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Boston, Massachusetts



Avian Inventory and Monitoring Needs for Gateway National Recreation Area: A Review of Available Literature and Data

Technical Report NPS/NER/NRTR--2006/061



ON THE COVER

Yellow-crowned Night Herons

Photograph by: Kevin T. Karlson

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Technical Report NPS/NER/NRTR--2006/061

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Executive Summary

In 1999, the National Park Service (NPS) announced the "Natural Resource Challenge" for preserving natural resources in parks. As part of the challenge, the National Park Service implemented a strategy designed to institutionalize natural resource inventory and monitoring on a programmatic basis throughout the agency. As a result the NPS developed the Inventory and Monitoring (I&M) Program.

This program ensures that the approximately 270 park units with significant natural resources possess the resource information needed for effective, science-based managerial decision-making and resource protection required as part of the Natural Resource Challenge. One of the many goals of the I&M Program is to gather all of the existing natural resource information for each of the I&M parks and compile it electronically in order to make it easily accessible and available for park management purposes.

Compilation of natural resource information, however, is just the first step. Information evaluation and interpretation is paramount to developing effective resource management strategies. With the preponderance of species that must be considered by park managers, the need for expert evaluation of existing taxa-specific information exists. When information is lacking, park managers may need advice regarding how best to fill gaps in knowledge, and where or how to allocate management resources to benefit species of greatest concern.

For park managers to develop effective strategies to maintain the viability of avian populations they must know which populations occur in their parks, their status, and potential threats. New Jersey Audubon Society (NJAS), under a cooperative agreement with the National Park Service (NPS), conducted a comprehensive review of existing avian information for Gateway National Recreation Area (GATE) and Fire Island National Seashore (FIIS), two parks within NPS's Northeast Coastal and Barrier Network.

Early in this process of reviewing NPSpecies we realized that looking at the park as a single entity, when in fact it encompassed three different and ecologically distinct units, would be ineffective at addressing the informational needs of resource managers. Consequently, we reviewed and evaluated avian occurrence, status, and abundance information for the Sandy Hook, Staten Island, and the Jamaica Bay/Breezy Point units separately, and created an NPSpecies-compatible database for each unit. We also developed a systematic method to classify the residency status of species that occur during more than one distinct period of the annual cycle, and a standardized way to present additional residency status and abundance information in the database.

Generally, we found the NPSpecies database was missing significant amounts of information and contained many inaccuracies for avian species occurring at GATE. After careful review of current documents and data sets, and with a working knowledge of avian abundance and distribution patterns in the region immediate to the park, we completed all fields in the GATE database and corrected inaccuracies. Our review of NPSpecies also revealed apparent data gaps

of a general nature suggesting that baseline inventory work should be conducted for the Staten Island unit, and possibly the Breezy Point portion of the Jamaica Bay/Breezy Point unit.

We used NatureBib and other bibliographic databases to identify information sources and data sets to use in evaluating existing knowledge gaps regarding GATE's avian resources. With the preponderance of species that must be considered by park managers, and limits on resources available to conduct active species management, the need to prioritize among species is important. Given this, our assessment of avian resource management needs was made in light of regional and national conservation objectives.

Our review mostly focused on comprehensive, multi-year reports and published, peer-reviewed manuscripts. Additionally, we reviewed recent scientific permit applications for research and monitoring efforts at GATE. We also interviewed several natural resource staff from each GATE unit to augment our perspective regarding inventory and monitoring needs throughout the park.

We found that several conservation priority species, across all avian groups, generally lack sufficient data to make informed resource management. Seaside Sparrow and Salt Marsh Sharp-tailed Sparrow (passerines), Northern Harrier and American Kestrel (raptors), American Oystercatcher and American Woodcock (shorebirds), American Black Duck (waterfowl), and Black Rail (waterbirds), are examples of the species that may require additional inventory and monitoring to support informed management actions. Additionally, we found that information about avian species during migration was lacking for some avian taxa.

For those species, species groups, or guilds identified as requiring additional abundance and distribution data, we also outlined several methods (e.g., point counts, MAPS) that could be used to accomplish inventory and monitoring needs.

Background

The National Park Service (NPS) recently embarked on an ambitious venture called the "Natural Resource Challenge." This program was designed to preserve natural resources in 270 park units that have significant natural resources. To address the goals of its new program, the NPS created the Inventory and Monitoring (I&M) Program to ensure that parks had the resource information needed for effective, science-based managerial decision-making and resource protection.

