HA File Number 2010.08

Spring 2010 Plant and Wildlife Inventory on Petty's Island, Pennsauken Township, Camden County, NJ

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To

Margaret O'Gorman
Executive Director
Conserve Wildlife Foundation of New Jersey
501 East State Street
PO Box 400
Trenton, NJ 08625

By

Matthew P. McCort, Ted Gordon, James Dowdell and Robert T. Zappalorti

Herpetological Associates, Inc.
575 Toms River Road
Jackson, New Jersey 08527
www.herpetologicalassociates.com

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INTRODUCTION

Herpetological Associates, Inc. (HA) was retained by the Conserve Wildlife Foundation of New Jersey to conduct an intensive plant and wildlife inventory on Petty's Island, an approximately 300 acre island in the Delaware River between Philadelphia, Pennsylvania and Camden New Jersey (**Figures 1 and 2**). Petty's Island is located in Pennsauken Township, Camden County, New Jersey. This survey was conducted in an attempt to better understand the importance of this unique island to migratory and nesting birds, reptiles and amphibians, and possible rare plant communities.

FUNDING

HA would like to acknowledge the William Penn Foundation, providers of a research grant which funded this work, without whom this project would not have been possible.

BACKGROUND AND FOCUS

Beginning in August of 2004 and continuing through the summer of 2006, HA had the opportunity to conduct a bald eagle (*Haliaeetus leucocephalus*) habitat use study on and in the vicinity of Petty's Island. This project proved to be extremely interesting and produced baseline species occurrence data for the island and surrounding habitat. Approximately 1,000 man hours were spent watching the resident nesting eagles. While the focus of this project was to determine critical habitat areas for the eagles, HA carefully detailed all of the wildlife species observed on Petty's Island, along the Main and Back Channels of the Delaware River, and in Fish House Cove (immediately east of Petty's Island).

MATERIALS AND METHODS

SURVEYORS

HA's field survey team consisted of the following individuals: James Dowdell, Senior Ornithologist; Ted Gordon, Senior Botanist; Matthew P. McCort, Herpetologist/Wildlife Ecologist; and David W. Schneider, Herpetologist/Wildlife Ecologist.

HOW HABITATS ARE EVALUATED AND DETERMINED

HA has three criteria for judging the value of the existing conditions and available habitat for plant or wildlife species. These are:

1. Structure of Available Habitat: Both the biotic and abiotic components are considered. These are good indicators for the possible occurrence of a particular plant or wildlife species within a particular study area or ecosystem.

2. Physical Evidence: Natural Heritage historic records from an area, as well as recent and/or historic sightings, are pertinent. HA used baseline plant and wildlife data collected during the prior bald eagle monitoring study to help determine survey points and target areas.

3. Indicator Species: The presence of plant and animal species that are often found in association with the target species is highly informative when conducting a habitat evaluation or wildlife inventory. Such species may include food/prey organisms, or species that typically occur in similar

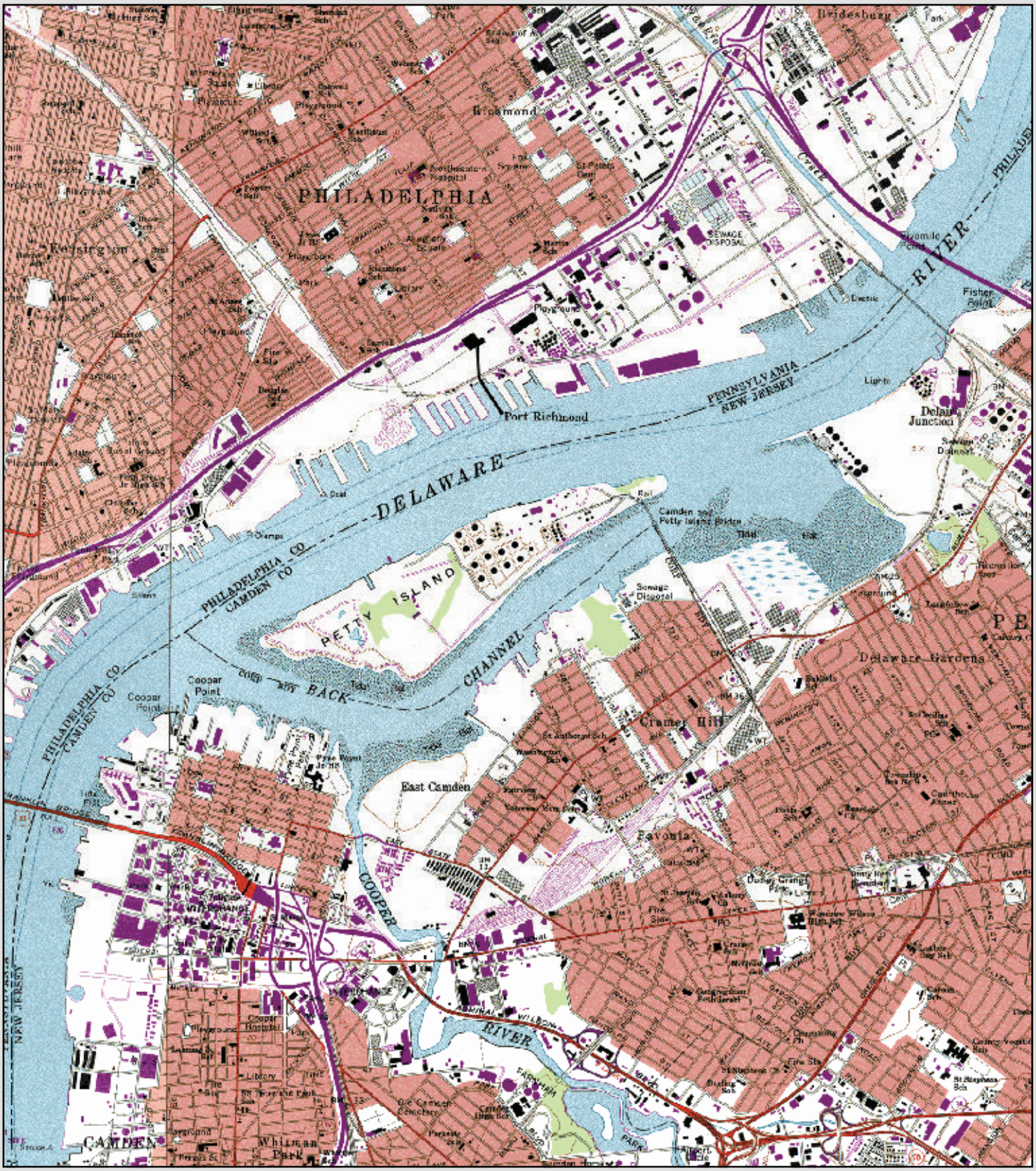

Figure 1. Location of Petty's Island in the Delaware River between Philadelphia, PA and Camden, NJ, in Pennsauken, Camden County, New Jersey.
Source Image: USGS Topographic Quadrangles "Camden" and "Philadelphia"
Herpetological Associates, Inc. 2010.

Figure 2. Location of Petty's Island in the Delaware River between Philadelphia, PA and Camden, NJ, in Pennsauken, Camden County, New Jersey.
Source Image: 2007 NJDEP Color Orthophotography
Herpetological Associates, Inc. 2010.

or identical habitats as the target species. The presence of indicator species will often increase the habitat suitability ranking of a particular study site.

REPTILE AND AMPHIBIAN SURVEY

James Dowdell, Matthew McCort, and David Schneider conducted the reptile and amphibian surveys on site.

Visual Survey Techniques

Reptiles and amphibians are often difficult to census due to their highly secretive nature and ability to remain hidden for long periods of time. Environmental conditions such as temperature, precipitation, soil moisture, humidity, light intensity, wind, and season have strong influences on reptile and amphibian activity patterns (Vogt and Hine, 1982). Unsuitable weather conditions may lead to increased fossorial behavior, markedly reduced activity, shifts in habitat types used, and/or aestivation. Therefore, the use of several sampling techniques which take into account the various aspects of an animal's biology often result in the best assessment of species abundance and richness. Three standard sampling methods for reptiles and amphibians were used in this study: standard time-constrained searching, which uses more survey periods of greater duration; random opportunistic sampling, which focuses on various habitat areas throughout a site for a particular species; and diurnal and nocturnal road cruising.

