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August 15, 2006

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I. EXECUTIVE SUMMARY

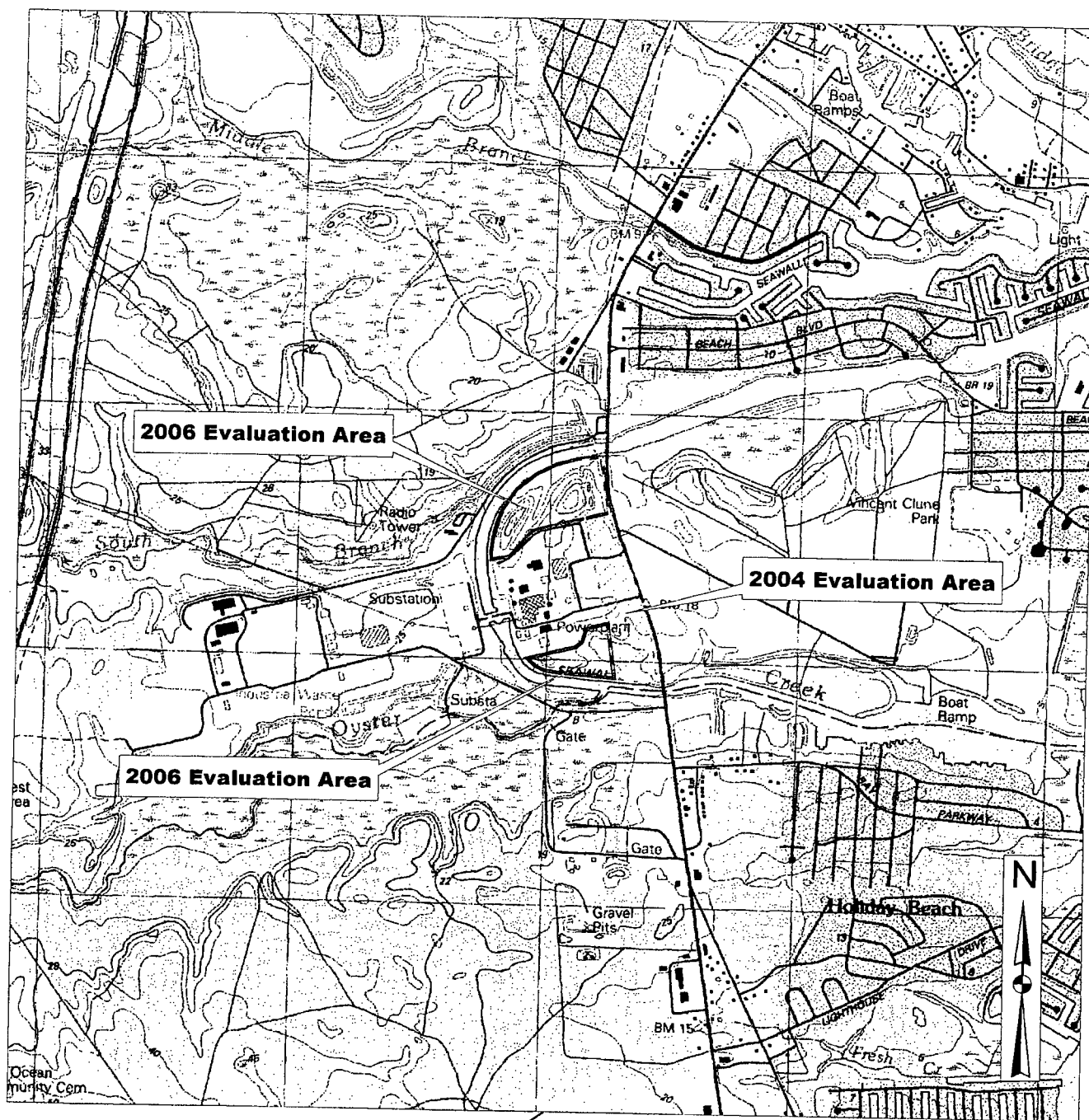
AmerGen Energy Co., LLC retained EcolSciences, Inc. to conduct a threatened and endangered plant and wildlife habitat evaluation in undeveloped areas on a portion of the Oyster Creek Generating Station property in Lacey Township, Ocean County, New Jersey (Figure 1). This report documents results for the studies conducted in the spring and summer of 2004 and summer of 2006.

The objective of the 2004 study was to assess habitat for threatened and endangered plants and wildlife in areas of proposed National Security upgrades, since constructed, around a portion of the generating station property enveloped by US Route 9 to the east, the intake canal to the north, and the discharge canal to the south (the "Site"). The 2006 study involved a habitat evaluation of all remaining undeveloped lands within the Site, a portion of which is proposed for further improvements. In addition to the initial habitat evaluation in 2004, EcolSciences conducted a survey for the State-threatened Pine Barrens treefrog (*Hyla andersonii*) in wetlands near the southeastern corner of the Site.

The threatened and endangered plant and wildlife habitat evaluation involved a review of local species records from the NJDEP Natural Heritage Program (NHP), review of the Landscape Project critical habitat maps for rare wildlife, review of vernal habitat mapping prepared by Rutgers University and the NJDEP, mapping of potential habitat of the State-threatened northern pine snake (*Pituophis melanoleucus*) based on draft habitat delineation criteria devised by the NJDEP Endangered and Nongame Species Program (ENSP), review of the Natural Heritage Grid Map of rare plant species and ecological communities, and on-Site field work.

The NHP Natural Heritage Database and Landscape Project indicates there are on-Site records of the State-threatened Pine Barrens treefrog, wood turtle (*Clemmys insculpta*), northern pine snake, barred owl (*Strix varia*), and Cooper's hawk (*Accipiter cooperii*) as well as herptile and invertebrate species of special concern (see Attachment A). In addition, the NHP has historic records of two State-endangered plants, Pine Barrens boneset (*Eupatorium resinosum*) and New Jersey rush (*Juncus caesariensis*), and two rare plants with no State status, curly grass fern (*Schizaea pusilla*) and awned mountain-mint (*Pycnanthemum setosum*), in the vicinity of the Site.

Vernal habitat mapping indicates a potential vernal pool just north of the discharge canal that, during the initial Site visit on April 28, 2004, appeared to possess vegetative structure and



SITE
LOCATION



State Plane Coordinates (New Jersey NAD 83)
575,200' E ; 357,700' N

FIGURE 1: USGS SITE LOCATION

Oyster Creek Generating Station
Township of Lacey
Ocean County, New Jersey

Source: USDA, NRCS. 2001. Digital Raster Graph of Ocean County,
New Jersey.

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hydrology characteristic of Pine Barrens treefrog habitat. Although the National Security upgrades, constructed following the 2004 habitat evaluation, do not impact these wetlands, a portion of the adjacent upland woodland may have been considered critical habitat if an occurrence of Pine Barrens treefrog was confirmed. This could have affected the parking lot expansion that presently occupies a portion of this wooded area. In order to determine the presence or absence of Pine Barrens treefrog in this wetland, a survey was conducted on three evenings in June 2004 during the height of the breeding period for this species. Sampling conditions were deemed appropriate through use of a control site. No Pine Barrens treefrogs were identified within the wetland and, as a result, the wetland is not habitat for the species.

Based upon the database and mapping review and field investigations, the Site does not provide habitat for threatened or endangered wildlife. Pine snake habitat mapping prepared for the Site following ENSP draft protocols indicates that much of the undeveloped Site is mapped as preferred habitat. However, the extent of this area is not expected to be large enough to support a sustainable population of pine snake. Appropriate wetland habitats for Pine Barrens treefrog, wood turtle, and barred owl are not present on-Site. Remaining on-Site woodland is fragmented and isolated, not suitable for a woodland-dependent species such as Cooper's hawk. No further surveys for threatened or endangered wildlife are recommended.

Impacts to rare plants such as awned mountain-mint, Pine Barren boneset, New Jersey rush, and curly grass fern are not anticipated, as there are no on-site historic records of these species. In addition, the latter three species are wetland-dependent. There are no impacts to wetlands as part of the latest proposed improvements.

The following sections describe the threatened and endangered species habitat evaluation methodology, Site description, and results of the field investigation.

II. METHODOLOGY

Prior to conducting the on-Site investigation, EcolSciences collected background information on local conditions and rare plant and wildlife records from several readily available sources such as the Natural Heritage Program's Natural Heritage Database and various mapping utilities including the Landscape Project critical habitat map, vernal habitat map prepared by Rutgers University and the NJDEP, pine snake habitat map based on draft ENSP methodology, and Natural Heritage Grid Map of rare plant species and ecological communities. The following sections describe these references and field methods in more detail.

A. Background Data Collection

EcolSciences has assembled a collection of reference materials regarding threatened and endangered species from prior studies, scientific journals, and mapping. These technical reports contain information regarding the natural history, habitat requirements, and survey methodologies for these species.

B. Natural Heritage Program and Landscape Project

Starting in July 2002, the Natural Heritage Program (NHP) adopted use of the Landscape Project to supplement threatened and endangered species data requests. The Landscape Project was developed by the NJDEP, Division of Fish & Wildlife, Endangered & Nongame Species Program (ENSP). It is a wildlife habitat-mapping program that is used to identify and map critical habitats for endangered, threatened, and special concern species. This method takes documented sightings of threatened and endangered wildlife and, based on a species-specific model, maps areas of suitable habitat contiguous to the sighting as critical wildlife habitat. In many cases, the mapped areas can be quite large, even encompassing square miles. The Landscape Project has undergone revision since its initial release. Landscape Project Version 2.0 was released in mid-February 2004 and is now used by the NHP for its data requests.

C. Vernal Habitat Map

The NJDEP and Rutgers University's Center for Remote Sensing and Spatial Analysis (CRSSA) are cooperating to map and document the State's vernal habitats. Vernal habitats are fish-free depressions that hold water for at least two months between March and September and provide breeding habitat for certain obligate and facultative species, some of which are endangered or threatened. Potential vernal habitats are identified through GIS and are certified through fieldwork if the above criteria are met. The map is available on the web (www.crssa.rutgers.edu/projects/biodiv/biodiv.htm).

D. Pine Snake Habitat Map

The NJDEP Endangered & Nongame Species Program (ENSP) has developed draft habitat delineation criteria for northern pine snake resulting in a map of potential habitat that integrates selected digital land use/land cover and soils data through Geographic Information Systems (GIS) in a report entitled *Northern Pine Snake Habitat Assessment and Mapping* (www.state.nj.us/dep/fgw/pinesnak.htm). The map is not available from the ENSP but can be reproduced using GIS software on readily obtainable digital data and following the methodology outlined within the report.

E. Natural Heritage Grid Map

The Office of Natural Lands Management maintains a database and associated map of documented rare plant species and ecological communities in New Jersey. The map consists of a coarse grid with cells ranging from 358 to 372 acres in size with 100 cells for every USGS quadrangle. The cells only indicate the general location of rare species and/or communities, if any. Each cell with documented sightings is linked to corresponding rare plant and ecological community records in a data table.

F. Field Investigation

On-site conditions represented in the assorted mapping utilities were evaluated in the field on April 28, 2004 and June 30, 2006. The 2004 study focused on undeveloped portions of the Site slated for National Security upgrades, since constructed. Remaining undeveloped areas within the Site, a portion of which is part of additional proposed improvements, were evaluated in 2006. Notes on existing vegetation and soil characteristics were taken. Current land use on the Site as well as the immediate area was also considered in an effort to determine the suitability of the area as potential habitat for threatened and endangered plants and wildlife.

The initial field investigation in 2004 determined that wetlands near the southeastern corner of the Site were potentially suitable habitat for Pine Barrens treefrog. A survey for Pine Barrens treefrog was conducted here on the evenings of June 15, 22, and 30, 2004, a span that coincides with the height of the breeding period of this species. Active listening, as well as the use of a taped call of Pine Barrens treefrog, was employed at several locations around the perimeter of the wetlands. Appropriate survey conditions have been suggested by the NJDEP to be warm, (70 °F+), humid or rainy nights in May and June (NJDEP, 2004). On each evening, a control site was used to verify conditions were appropriate for sampling. The control site consists of a documented Pine Barrens treefrog population located near Webbs Mill Branch, near milepost 20 on County Route 539 within Greenwood Forest Wildlife Management Area, Lacey Township.