One of the first objectives of the I&M Program was to gather and compile existing natural resource information for each of the I&M parks into a format that was easy to use and available for park management purposes. NPSpecies, a relational database that resource managers can use to retrieve information on living resources across all parks, or for just a single park, is a major component of this information delivery system. Another is NatureBib, a searchable database of bibliographic citations that can provide a mechanism to find more detailed information about a particular resource in a park, or systemwide.

Compilation of natural resource information, however, is just the first step. Databases are only as good as the information they contain, so evaluating the validity and completeness of information in NPSpecies and NatureBib is paramount to developing effective resource management strategies. When data are lacking, their interpretation can be difficult or misleading. Consequently, uncertainty regarding allocation of management resources to benefit species, or the misappropriation of those resources, will prevail when based on incomplete or incorrect data.

These problems form the basis of this project's goals. New Jersey Audubon Society (NJAS), under cooperative agreement H4525037052 with the National Park Service (NPS) was charged with evaluating the completeness and accuracy of avian species information contained in NPSpecies for two parks in the Coastal and Barrier Island Network, Gateway National Recreation Area (GATE) and Fire Island National Seashore (FIIS). NJAS was also asked to identify knowledge gaps for avian resources at GATE, and make recommendations on how to fill those gaps with new inventory and monitoring programs.

NJAS and its staff are recognized as one of the leading non government conservation organizations in the region that includes the two parks of interest. The products that result from this effort will provide park resource managers the necessary tools to develop strategies that can help ensure long-term persistence of avian populations. This report covers activities, findings, and recommendations related to avian databases and resources for GATE. A separate document will cover the same for FIIS.

Goals and Objectives

The goal of this project is to compile and evaluate existing avian inventory and monitoring data for two of the Northeast Region National Parks, Gateway National Recreation Area (GATE) and Fire Island National Seashore (FIIS). Both of these parks encompass large tracts of land with a variety of habitats that support numerous species of birds comprising several taxonomic guilds. Specifically, our objectives are to (1) compile and review existing avian occurrence, status, and abundance, for each park, (2) update and where necessary, make corrections to existing NPS databases, (3) compile and review existing inventory and monitoring information pertinent to the parks (4) determine completeness and quality of existing inventory and monitoring data, (5) develop a historical perspective of inventory and monitoring activities and evaluate the spatial and temporal applicability of the available information, and (6) identify gaps in knowledge and make recommendations for future inventory and monitoring efforts. This report addresses the above objectives for GATE. Results of our efforts and findings for FIIS will be covered in a separate document.

Approaches

NPSpecies Database

To meet Objectives 1 and 2, we reviewed available documents (See Appendix A) that provided information on the occurrence, status, and abundance of avian species at GATE. Several of these were already acknowledged as source material in the NPSpecies database. Early in this process we realized that looking at the park as a single entity, when, in fact, it encompassed three different and ecologically distinct units, would be ineffective at addressing the informational needs of resource managers. Consequently, we reviewed and evaluated avian occurrence, status, and abundance information for the Sandy Hook, Staten Island, and the Jamaica Bay/Breezy Point (JBWP) units separately. We also created an NPSpecies-compatible database for each unit.

Another major issue that we needed to address before updating the NPSpecies database was how systematically to classify the residency status of species that occur during more than one distinct period of the annual cycle. We decided that the order of status priority was breeder, migrant, resident, and transient for species that could be classified in more than one residency category (see Appendix B for details and justification). For example, although Song Sparrow (*Melospiza melodia*) occurs in the park as a "breeder," a "migrant," and a "resident," according to NPSpecies definitions of these categories, we classified it as a "breeder." Abundance data relevant to the breeding season then appears in the "Abundance" field.

This meant, however, that information about the status and abundance during the other part of the annual cycle needed to be incorporated into the database to provide a comprehensive perspective of the species' occurrence in the park. To address this need, we developed a standardized way to present additional residency status and abundance information in the "Residency" and "Abundance" Details fields of the database for species classified in multiple residency status categories (see Appendix B for examples).

We used the Checklist of Birds of Jamaica Bay Wildlife Refuge (JBWR, Davis et al. 1996) and the Checklist of Birds of Sandy Hook (Barnes 2004) as primary sources of information because these represented the most comprehensive treatment of the seasonal occurrence, status, and abundance of birds for their respective units. A similar resource does not appear to exist for the Staten Island unit.