Time Constrained Technique. In this method, a specific habitat is selected (e.g., oak/pine forest, pine/oak forest, wetland corridor) and all potential hiding places for reptiles and amphibians were searched. Fallen logs and leaf litter were overturned, as well as artificial hiding places such as discarded sheets of wood or metal, rugs, furniture, etc. Open, sunny areas were searched for surface active or basking snakes and lizards. Spatial boundaries for each search were set, or were based on the selected habitat type. Time limits were also set, ensuring that each habitat was adequately examined (Campbell and Christman, 1982; Karns, 1986).

Random Opportunistic Sampling. A relatively simple method for the trained herpetologist, Random Opportunistic Sampling was employed while performing other sampling techniques on the study site. This involves searching various areas of the site which show potential habitat for a species of interest, or areas which are conveniently accessible. Locations on site which do not fall into any specific habitat classification (e.g., disturbed areas, debris piles, etc.) may generate previously undiscovered species that would not have been found without the use of this method. All reptiles and amphibians encountered were recorded to supplement the species list generated by other field methods. This method is effective if there are no time constraints on the survey and the survey area is visited often. Qualitative impressions can be developed as to the relative abundance and habitat use of certain species (Campbell and Christman, 1982; Karns, 1986).

Diurnal and Nocturnal Road Cruising. Road cruising was used passively, such as while driving to and from the site or while driving/walking to and from areas on the site, or it was initiated as a specific surveying technique. This method involves driving a vehicle at slow speed or walking along paved roads or dirt trails at various times of the day and/or night. Road cruising is often highly productive on warm, humid or rainy spring nights, or during other high activity times of the year (depending on the species). Animals moving across roads can be easily identified and/or captured. In addition, roads which border potential habitat often yield dead reptiles or amphibians or other animals, killed as they attempt to cross. These "road-killed" animals can be identified and provide

useful information on migration routes, activity patterns, and habitat utilization/partitioning. The basic presence or absence of a species in a particular area can also be determined by the identification of their remains (Karns, 1986).

AVIAN SURVEY

James Dowdell, Matthew McCort, and David Schneider conducted the avian surveys on site. In order to maximize species diversity during spring migration, HA targeted weather conditions that are typically conducive to migration. The main weather component that HA focused on was wind. Winds with a southerly to southwesterly component are desirable to northbound migrants as light tail winds can ease their journey and generally produce flights. Environmental conditions such as temperature, precipitation, wind, and season can have strong influences on avian activity patterns. Unsuitable weather conditions may lead to markedly reduced activity. Based upon HA's knowledge of bird biology, appropriate field survey methods were selected and implemented. These methods included visual surveys, nest surveys, and call playback. Birds were identified through visual observations of birds/feathers, and/or by audio observations of songs/calls.

Nesting and migrant birds were identified visually or by each species' characteristic song and calls. Of the species observed, a distinction was made between breeding and migrant birds. Numbers and species of all birds seen or heard were recorded at the end of each site visit. Nesting/breeding confirmation was determined by behavior. Birds (males) singing on territory on multiple visits in the same vicinity, birds seen carrying food, observations of fledglings, and observations of nests were all considered confirmation of breeding for that species. Transects that cover the potential habitats on the site were walked for visual and/or audible evidence of all birds present on each survey date.

Avian Call Playback Surveys

Call playback surveys consisted of repetitive playback of the species-specific territorial calls of the target avian species. The audio was played from a hand-held portable compact disc player and was amplified and broadcast via an Anchor Audio, Inc. Mini Vox (Model PB-25) speaker. In this type of survey, the pre-recorded call of the target avian species is played at 30 second intervals with approximately 60 seconds of silence between each playback replication. At least 4 replications were made, for a total of 2 minutes of call playback time per site visit, at each of the potential habitats. Biologists may vary the length of playback and/or silence depending on the target species or site conditions. The speaker is periodically rotated 90 degrees to provide even broadcast coverage. The goal of this type of survey is to elicit territorial responses from individuals of a target species who are defending nesting habitat. Territorial responses usually consist of vocal and flight responses where one or more individual birds fly in to the observer, often times vocalizing, in an attempt to challenge their perceived rival.

In this survey, the main target of call playback was breeding Cooper's hawk (*Accipiter cooperii*). Based on the existing habitat characteristics, this was the only threatened or endangered woodland raptor species that could potentially breed on the island. Call playback was conducted in a biased fashion, where locations were selected based on habitat structure and observer vantage point.

INVERTEBRATE SURVEY

James Dowdell conducted the invertebrate surveys on Petty's Island. Binoculars were used to identify specimens. Specimens were not captured for identification purposes. This visual survey was conducted in all potential habitats for invertebrates and concentrated on butterflies, damselflies, and dragonflies. The two main field guides used to prepare for and conduct this survey are Dunkle (2000) and Lam (2004).

BOTANICAL SURVEY

Ted Gordon was the lead botanist on this project. James Dowdell, Matthew McCort, and David Schneider assisted with the botanical inventory. Based on HA's knowledge of rare plant species, all habitats were searched for any of the plant species listed by the New Jersey Natural Heritage Program. The plant survey utilized a biased approach whereby the project site was evaluated for probable locations of rare plants and/or communities. Searches were conducted along transects approximately four meters apart, but that distance was often modified according to site conditions. Plant species habitats were identified by community type (e.g., bog, swamp, hardwood forest, oak-pine forest, etc.).

Botanical Identification

Dominant plants were identified and categorized. Plant species were also identified by community type (e.g., bog, swamp, hardwood forest, oak-pine forest, wet meadow, etc.). Various field guides and manuals, dichotomous technical keys, guides to synonymy, and local New Jersey plant lists on floras were used to prepare for and conduct field work. These include Fernald (1950); Gleason and Cronquist (1991) and Holmgren's Illustrated Companion to Gleason and Cronquist's Manual (1998); available volumes of the Flora of North America (various publication dates); Synthesis of the North American Flora: a digital synonymized checklist (Kartesz & Meacham 1999); Snyder and Vivian (1981); and Stone (1911).

RESULTS

Surveys were conducted on March 25, April 23 and 30, May 6, 14, 21, 26, June 17 and 25, 2010. Please see **Appendix I** for the survey dates, times, names of surveyors, survey type, and weather conditions recorded for each survey date.

HABITAT DESCRIPTION

Petty's Island is an approximately 300-acre island situated in the Delaware River (**Figures 1 and 2**). It is bordered to the north (northwest) by the Main Channel of the Delaware River, while the Back Channel of the Delaware borders it to the south (southeast). Due south of the island lies the mouth of the Cooper River. The entire island comprises a severely impacted landscape of anthropogenic disturbances. Among these impacts are the deposition of dredge spoil, bulkheading of the Delaware River shoreline, presence of an active shipping facility, and an abandoned storage tank installation with associated wetland basins and dikes in the northeastern half of the island.

The island is approximately half vegetated; the other half is developed with an office (Citgo) and associated outbuildings, oil storage tanks (Citgo), and a large shipping terminal (Crowley Marine) (**Figures 1, 2, 3, 4, 5, and 6**). Several different habitat types are present on and bordering the island including a large area of palustrine hardwood forest in the southwestern end of the island, several small ponds, tidal wetlands along the Back Channel side of the island (southern edge and across from the mouth of the Cooper River), scrub/shrub wetlands, fields, and manicured lawns.

The largest vegetated tracts are located to the northeast and southwest of the Crowley Marine shipping terminal. There is a large forested tract on the southwestern end of the island that contains a series of small freshwater ponds, which are generally surrounded by dikes, that cover an area of approximately 13 acres (**Figure 7**). These man made impoundments function as habitat for a wide variety of wildlife species including nesting great blue heron (*Ardea herodias*), a species of special concern in New Jersey.

The dominant tree species observed on the island include eastern cottonwood (*Populus deltoides*), black willow (*Salix nigra*), white poplar (*P. alba*), river birch (*Betula nigra*), green ash (*Fraxinus pensylvanica*), box elder (*Acer negundo*), large-toothed aspen (*P. grandidentata*), empress tree (*Paulownia tomentosa*), tree of heaven (*Ailanthus altissima*), gray birch (*B. populifolia*), black cherry (*Prunus serotina*), red mulberry (*Morus rubran*), and black locust (*Robinia pseudoacacia*). Other tree species observed include, but are not limited to, red maple (*A. rubrum*), eastern red cedar (*Juniperus virginiana*), quaking aspen (*P. tremuloides*), white pine (*Pinus strobus*), American holly (*Ilex opaca*), southern red oak (*Quercus falcata*), willow oak (*Q. phellos*), staghorn sumac (*Rhus typhina*), winged sumac (*R. copallinum*), northern hackberry (*Celtis occidentalis*), silver maple (*A. saccharinum*), and tulip poplar (*Liriodendron tulipifera*).