III. RESULTS

Based on surrounding land use and existing land cover, EcolSciences has determined that the Site does not serve as critical or suitable habitat for threatened and endangered species. The following sections provide details of EcolSciences' findings:

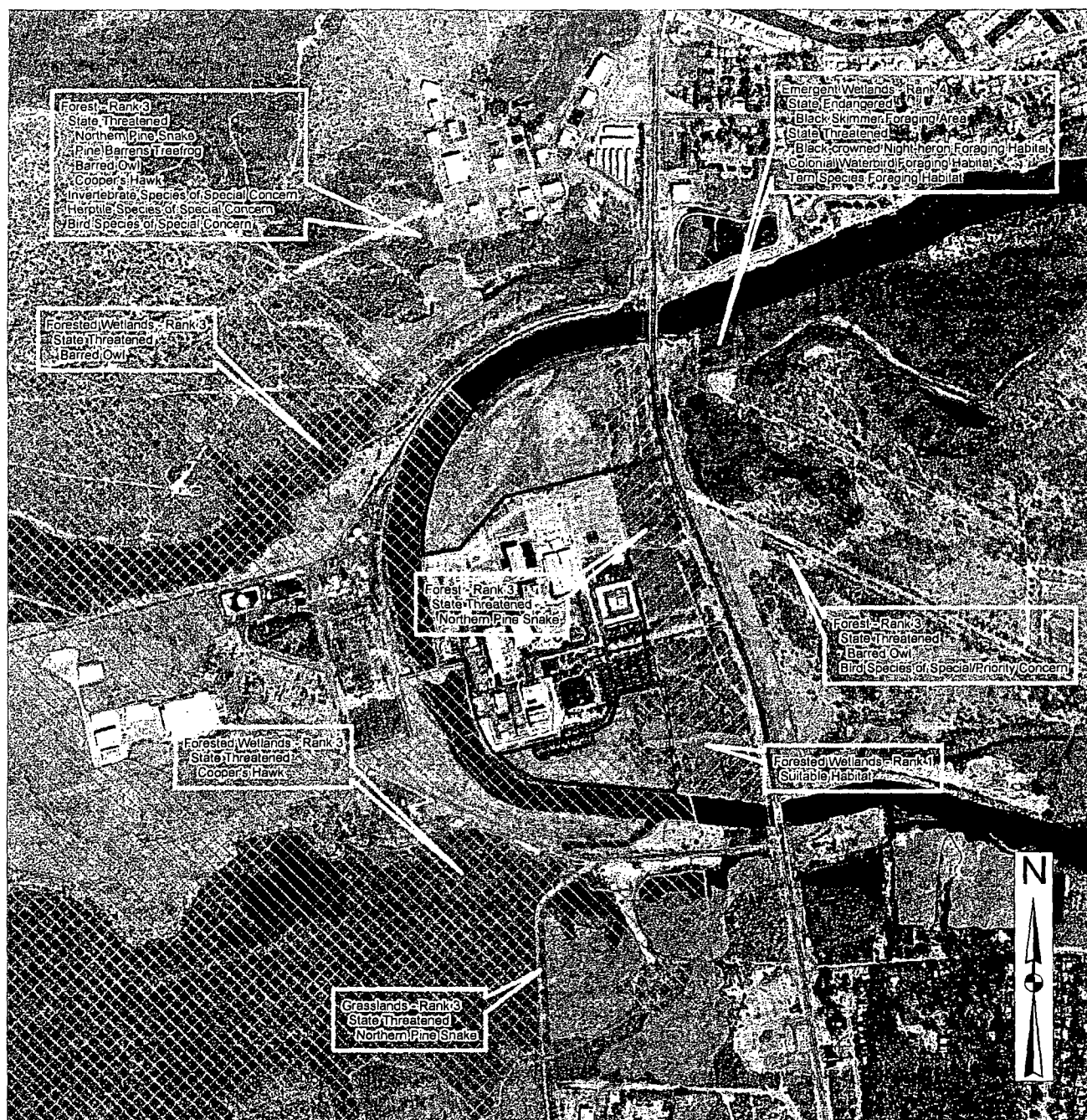
A. Natural Heritage Program and Landscape Project

The NHP responded to a request for threatened and endangered species information for the site and its immediate vicinity in a letter dated July 12, 2006 (Attachment A). According to the Natural Heritage Database and Landscape Project habitat mapping, the State-threatened northern pine snake (*Pituophis melanoleucus*) and wood turtle (*Clemmys insculpta*) occur on-site. In addition, records of several listed species occur within ¼-mile of the Site, including the State-threatened Pine Barrens treefrog (*Hyla andersonii*), barred owl (*Strix varia*), and Cooper's hawk (*Accipiter cooperii*); herptile species of special concern; invertebrate species of special concern; and foraging habitat for the State-endangered black skimmer (*Rhynchops niger*) and State-threatened black-crowned night-heron (*Nycticorax nycticorax*). According to the NJDEP, special concern refers to species that are not listed as threatened or endangered, but whose status is being monitored by the NJDEP Endangered and Nongame Species Program. At present, these species have no regulatory bearing.

In addition to above-listed wildlife, the NHP has historic local records of two State-endangered plants, Pine Barrens boneset (*Eupatorium resinosum*) and New Jersey rush (*Juncus caesariensis*), and two rare plants with no State status, curly grass fern (*Schizaea pusilla*) and awned mountain-mint (*Pycnanthemum setosum*).

Figure 2 presents Landscape Project (Version 2.0) mapping for the site and surrounding area. As shown, a forested polygon and forested wetland polygon are located entirely within the area bounded by the canal and Route 9. The on-site forest polygon is Rank 3, based on a single record of northern pine snake. The forested wetland polygon is Rank 1, indicating a polygon that meets habitat-specific requirements, but does not intersect with any documented records of endangered, threatened, or special concern species.

The critical areas mapped by the Landscape Project, in general, consist of numerous polygons broken down into five basic categories: beach, grasslands, forest, forested wetlands, and emergent wetlands. Every polygon of each habitat type is ranked based on the status of a species



Critical Habitat

Wood Turtle

Emergent Wetlands Forest

RANK

- 1 - Suitable Habitat
- 2 - Priority Species
- 3 - State Threatened
- 4 - State Endangered
- 5 - Federal T and E

Forested Wetlands

RANK

- 1 - Suitable Habitat
- 2 - Priority Species
- 3 - State Threatened
- 4 - State Endangered
- 5 - Federal T and E

RANK

- 1 - Suitable Habitat
- 2 - Priority Species
- 3 - State Threatened
- 4 - State Endangered
- 5 - Federal T and E

Grasslands

RANK

- 1 - Suitable Habitat
- 2 - Priority Species
- 3 - State Threatened
- 4 - State Endangered
- 5 - Federal T and E

2006 Evaluation Area

2004 Evaluation Area

0 1,000 2,000 3,000 Feet

FIGURE 2: LANDSCAPE PROJECT

Oyster Creek Generating Station
Township of Lacey
Ocean County, New Jersey

Sources:
NJDEP, DFW, ENSP. 2004. New Jersey's Landscape Project (Version 2.0).
State of NJ, OIT. 2003. NJ 2002 High Resolution Orthophotography.

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record, if present, within or near a polygon. A Rank 5 polygon indicates at least one record of a Federally-endangered or threatened species whereas a Rank 1 polygon has no known species records, but meets other habitat-specific criteria (Niles, *et. al.*, 2004). A Rank 3 polygon, which includes the on-Site forest polygon, has one or more occurrences of at least one State-threatened species.

Landscape Project critical areas for a listed species is determined through specific models applied from the location of an accepted record from the NHP Natural Heritage database. The NHP's Biological Conservation Database model for barred owl provides a buffer of 1-mile radius from the point of an accepted record. Critical areas for barred owl consist of all forest and forested wetland polygons that intersect this buffer in their entirety. The model applied to Cooper's hawk also values forest and forested wetland polygons, though only those that occur within 300 meters of an accepted record in the Natural Heritage Database. The Pine Barrens treefrog model values all forest, forested wetland, or emergent wetland polygons that occur within 300 meters of an accepted record. The pine snake model values all forest and grassland polygons that fall within 500 meters of an accepted record (Niles, *et. al.*, 2004).

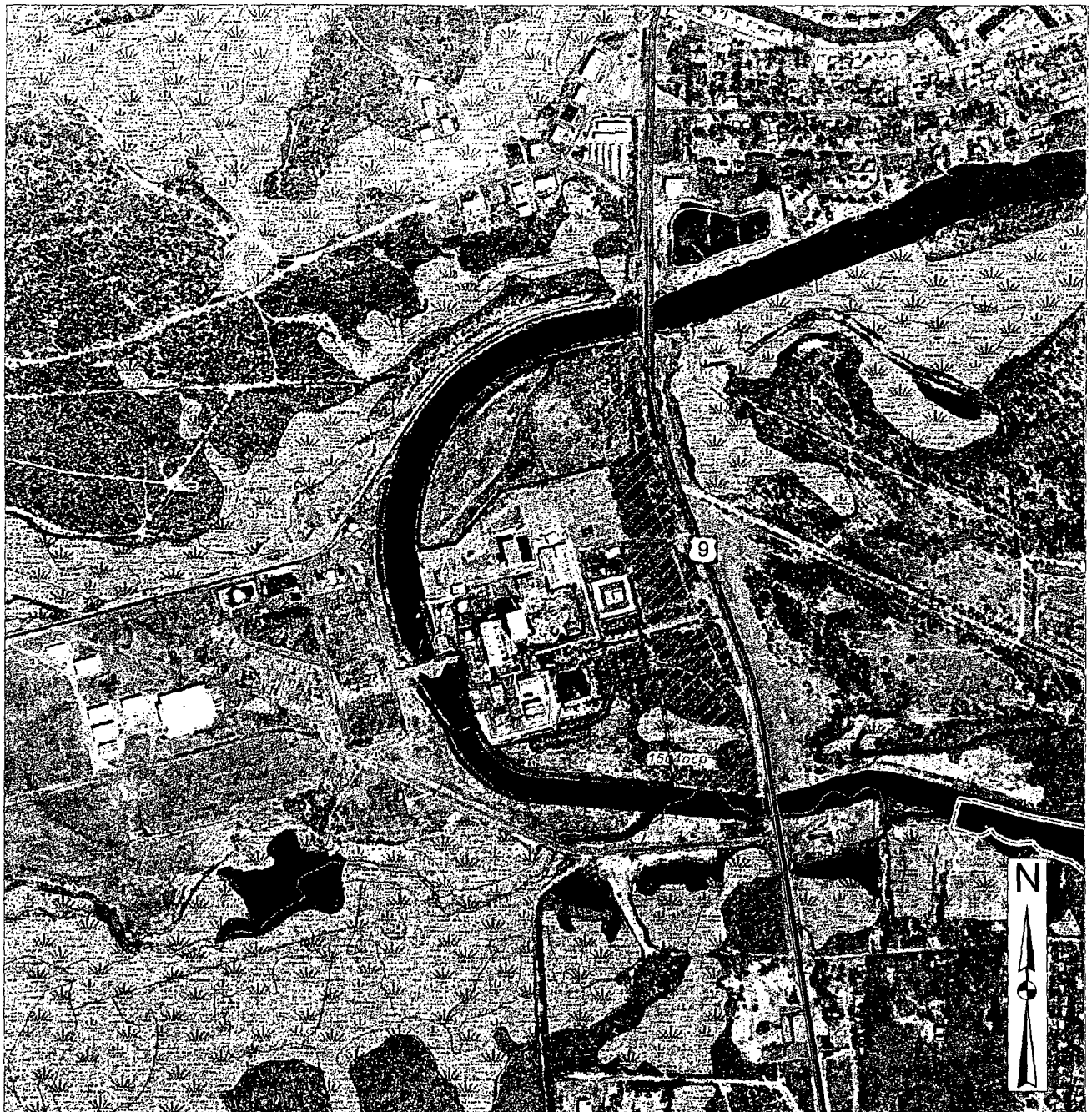
The spatial extent of a polygon is dependent in part upon contiguity of areas of similar land use/land cover and is divided by major roads (500 level and above) (Niles, *et. al.*, 2004). The on-site forested polygon is 54 acres in area. The on-site forested wetland polygon is only 3 acres in area. In contrast, the large forested polygon adjacent to the canal is 6,833 acres (10.7 mi²) and is bounded by US Route 9 to the east and north, the Garden State Parkway approximately 1 mile to the west, and County Route 532 approximately 1.3 miles to the south.

B. Vernal Habitat Map

The Rutgers Center for Remote Sensing and Spatial Analysis has mapped a single potential vernal pool in the southern portion of the area of interest (Figure 4). This pool has not been surveyed to determine if it meets the NJDEP's criteria for vernal habitats. This includes an assessment of obligate and/or facultative wildlife species that may be present.

C. Pine Snake Habitat Map

Northern pine snake habitat, according to ENSP mapping methodology, is derived from the intersection of specific land use/land cover and soil types that pine snakes are most often associated with. Selected land use/land cover is ranked (primary, secondary), as are soils (primary, secondary, tertiary). The intersected pine snake habitat polygons are then categorized (preferred 1A or 1B or suitable 2, 3, or 4) depending on the combination of overlapping vegetation and soil types. The



Potential/Certified Vernal Pools




- Certified
- Not Surveyed
- Yes/vernal pool
- NOT a Vernal Pool
-  Freshwater Wetlands
-  2006 Evaluation Area
-  2004 Evaluation Area

FIGURE 3: VERNAL HABITAT

Oyster Creek Generating Station
Township of Lacey
Ocean County, New Jersey

Sources:
NJDEP and Rutgers CRSSA. 2004. Mapping New Jersey's Vernal Pools.
www.crssa.rutgers.edu/projects/biodiv/biodiv.htm
State of NJ, OIT. 2003. NJ 2002 High Resolution Orthophotography.

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rank of most pine snake habitat polygons (preferred 1B and suitable 2, 3, and 4) is also dependent on adjacency to or isolation from other habitat polygons (NJDEP, ENSP, undated, www.state.nj/dep/fgw/pinesnak.htm).

The ENSP northern pine snake habitat model values certain upland cover types (Figure 4) including coniferous and mixed forest and brush/shrubland. As shown, much of the on-Site wooded uplands are ranked as primary (4220 – coniferous forest) land cover. Land use/land cover is from 1995/97 and does not reflect current conditions as a portion of this woodland has since been constructed upon.

Northern pine snakes are generally closely allied to sandy substrates in which to dig their dens. The ENSP model (Figure 5) regards various “sugar” sand units such as Lakehurst and Evesboro sand as primary soils types. Various other sand and loamy sands are considered secondary soils, including units where disturbance remains such as in borrow pits. According to the digital data derived from the Soil Conservation Service’s Soil Survey of Ocean County, published in 1980, much of the site along Route 9 is mapped with Lakehurst sands (LhA), a primary soil.

Figure 6 shows the pine snake habitat map with combined cover and soils data. Only the wooded edge of the Site is valued as preferred habitat. Other locally mapped preferred and suitable habitat is fragmented by various land uses, roads, wetlands, and waterways.