The Birds of New Jersey (NJBBA, Walsh et al. 1999) and New York Breeding Bird Atlas (NYBBA, Andrie and Carroll 1985, <http://www.dec.state.ny.us/apps/bba/results> 2000) were used as primary sources for breeding bird information (see Appendix C for relevant Atlas blocks reviewed) and to cross-check breeding status information contained in checklists. Other sources (see Appendix C) were reviewed to cross-check breeding status and abundance information contained by primary sources.

Christmas Bird Count data (CBC, <http://www.audubon.org/bird/cbc>) were used as a major source for winter residency information (see Appendix D for relevant count circles reviewed).

Additionally, we used the Bull's Birds of New York State (Levine et al. 1998) for information on migratory and residency information.

Data for every field, for each species known to occur, were compiled and entered into our unit-specific databases by Jeannine Parvin, NJAS's Database Manager. Final review to validate information and to detect discrepancies was conducted primarily by Scott Barnes, Program Director at Sandy Hook Bird Observatory, and secondarily by David Mizrahi, Ph.D., Vice-president for Research and Monitoring for New Jersey Audubon Society.

Literature and Data Review

To address Objectives 3-5, we used a variety of keywords (see Table 1) to search and extract bibliographic information on avian inventory and monitoring activities from NatureBib, the NPS's citation database. When available, we also extracted abstracts of relevant papers and reports. We found a total of 322 avian-related citations for GATE (Table 1). To facilitate our review, we sorted these citations based on the general taxonomic categories used in NPS document titled "Review of Monitoring Programs for Vertebrates of the Northeast Coastal and Barrier Network" (Fabre 2003). A breakdown of citation numbers by taxonomic group is provided in Table 2. A similar approach was taken to identify citations in other bibliographic databases, such as Ingenta, BIOSIS, and Rutgers University Libraries.

Our review of available literature focused primarily on comprehensive, multi-year reports (e.g., New York State Department of Environmental Conservation [NYSDEC] Colonial Waterbird Survey, New York State Ornithological Association [NYSOA] Winter Waterfowl Count) and published, peer-reviewed manuscripts. We also reviewed recent scientific permit applications for research and monitoring efforts at GATE made available to us by Dr. George Frame. This effort also revealed several reports not found in our search of NatureBib or other bibliographic databases.

Sources more than 20 years old generally were not reviewed because their relevance to current inventory and monitoring needs is limited. Several sources (e.g., Sandy Hook Hawk Watch) were previously known and therefore not reviewed. Casual reports, reports with "anonymous" authors, sources described as "loose sheets," or those appearing as lists, generally were not reviewed. Information from these sources, if credible, has likely been incorporated into the various checklists that are currently available for the park.

In our review, we considered the overall spatial and temporal scope of the information with respect to the park and its units. That is, we assessed whether the data were applicable park-wide, unit-specific, or just to specific sites within a particular unit. We also evaluated whether the information was sufficient to meet current inventory and monitoring needs.

Table 1. Keywords used to search the National Park Service's NatureBib online bibliographic database for Gateway National Recreation Area. The keyword "Birds" produced the greatest number of citations. Subsequent searches using other keywords yielded bird-related citations, but only a portion of these were not found in the original search using the term "Birds."

Keyword(s)	# Citations	# Unique citations
Birds	251	251
Bird	23	7
Avian	11	3
Aves	1	1
Ecology	304	8
Ecological	0	0
Hawk	2	0
Hawks	15	0
Inventory	33	13
Marshbird	0	0
Marshbirds	0	0
Passerine	0	0
Passerines	2	0
Raptor	0	0
Raptors	7	2
Falcons	1	1
Eagles	2	2
Owls	0	0
Shorebird	1	0
Shorebirds	39	10
Waterbird	0	0
Waterbirds	45	20
Waterfowl	19	4
Total	756	322

Table 2. Number of citations by avian group for Gateway National Recreation Area (GATE) found by searching the National Park Service's NatureBib bibliographic database.