The understory and shrub layer are dominated by poison ivy (*Toxicodendron radicans*), Japanese honeysuckle (*Lonicera japonica*), Asiatic bittersweet (*Celastrus orbiculatus*), stinging nettle (*Urtica dioica*), false indigo (*Amorpha fruiticosa*), and mugwort (*Artemisia vulgaris*). Tidal areas on the margin of the island are generally dominated by spatterdock (*Nuphar lutea ssp. advena*).

REPTILE AND AMPHIBIAN SURVEY RESULTS

Visual surveys for reptiles and amphibians, as well as mammals, were conducted on March 25, April 23 and 30, May 6, 14, 21, and 26, June 17 and 25, 2010. HA's survey team consisted of 2-3 researchers. Surveys were conducted throughout the site using the aforementioned visual search techniques, and under optimal conditions for observing reptiles and amphibians in southern New Jersey (**Appendix I**). No threatened or endangered reptile or amphibian species were expected to occur on Petty's Island and none were observed. However, it is important to note that the redbelly turtle (*Pseudemys rubriventris*), a state-threatened species in Pennsylvania (PA Fish and Boat Commission), and the coastal plain leopard frog (*Rana sphenocephala*), a state-endangered species in Pennsylvania (PA Fish and Boat Commission), were both observed on Petty's Island. A total of ten (10) species of reptiles and amphibians were observed. **See Figures 8, 9, 10, and 11** for a photographic sample of some of the reptiles and amphibians observed and **Appendix II** for a complete list of the reptiles, amphibians, and mammals observed during visual surveys.

AVIAN SURVEY RESULTS

Migratory and breeding bird surveys were conducted on March 25, April 23 and 30, May 6, 14, 21, 26 and June 17, 2010 between 0600 and 1700 hours. A total of 141 species were observed during these survey efforts. This number includes 54 species breeding on the island proper. Some of these species, such as yellow warbler (*Dendroica petechia*), warbling vireo (*Vireo gilvus*), Baltimore oriole (*Icterus galbula*), orchard oriole (*Icterus spurius*), rough-winged swallow (*Stelgidopteryx serripennis*), tree swallow (*Tachycineta bicolor*), blue-gray gnatcatcher (*Polioptila caerulea*), cedar waxwing (*Bombycilla cedrorum*), and catbird (*Dumetella carolinensis*) were in fact particularly common breeders on the island. In addition, 6 singing male willow flycatchers (**Figure 12**) were observed on territory on the last two visits. This species was breeding in wetland habitat at various locations on the island where black willow and scrubby vegetation provide ideal habitat (**Figure 13**). This habitat type has become more widespread on the island over the past several years due to natural succession. Also noteworthy, a spotted sandpiper (*Actitis macularia*) nest (**Figure 14**) was found along an access road in the oil tank field and 2 territorial male swamp sparrows (*Melospiza georgiana*) were observed singing in the habitat near the oil tanks on four consecutive visits.

Special attention was paid to monitoring the great blue heron (*Ardea herodias*) rookery that is known to occur in the southwestern portion of the island in an area containing several small ponds. HA's goal was to document any heron activity at this location. This rookery, at which 5 nests were counted in December of 2004, consisted of two nests in the spring of 2010. The first was under construction on HA's first site visit on March 25. This nest was subsequently abandoned. A second nest was observed on May 21, 2010 in a different tree at the same pond (**Figure 15**). This nest appeared to be active as one of the adults was observed brooding and shading the nest. No activity was observed at this nest on the last two visits (May 26 and June 17); however, the adults were still present in the vicinity. It is likely, based on this lack of activity, that this nest failed shortly after hatching.

Great horned owl (*Bubo virginianus*) (**Figure 16**), red-tailed hawk (*Buteo jamaicensis*), and very likely Cooper's hawk (*Accipiter cooperii*), a state-threatened species in New Jersey, were breeding on Petty's Island during the 2010 season.

Several noteworthy species were observed in 2010 and during past survey efforts by HA on Petty's Island and along the Delaware River in the immediate vicinity. For example, a lone migrant grasshopper sparrow (*Ammodramus savannarum*) was observed on April 30, 2010 (**Figure 17**). Please see **Appendix III** for a list of all birds observed on and in the vicinity of the site in 2010. Breeding species are preceded by (**B**) in this table. In addition, please see **Appendix VI** for species observed during prior studies on Petty's Island that were not observed during 2010.

INVERTEBRATE SURVEY RESULTS

Invertebrate surveys were conducted concurrent with the avian surveys on the above dates. A total of 29 butterfly, 10 dragonfly, and 4 damselfly species were observed on and in the vicinity of Petty's Island. Please see **Appendix IV** for a complete list of invertebrate species observed.

BOTANICAL SURVEY RESULTS

Limited botanical survey of Petty's Island was conducted by HA's senior botanist Ted Gordon on April 23 (accompanied by Matthew McCort and James Dowdell) and June 25, 2010 (accompanied by Dave Schneider). Covering an estimated 2/3 of the island, we meandered through the site as terrain and understory density would allow. Among the obstacles encountered were fallen trees, steep dredge-spoil slopes choked by thickets of Japanese knotweed (*Polygonum cuspidatum*), poison ivy (*Toxicodendron radicans*) (**Figure 18**), stinging nettle (*Urtica dioica*), and other invasive species.

The closest thing to a natural plant community on this developed island is the narrow, emergent, tidal zone dominated by *Nuphar* along Back Channel on the eastern border of the island (**Figure 19**). At the southern half of the island, an impressive xeric to mesic mixed hardwood forest of tall trees (*Salix, Morus, Fraxinus, Sycamore*, *Acer,* and *Populus* interspersed with numerous shrubs and herbs) has become established on spoil mounds, ridges, and depressions. Two or three small excavations here behave like natural ponds.

Dominated by grasses and composites, the xeric fields in the northern half of the island are being invaded by various species of *Populus.* Near the edge of the base of a dike bordering a wetland basin, east of Tank #26, we discovered seven flowering specimens of the spring ladies'tresses, *Spiranthes vernalis* (**Figures 7 and 20**). This coastal orchid is rarely found this far inland.

Please see **Appendix V** for a complete list of dominant botanical species observed.

DISCUSSION AND RECOMMENDATIONS

The habitat present on Petty's Island is an amalgam of invasive and native species; in many cases, the invasives, such as Japanese knotweed, stinging nettle, and poison ivy, are winning the battle for a permanent foothold. However, as degraded as the habitat is in its current state, there is a diversity of habitat types present that provide refuge for both breeding and migratory birds.

In addition to the diverse avian life, reptiles, amphibians, and mammals inhabit the island as well. White-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), and red fox (*Vulpes fulva*) (**Figure 21**), were confirmed to breed on the island, as young of all three species were observed.

REPTILES AND AMPHIBIANS

The surveys for reptiles and amphibians yielded common species that are typically well-adapted to persist in degraded habitats. All but the redbelly turtle (*Pseudemys rubriventris*), a state-threatened species in Pennsylvania (PA Fish and Boat Commission), and the coastal plain leopard frog (*Rana sphenocephala*), a state-endangered species in Pennsylvania (PA Fish and Boat Commission), generally fall into the category of disturbance tolerant species. In fact, some species such as the bullfrog (*Rana catesbeiana*), green frog (*R. clamitans melanota*) and northern brown snake (*Storeria d. dekayi*) seem to do exceptionally well in degraded, and sometimes urban, habitat types. Bullfrog and green frog are, by far, the most common amphibians on site. Except for the red-eared slider (*Trachemys scripta elegans*), all of the reptile and amphibian species that were observed are native to New Jersey. The coastal plain leopard frog was the least common species of all of the amphibians and reptiles, as only three (3) calling males were heard at the ponds in the southern portion of the island on March 25.