D. Natural Heritage Grid Map

Figure 7 presents Natural Heritage Grid Mapping for the site. As with the Natural Heritage Program response letter, the map indicates that two State-endangered plants, Pine Barrens boneset (*Eupatorium resinosum*) and New Jersey rush (*Juncus caesariensis*), and two rare plants with no State status, curly grass fern (*Schizaea pusilla*) and awned mountain-mint (*Pycnanthemum setosum*), occur within two grid cells that coincide with the Site. The former three species are associated with wetland habitat while awned mountain-mint occurs in dry fields and upland woods. In addition to the above species, a data sensitive species or ecological community with no identifying information occurs somewhere within the southern cell that overlaps a portion of the Site.

Figure 7 and the Natural Heritage Program response letter shows that the Forked River Natural Heritage Priority Site occurs northwest of the Site. Its boundary justification is based on the presence of several globally rare and State listed plant species.




Pine Snake Land Use/Land Cover

 Primary Vegetation

Code


- 4210 Coniferous Forest (10-50% Crown Closure)
- 4220 Coniferous Forest (>50% Crown Closure)
- 4311 Mixed Forest (>50% Coniferous with 10-50% Crown Closure)
- 4312 Mixed Forest (>50% Coniferous with >50% Crown Closure)

 Secondary Vegetation

Code

- 4321 Mixed Forest (>50% Deciduous with 10-50% Crown Closure)
- 4322 Mixed Forest (>50% Deciduous with >50% Crown Closure)
- 4430 Coniferous Brush/Shrubland
- 4440 Mixed Deciduous/Coniferous Brush/Shrubland

* According to ENSP methodology

 2006 Evaluation Area

 2004 Evaluation Area

0 1,000 2,000 3,000
Feet

FIGURE 4: PINE SNAKE LAND USE/LAND COVER*

Oyster Creek Generating Station
Township of Lacey
Ocean County, New Jersey

Sources:

NJDEP, OIRM, BGIS. 2001. 1995/97 Land Use/Land Cover, Series 1, Volume 5.
State of New Jersey, Office of Information Technology. 2003. New Jersey
2002 High Resolution Orthophotography

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Soils Boundaries

Pine Snake Soils

Primary Soils

Lakehurst
 Lakewood
 Evesboro Sands

Secondary Soils

Klej Sands
 Klej Loamy Sands
 Hammonton Loamy Sands
 Woodmansie Sands
 Abandoned Sand Mines

All Other Soils Tertiary

* According to ENSP methodology

2006 Evaluation Area

2004 Evaluation Area

0 1,000 2,000 3,000 Feet

FIGURE 5: PINE SNAKE SOILS*

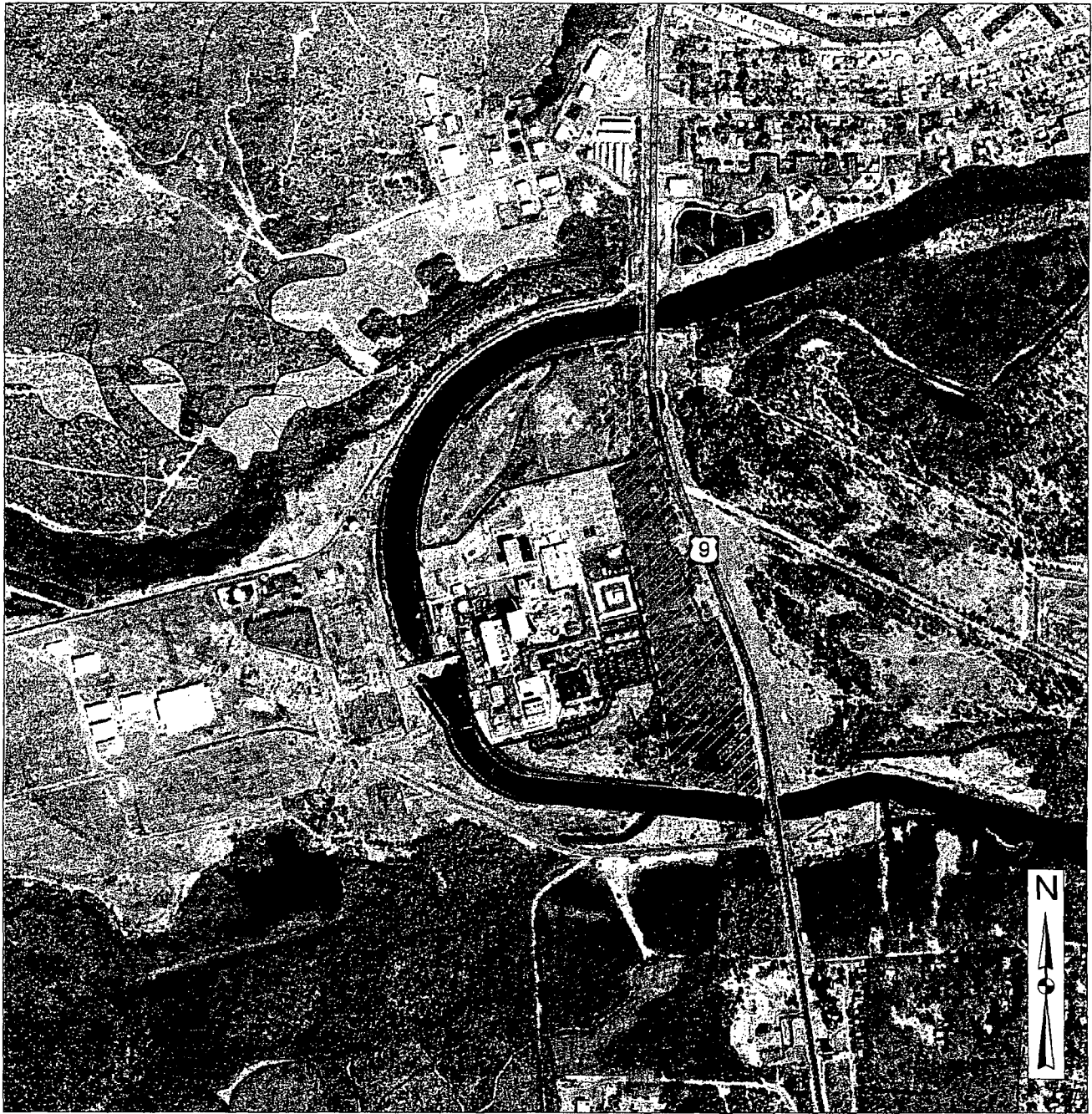
Oyster Creek Generating Station
 Township of Lacey
 Ocean County, New Jersey

Sources:
 NJDEP, OIRM, BGIS. 1996. GIS Resource Data, Series 1, Volume 2.
 State of New Jersey, Office of Information Technology. 2003. New Jersey
 2002 High Resolution Orthophotography

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
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0 1,000 2,000 3,000 Feet

Pine Snake Habitat

-  1-A Preferred Habitat: Primary Cover, Primary Soils
-  1-B Preferred Habitat: Primary Cover, Secondary Soils (adjacent to 1-A)
-  2 Suitable Habitat: Primary Cover, Secondary Soils (isolated from 1-A)
-  3 Suitable Habitat: Secondary Cover, Primary Soils (adjacent to 1-A/1-B)
-  4 Suitable Habitat: Primary Cover, Tertiary Soils (adjacent to 1-A/1B)

* According to ENSP methodology



-  2006 Evaluation Area
-  2004 Evaluation Area

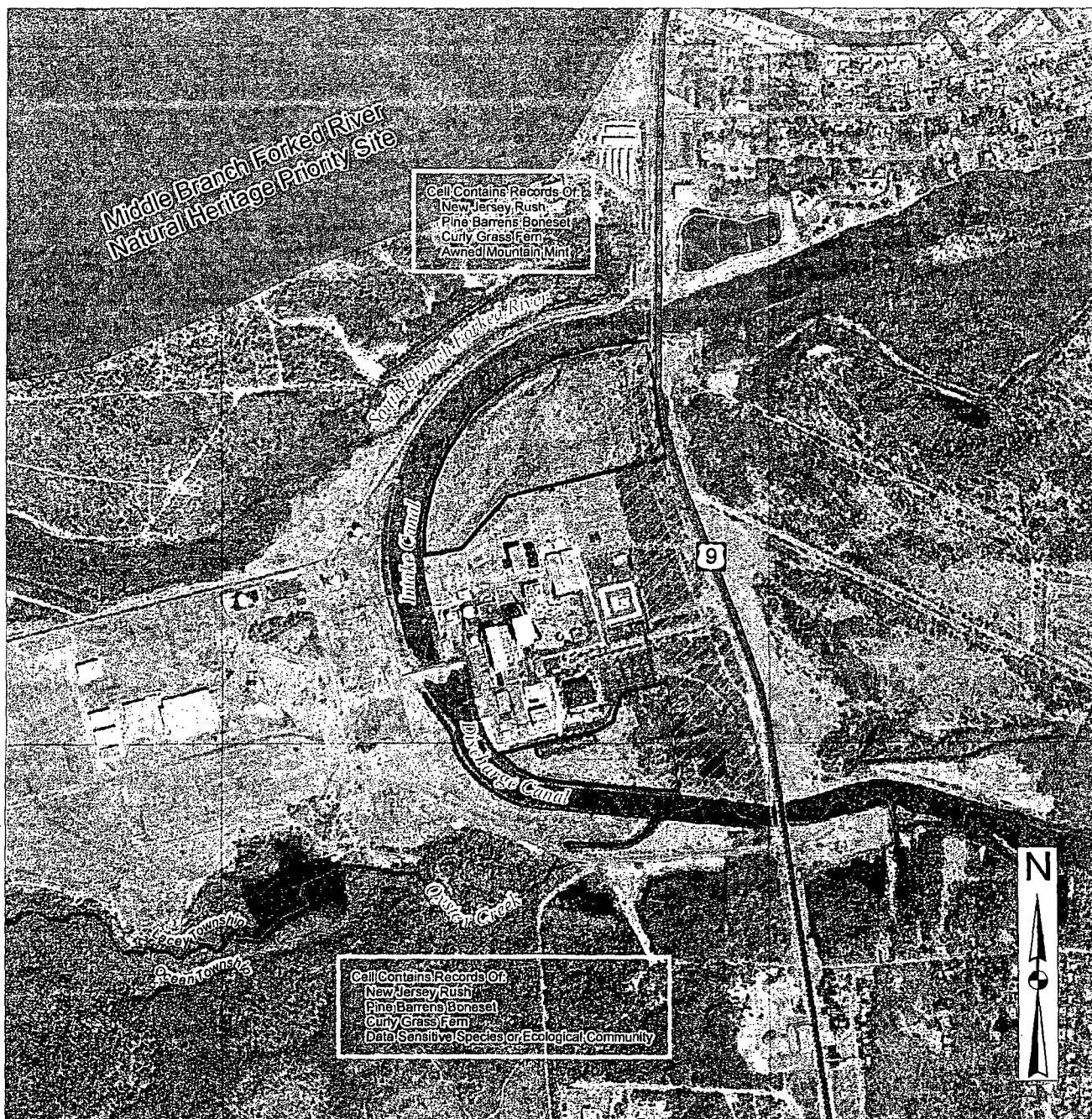
FIGURE 6: PINE SNAKE HABITAT*

Oyster Creek Generating Station
Township of Lacey
Ocean County, New Jersey

Sources:
NJDEP, OIRM, BGIS. 1996. GIS Resource Data, Series 1, Volume 2.
NJDEP, OIRM, BGIS. 2001. 1995/97 Land Use/Land Cover, Series 1, Volume 5.
State of New Jersey, Office of Information Technology. 2003. New Jersey
2002 High Resolution Orthophotography

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Natural Heritage Grid Map

February 2004 Version

**Generalized Locations of Rare Plant Species
and Ecological Communities**

- S - Documented Location Known Precisely
- M - Documented Location Known Within 1.5 Miles
- Both - Both 'M' and 'S' Occurrences
- None

- 2006 Evaluation Area
- 2004 Evaluation Area

0 1,000 2,000 3,000
Feet

FIGURE 7: NATURAL HERITAGE GRID MAP

**Oyster Creek Generating Station
Township of Lacey
Ocean County, New Jersey**

Sources:
NJDEP, ONLM. 2004. Natural Heritage Grid Map.
State of New Jersey, OIT. 2003. New Jersey 2002 High Resolution Orthophotography.

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E. Field Investigation

The field investigations conducted in 2004 and 2006 were used to gather information regarding on-site conditions and the surrounding character of the area and to field verify conditions presented in the various referenced mapping utilities. Undeveloped portions of the site are characterized by a mix of field, shrubland, pine-oak woodland, and emergent, scrub/shrub, and forested wetlands.

A majority of the land area north and south of the generating station consists of successional field/shrubland habitat. The entire community is suggestive of a disturbed habitat as the sand and loamy sand that characterizes this area is most likely fill material. Most of this area is covered with several grass species of variable height. Several trees dot the landscape including willow, gray birch, eastern red cedar, and pitch pine. Shrubs and vines such as bayberry, sweetfern, and dewberry occur as individuals or scattered clumps. Two sub-shrubs, golden heather and beach heather, occur in drier, sandier, more barren areas. Herbs that inhabit this community include phragmites, path rush, joe-pye-weed, bush clover, field garlic, common milkweed, thistle, Deptford pink, Venus' looking-glass, hop clover, white clover, yellow sweet clover, rabbit's foot clover, English plantain, aster, yarrow, sandwort, and hawkweed.

A rip-rap channel goes from southwest to northeast across the northern portion of successional field/shrubland habitat towards the intake canal. The rip-rap channel is generally dry and unvegetated for most of its length, but has standing water as it approaches a long linear wetland located parallel to the intake canal. This wetland apparently is directly connected to the intake canal via a 4-foot diameter pipe. The linear wetland consists of open water heavily bordered by phragmites as well as red maple, sweet gum, bayberry, sweet pepperbush, and Japanese knotweed.