<u>Category</u>	<u>Citations</u>
Passerines/Landbirds	5
Diurnal/Nocturnal Raptors	33
Shorebirds	41
Waterbirds	101
Waterfowl	13
GeneralInventory	13
Miscellaneous	116
Totals	322

We used state (i.e., New York and New Jersey) and federal "endangered," "threatened," and "special concern" species lists, to identify gaps in knowledge and recommend focused inventory and monitoring efforts by the park. We also reviewed and compiled information from national bird conservation plans pertinent to the park, such as the Partners in Flight (PIF) mid-Atlantic Coastal Plain (MACP, Watts 1999, see Figure 1 for map of plan coverage area) and Southern New England (SONE, Dettmers and Rosenberg 2000, see Figure 2 for map of plan coverage area) Plans, Bird Conservation Region 30 Plan (BCR 30, a synthesis of PIF MACP and SONE plans, (Rosenberg et al. 2002), the U.S. Shorebird Conservation Plan/North Atlantic Region (USSCP, Clark and Niles 2000), North American Waterfowl Management Plan (NAWMP), and North American Waterbird Conservation Plan (NAWCP, Kushlan et al. 2002), to evaluate inventory and monitoring needs for species identified as national and regional conservation priorities.

Because we were unable to obtain some reports and manuscripts for review, we also took a meta analysis approach to developing a historic perspective of inventory and monitoring in the two parks and identifying gaps in knowledge. We considered the total of taxa-specific inventory and monitoring information available for a park, the time frame of these data, and their overall ability to address current inventory and monitoring information needs with respect to endangered, threatened, special concern, and priority species. In this report, species groups are treated separately, with groupings generally following those used by Fabre (2003). They differ in that (1) grassland/shrubland passerine species are covered with other landbirds and passerines and (2) non passerine marsh birds (e.g., rails) are covered with colonial waterbirds in a single section.

We also interviewed park staff from each of the units, and individuals familiar with the park, to explore what gaps in information might exist that a literature and data review would not reveal. Scott Barnes conducted a standardized interview at each unit (see Appendix F for a list of interviewees and questions) and also conducted several phone interviews. Notes from these interviews and conversations (see Appendix G) were incorporated into our assessment of avian inventory and monitoring needs for the park.

The primary purpose of our pertinent literature and data review was to identify gaps in knowledge about avian species at GATE, and recommend actions that would begin to resolve them (i.e., Objective 6). Throughout the document we point out what we believe are obvious needs for information regarding the abundance, distribution, and ecology of particular avian species, species groups, or guilds. A synopsis of our findings are presented in Appendix G.



Figure 1. Partners-in-Flight Mid-Atlantic Coastal Plain (MACP) physiographic region (#44) covering 5,460,600 hectares (13,493,143 acres) across Virginia, Maryland, Delaware, Pennsylvania, and New Jersey.