This baseline occurrence data can be used to help land managers focus on the appropriate types of habitat management for reptiles and amphibians on Petty's Island. Some preliminary suggestions for habitat and species management activities include maintenance of field habitat, the creation of nesting beaches and basking platforms for the three species of native aquatic turtles, and the creation of vernal ponds that could support breeding amphibians such as coastal plain leopard frogs. As many predated turtle nests were observed around the southern ponds (**Figures 22 and 23**), the use of predator excluders made out of galvanized hardware cloth could greatly offset the impact of human subsidized predators, such as raccoon and red fox, on the reproductive success of the native turtles that inhabit the island.

AVIAN

While plant species composition undoubtedly dictates vegetative structure, many of the undesirable plant species present have structural similarities to the native vegetation for this geographic region. Thus, the habitat present on the island is suitable as stop-over habitat for a wide variety of migratory avian species. An oasis in an otherwise industrial landscape, Petty's Island is, in fact, quite the paradox. Despite the oil tanks, shipping terminal and heavy truck traffic, it offers a variety of habitats amongst an otherwise completely developed urban setting. The fact that it is partially heavily vegetated and situated in the Delaware River, an obvious avian migratory pathway, no doubt attracts birds to stop, rest, forage, and even breed.

Many of the observed avian species are obviously the product of migration and probably only use the island for up to a few days. It is the shelter, rest, and invaluable refueling that makes migratory stop-over habitat so important to long distance migrants. Twenty three (23) species of warblers were observed during the 2010 surveys. Some of these species, as well as other land birds, were observed in good numbers. On April 30, 85 yellow-rumped warblers (*Dendroica coronata*), 30 hermit thrushes (*Catharus guttatus*), 23 black-and-white warblers (*Mniotilta varia*), 20 common yellowthroats (*Geothlypis trichas*), 18 American redstarts (*Setophaga ruticilla*), and 16 black-throated blue warblers (*Dendroica caerulescens*) were observed. On May 21, 36 Swainson's thrushes (*Catharus ustulatus*) and 30 blackpoll warblers (*Dendroica striata*) were observed, along with more than 200+ cedar waxwings (*Bombycilla cedrorum*) throughout the island.

The great blue heron rookery on the southwestern portion of the island appeared to be active this spring, but was only occupied by one or two pairs. The habitat at this location has not significantly changed in structure since five nests were counted here in December of 2004. Plenty of suitable nest placement sites clearly exist among the numerous black willow trees that border, and stand within, this wetland habitat. It is possible that successful rookeries on nearby islands in the Delaware River, both to the north and south of Petty's Island, may have taken the focus off of the southern end of Petty's Island as an important nesting site for this colonial nesting species.

Future land managers will undoubtedly be faced with decisions on how to best improve the habitats for wildlife, post remediation, and how to maintain these habitat types in perpetuity once they are created or enhanced. Some preliminary suggestions include the restoration and enhancement of the impoundments around the oil tanks for shorebirds, ducks, and other waterfowl that tend to drop in and use these features from time to time during spring and fall migration; development of a system of hiking/wildlife observation trails that incorporate the impoundments surrounding the oil tanks as well as the dikes surrounding the ponds to the south; development of a mowing regime that is sensitive to breeding avian species such as spotted sandpiper and killdeer (*Charadrius vociferus*), the maintenance of field and edge habitat, the installation of birding and wildlife observation trails

along the oil tank impoundments and along the dikes bordering the ponds to the south, and the installation of American kestrel (*Falco sparverius*) nest boxes. American kestrel, a likely candidate for state listing, was documented as a breeder on Petty's Island in 2005. This species was absent during HA's 2010 survey efforts. Nesting boxes specifically designed for American kestrel could increase the chances that the species would return to the island and breed once again.

Future Surveys

In the future, it would be extremely useful to conduct a fall migratory bird survey at Petty's Island. Species composition and habitat use data for fall avian migrants could be easily compared to the spring migration data collected in 2010. Any habitat management planning that may be conducted in the future should undoubtedly consider the array of species present during fall migration.

BOTANICAL

No rare plants were found anywhere on the project site. It is HA's professional opinion that there are no threatened or endangered plant species present on the subject property. To enhance access to the mature forest atop the spoil mounds, it is recommended that a system of hiking trails be established along the ridges and through depressions, with subsidiary trails leading to isolated ponds and down to the Back Cove and Delaware shorelines. Initial clearing and periodic mowing of invasive species well be necessary to maintain this trail system.

HABITAT MANAGEMENT

This report provides baseline data on wildlife habitats and species occurrence. Some of the species present on the property may benefit from habitat management. A habitat management plan that takes into account all of the wildlife species that use the island would be preferred. Some habitat management/ modification ideas include, but are not limited to, nesting beaches for turtles, a wildlife sensitive mowing regime, basking platforms for aquatic turtles, and hiking/wildlife observation trails with interpretive graphics/signage. Future surveys are recommended, particiularly to monitor after any management strategies are implemented.

SUMMARY

HA was retained by the Conserve Wildlife Foundation of New Jersey to conduct an intensive plant and wildlife inventory on Petty's Island, an approximately 300-acre island in the Delaware River in the vicinity of Philadelphia and Camden. This survey was conducted in an attempt to better understand the importance of this unique island oasis to plant and wildlife species. Surveys were conducted specifically for migratory birds, nesting birds, reptiles and amphibians, and possible rare plant communities.

In total, 141 bird, 10 reptile and amphibian, 5 mammal, 29 butterfly, 10 dragonfly, and 4 damselfly species were observed on and in the vicinity of Petty's Island. Fifty four (54) of the observed bird species were confirmed to be breeding on Petty's Island.

Figure 3. A photograph of the welcome sign, as seen upon first entering Petty's Island. Herpetological Associates, Inc. 2010.

Figure 4. Petty's Island, in its current state, is an oil storage field and an extremely active shipping terminal. Herpetological Associates, Inc. 2010.

Figure 5. A large field of oil storage tanks lies in the center of the island. Herpetological Associates, Inc. 2010.

Figure 6. Crowley Marine is a busy shipping terminal with a large dock for loading barges located on the Main Channel. Herpetological Associates, Inc. 2010.