Pitch pine is particularly prevalent within upland woodland portions of the area near Route 9, growing densely especially to the north. Other fairly common trees within this community include black cherry, sassafras, post oak, black oak, and eastern red cedar. Scrub oak, black huckleberry, lowbush blueberry, Virginia creeper, greenbrier, and saplings of the above-mentioned trees are all fairly common to common in the understory. According to the Ocean County Soil Survey, as prepared by the USDA Soil Conservation Service (SCS, 1980), soils within this community consist of Lakehurst sands.

The combination of a coniferous canopy and sandy soils in other circumstances may be indicative of possible pine snake habitat as evidenced by habitat mapping. However, it is likely that the steep-sided banks, width and water of the canal surrounding much of the generating station in

combination with US Route 9 would act as significant barriers to terrestrial species such as northern pine snake and wood turtle that may inhabit extensive territories. Cooper's hawk inhabits a wide variety of woodland types and is somewhat tolerant of human disturbance and forest fragmentation. No raptor nests were found during the site visits and the dense canopy and other human-influenced factors also likely combine to preclude the use of the woodland as Cooper's hawk habitat.

Potential Pine Barrens treefrog habitat observed in 2004 consists of an area of emergent/scrub-shrub and forested wetlands near the southeastern corner of the Site. Arrow arum, marsh fern, phragmites, spatulate-leaved sundew, sphagnum moss, water-lily and occasionally highbush blueberry are found in more open portions of the area. Atlantic white cedar, red maple, highbush blueberry, bayberry, sweet pepperbush, and inkberry line the edges. The southwestern portion of the wetland consists of numerous standing or fallen dead trees and is densely vegetated with various herbaceous species. Sweetbay magnolia is currently the only tree that marginally tolerates the saturated conditions. Swamp loosestrife is abundant and other common plants in this particular part of the wetland include marsh St. John's-wort, spotted joe-pye weed, bur-reed, bushy beardgrass, spike-rush, wool-grass, marsh fern, sweet flag, arrow arum, Canada rush, cranberry, and sphagnum moss. The eastern quarter of the wetland consists of open water that discharges intermittently to the southeast via a narrow channel, eventually emptying into the discharge canal, located approximately 200 feet south of the wetland.

The on-site forested wetlands are far too small for barred owl, which requires extensive, relatively undisturbed forested and forested wetland areas for breeding and foraging. The emergent/scrub-shrub portion of the wetlands, though, during the initial April 28, 2004 visit appeared to provide suitable Pine Barrens treefrog habitat and nearby Natural Heritage and Landscape Project records further supported this possibility.

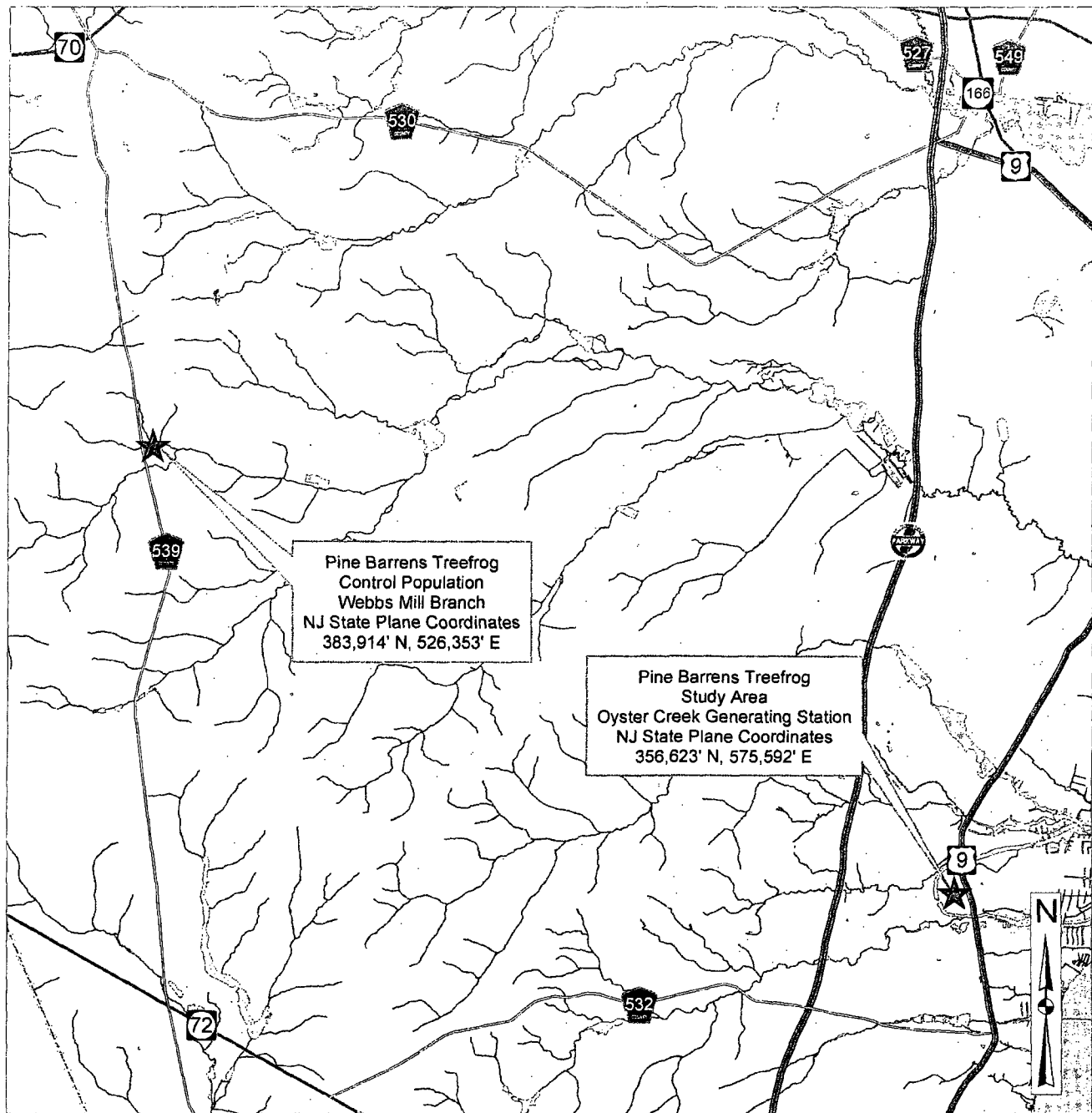
Although no impacts to on-site wetlands were proposed as part of the planned security upgrades in 2004, the presence of Pine Barrens treefrog could have affected the proposed activities in the adjacent pine-oak woodland. No Pine Barrens treefrogs were encountered during the preliminary site inspection on April 28, 2004, but the presence of Pine Barrens treefrog could only be determined through an active survey at the appropriate season.

Surveys for Pine Barrens treefrog were conducted on the evenings of June 15, 22, and 30, 2004 during the peak calling period for this species. Active listening, as well as the use of a taped call of Pine Barrens treefrog, were employed at several locations around the perimeter of the emergent/scrub-shrub wetlands. Appropriate survey conditions have been suggested by the NJDEP to be warm, (70 °F+), humid or rainy nights in May and June. As a result, sampling of the wetland

was conducted between 8:30 and 10:00 in the evening with temperatures ranging from 73.1 to 80.6 °F, humidity from 66 to 84 percent, wind speeds less than 10 miles per hour, and on the former two dates, during occasional showers.

In addition, a control population of Pine Barrens treefrogs was visited immediately following each sampling evening to determine conditions were appropriate for survey. The control population chosen for this survey is located in an emergent/scrub-shrub wetland south of Webbs Mill Branch, near milepost 20 on County Route 539 within Greenwood Forest Wildlife Management Area, Lacey Township (Figure 8). Oyster Creek Generating Station is located approximately 11 miles southeast of the control population.

Pine Barrens treefrogs were not found on any of the three survey nights at the Oyster Creek Generating Station. Green frogs were heard from this wetland on each sampling date while bullfrog was identified by call on June 22, 2004 only. In contrast, at the control site near Webbs Mill Branch, numerous Pine Barrens treefrogs were heard spontaneously calling on each sampling evening. Green frog and carpenter frog were also heard at the control site. Based on the appropriate weather conditions, the lack of a response at the study area, and results at the control site on the same evenings, it can be concluded that Pine Barrens treefrog does not inhabit this area.



0 1 2 3 4 Miles

FIGURE 8: PINE BARRENS TREEFROG CONTROL SITE

Relative Locations of Control Site,
Webbs Mill Branch, County Route 539
and
Study Area,
Oyster Creek Generating Station
both Township of Lacey
Ocean County, New Jersey

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Date: 6/23/06
F:\Jobs\04\EN04-086\GIS\06_projects
control_site.mxd

IV. CONCLUSION

- In both 2004 and 2006, EcolSciences conducted a habitat evaluation for threatened and endangered species on undeveloped portions of the Oyster Creek Generating Station property bounded by US Route 9 and the canal. The 2004 study was prompted by planned National Security upgrades, since constructed, around the generating station that necessitated a review of possible impacts to potential threatened and endangered species habitat in undeveloped portions of the facility. The 2006 study focused on all remaining undeveloped areas on the Site.
- According to the Natural Heritage Database and Landscape Project (Version 2.0) mapping as interpreted by the NJDEP Natural Heritage Program, the State-threatened Pine Barrens treefrog, northern pine snake, wood turtle, barred owl, and Cooper's hawk have been identified as occurring on the site. A review of Landscape Project 2.0 mapping by EcolSciences revealed, however, that only one record of northern pine snake occurs within the area of interest. Based on surrounding land use and existing land cover, EcolSciences determined during the initial site visit on April 28, 2004 that the area of interest is not critical habitat for any of the above species with the possible exception of Pine Barrens treefrog.
- Pine snake habitat mapping prepared for the site following ENSP draft protocol indicates the majority of the area of interest is mapped as preferred habitat. Undeveloped upland habitat within the area of interest, though, is too small in extent to support a sustainable population of northern pine snake. In addition, the area of interest is essentially geographically isolated for terrestrial creatures requiring large territories such as pine snake or wood turtle due to barriers such as the canal and US Route 9.
- Vernal habitat mapping provided by Rutgers' Center for Remote Sensing and Spatial Analysis indicates a single on-site vernal pool that has not been surveyed. This pool coincides with an area that, during the 2004 field investigation, was determined to be potential habitat for Pine Barrens treefrog. Although no activities have been proposed in this area, presence of Pine Barrens treefrog may affect adjacent upland habitat, including the area of a proposed parking lot expansion, since constructed. A survey for Pine Barrens treefrog was therefore necessary.
- EcolSciences conducted a Pine Barrens treefrog survey within the wetlands just north of the discharge canal on the evenings of June 15, 22, and 30 during the height of the calling period for this species. A control site was utilized to confirm conditions were appropriate for sampling on each evening. No Pine Barrens treefrogs were seen or heard at the study area but were spontaneously calling at the control site on the same evenings.
- The habitat evaluation conducted by EcolSciences in 2004 and 2006 indicates that no further investigation for threatened and endangered species is warranted for this Site.

V. REFERENCES

- New Jersey Department of Environmental Protection (NJDEP). 2004.** Protocols for the establishment of exceptional resource value wetlands pursuant to the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 *et seq.*) based on documentation of state or federal endangered or threatened species.
- NJDEP, Division of Fish and Wildlife (DFW), Endangered and Nongame Species Program (ENSP), 2004.** New Jersey's Landscape Project, Version 2.0.
- NJDEP, DFW, ENSP. 2003.** Northern Pine Snake Habitat Enhancement. New Jersey Division of Fish and Wildlife website. www.state.nj.us/dep/fgw/pinesnak.htm
- NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). 1996.** GIS Resource Data, Series 1, Volume 2.
- NJDEP, OIRM, BGIS. 2001.** 1995/97 Land Use/Land Cover, Series 1, Volume 5.
- NJDEP, Office of Natural Lands Management (ONLM). 2004.** NJDEP Natural Heritage Grid Map.
- NJDEP and Rutgers Center of Remote Sensing and Spatial Analysis. 2004.** Mapping New Jersey's Vernal Pools. www.crssa.rutgers.edu/projects/biodiv/biodiv.htm
- Niles, L.J., M. Valent, P. Winkler and P. Woerner. 2004.** New Jersey's Landscape Project, Version 2.0: New Jersey Department of Environmental Protection, New Jersey Division of Fish and Wildlife, Endangered and Nongame Species Program.
- Robichaud, B., and M. F. Buell. 1973.** Vegetation of New Jersey: A Study of Landscape Diversity. Rutgers University Press, New Brunswick, New Jersey.
- State of New Jersey, Office of Information Technology. 2003.** New Jersey 2002 High Resolution Orthophotography.
- United States Department of Agriculture, Natural Resource Conservation Service. 2001.** Digital Raster Graph Mosaic of Ocean County, New Jersey.
- United States Soil Conservation Service (SCS). 1980.** Soil Survey of Ocean County.

ATTACHMENT A

Natural Heritage Program Letter

EcolSciences, Inc.

Environmental Management & Regulatory Compliance



State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

RON S. CORZINE
Governor

Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

LISA P. JACKSON
Commissioner

July 12, 2006

RECEIVED

JUL 17 2006

ECOLSCIENCES, INC.

Daniel Brill
EcolSciences, Inc.
75 Fleetwood Drive, Suite 250
Rockaway, NJ 07866

Re: HW05-187, Oyster Creek Generating Station

Dear Mr. Brill:

Thank you for your data request regarding rare species information for the above referenced project site in Lacey Township, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 2) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
northern pine snake	<i>Pituophis m. melanoleucus</i>		T	G4T4	S3
wood turtle	<i>Clemmys insculpta</i>		T	G4	S3

We have also checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat within 1/4 mile of the referenced site. Please see Table 2 for species list and conservation status. This table excludes any species listed in Table 1.