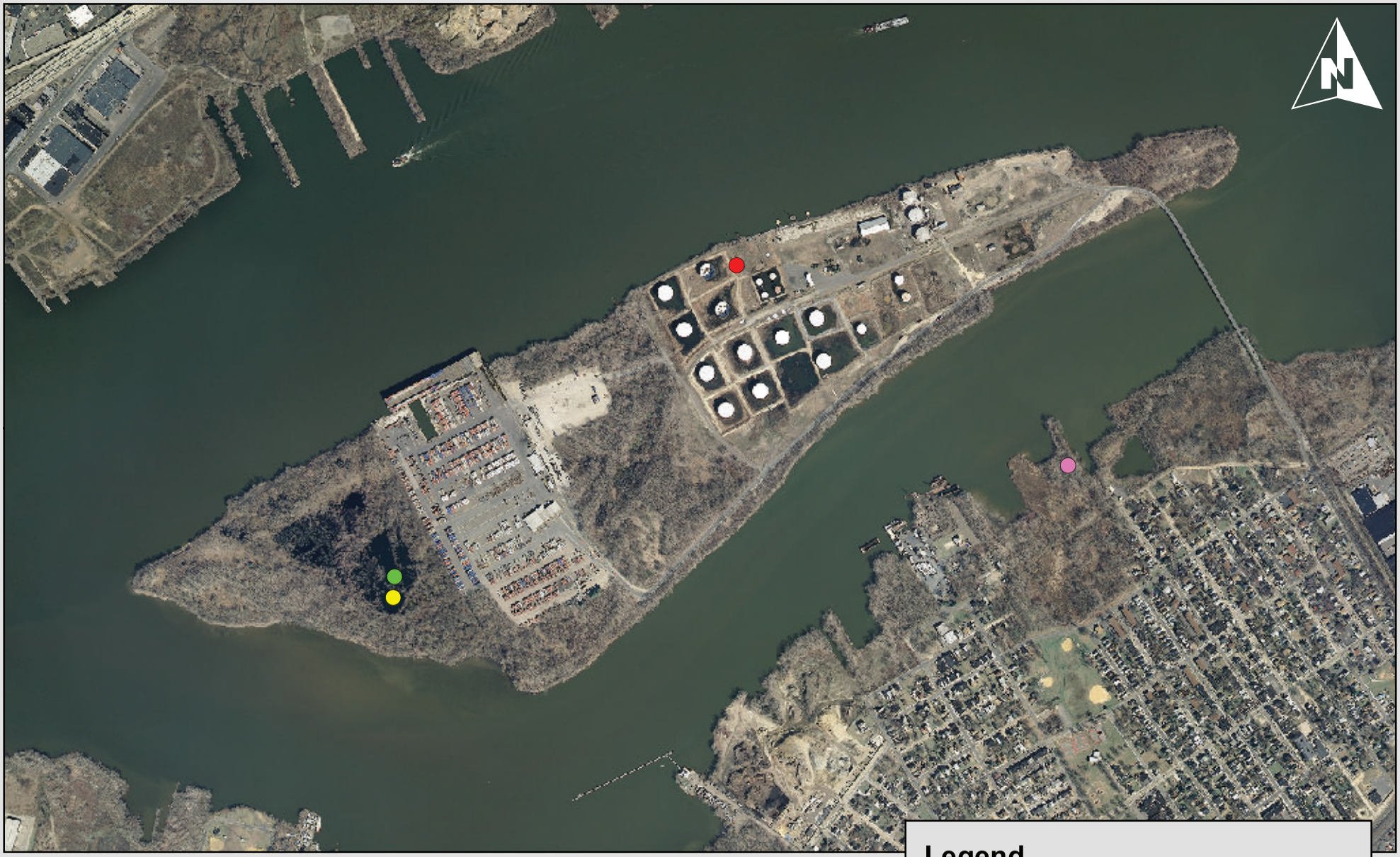

Figure 7. Location of noteworthy species on Petty's Island in Pennsauken, Camden County, New Jersey.
Source Image: 2007 NJDEP Color Orthophotography
Herpetological Associates, Inc. 2010.

Figure 8. Several eastern garter snakes (*Thamnophis s. sirtalis*) were observed on site. This species was typically found by turning over natural and man-made debris. Herpetological Associates, Inc. 2010.

Figure 9. Fowler's toads (*Bufo fowleri*) were encountered at various locations on the island on several occasions. Herpetological Associates, Inc. 2010.

Figure 10. Northern brown snakes (*Storeria d. dekayi*) were found under various types of debris on the island. Herpetological Associates, Inc. 2010.

Figure 11. Redbelly turtles (*Pseudemys rubriventris*) were often seen basking or breaching the surface at the ponds at the Southern end of the island. Herpetological Associates, Inc. 2010.

Figure 12. A willow flycatcher (*Empidonax traillii*) perched on false indigo (*Amorpha fruticosa*). Six males were observed singing on territory on the last two survey dates. Herpetological Associates, Inc. 2010.

Figure 13. An example of suitable, and confirmed, willow flycatcher breeding habitat. According to Sibley (2000), willow flycatchers prefer low, brushy habitats, usually by water. Herpetological Associates, Inc. 2010.

Figure 14. A spotted sandpiper (*Actitis macularia*) nest was found amongst the oil tanks along an access road. Spotted sandpipers, as well as other shorebirds, have been observed foraging in the marshy impoundments surrounding the oil tanks on site. Herpetological Associates, Inc. 2010.

Figure 15. The great blue heron (*Ardea herodias*) rookery was monitored by HA during the 2010 survey. This nest was observed after the first nest was abandoned. Although hard to see in this photograph, there is an adult brooding on this nest. By May 26, this nest was also abandoned. Herpetological Associates, Inc. 2010.

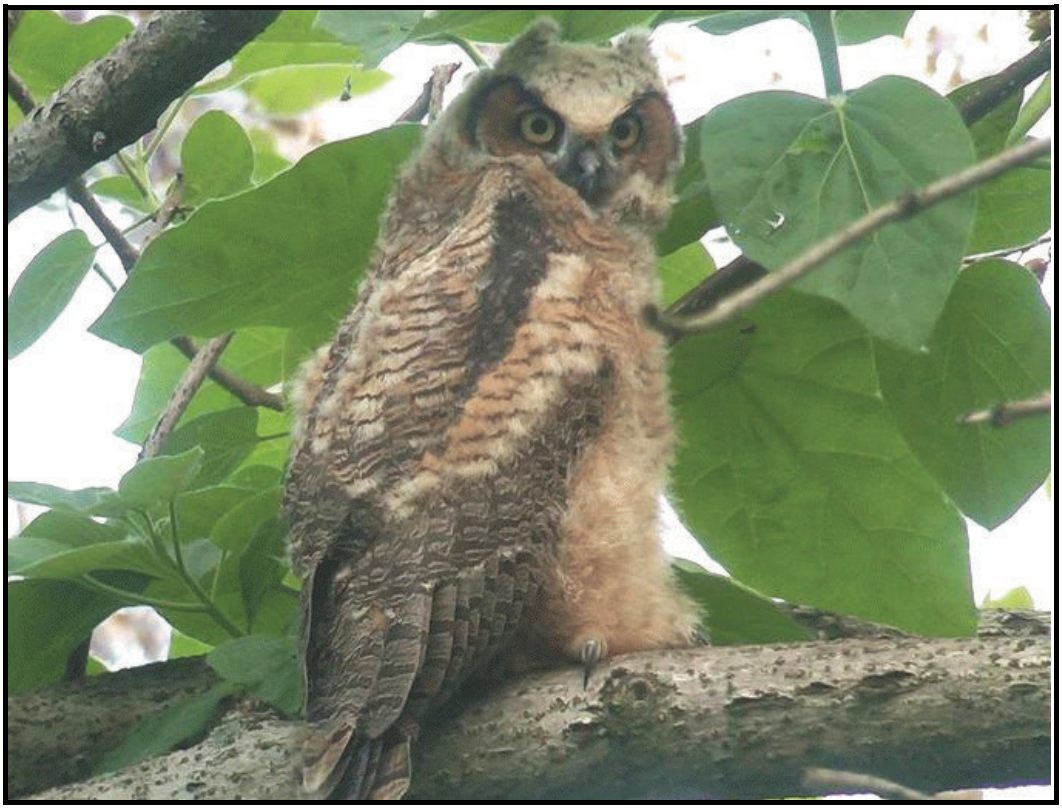

Figure 16. Two fledgling great horned owls (*Bubo virginianus*), one of which is pictured here, were found in a clearing surrounded by large trees just northeast of the Crowley Marine facility. Herpetological Associates, Inc. 2010.

Figure 17. On April 30, 2010, this lone migrant grasshopper sparrow (*Ammodramus savannarum*) was observed at the northeastern end of Petty's Island. Herpetological Associates, Inc. 2010.

Figure 18. Poison ivy (*Toxicodendron radicans*) is an extremely commonly encountered invasive on Petty's Island. Growing in both vine and shrub forms, this plant creates dense cover in many locations. Herpetological Associates, Inc. 2010.

Figure 19. Th majority of the tidal flats that border Petty's Island are dominated by spatterdock (*Nuphar lutea ssp. advena*). Herpetological Associates, Inc. 2010.

Figure 20. Seven (7) flowering specimens of the spring ladies' tresses (*Spiranthes vernalis*) were found just east of the dike bordering tank # 26. Herpetological Associates, Inc. 2010.

Figure 21. HA staff had a close encounter with two fox kits and their mother while conducting wildlife surveys on Petty's Island. The youngsters were extremely curious and approached HA biologists without much hesitation. Herpetological Associates, Inc. 2010.

Figure 22. Several predated turtle nests were discovered in the habitat surrounding the ponds in the southern portion of the island. Pictured here is a redbelly turtle (*Pseudemys rubriventris*) nest. Herpetological Associates, Inc. 2010.

Figure 23. This is a redbelly turtle egg from one of the predated nests found by HA. Predator exclusion devices made out of galvanized hardware cloth can greatly increase hatching success, despite the presence of mammalian predators. Herpetological Associates, Inc. 2010.

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Appendices

Appendix I

Appendix I. Petty's Island survey dates, surveyors, survey type, and daily weather conditions.

Date	Time	Surveyors	Survey Type	Weather
3/25/10	**In:** 0730 hrs **Out:** 1700 hrs	J. Dowdell D. Schneider M. McCort	Avian, Reptile, Amphibian, and Mammal	**Temperature:** 34-70°F **Wind:** Calm a.m. to south 5-15mph late a.m. to p.m. **Cloud Cover:** 40% to 100%
4/23/10	**In:** 0700 hrs **Out:** 1600 hrs	J. Dowdell M. McCort T. Gordon	Avian, Reptile, Amphibian, Mammal, and Botanical	**Temperature:** 48-68°F **Wind:** north 10-15mph early a.m. then northwest 10-20mph **Cloud Cover:** 0%
4/30/10	**In:** 0700 hrs **Out:** 1600 hrs	J. Dowdell M. McCort	Avian, Reptile, Amphibian, and Mammal	**Temperature:** 50-80°F **Wind:** Calm a.m. to southwest 10 to 20mph p.m. **Cloud Cover:** 0-10%
5/6/10	**In:** 0700 hrs **Out:** 1500 hrs	J. Dowdell M. McCort	Avian, Reptile, Amphibian, and Mammal	**Temperature:** 58-81°F **Wind:** south 10-15mph early a.m.; southwest to west 15-25mph late a.m. to p.m. **Cloud Cover:** 40-80%
5/14/10	**In:** 0700 hrs **Out:** 1600 hrs	J. Dowdell M. McCort	Avian, Reptile, Amphibian, and Mammal	**Temperature:** 58-84°F **Wind:** southwest 10-15mph early a.m. then southwest 10-20mph p.m. **Cloud Cover:** 10-40%
5/21/10	**In:** 0700 hrs **Out:** 1500 hrs	J. Dowdell M. McCort	Avian, Reptile, Amphibian, and Mammal	**Temperature:** 61-87°F **Wind:** calm to south 5-10mph **Cloud Cover:** 10-40%
5/26/10	**In:** 0730 hrs **Out:** 1400 hrs	J. Dowdell M. McCort	Avian, Reptile, Amphibian, and Mammal	**Temperature:** 64-91°F **Wind:** southwest 5-10mph a.m. to west 5-10mph p.m. **Cloud Cover:** 10-20%
6/17/10	**In:** 0600 hrs **Out:** 1300 hrs	J. Dowdell M. McCort	Avian, Reptile, Amphibian, and Mammal	**Temperature:** 69-81°F **Wind:** northwest 10-15mph a.m. to northwest 10-20mph w/ gusts to 25mph p.m. **Cloud Cover:** 0-30%
6/25/10	**In:** 0900 hrs **Out:** 1500 hrs	D. Schneider T. Gordon	Reptile, Amphibian, Mammal, and Botanical	**Temperature:** 77-86°F **Wind:** north northwest 5-10mph a.m. to west southwest 5-10mph p.m. **Cloud Cover:** 40-70%

Appendix II

Appendix II. Reptiles, amphibians, and mammals observed on Petty's Island during visual surveys conducted in the spring of 2010.

Common Name	Scientific Name	Number Observed = High Count (highest number counted on any one visit)
Snakes		
northern brown snake	*Storeria d. dekayi*	3
eastern garter snake	*Thamnophis s. sirtalis*	3
Turtles		
common snapping turtle	*Chelydra s. serpentina*	5
red-eared slider	*Trachemys scripta elegans*	1
redbelly turtle	*Pseudemys rubriventris*	6
eastern painted turtle	*Chrysemys p. picta*	10
Frogs and Toads		
Fowler's toad	*Bufo fowleri*	2
bullfrog	*Rana catesbeiana*	30+
green frog	*Rana clamitans melanota*	20+
coastal plain leopard frog	*Rana sphenocephala*	3
Mammals		
white-footed mouse	*Peromyscus leucopus*	2
red fox	*Vulpes fulva*	3 (**B**)
white tailed deer	*Odocoileus virginianus*	8
raccoon	*Procyon lotor*	2 (**B**)

(**B**) = Breeding Confirmed

Appendix III

Appendix III. Birds observed on and in the vicinity of Petty's Island during the spring of 2010.

Breeding (B)	Common Name	Scientific Name	Number Observed = High Count (highest number counted on any one visit)
	common loon	*Gavia immer*	1
	double-crested cormorant	*Phalacrocorax auritus*	110
	great cormorant	*Phalacrocorax carbo*	2
(**B**)	great blue heron (SC)	*Ardea herodias*	4 (high count), one attempted nest (ultimately abandoned) and one successful nest on Petty's Island
(**B**)	green heron	*Butorides virescens*	4
	snow goose	*Chen caerulescens*	3
(**B**)	Canada goose	*Branta canadensis*	382
(**B**)	wood duck	*Aix sponsa*	19
	American black duck	*Anas rubripes*	48
(**B**)	mallard	*Anas platyrhynchos*	38
	blue-winged teal	*Anas discors*	1
	green-winged teal	*Anas crecca*	44
	bufflehead	*Bucephala albeola*	32
	hooded merganser	*Lophodytes cucullatus*	7
	common merganser	*Mergus merganser*	28
	ruddy duck	*Oxyura jamaicensis*	204
	black vulture	*Coragyps atratus*	1
	turkey vulture	*Carthartes aura*	6
	osprey (T)	*Pandion haliaetus*	1
(**B**)	bald eagle (E)	*Haliaeetus leucocephalus*	3, nesting on mainland, 2010 nest failed
	sharp-shinned hawk	*Accipiter striatus*	1
(**B**)	Cooper's hawk (T)	*Accipiter cooperii*	1, immature male gave territorial response to tape after observed flying over (4/23/10); adult male displaying over ponds gave territorial response to tape played (6/17/10); species likely breeds on Petty's Island based on this data
(**B**)	red-tailed hawk	*Buteo jamaicensis*	7
	merlin	*Falco columbarius*	1
(**B***)	peregrine falcon	*Falco peregrinus*	1 (*likely breeds nearby on major bridge, not on Petty's Island, likely forages on Island)
	northern bobwhite	*Colinus virginianus*	1
(**B**)	killdeer	*Charadrius vociferus*	10
	greater yellowlegs	*Tringa melanoleuca*	1
	lesser yellowlegs	*Tringa flavipes*	10
	solitary sandpiper	*Tringa solitaria*	10

Appendix III. Birds observed on and in the vicinity of Petty's Island during the spring of 2010 (Continued).

Breeding (**B**)	**Common Name**	**Scientific Name**	**Number Observed = High Count (highest number counted on any one visit)**
(**B**)	spotted sandpiper	*Actitis macularia*	6
	semipalmated sandpiper	*Calidris pusilla*	4
	least sandpiper	*Calidris minutilla*	30
	Wilson's snipe	*Gallinago gallinago*	1
(**B**)	American woodcock	*Scolopax minor*	1
	laughing gull	*Larus atricilla*	220
	ring-billed gull	*Larus delawarensis*	250
	herring gull	*Larus argentatus*	75
	Iceland gull	*Larus glaucoides*	1 (3/25/10)
	great black-backed gull	*Larus marinus*	30
	Caspian tern	*Sterna caspia*	1 (4/30/10)
	Forster's tern	*Sterna forsteri*	3
(**B**)	rock dove	*Columba livea*	15
(**B**)	mourning dove	*Zenaida macroura*	18
	yellow-billed cuckoo	*Coccyzus americanus*	2
(**B**)	great-horned owl	*Bubo virginianus*	2 (Fledglings)
(**B**)	chimney swift	*Chaetura pelagica*	36, (likely breeds nearby, not on Petty's Island)
(**B**)	ruby-throated hummingbird	*Archilochus colubris*	1 + nest
	belted kingfisher	*Ceryle alcyon*	1
(**B**)	red-bellied woodpecker	*Melanerpes carolinus*	8
(**B**)	downy woodpecker	*Picoides pubescens*	8
(**B**)	hairy woodpecker	*Picoides villosus*	4
(**B**)	northern flicker	*Colaptes auratus*	12
	eastern wood pewee	*Contopus virens*	3
	yellow-bellied flycatcher	*Empidonax flaviventris*	1
	alder flycatcher	*Empidonax alnorum*	1
(**B**)	willow flycatcher	*Empidonax traillii*	6 (males singing on territory)
	least flycatcher	*Empidonax minimus*	5
	eastern phoebe	*Sayornis phoebe*	1
(**B**)	great-crested flycatcher	*Myiarchus crinitus*	14
(**B**)	eastern kingbird	*Tyrannus tyrannus*	12

Appendix III. Birds observed on and in the vicinity of Petty's Island during the spring of 2010 (Continued).