Table 2 (additional species within 1/4 mile of referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
barred owl	<i>Strix varia</i>		T/T	G5	S3B
black skimmer foraging area	<i>Rynchops niger</i>		E	G5	S1B
black-crowned night-heron foraging habitat	<i>Nycticorax nycticorax</i>		T/S	G5	S3B,S4N
colonial waterbird foraging habitat					
Cooper's hawk	<i>Accipiter cooperii</i>		T/T	G5	S3B,S4N
dotted skipper	<i>Hesperia attalus slossonae</i>		Special Concern	G3G4T3	S2S3
eastern box turtle	<i>Terrapene carolina</i>		Special Concern	G5	S5B
Fowler's toad	<i>Bufo woodhousii fowleri</i>		Special Concern	G5	S4
pine barrens treefrog	<i>Hyla andersonii</i>		T	G4	S3
spotted turtle	<i>Clemmys guttata</i>		Special Concern	G5	S4
tern species foraging habitat					

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database has records for occurrences of *Eupatorium resinosum*, *Pycnanthemum setosum*, *Juncus caesariensis* and *Schizaea pusilla* that may be in the immediate vicinity of the site. The attached list provides more information about these occurrences. Because some species are sensitive to disturbance or sought by collectors, this

information is provided to you on the condition that no specific locational data are released to the general public. This is not intended to preclude your submission of this information to regulatory agencies from which you are seeking permits.

Also attached is a list of rare species and ecological communities that have been documented from Ocean County. If suitable habitat is present at the project site, these species have potential to be present.

Status and rank codes used in the tables and lists are defined in the attached EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. One of these sites is located within or near the areas you have outlined. Please refer to the enclosed Natural Heritage Priority Site Map for the location and boundary of this site. On the back of each Priority Site Map is a report describing the significance of the site.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, <http://www.state.nj.us/dep/gis/depsplash.htm> or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
Lawrence Niles
NHP File No. 06-3907472

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program in order to map critical habitat for rare animal species. Natural Heritage Database response letters will also list all species (if any) found during a search of the Landscape Project. However, this office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.



NJ Department of Environmental Protection
Division of Parks and Forestry

Natural Lands Management

July 11, 2006

Page: 1

Immediate Vicinity of Project Site
Based on Search of Natural Heritage Database
Rare Plant Species and Ecological Communities Currently Recorded in
the New Jersey Natural Heritage Database

Scientific Name	Common Name	Federal Status	State Status	Regional Status	G Rank	S Rank	Last Obs	Ident	Location
Vascular Plant									
<i>Eupatorium resinosum</i>	Pine Barren Boneset		E	LP, HL	G3	S2	1993-08-??	Y	East side of Route 9 just north of Bay Parkway. In recovering cranberry bog on south bank of Oyster Creek.
<i>Juncus caesariensis</i>	New Jersey Rush		E	LP, HL	G2	S2	1922-09-??	Y	OYSTER CREEK ALONG TUCKERTON RR, NW [OF] WARETOWN.
<i>Pycnanthemum setosum</i>	Awned Mountain-mint			HL	G3?	S3	1993-??-??	Y	East side of Route 9, just north of Bay Parkway, south of Oyster Creek.
<i>Schizaea pusilla</i>	Curly Grass Fern			LP, HL	G3	S3	1915-07-10	Y	BY OYSTER CREEK NW ALONG TUCKERTON RR FROM WARETOWN.

4 Records Selected

Frequently Asked Questions About Natural Heritage Priority Sites

What are Natural Heritage Priority Sites?

Through its Natural Heritage Database, the Office of Natural Lands Management (ONLM) identifies critically important areas to conserve New Jersey's biological diversity. The database provides detailed information on rare species and ecological communities to planners, developers, and conservation agencies for use in resource management, environmental impact assessment, and both public and private land protection efforts.

Using the database, ONLM has identified 414 Natural Heritage Priority Sites, representing some of the best remaining habitat for rare species and exemplary ecological communities in the state. The DEP Endangered and Nongame Species Program provided key information and assisted with the delineation of a number of the sites. These areas should be considered to be top priorities for the preservation of biological diversity in New Jersey. If these sites become degraded or destroyed, we may lose some of the unique components of our natural heritage.

How are Natural Heritage Priority Site maps used in conservation of biological diversity?

Natural Heritage Priority Site maps are used by individuals and agencies concerned with the protection and management of land. The maps have been used by municipalities preparing natural resource inventories; public and private conservation organizations preparing open space acquisition goals; land developers and consultants identifying environmentally sensitive lands; and public and private landowners developing land management plans.

Natural Heritage Priority Sites contain some of the best and most viable occurrences of endangered and threatened species and ecological communities, but they do not cover all known habitat for endangered and threatened species in New Jersey. If information is needed on whether or not endangered or threatened species have been documented from a particular piece of land, a Natural Heritage Database search can be requested by contacting the Office of Natural Lands Management at the address below.

What do the boundaries of the sites contain?

The boundaries of each Natural Heritage Priority Site are drawn to encompass critical habitat for rare species or ecological communities. Often the boundaries extend to include additional buffer lands that should be managed to protect the habitat. A justification for the boundary is provided for each site. The term "primary bounds" is sometimes used to refer to boundaries enclosing critical habitat. The term "secondary bounds" is sometimes used

to refer to boundaries enclosing additional buffer. In maps where both primary and secondary boundaries are described, only the outermost boundary is provided in the mapping.

What is the background map that the sites are drawn upon?

The sites are portrayed on background maps produced from a digital copy of the U.S. Geological Survey 7.5 minute topographic maps. The background maps contain topographic lines as well as streams, lakes, roads, towns and place names. These background maps do not always reflect recent changes in land development. Some may be more than 20 years old. Some sites appear to be shifted in position against this topo map. This shift is due to the fact that most sites have been digitized using rectified aerial photography, and some of the digitized USGS topo maps do not align with this photography.

What do "public lands" depict on the maps?

The "public lands" shaded on these maps are state-owned open space lands that have been digitized as a GIS coverage by the state Green Acres Program. This information is provided to show patterns of State land ownership in the vicinity of the Priority Site. The public lands are areas such as State Parks and Forests, Wildlife Management Areas, and Natural Lands Trust preserves. They do not currently include lands owned by other state agencies, federal, county or municipal governments or nonprofit conservation organizations. This GIS coverage is constantly being updated, and therefore future editions of the maps will likely contain additional public lands that are not currently mapped as such.

What is the biodiversity significance rank and how is it used?

Each site is ranked according to its significance for biological diversity using a scale developed by The Nature Conservancy, the network of Natural Heritage Programs, and the New Jersey Natural Heritage Program. The ranks can be used to distinguish between sites that are of global significance for conservation of biological diversity vs. those that are of state significance. The global biodiversity significance ranks range from B1 to B5. In some cases the global biodiversity significance rank is then combined with a state biodiversity significance rank which provides information about the significance of the site on a state level. The state biodiversity significance rank ranges from V1 to V5. The specific definitions for each rank are as follows:

B1 - Outstanding significance on a global level, generally the "last of the least" in the world, such as the only known occurrence of any element (species or ecological community),

the best or an excellent occurrence of an element ranked critically imperiled globally, or a concentration (4+) of good or excellent occurrences of elements that are imperiled or critically imperiled globally. The site should be viable and defensible for the elements or ecological processes contained.

B2 - Very high significance on a global level, such as the most outstanding occurrence of any ecological community. Also includes areas containing other occurrences of elements that are critically imperiled globally, a good or excellent occurrence of an element that is imperiled globally, an excellent occurrence of an element that is rare globally, or a concentration (4+) of good occurrences of globally rare elements or viable occurrences of globally imperiled elements.

B3 - High significance on a global level, such as any other viable occurrence of an element that is globally imperiled, a good occurrence of a globally rare element, an excellent occurrence of any ecological community, or a concentration (4+) of good or excellent occurrences of elements that are critically imperiled in the State.

B4 - Moderate significance on a global level, such as a viable occurrence of a globally rare element, a good occurrence of any ecological community, a good or excellent occurrence or only viable state occurrence of an element that is critically imperiled in the State, an excellent occurrence of an element that is imperiled in the State, or a concentration (4+) of good occurrences of elements that are imperiled in the State or excellent occurrences of elements that are rare in the State.

B5 - Of general biodiversity interest on a global level.

V1 - Outstanding significance on a state level. Only known occurrence in the state for an element or Site with an excellent occurrence or the best occurrence in the state for an element ranked critically imperiled in the state or a concentration (4+) of good or excellent occurrences of elements that are imperiled or critically imperiled in the state.

V2 - Very high significance on a state level. Includes sites containing other occurrences of elements that are critically imperiled in the state or a concentration (4+) of other occurrences of state imperiled elements and/or good or excellent occurrences of state rare elements.

V3 - High significance on a state level. Includes sites containing the best occurrence in the state or an excellent occurrence of a state imperiled element or multiple (2+) other occurrences for state imperiled elements and/or excellent, good or moderate quality occurrences of state rare elements.

V4 - Moderate significance on a state level. Includes sites containing the best occurrence in the state or an excellent occurrence of a state rare element or any site with other occurrences of a state imperiled element or multiple (2+) other occurrences of state rare elements.

V5 - Any site with any other occurrence of a state rare element.

Note: All sites have been assigned a global biodiversity significance rank (B rank), but not all sites have been assigned a state biodiversity rank (V rank).

How can I obtain Natural Heritage Priority Site maps for an area of interest to me?

Natural Heritage Priority Site hard copy maps can be obtained by submitting a written request accompanied by a check or money order made payable to the Office of Natural Lands Management at the following address:

Office of Natural Lands Management
P.O. Box 404
Trenton, NJ 08625-0404
Phone: 609-984-1339; Fax: 609-984-1427

Individual 8.5" X 11" maps are available at the following rate:

1 - 10 site maps & reports:	\$1.50/site
11 - 20 site maps & reports:	\$1.00/site
> 20 sites:	\$0.50/site

How often are the maps updated?

The Natural Heritage Priority Site information is constantly being updated in the Natural Heritage Database. A new edition of the maps will be made available after significant revisions or additions to the Database.

April 5, 2006



NJ Department of Environmental Protection
Division of Parks and Forestry

Natural Lands Management

Natural Heritage Priority Site Middle Branch Forked River

Locational Information

Quad Name: Forked River
County: Ocean
Municipality: Lacey Twp

Description of Site

Open wetlands adjacent to pine barren stream through Atlantic white cedar swamp.

Boundary Justification

Boundaries include wetland habitat for rare plant species plus undeveloped uplands in the drainage basin east of the Garden State Parkway. With additional field work, bounds may be expanded upstream west of the Parkway.

Biodiversity Rank **B2**

Several globally rare and State listed plant species.



EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

- LE Taxa formally listed as endangered.
- LT Taxa formally listed as threatened.
- PE Taxa already proposed to be formally listed as endangered.
- PT Taxa already proposed to be formally listed as threatened.
- C Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
- S/A Similarity of appearance species.

STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

- D Declining species—a species which has exhibited a continued decline in population numbers over the years.
- E Endangered species—an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors – a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
- EX Extirpated species—a species that formerly occurred in New Jersey, but is not now known to exist within the state.
- I Introduced species—a species not native to New Jersey that could not have established itself here without the assistance of man.
- INC Increasing species—a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
- T Threatened species—a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
- P Peripheral species—a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
- S Stable species—a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
- U Undetermined species—a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a dual status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

Special Concern applies to animal species that warrant special attention because of some evidence of decline, inherent vulnerability to environmental deterioration, or habitat modification that would result in their becoming a Threatened species. This category would also be applied to species that meet the foregoing criteria and for which there is little understanding of their current population status in the state.

Plant taxa listed as endangered are from New Jersey's official Endangered Plant Species List N.J.S.A. 131B-15.151 et seq.

E Native New Jersey plant species whose survival in the State or nation is in jeopardy.

REGIONAL STATUS CODES FOR PLANTS AND ECOLOGICAL COMMUNITIES

- LP Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan.
- HL Indicates taxa or ecological communities protected by the Highlands Water Protection and Planning Act within the jurisdiction of the Highlands Preservation Area.

EXPLANATION OF GLOBAL AND STATE ELEMENT RANKS

The Nature Conservancy has developed a ranking system for use in identifying elements (rare species and natural communities) of natural diversity most endangered with extinction. Each element is ranked according to its global, national, and state (or subnational in other countries) rarity. These ranks are used to prioritize conservation work so that the most endangered elements receive attention first. Definitions for element ranks are after The Nature Conservancy 1982: Chapter 4, 4.1-1 through 4.4.1.3-3).

GLOBAL ELEMENT RANKS

- G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
- G2 Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
- G3 Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; with the number of occurrences in the range of 21 to 100.
- G4 Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.
- G5 Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.
- GH Of historical occurrence throughout its range i.e., formerly part of the established biota, with the expectation that it may be rediscovered.
- GU Possibly in peril range-wide but status uncertain; more information needed.
- GX Believed to be extinct throughout range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.
- G? Species has not yet been ranked.
- GNR Species has not yet been ranked.

STATE ELEMENT RANKS

- S1 Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.
- S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.
- S3 Rare in state with 21 to 100 occurrences (plant species and ecological communities in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.
- S4 Apparently secure in state, with many occurrences.
- S5 Demonstrably secure in state and essentially ineradicable under present conditions.
- SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.
- SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).
- SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.
- SP Element has potential to occur in New Jersey, but no occurrences have been reported.
- SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.
- SRF Elements erroneously reported from New Jersey, but this error persists in the literature.
- SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.
- SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.
- SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.

SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined.

Typically, the SZ rank applies to a non-breeding population (N) in the state – for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ will only apply when the migrants occur in an irregular, transitory and dispersed manner.

B Refers to the breeding population of the element in the state.

N Refers to the non-breeding population of the element in the state.

T Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species. For example *Stachys palustris* var. *homotricha* is ranked "G5T? SH" meaning the full species is globally secure but the global rarity of the var. *homotricha* has not been determined; in New Jersey the variety is ranked historic.

Q Elements containing a "Q" in the global portion of its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level.

.1 Elements documented from a single location.

Note: To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).

IDENTIFICATION CODES

These codes refer to whether the identification of the species or community has been checked by a reliable individual and is indicative of significant habitat.

Y Identification has been verified and is indicative of significant habitat.

BLANK Identification has not been verified but there is no reason to believe it is not indicative of significant habitat.

? Either it has not been determined if the record is indicative of significant habitat or the identification of the species or community may be confusing or disputed.

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** Vertebrates

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B, S4N
AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER		E		G5T5	S2
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
ARDEA HERODIAS	GREAT BLUE HERON		S/S		G5	S2B, S4N
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1B
BOTAURUS LENTIGINOSUS	AMERICAN BITTERN		E/S		G4	S2B
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5	S1B, S2N
CALIDRIS CANUTUS	RED KNOT		T		G5	S3N
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B
CIRCUS CYANEUS	NORTHERN HARRIER		E/U		G5	S1B, S3N
CISTOTHORUS PLATENSIS	SEdge WREN		E		G5	S1B
CLEMMYS INSCULPTA	WOOD TURTLE		T		G4	S3
CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E		G3	S2
CROTALUS HORRIDUS HORRIDUS	TIMBER RATTLESNAKE		E		G4T4	S2
EGRETta CAERULEA	LITTLE BLUE HERON		S/S		G5	S2B
EGRETta THULA	SNOWY EGRET		S/S		G5	S3B, S4N
EGRETta TRICOLOR	TRICOLORed HERON		INC/S		G5	S3B
ELAPHE GUTTATA GUTTATA	CORN SNAKE		E		G5T5	S1
EUMECES FASCIATUS	FIVE-LINED SKINK		U		G5	S3
FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B, S7N
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E		G4	S1B, S2N
HYLA ANDERSONII	PINE BARRENS TREEFROG		T		G4	S3
HYLA CHRYSOSCELIS	COPE'S GRAY TREEFROG		E		G5	S2
IXOBRYCHUS EXILIS	LEAST BITTERN		D/S		G5	S3B
LAMPROPELTIS GETULA GETULA	EASTERN KING SNAKE		U		G5T5	S3
LATERALLUS JAMAICENSIS	BLACK RAIL		T/T		G4	S2B
LYNX RUFUS	BOBCAT		E		G5	S3
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B, S2N
NYCTANASSA VIOLACEA	YELLOW-CROWNED NIGHT-HERON		T/T		G5	S2B

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT-HERON		T/S		G5	S3B, S4N
PANDION HALIAETUS	OSPREY		T/T		G5	S2B
PITUOPHIS MELANOLEUCUS	NORTHERN PINE SNAKE		T		G4T4	S3
MELANOLEUCUS						
PLEGADIS FALCINELLUS	GLOSSY IBIS		D/S		G5	S3B, S4N
PODILYMBUS PODICEPS	PIED-BILLED GREBE		E/S		G5	S1B, S3N
POECETES GRAMINEUS	VESPER SPARROW		E		G5	S1B, S2N
RYNCHOPS NIGER	BLACK SKIMMER		E		G5	S1B
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B
STERNA DOUGALLII DOUGALLII	ROSEATE TERN	LE	E		G4T3	SHB
STERNA HIRUNDO	COMMON TERN		D/S		G5	S3B
STERNA NILOTICA	GULL-BILLED TERN		S		G5	S1B
STRIX VARIA	BARRED OWL		T/T		G5	S3B
SYNAPTOMYS COOPERI	SOUTHERN BOG LEMMING		U		G5	S2
*** Ecosystems						
CAREX STRIATA VAR BREVIS	WALTER'S SEDGE COASTAL PLAIN				G7	S1S3
HERBACEOUS VEGETATION	INTERMITTENT POND HERBACEOUS VEGETATION					
COASTAL DUNE SHRUBLAND	COASTAL DUNE SHRUBLAND				G4	S2?
COASTAL DUNE WOODLAND	COASTAL DUNE WOODLAND				G2G3	S1
DRY OAK-PINE FOREST	DRY OAK-PINE FOREST				G4G5	S4?
DWARF PINUS RIGIDA-QUERCUS (MARILANDICA, ILICIFOLIA)/COREMA CONRADII SHRUBLAND	PINE PLAINS (PP4/5)				G1	S1

*** Invertebrates

BARRENS DAGGER MOTH

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
ELEOCHARIS (OLIVACEA, MICROCARPA, ROBBINSII) - XYRIS (DIFFORMIS VAR DIFFORMIS, SMALLIANA) HERBACEOUS VEGETATION	SPIKERUSH (SMALLFRUIT, BRIGHT GREEN, ROBBIN'S) - YELLOWEYED GRASS (BOG, SMALL'S) COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2	S2
MARINE INTERTIDAL GRAVEL/SAND BEACH COMMUNITY	MARINE INTERTIDAL GRAVEL/SAND BEACH COMMUNITY				GU	SU
PANICUM RIGIDULUM VAR PUBESCENS - DICHANTHELIUM SP / SPHAGNUM SPP HERBACEOUS VEGETATION	REITOP PANICGRASS - ROSETTE GRASS / SPHAGNUM MOSS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2	S2
PINUS RIGIDA SATURATED WOODLAND ALLIANCE	PITCH PINE LOWLANDS (UNDIFFERENTIATED)				G3	S3
PINUS RIGIDA-(P. ECHINATA)-QUERCUS SPP./QUERCUS (MARILANDICA, ILICIFOLIA) WOODLAND	PINE-OAK-SHRUB OAK WOODLAND (POW)				G3	S3
PINUS RIGIDA-CALAMOVILFA BREVIPILIS SAVANNA	PITCH PINE-PINELANDS REEDGRASS SAVANNA				G1	S1
PINUS RIGIDA/QUERCUS (MARILANDICA, ILICIFOLIA)/PYXIDANTHERA BARBULATA WOODLAND	PITCH PINE-SHRUB OAK BARRENS (PB4/5)				G2	S2
RHEXIA VIRGINICA - PANICUM VERRUCOSUM HERBACEOUS VEGETATION	VIRGINIA MEADOW-BEAUTY - WARTY PANICGRASS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2G3	S1S3
ACRONICTA ALBARUFA	BARRENS DAGGER MOTH				G3G4	SU

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
AESHNA CLEPSYDRA	MOTTLED DARNER				G4	S2S3
AGROTIS BUCHHOLZI	BUCHHOLZ'S DART MOTH				G2	S2
AMBLYSCIRTES VIALIS	COMMON ROADSIDE SKIPPER				G5	S2S3
ANAX LONGIPES	COMET DARNER				G5	S2S3
APHARETRA DENTATA	A NOCTUID MOTH				G4	S2S3
ATRYTONE AROGOS AROGOS	AROGOS SKIPPER		E		G3G4T1T2	S1
BOLORIA SELENE MYRINA	A SILVER-BORDERED FRITILLARY		T		G5T5	S2
CALLOPHRYS HENRICI	HENRY'S ELFIN				G5	S3S4
CALLOPHRYS HESSELI	HESSEL'S HAIRSTREAK				G3G4	S3S4
CALLOPHRYS IRUS	FROSTED ELFIN		T		G3	S2S3
CALLOPHRYS POLIOS	HOARY ELFIN				G5	S3
CALLOPISTRIA GRANITOSA	GRANITOSA FERN MOTH				G4G5	S2S3
CATOCALA HERODIAS GERHARDI	HERODIAS OR PINE BARRENS UNDERWING				G3T3	S3
CATOCALA JAIR SSP 2	JERSEY JAIR UNDERWING				G4T4	S3
CELITHEMIS MARTHA	MARTHA'S PENNANT				G4	S3S4
CICINDELA DORSALIS DORSALIS	NORTHEASTERN BEACH TIGER BEETLE	LT	E		G4T2	S1
CICINDELA PATRUELA	A TIGER BEETLE				G3T2T3	S2S3
CONSENTANEA						
CRAMBUS DAECKELLUS	DAECKE'S PYRALID MOTH				G1G3	S1S3
DATANA RANAECEPS	A HAND-MAID MOTH				G3G4	S3S4
ENALLAGMA PICTUM	SCARLET BLUET				G3	S3
ENALLAGMA RECURVATUM	PINE BARRENS BLUET				G3	S3
ERYNNIS PERSIUS PERSIUS	A PERSIUS DUSKYWING				G5T2T3	SH
EUPHYES BIMACULA	TWO-SPOTTED SKIPPER				G4	S3
PARONTA RUBRIPENNIS	PINK STREAK				G3G4	S3
GLENA PLUMOSARIA	A GEOMETRID MOTH				G4	SU
GRAMMIA PLACENTIA	PLACENTIA TIGER MOTH				G4	S1S3
HESPERIA ATTALUS SLOSSONAE	DOTTED SKIPPER				G3G4T3	S2S3

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
HETAERINA AMERICANA	AMERICAN RUBYSPO				G5	S3
HETEROCAMPA VARIA	A NOTODONTID MOTH				G3G4	S3
HYPOMECIS BUCHHOLZARIA	BUCHHOLZ'S GRAY				G3G4	S3
ITAME SP 1	BARRENS ITAME				G3	S3
LIBELLULA AURIPENNIS	GOLDEN-WINGED SKIMMER				G5	S1S2
LIBELLULA AXILENA	BAR-WINGED SKIMMER				G5	S3B, S2N
LITHOPHANE LEMMERI	LEMMER'S NOCTUID MOTH				G3G4	S2
MACROCHILO SP 1	A NOCTUID MOTH				G3	S3
MEROLONCHE DOLLI	DOLL'S MEROLONCHE				G3G4	S1S3
METARRANTHIS PILOSARIA	COASTAL BOG METARRANTHIS				G3G4	S3S4
METARRANTHIS SP 1	A GEOMETRID MOTH				G3	S2
NEONYMPHA AREOLATA	A SATYR				G4T3T4	S3
SEPTENTRIONALIS						
NICROPHORUS AMERICANUS	AMERICAN BURYING BEETLE	LE	E		G2G3	SH
PONTIA PROTODICE	CHECKERED WHITE		T		G4	S1
PTICHODIS BISTRIGATA	SOUTHERN PTICHODIS				G3	S1S3
PYGARTIA ABDOMINALIS	YELLOW EDGED PYGARTIA				G3G4	SH
RICHIA SP 2	A NOCTUID MOTH				G1Q	S1
SEMIOTHISA EREMIATA	THREE-LINED ANGLE MOTH				G4	SU
SPARTINIPHAGA CARTERAE	CARTER'S NOCTUID MOTH				G2G3	S2
ZALE SP 1	PINE BARRENS ZALE				G3G4	S3
ZANCLOGNATHA SP 1	A NOCTUID MOTH				G3G4	S3
ZANCLOGNATHA THERALIS	A NOCTUID MOTH				G4	SH
*** Nonvascular plants						
SPHAGNUM MACROPHYLLUM	SPHAGNUM				G3	S2
*** Other types						
BALD EAGLE WINTERING SITE	BALD EAGLE WINTERING SITE				G?	S?
COASTAL HERON ROOKERY	COASTAL HERON ROOKERY				GU	S3

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G7	S7
*** Vascular plants						
ALOPECURUS AEQUALIS VAR AEQUALIS	SHORT-AWN MEADOW-FOXTAIL				G5T7	S2
AMARANTHUS PUMILUS	SEABEACH AMARANTH	LT	E		G2	S1
AMANTHUM MUSCITOXICUM	FLY POISON				G4G5	S2
ARETHUSA BULBOSA	DRAGON MOUTH				G4	S2
ARISTIDA DICHOTOMA VAR CURTISSII	CURTISS' THREE-AWN GRASS				G5T5	S2
ARISTOLOCHIA SERPENTARIA	VIRGINIA SNAKEROOT				G4	S3
ARTEMISIA CAMPESTRIS SSP CAUDATA	BEACH WORMWOOD				G5T5	S2
ASCLEPIAS LANCEOLATA	SMOOTH ORANGE MILKWEED				G5	S2
ASCLEPIAS RUBRA	RED MILKWEED			LP	G4G5	S2
ASTER CONCOLOR	EASTERN SILVERY ASTER			LP	G47	S2
ASTER RADULA	LOW ROUGH ASTER		E		G5	S1
BUCHNERA AMERICANA	BLUEHEARTS				G57	SX
CACALIA ATRIPLICIFOLIA	PALE INDIAN PLANTAIN		E		G4G5	S1
CALAMOVILFA BREVIPILIS	PINE BARREN REEDGRASS			LP	G4	S4
CARDAMINE LONGII	LONG'S BITTERCRESS		E		G3	SH
CAREX BARRATTII	BARRATT'S SEDGE			LP	G4	S4
CAREX MITCHELLIANA	MITCHELL'S SEDGE				G3G4	S2
CAREX PALLESCENS	PALE SEDGE				G5	S2
CAREX WILLDENOWII VAR WILLDENOWII	WILLDENOW'S SEDGE				G5T5	S2
CIRSIIUM VIRGINIANUM	VIRGINIA THISTLE		E		G3	S1
CLITORIA MARIANA	BUTTERFLY-PEA		E		G5	S1
COREMA CONRADII	BROOM CROWBERRY		E	LP	G4	S1