Breeding (**B**)	**Common Name**	**Scientific Name**	**Number Observed = High Count (highest number counted on any one visit)**
	white-eyed vireo	*Vireo griseus*	1
	yellow-throated vireo	*Vireo flavifrons*	1
	blue-headed vireo	*Vireo solitarius*	6
(**B**)	warbling vireo	*Vireo gilvus*	22
(**B**)	red-eyed vireo	*Vireo olivaceus*	21
(**B**)	blue jay	*Cyanocitta cristata*	3
(**B**)	American crow	*Corvus brachyrhyncos*	15
	fish crow	*Corvus ossifragus*	2
	purple martin	*Progne subis*	1
(**B**)	tree swallow	*Tachycineta bicolor*	75
(**B**)	northern rough-winged swallow	*Stelgidopteryx serripennis*	25
	bank swallow	*Riparia riparia*	6
	cliff swallow	*Petrochelidon pyrrhonota*	1
(**B**)	barn swallow	*Hirundo rustica*	30
(**B**)	Carolina chickadee	*Poecile carolinensis*	12
(**B**)	tufted titmouse	*Baeolophus bicolor*	1
(**B**)	Carolina wren	*Thryothorus ludovicianus*	13
(**B**)	house wren	*Troglodytes aedon*	24
	winter wren	*Troglodytes troglodytes*	1
	golden-crowned kinglet	*Regulus satrapa*	1
	ruby-crowned kinglet	*Regulus calendula*	6
(**B**)	blue-gray gnatcatcher	*Polioptila caerulea*	24
	veery	*Catharus fuscescens*	4
	gray-cheeked thrush	*Catharus minimus*	6
	Swainson's thrush	*Catharus ustulatus*	36
	hermit thrush	*Catharus guttatus*	30
	wood thrush	*Hylocichla mustelina*	6
(**B**)	American robin	*Turdus migratorius*	70
(**B**)	gray catbird	*Dumetella carolinensis*	35
(**B**)	northern mockingbird	*Mimus polyglottos*	8
(**B**)	brown thrasher	*Toxostoma rufum*	4
(**B**)	European starling	*Sturnus vulgaris*	50
(**B**)	cedar waxwing	*Bombycilla cedrorum*	200+

Appendix III. Birds observed on and in the vicinity of Petty's Island during the spring of 2010 (Continued).

Breeding (**B**)	**Common Name**	**Scientific Name**	**Number Observed = High Count (highest number counted on any one visit)**
	Tennessee warbler	*Vermivora perigrina*	5
	Nashville warbler	*Vermivora ruficapilla*	1
	northern parula	*Parula americana*	8
(**B**)	yellow warbler	*Dendroica petechia*	50+
	chestnut-sided warbler	*Dendroica pensylvanica*	10
	magnolia warbler	*Dendroica magnolia*	16
	black-throated blue warbler	*Dendroica caerulescens*	16
	yellow-rumped warbler	*Dendroica coronata*	85
	black-throated green warbler	*Dendroica virens*	2
	blackburnian warbler	*Dendroica fusca*	7
	pine warbler	*Dendroica pinus*	4
	prairie warbler	*Dendroica discolor*	1
	palm warbler	*Dendroica palmarum*	2
	bay-breasted warbler	*Dendroica castanea*	1
	blackpoll warbler	*Dendroica striata*	30
	black-and-white warbler	*Mniotilta varia*	23
(**B**)	American redstart	*Setophaga ruticilla*	18
	ovenbird	*Seiurus aurocapillus*	5
	northern waterthrush	*Seiurus noveboracensis*	10
	mourning warbler	*Oporornis philadelphia*	2
(**B**)	common yellowthroat	*Geothlypis trichas*	20
	Wilson's warbler	*Wilsonia pusilla*	2
	Canada warbler	*Wilsonia canadensis*	4
	scarlet tanager	*Piranga olivacea*	4
(**B**)	eastern towhee	*Pipilo erythrophthalmus*	14
	chipping sparrow	*Spizella passerina*	2
(**B**)	field sparrow	*Spizella pusilla*	7
	savannah sparrow (T)	*Passerculus sandwichensis*	4
	grasshopper sparrow (T)	*Ammodramus savannarum*	1 migrant observed on Petty's Island
(**B**)	song sparrow	*Melospiza melodia*	24

Appendix III. Birds observed on and in the vicinity of Petty's Island during the spring of 2010 (Continued).

Breeding (**B**)	**Common Name**	**Scientific Name**	**Number Observed = High Count (highest number counted on any one visit)**
	Lincoln's sparrow	*Melospiza lincolnii*	1
(**B**)	swamp sparrow	*Melospiza georgiana*	2
	white-throated sparrow	*Zonotrichia albicollis*	80
	dark-eyed junco	*Junco hyemalis*	1
(**B**)	northern cardinal	*Cardinalis cardinalis*	14
	rose-breasted grosbeak	*Pheucticus ludovicianus*	4
	indigo bunting	*Passerina cyanea*	3
	bobolink (T)	*Dolichonyx oryzivorus*	8
(**B**)	red-winged blackbird	*Agelaius phoeniceus*	40
	rusty blackbird	*Euphagus carolinus*	1
(**B**)	common grackle	*Quiscalus quiscula*	30
(**B**)	brown-headed cowbird	*Molothrus ater*	30
(**B**)	orchard oriole	*Icterus spurius*	16
(**B**)	Baltimore oriole	*Icterus galbula*	24
(**B**)	house finch	*Carpodacus mexicanus*	15
(**B**)	American goldfinch	*Carduelis tristis*	60
(**B**)	house sparrow	*Passer domesticus*	10

NJ State Status Designations: "E" = Endangered, "T" = Threatened, "SC" = Species of Special Concern
(**B**) = Breeding on Petty's Island

Appendix IV

Appendix IV. Butterflies, dragonflies, and damselflies observed on Petty's Island in the spring of 2010.

Common Name	Scientific Name	Number Observed = High Count (highest number counted on one visit)
Butterflies		
black swallowtail	*Papilio polyxenes*	4
eastern tiger swallowtail	*Papilio glaucus*	30
spicebush swallowtail	*Papilio troilus*	1
cabbage white	*Pieris rapae*	80
falcate orangetip	*Anthocharis midea*	3
clouded sulphur	*Colias philodice*	2
orange sulphur	*Colias eurytheme*	6
American copper	*Lycaena phlaeas*	1
red-banded hairstreak	*Calycopus cecrops*	2
eastern tailed blue	*Everes comyntas*	6
"spring" spring azure	*Celastrina ladon*	1
"summer" spring azure	*Celastrina ladon*	1
American snout	*Libytheana carinenta*	1
variegated fritillary	*Euptoieta claudia*	1
pearl crescent	*Phyciodes tharos*	15
question mark	*Polygonia interrogationis*	6
eastern comma	*Polygonia comma*	8
mourning cloak	*Nymphalis antiopa*	1
American lady	*Vanessa virginiensis*	20
red admiral	*Vanessa atalanta*	350+
common buckeye	*Junonia coenia*	6
red-spotted purple	*Limenitis arthemis astyanax*	30
viceroy	*Limenitis archippus*	5
little wood-satyr	*Megisto cymela*	15
silver-spotted skipper	*Epargyreus clarus*	20
Juvenal's duskywing	*Erynnis juvenalis*	1
wild indigo duskywing	*Erynnis baptisiae*	2
sachem	*Atalopedes campestris*	8
zabulon skipper	*Poanes zabulon*	2

Appendix IV. Butterflies, dragonflies, and damselflies observed on Petty's Island in the spring of 2010 (Continued).

Common Name	Scientific Name	Number Observed = High Count (highest number counted on one visit)
Dragonflies		
common green darner	*Anax junius*	30
swamp darner	*Epiaeschna heros*	1
eastern pondhawk	*Erythemis simplicicollis*	50
painted skimmer	*Libellula semifasciata*	1
pied skimmer	*Libellula luctuosa*	1
blue dasher	*Pachydiplax longipennis*	100+
spot-winged glider	*Pantala hymenaea*	30
common whitetail	*Plathemis lydia*	25
violet-masked glider	*Tramea carolina*	10
black-mantled glider	*Tramea lacerata*	30
Damselflies		
slender spreadwing	*Lestes rectangularis*	10
familiar bluet	*Enallagma civile*	100+
big bluet	*Enallagma durum*	10
fragile forktail	*Ischnura posita*	200+

Appendix V

Botanical Species Observed

Nomenclature essentially is based on Gleason and Cronquist's *Manual of Vascular Plants of the Northeastern United States and Adjacent Canada* (1991) and in a few instances on the digital listing of Kartesx and Meacham (1999).