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
COREOPSIS ROSEA	ROSE-COLOR COREOPSIS			LP	G3	S2
CROTON WILLDENOWII	ELLIPTICAL RUSHFOIL			LP	G5	S2
DESMODIUM PAUCIFLORUM	FEW-FLOWER TICK-TREFOIL		E		G5	S1
ELEOCHARIS HALOPHILA	SALT-MARSH SPIKE-RUSH				G4	S2
ELEOCHARIS TORTILIS	TWISTED SPIKE-RUSH		E		G5	S1
ERIOCAULON PARKERI	PARKER'S PIPEWORT				G3	S2
ERIOPHORUM TENELLUM	ROUGH COTTON-GRASS		E		G5	S1
ERYNGIUM AQUATICUM VAR AQUATICUM	MARSH RATTLESNAKE-MASTER				G4T4	S3
EUPATORIUM RESINOSUM	PINE BARREN BONESET		E	LP	G3	S2
FIMBRISTYLIS CAROLINIANA	CAROLINA FIMBRY				G4	S2
FRAXINUS PROFUNDA	PUMPKIN ASH		E		G4	S1
FUIRENA SQUARROSA	HAIRY UMBRELLA-SEDGE				G4G5	S3
GALACTIA VOLUBILIS	DOWNY MILK-PEA		E		G5	SH
GENTIANA AUTUMNALIS	PINE BARREN GENTIAN			LP	G3	S3
GLAUX MARITIMA	SEA-MILKWORT		E		G5	6X.1
GNAPHALIUM HELLERI	SMALL EVERLASTING		E		G4G5T3?	SH
HELONIAS BULLATA	SWAMP-PINK	LT	E	LP	G3	S3
HONCKENYA PEPLOIDES VAR ROBUSTA	SEABEACH SANDWORT				G5T4	S2
HOTTONIA INFLATA	FEATHERFOIL		E		G4	S1
HOUSTONIA LONGIFOLIA	LONG-LEAF SUMMER BLUET				G4G5	SH
JEFFERSONIA DIPHYLLA	TWINLEAF		E		G5	S1
JUNCUS ARTICULATUS	JOINTED RUSH				G5	S2
JUNCUS CAESARIENSIS	NEW JERSEY RUSH		E	LP	G2	S2
JUNCUS GREENEI	GREENE'S RUSH				G5	S2
JUNCUS TORREYI	TORREY'S RUSH		E		G5	S1
LIMOSELLA SUBULATA	AWL-LEAF MUDWORT		E		G4G5	S1
LINUM INTERCURSUM	SANDPLAIN FLAX		E		G4	S1
LISTERA AUSTRALIS	SOUTHERN TWAYBLADE			LP	G4	S2

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
LOBELIA CANBYI	CANBY'S LOBELIA			LP	G4	S3
LUDWIGIA BREVIPES	TUCKER'S ISLAND PRIMROSE-WILLOW				G4G5	SX.1
LUZULA ACUMINATA	HAIRY WOOD-RUSH		E		G5T4T5	S2
MALAXIS UNIFOLIA	GREEN ADDER'S-MOUTH				G5	S2
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5	S1
MUHLENBERGIA TORREYANA	PINE BARREN SMOKE GRASS			LP	G3	S3
MYRIOPHYLLUM TENELLUM	SLENDER WATER-MILFOIL		E		G5	S1
MYRIOPHYLLUM VERTICILLATUM	WHORLED WATER-MILFOIL		E		G5	SH
NARTHECIUM AMERICANUM	BOG ASPHODEL	C	E	LP	G2	S2
NYMPHOIDES CORDATA	FLOATINGHEART			LP	G5	S3
OENOTHERA HUMIFUSA	SEA-BEACH EVENING-PRIMROSE		E		G5	S2
ONOSMODIUM VIRGINIANUM	VIRGINIA FALSE-GROMWELL		E		G4	S1
PASPALUM DISSECTUM	MUDBANK CROWN GRASS				G47	S2
PHORADENDRON LEUCARPUM	AMERICAN MISTLETOE			LP	G5	S2
PITYOPSIS FALCATA	SICKLE-LEAF GOLDEN-ASTER			LP	G3G4	S3
PLANTAGO MARITIMA VAR JUNCOIDES	SEASIDE PLANTAIN				G5T5	S2
PLANTAGO PUSILLA	DWARF PLANTAIN		E		G5	SH
POLYGONUM GLAUCUM	SEA-BEACH KNOTWEED		E		G3	S1
PRENANTHES AUTUMNALIS	PINE BARREN RATTLESNAKE-ROOT			LP	G4G5	S2
PRUNUS ANGUSTIFOLIA	CHICKASAW PLUM		E		G5T4T5	S2
PUCCINELLIA FASCICULATA	SALTMARSH ALKALI GRASS				G3G5	S2
PYCNANTHEMUM SETOSUM	AWNED MOUNTAIN-MINT				G37	S3
RANUNCULUS CYMBALARIA	SEASIDE BUTTERCUP		E		G5	SH
RHODODENDRON ATLANTICUM	DWARF AZALEA		E		G4G5	S1
RHYNCHOSPORA CEPHALANTHA	LARGE-HEAD BEAKED-RUSH			LP	G5	S3
RHYNCHOSPORA GLOBULARIS	COARSE GRASS-LIKE BEAKED-RUSH		E		G57	S1
RHYNCHOSPORA INUNDATA	SLENDER HORNED-RUSH			LP	G3G4	S2
RHYNCHOSPORA KNIESKERNII	KNIESKERN'S BEAKED-RUSH	LT	E	LP	G2	S2

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RHYNCHOSPORA MICROCEPHALA	SMALL-HEAD BEAKED-RUSH		E		G5T5	S1
RHYNCHOSPORA NITENS	SHORT-BEAKED BALD-RUSH				G4?	S2
RHYNCHOSPORA PALLIDA	PALE BEAKED-RUSH				G3	S3
RUBUS RECURVICAULIS	BLANCHARD'S DEWBERRY				G4?	S1.1
RUMEX HASTATULUS	ENGELMANN'S SORREL				G5	SH
SABATIA CAMPANULATA	SLENDER MARSH-PINK				G5	S3
SABATIA DODECANDRA VAR DODECANDRA	LARGE MARSH-PINK				G5?T4T5	S2
SCHIZAEA PUSILLA	CURLY GRASS FERN			LP	G3	S3
SCHWALBEA AMERICANA	CHAFFSEED	LE	E	LP	G2	S1
SCIRPUS LONGII	LONG'S WOOLGRASS		E	LP	G2	S2
SCIRPUS MARITIMUS	SALTMARSH BULRUSH		E		G5	SH
SCLERIA MINOR	SLENDER NUT-RUSH			LP	G4	S4
SOLIDAGO STRICTA	WAND-LIKE GOLDENROD			LP	G5	S3
SOLIDAGO TARDA	LATE GOLDENROD				G4?Q	S3
SPIRANTHES LACINIATA	LACE-LIP LADIES'-TRESSES		E		G4G5	S1
SPIRANTHES ODORATA	FRAGRANT LADIES'-TRESSES				G5	S2
STYLISMA PICKERINGII VAR PICKERINGII	PICKERING'S MORNING-GLORY		E	LP	G4T2T3	S1
TIPULARIA DISCOLOR	CRANEFLY ORCHID				G4G5	S3
TRIDENS FLAVUS VAR CHAPMANII	CHAPMAN'S REDTOP		E		G5T?	SH
TRIGLOCHIN MARITIMA	SEASIDE ARROW-GRASS		E		G5	S1
UTRICULARIA BIFLORA	TWO-FLOWER BLADDERWORT		E		G5	S1
UTRICULARIA MINOR	LESSER BLADDERWORT		E		G5	S1
UTRICULARIA PURPUREA	PURPLE BLADDERWORT			LP	G5	S3
UVULARIA PUBERULA VAR NITIDA	PINE BARREN BELLWORT		E		G5T3?	S2
VERBENA SIMPLEX	NARROW-LEAF VERVAIN		E		G5	S1
XYRIS FIMBRIATA	FRINGED YELLOW-EYED-GRASS		E		G5	S1
ZIGADENUS LEIMANTHOIDES	DEATH-CAMUS		E		G4Q	S1

14 Records Processed

ATTACHMENT B

Qualifications of Preparers

EcolSciences, Inc.

Environmental Management & Regulatory Compliance

ECOLSCIENCES, INC.

CORPORATE HISTORY

EcolSciences, Inc., was founded in 1973 in response to the growing need for responsible environmental planning, as mandated by NEPA, The National Environmental Policy Act. EcolSciences specializes in performing environmental investigations relating to permit acquisition and regulatory compliance, demonstration of "due diligence", waste management, impact analysis, mitigation and remediation. EcolSciences' strength is a proficiency in current environmental and waste management laws, regulations, and policies, coupled with a practical problem-solving approach to analyzing the environmental consequences of projects.

During more than twenty years, EcolSciences has successfully completed more than 5,000 studies for private, quasi-public and public clients. EcolSciences has represented many of the country's and the metropolitan area's leading industries, corporations, developers, and financial institutions including AT&T, American Cyanamid Company, Merck, Johnson & Johnson, Hartz Mountain Industries, Trammell Crow Company, The Kushner Companies, Roseland Properties, The Hovnanian Companies, Pinnacle Communities, Principal Mutual Life Insurance Company, PNC Bank, and First Union National Bank. Among the many utilities that EcolSciences has served are Jersey Central Power & Light, New Jersey Natural Gas Company, Elizabethtown Gas Company, Essex and Hudson County Improvement Authorities, Ocean County Utilities Authority, and numerous municipal utilities authorities. Representative government agency clients include the U.S. Environmental Protection Agency, New York City Economic Development Corporation and New York City Department of Sanitation.

EcolSciences' interdisciplinary staff of environmental engineers, geologists, biologists and scientists has extensive experience in a diversity of studies related to biological assessment and toxic and hazardous materials management. EcolSciences has performed environmental assessments and has acquired appropriate permits and approvals under a wide variety of Federal, state, regional, and local jurisdictions. These permits include: Section 404 and Section 10 authorizations, CAFRA and Waterfront Development permits, Pinelands Commission certifications, New Jersey Freshwater Wetlands Act permits (both general and individual permits), Hackensack Meadowlands Development Commission (HMDC) approvals, and D&R Canal Commission approvals. EcolSciences' senior staff are experienced in the delivery of expert testimony; senior staff of the firm have testified in public hearings, Superior Court, Administrative Law proceedings, and county, regional and municipal planning boards.

Since the promulgation of the New Jersey Environmental Cleanup Responsibility Act (ECRA) and its successor, the Industrial Site Recovery Act (ISRA), EcolSciences has been involved in the implementation of the entire ECRA/ISRA program for its industrial and financial institutional clients. As the demonstration of "due diligence" has become a leading industry standard, EcolSciences has completed numerous Phase I environmental assessments and follow-up Phase II studies to clarify the level of environmental risk and liability associated with past and current practices at a particular site or facility. These assessments typically include such activities as hazardous materials inventories, building and site inspections, subsurface soil investigations, groundwater monitoring, tank testing, asbestos bulk sampling, development of remediation plans and supervision of cleanup activities. The firm and technical staff members are also certified by the NJDEP for the performance of underground storage tank installation, closure, and subsurface evaluation. All work is conducted under the supervision of a licensed professional engineer.

The biological staff of EcolSciences has conducted over 4,000 wetland delineations and environmental assessments throughout the eastern and central portions of the United States. Our staff is skilled in all technical aspects of wetland identification and delineation methodologies established by the COE, USFWS, EPA and SCS; the assessment of wetland functions and values using techniques such as HEP and WET; the assessment of development-related wetland impacts; the acquisition of wetland permits; and the development and implementation of mitigation plans. Key members of our staff are certified as Professional Wetland Scientists and provisionally certified by the COE. Additionally, EcolSciences' biologists routinely performs specialized studies related to threatened and endangered species, wildlife habitat surveys and the assessment of development-related impacts. EcolSciences' staff is skilled in the field methodologies and reporting requirements of the Federal and state agencies and has substantial experience in the field identification of protected plants and animals and their preferred habitat.

EcolSciences has and continues to play an instrumental role in the development of federal environmental policies pertaining to wetlands and hazardous waste sites through a number of manuals that have been prepared under government contract for the USEPA. Recent examples include the Manual for Achieving NEPA Functional Equivalency in CERCLA Remedial Actions, Creation of Wetland Banks for Mitigation of Impacts at Superfund Sites, Technical Procedures Manual for the Advance Identification of Wetlands, Policy Document on Wetlands Mitigation at Superfund sites, Wetland Regulations Guidebook for New York State, and Principles of Environmental Assessment: An International Training Manual.

EcolSciences is a multi-disciplinary firm that has the experience and capabilities to provide a full range of environmental services. Studies are conducted in a manner that emphasizes the balance of environmental, engineering and cost factors. This approach provides the information necessary for sound and practical project decisions.

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

DAVID P. MOSKOWITZ

EDUCATION:

B.A., 1984 - Environmental Studies

George Washington University, Washington, D.C.

M.S. 2000 - Environmental Policy Studies

New Jersey Institute of Technology, Newark, N.J.

Ph.D. Program - Ecology and Evolution

Rutgers University, New Brunswick, N.J.