Species preceded by an asterisk (*) is an exotic.

Trees

Acer negundo box elder
Acer rubrum red maple
Acer saccharinum silver maple
Ailanthus altissima tree of heaven
Alnus glutinosa *European alder*
Betula nigra river birch
Betula populifolia gray birch
Catalpa bignonioides southern catalpa
Carya sp. a hickory
Celtis occidentalis northern hackberry
Fraxinus pensylvanica green ash
Ilex opaca American holly
Juniperus virginiana eastern red cedar
Liquidambar styraciflua sweet gum
Liriodendron tulipifera tulip-tree
Morus alba white mulberry
Morus rubran red mulberry
Paulownia tomentosa empress tree
Pinus strobus white pine
Platinus occindentalis sycamore
Populus alba white poplar
Populus deltoides eastern cottonwood
Populus grandidentata large-toothed aspen
Populus tremuloides quaking aspen
Prunus serotina wild black cherry
Quercus falcata southern red oak
Quercus palustrus pin oak
Quercus phellos willow oak
Rhus copallinum winged sumac
Rhus typhina staghorn sumac
Robinia pseudoacacia black locust
**Salix babylonica* weeping willow
Salix nigra black willow
Salix sericea silky willow

Shrubs

Amorpha fruticosa false indigo
**Berberis thunbergii* Japanese barberry

Campsis radicans trumpet creeper
**Celastrus obiculatus* Asiatic bittersweet
Cephalanthus occidentalis buttonbush
Cornus sericea red osier dogwood
**Lonicera japonica* Japanese honeysuckle
Myrica (Morella) pensylvanica bayberry
Parthenocissus quinquefolia Virginia creeper
**Polygonum cuspidatum* Japanese knotweed
Rubus allegheniensis common blackberry
Smilax rotundifolia bullbrier
Toxicodendron radicans poison ivy
Viburnum dentatum arrowwood

Herbs
**Achillea millefolium* yarrow
**Alliaria officionalis* garlic mustard
**Allium vineale* field garlic
Ambrosia artemisiifolia common ragweed
**Artemisia vulgaris* common mugwort
Asclepias tuberosa butterfly weed
Asclepias syriaca common milkweed
Boehmeria cylindrica false nettle
**Carduus nutans* nodding thistle
**Centaurea biebersteinii* spotted knapweed
**Chenopodium album* lamb's quarter
**Cichorium intybus* chickory
**Cirsium arvense* Canada thistle
Circaea quadrisulcata enchanter's nightshade
Conyza canadensis var. *canadensis* horseweed
**Daucus carota* queen ann's lace
**Dianthus armeria* Deptford pink
Elodea nuttallii Nuttal's waterweed
Eupatorium hyssopifolium hyssop-leaved boneset
Eupatorium rugosum white snakeroot
Eupatorium perfoliatum common boneset
Eupatorium serotinum late-flowering boneset
**Glechoma hederacea* ground ivy
Heracleum maximum cow parsnip
**Lamium amplexicaulis* henbit
Lespedeza capitata round-headed bushclover
**Lespedeza cuneata* Chinese lespedeza
**Lythrum salicaria* purple loosestrife
Maianthemum canadense Canada mayflower
**Melilotus alba* white sweet clover
**Melilotus officionalis* yellow sweet clover
Nuphar lutea ssp. advena spatterdock
**Petrorhagia prolifera* childing pink
Pilea pumula clearweed
Phytolacca americana pokeweed

Plantago aristata bracted plantain
**Plantago lanceolata* English plantain
Polygonum hydropiper mild water pepper
**Rumex acetosella* sheep sorrel
**Rumex crispus* curled dock
Spiranthes vernalis spring ladies' tresses
Teucrium canadense American germander
**Trifolium arvense* rabbit-foot clover
Typha latifolia common cattail
**Urtica dioica* stinging nettle
**Verbascum blattaria* moth mullein
**Verbascum thapsus* common mullein
Verbena hastata blue vervain

Ferns

Onoclea sensibilis sensitive fern
Pteridium aquilinum bracken fern

Grasses

Andropogon virginicus Virginia beardgrass
**Anthoxanthum odoratum* sweet vernal grass
**Bromus inermis* smooth brome grass
**Dactylis glomerata* orchard grass
Leersia oryzoides rice cutgrass
Leptoloma cognatum fall witch-grass
**Microstegium vimineum* Nepalese stiltgrass
Panicum clandestinum deer tongue
Panicum virgatum switchgrass
**Phragmites australis* common reed

Sedges

Carex lurida sallow sedge
Carex pensylvanica Pennsylvania sedge
Carex scoparia pointed broom sedge
Carex vulpinoidea fox sedge
Schoenoplectus pungens common threesquare
Scirpus atrovirens dark-green bulrush

Rushes

Juncus acuminatus sharp-fruited rush
Juncus effusus soft rush
Juncus tenuis path rush

Appendix VI

Appendix VI. Reptiles and mammals observed by HA during prior surveys on Petty's Island in 2004, 2005, and 2006. Only animals not observed in 2010 are listed.

Common Name	Scientific Name	Number Observed = High Count (highest number counted on any one visit)
Turtles		
northern diamondback terrapin	*Malaclemys t. terrapin*	1 (shell, likely washed up on Petty's Island)
Mammals		
eastern gray squirrel	*Sciurus carolinensis*	N/A
eastern cottontail	*Sylvilagus floridanus*	N/A

Appendix VI. Birds observed on and in the vicinity of Petty's Island during prior surveys conducted in 2004, 2005, and 2006. Only animals not observed in 2010 are listed.

Common Name	Scientific Name
red-throated loon	*Gavia stellata*
pied-billed grebe (E)	*Podilymbus podiceps*
horned grebe	*Podiceps auritus*
least bittern	*Ixobrychus exilis*
great egret	*Ardea alba*
black-crowned night-heron (T)	*Nycticorax nycticorax*
glossy ibis	*Plegadis falcinellus*
mute swan	*Cygnus olor*
gadwall	*Anas strepera*
American wigeon	*Anas americana*
northern shoveler	*Anas clypeata*
northern pintail	*Anas acuta*
canvasback	*Aythya valisineria*
ring-necked duck	*Aythya collaris*
greater scaup	*Aythya marila*
lesser scaup	*Aythya affinis*
black scoter	*Melanitta nigra*
long-tailed duck	*Clangula hyemalis*
common goldeneye	*Bucephala clangula*
red-breasted merganser	*Mergus serrator*
northern harrier (E)	*Circus cyaneus*
red-shouldered hawk (E, breeding; T, nonbreeding)	*Buteo lineatus*
broad-winged hawk	*Buteo platypterus*

Appendix VI. Birds observed on and in the vicinity of Petty's Island during prior surveys conducted in 2004, 2005, and 2006 (Continued). Only animals not observed in 2010 are listed.

Common Name	Scientific Name
rough-legged hawk	*Buteo lagopus*
golden eagle	*Aquila chrysaetos*
American kestrel	*Falco sparverius*
Virginia rail	*Rallus limicola*
American coot	*Fulica americana*
semipalmated plover	*Charadrius semipalmatus*
little gull	*Larus minutus*
Bonaparte's gull	*Larus philadelphia*
lesser black-backed gull	*Larus fuscus*
glaucous gull	*Larus hyperboreus*
common tern	*Sterna hirundo*
arctic tern	*Arctic tern*
short-eared owl (E, breeding poulation)	*Asio flammeus*
horned lark	*Eremophila alpestris*
white-breasted nuthatch	*Sitta carolinensis*
brown creeper	*Certhia americana*
marsh wren	*Cistothorus palustris*
American pipit	*Anthus rubescens*
American tree sparrow	*Spizella arborea*
fox sparrow	*Passerella iliaca*
Eastern meadowlark	*Sturnella magna*
purple finch	*Carpodactus purpureus*

NJ Sate Status Designations: "E" = Endangered, "T" = Threatened, "SC" = Species of Special Concern