PROFESSIONAL AFFILIATIONS:

Society of Wetland Scientists

Association of Field Ornithologists

ASTM Environmental Committee (1998-2002)

Dragonfly Society of the Americas

PROFESSIONAL CERTIFICATIONS:

Professional Wetland Scientist - SWS

Certified Wetland Delineator - Corps of Engineers

USEPA Wetland Delineation - WTI

Qualified Ornithologist - NJDEP

Qualified Bog Turtle Surveyor - USFWS

OTHER:

Wetland Journal Technical Review Board (2000-2002)

SWS Certification Review Panel (1998-2001)

Poricy Park Board of Directors (1999-2002)

East Brunswick Environmental Commission

USFWS N.J. Breeding Bird Survey Coordinator (1995-1997)

Identification of Sedges and Rushes - Rutgers University

Field Identification of Raptors - University of Maine

Identification of Adult Dragonflies - University of Maine

Identification of Larval Dragonflies - University of Maine

Systematics & Conservation of Lepidoptera - University of Maine

Identification of Microlepidoptera - University of Maine

EXPERIENCE:

Mr. Moskowitz is a Senior Vice President with EcolSciences, Inc. During the past 20 years, Mr. Moskowitz has conducted more than 4,000 environmental studies for a wide range of clients including government agencies, and the development, legal, engineering and financial professions. These studies have focused on wetland and wildlife issues including delineations, mitigation, field surveys and regulatory compliance as well as Phase I, Phase II and Brownfields Redevelopment. Mr. Moskowitz has also provided expert testimony before numerous municipal boards and the New Jersey Meadowlands Commission and has been qualified as an expert in Superior Court of New Jersey, New Jersey Office of Administrative Law, New Jersey Condemnation Commission, and the Morris County Board of Taxation. Mr. Moskowitz has published more than two-dozen technical and popular papers on wildlife, wetland, and threatened and endangered species related topics and has lectured widely on numerous environmental topics.



EcolSciences, Inc.
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Wetland Studies

Directed and participated in more than 3,000 field studies in NJ, NY, PA, MD and CT evaluating all aspects of wetland ecology. Representative experience includes:

- The evaluation of more than 10,000 acres in the New Jersey Highlands.
- The evaluation of more than 7,500 acres in the complex red soils of the New Jersey Piedmont.
- The evaluation of nearly 3,000 acres on Staten Island, New York.

Brownfields and Site Investigation Studies

Principal in charge of numerous Phase I Environmental Assessments, historic pesticide investigations and remedial activities, hazardous waste investigations and brownfields redevelopment projects.

Wetland Mitigation Studies

Numerous mitigation plans have been prepared to remedy regulatory violations of various State and Federal wetland laws, and to compensate for wetland losses resulting from permitted wetland fills. Two examples of the wide variety of studies include:

Preparation of mitigation plans and specifications for the remediation of wetlands and shorelines of the Freshkills Sanitary Landfill, Staten Island, New York.

Design and implementation of a 13-acre wetland restoration project in Morris County, New Jersey utilizing air conditioning condensation as a hydrologic supplement.

Threatened and Endangered Species Studies

Designed, directed and participated in numerous field studies for rare plant and animal species including Bog Turtle, Wood Turtle, Northern Pine Snake, Blue Spotted Salamander, Long Tailed Salamander, Pine Barrens Tree Frog, Great Blue Heron, Coopers Hawk, Grasshopper Sparrow, Savannah Sparrow, Upland Sandpiper, Barred Owl, Swamp Pink, Knieskern's Beaked Rush, Curly Grass Fern and Barrett's Sedge.

Ornithological Studies

Numerous studies conducted throughout the northeast designed to evaluate and census individual species, avian communities and habitats, to assess potential impacts upon the species and habitats associated with land development proposals, and to comply with State and Federal Wildlife regulations. Two examples of the wide variety of studies include:

Long-eared owl habitat evaluation, pellet analysis and management plan in Somerset County, New Jersey.

Two-year avian census, habitat evaluation and regulatory assessment for the proposed redevelopment of Flushing Airport in Queens, New York by the New York City Economic Development Corporation. Breeding, wintering and migratory utilization of the site was comprehensively evaluated and barn owl pellet analysis was conducted to augment small mammal population studies.

Commercial/Residential/Industrial Studies

More than 3,000 properties have been evaluated throughout NJ, NY, PA, and CT to assess potential environmental impacts from proposed development and to insure regulatory compliance with various Local, State and Federal environmental laws. Tasks have included wetland delineation, permit acquisition and mitigation planning.

Corridor Studies

Designed, directed and participated in ecological studies and regulatory assessments for more than 350 linear miles of road corridors, gas and electric transmission right of ways and sewer and water alignments. Studies have been performed for the New Jersey Turnpike Authority, New Jersey DOT, Jersey Central Power and Light, New Jersey Natural Gas, and numerous local governments.

Special Environmental Studies

A wide range of ecological studies have been conducted for various private clients, the USEPA and other government agencies. Representative studies include:

- Bird, mammal, dragonfly, damselfly, butterfly and floral surveys for the proposed Catskill/Delaware Water Treatment Facility in Westchester County, New York.
- Habitat assessments for Pine Barrens Tree Frog and River Otter in New Jersey.
- An avifaunal study of a 500-acre proposed incinerator ash landfill site in New York, conducted for a county agency, to evaluate FAA concerns about bird strike hazards to aircraft passing over the site, resulting in the preparation of a Bird Deterrent Plan.
- Biological studies of the impacts of Folcroft Landfill upon ecological communities of Tinicum National Environmental Center, Philadelphia, PA for the USEPA, Region III.
- Red-Headed Woodpecker evaluation of two central New Jersey properties.

Publications/Articles

- Moskowitz, D.P., 1996. Swamp Pink: A Federally-Listed Threatened Species. *Wetland Journal* 8(3): 14-16.
- Moskowitz, D., Aufferorde, T. and M. Kovacs, (1997). Vegetation and Surrounding Landscape Characteristics of Long-Eared Owl (*Asio otus*) Winter Roosts in Central New Jersey. *Records of New Jersey Birds*. (23)1: 2-6.
- Moskowitz, D.P., 1997. Wetland Restoration Using Non-Contact Cooling Water and Stormwater Runoff as a Supplemental Hydrologic Source. *Wetland Journal* 9(1): 17-20.
- Moskowitz, D.P., 1997. Hine's Emerald Dragonfly (*Somatochlora hineana*): The First Federally Endangered Dragonfly. *Wetland Journal* (9)3: 12-14.
- Moskowitz, D.P., 1997/98. Fall Migrant Landbird Observations at Sea. *Records of New Jersey Birds*. (23)4: 95.
- Moskowitz, D.P., 1998. Build a Wetland Garden. *Water Gardening Magazine*. (2)6: 58-60.
- Moskowitz, D.P., 1998. Tips Offered on Negotiating N.J.'s Mining, Dredging Rules. *Mine Regulation Reporter*. 11(4): 86-87.
- Moskowitz, D.P., 1998. Vegetation Change in a Forested Wetland after a Bird Roost. *Northeastern Naturalist*. 5(1): 61-66.
- Moskowitz, D.P., 1998. A Wetland Delineation Primer for the Professional Land Surveyor. *Professional Surveyor Magazine*. 18(1): 22-28.
- Moskowitz, D.P. and D.M. Bell., 1998. *Archilestes Grandis* (Great Spreadwing) in Central New Jersey, with Notes on Water Quality. *Bulletin of American Odonatology*. 5(3): 49-54.
- Moskowitz, D.P., 1999. The Pine Barrens Treefrog (*Hyla Andersonii*): An Ecologist's Dream. *Wetland Journal* 11(4): 8-13.
- Moskowitz, D.P., 2000. A Comparison of Field-Delineated Wetlands to the New Jersey Freshwater Wetland Maps. M.S. thesis - New Jersey Institute of Technology.
- Moskowitz, D.P., 2000. Old Maps and Wetland Regulation. *Professional Surveyor Magazine*. 20(6): 22-30.
- Moskowitz, D.P. and T.A. Aufferorde., 2000. Persistence of Skunk Cabbage (*Symplocarpus foetidus* [L.] Nutt.) in a Drained Wetland. *Wetland Journal* 12(3): 23-29.

- Moskowitz, D., 2000. A New County Record for *Archilestes Grandis* in New York with Notes on Habitat and Water Quality. *ARGIA* 12(4): 7-8.
- Moskowitz, D.P., 2000. Habitat Notes on a Winter Saw-whet Owl (*Aegolius acadicus*) Roost in Central New Jersey. *Records of New Jersey Birds*. 26(4): 138-139.
- Moskowitz, D., 2000. Book Review: *Dragonflies through Binoculars - A Field Guide to Dragonflies of North America*. *Wetland Journal* 12(4): 41.
- Poricy Park Citizens Committee. 2001. A Checklist and Guide to the Butterflies of Poricy Park. Pamphlet.
- Moskowitz, D. P. 2001. First Record of the Queen Butterfly (*Danaus gilippus* Cramer) in New Jersey. *News of the Lepidopterists' Society* 43(3): 72, 74.
- Moskowitz, D., J. Moskowitz, S. Moskowitz and H. Moskowitz. 2001. Notes on a large dragonfly and butterfly migration in New Jersey. *Northeastern Naturalist* 8(4): 483-490.
- Moskowitz, D. P. 2002. An unusual interaction between a banded hairstreak butterfly (*Satyrrium calanus*) Lycaenidae and a stink bug (*Banasa dimidiata*) Pentatomidae. *Entomological News* 113:(3) 183-186.
- Moskowitz, D. P. 2002. Was there an invasion of the Queen butterfly (*Danaus gilippus* Cramer) in the northeastern United States in 2001? *News of the Lepidopterists' Society* 44(2): 66-67.
- Newgard, L. and D. Moskowitz. Bog turtle: It's small, secretive, rare, and it's in our hiking region *Trailwalker* 29(4): p. 5.
- Moskowitz, D.P. and C. Westphal. 2002. Notes on the larval diet of the Painted Lichen moth *Hypoprepia fucosa*: Hubner (Arctiidae:Lithosiinae). *Journal of the Lepidopterist's Society* 56 (4): 289-290.
- Moskowitz, D. P. and T. M. Auffenorde. 2003. Bird Use at Two Simulated-Tree Cellular Towers in New Jersey. *Records of New Jersey Birds*. 28(4): p. 88-91.
- Moskowitz, D.P. 2003. The Queen Dilemma in the Northeastern United States. *New York State Butterfly Records 2002*. New York Chapter, North American Butterfly Association. p. 49-51.
- Moskowitz, D.P., Kovacs, M. and J. Tesauro. (in press). An abnormally-colored bog turtle (*Clemmys muhlenbergii*) in New Jersey. *Herpetological Review*.

DANIEL BRILL

EDUCATION: *B.A., 1996 – Environmental Studies
Richard Stockton College*

**AREAS OF
EXPERTISE:** *Threatened & Endangered Species Habitat Assessments
and Surveys
Geographic Information Systems*

**PROFESSIONAL
ASSOCIATIONS:** *New Jersey Audubon Society
Cape May Bird Observatory*

**PROFESSIONAL
CERTIFICATIONS:** *Rutgers Cook College Office of Continuing Professional
Education (2001)
Wetlands Delineation Certificate Series
Professional Certificate Program in Geomatics*

EXPERIENCE:

Mr. Brill is employed as an environmental scientist with EcolSciences, Inc. His expertise is based in threatened and endangered species studies and the use of Geographic Information Systems (GIS) in its capacity as an instrument of environmental analysis.

Mr. Brill's responsibilities include: the implementation and documentation of wildlife habitat assessments and surveys, the delineation of wetlands based on the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, and the preparation of various wetland-related permit applications and Environmental Impact Statements (EIS).

Mr. Brill was an educator at the Cooper Environmental Center with Ocean County Parks and Recreation and a frequent volunteer with the New Jersey Department of Environmental Protection (NJDEP) and New Jersey Audubon Society (NJAS) preceding his position with EcolSciences.

An outline of Mr. Brill's applicable skills and accumulated experience includes:

- The implementation of numerous habitat analyses and wildlife surveys, often involving threatened and endangered species. Such species consist of the Federally-threatened and State-endangered bald eagle; the State-endangered southern gray treefrog, timber rattlesnake, corn snake, and red-shouldered hawk; and the State-threatened pine barrens treefrog, northern pine snake, Cooper's hawk, barred owl, and red-headed woodpecker. Select studies include:
 - The use of GIS to determine areas potentially impacted by bald eagle nests and critical foraging habitat based on accepted species models.



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- Employing GIS to trace change in land use/land cover over time in areas of potential habitat for threatened and endangered species such as barred owl and northern pine snake.
 - Participation in several large-scale and long-term studies for northern pine snake, corn snake, and timber rattlesnake approved by the NJDEP and Pinelands Commission. Such studies employ drift fences, traps, and radio telemetry equipment.
- Assist in several surveys for rare plants including the Federally-threatened and State-endangered swamp pink and Knieskern's beaked-rush.
- Volunteer field work for the NJDEP and New Jersey Audubon Society including:
 - Assisted the annual Sandy Hook Hawk Watch. Thirteen species of raptors were recorded including bald eagle and peregrine falcon. This work included educating the public on raptor identification and conservation.
 - Project assistance for Neotropical Passerine Critical Areas: Pinelands Survey (Landscape Project for Protection of Rare Species). The objective of this NJDEP-sponsored study was to determine the distribution, abundance, and habitat characteristics of neotropical migratory birds and other observed species. Personal observations include the State-threatened Cooper's hawk and grasshopper sparrow.
 - Participation in the New Jersey Breeding Bird Atlas with data contributed towards *Birds of New Jersey* (Walsh, Elia, Kane, and Halliwell, 1999) published by the New Jersey Audubon Society. Work involved identifying and recording all bird species and observed breeding behavior during the appropriate season.
 - Submitted personal observations of rare and accidental species in the state to the Endangered & Nongame Species Program and the NJAS New Jersey Bird Records Committee including swallow-tailed kite and one of the few accepted state records of wood stork, a Federally-endangered species.
- Assists in the delineation of wetlands using the Federal Manual three-parameter approach using vegetation, soils, and hydrology.
- Contributes in the composition of Environmental Impact Statements and Assessments for residential, industrial, and commercial projects.