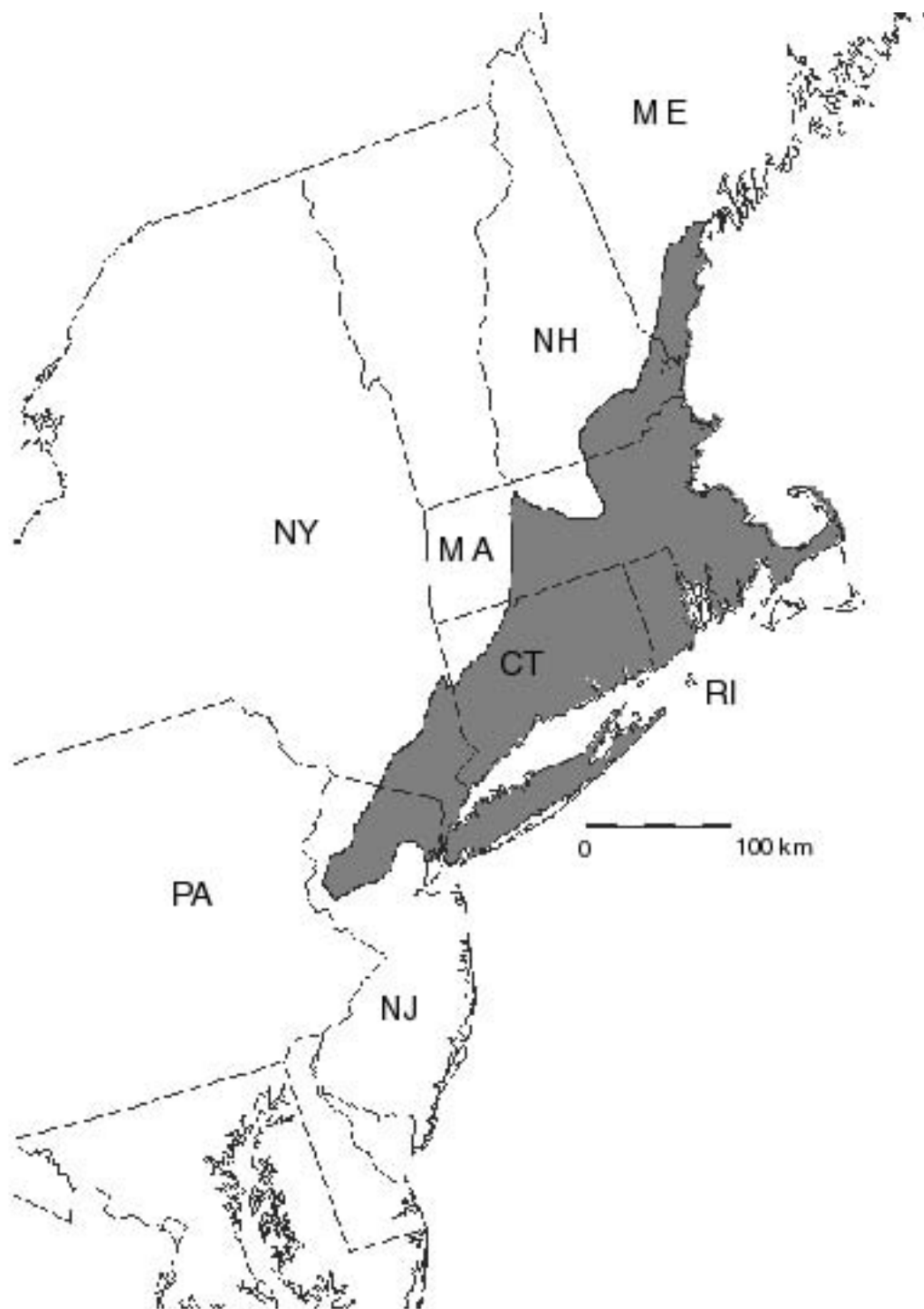


Figure 2. Partners-in-Flight Southern New England (SNE) physiographic region (#9) covering 4,425,100 hectares (10,934,422 acres) across New Jersey, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, and Maine.

Results of Review

NPSpecies Database

We found the avian database for GATE to be in relatively poor condition with respect to how much information was previously entered. None of the abundance and nativity fields were completed for any species records, and many did not have the residency status field completed. Additionally, citations referencing the information sources for particular fields were not always included.

After thorough review of available official checklists, state atlases, and multi-year, systematic seasonal counts and studies, we generated a draft database for each park unit. This draft had all fields completed with appropriate citations, except for "residency" and "abundance" details information. These fields were completed as part of a comprehensive review of the draft conducted by Scott Barnes. Information in the "details" sections included data on residency for species that occur during more than one distinct period of the annual cycle and their corresponding abundance data.

The final draft of the database was recently submitted to NPS's Northeast Coastal and Barrier Network Inventory and Monitoring staff for review. From this we derived species lists for the JBBP, Staten Island, and Sandy Hook units (see Appendices H, I, and J respectively for lists).

Review of the NPSpecies database and the information necessary to complete all fields did not reveal obvious gaps in information for the Sandy Hook unit. Species occurrence data for the JBBP unit, however, suggest that information may be lacking for Breezy Point. Currently, species checklists exist for JBWR and Floyd Bennett Field, two major sites within the unit, but no such document exists for Breezy Point.

Our review of the JBWR checklist also indicated that the occurrence and abundance information it contains likely does not reflect data from Breezy Point. For example, Black Scoter (*Melanitta nigra*) and Surf Scoter (*M. perspicillata*) were listed as "rare" in winter. These species are widespread in coastal waters of the mid-Atlantic during the winter, and CBC data for the area indicate that these two species are common. When discrepancies in occurrence and abundance information between the JBWR checklist and CBC data were apparent, we carefully reviewed other available sources (Levine et al. 1998) and, where appropriate, changed the database to reflect the more comprehensive data collected during the CBC.

Finally, we found that the Staten Island unit generally lacks specific avian data across the annual cycle. The five NYBBA blocks pertinent to the unit (<http://www.dec.state.ny.us/apps/bba/results>) also include large areas of possible breeding habitat outside of the park limits, making it difficult to draw inference about breeding occurrences for the park. Similarly, Christmas Bird Counts conducted on Staten Island cover the entire borough, so that specific data on winter occurrences cannot be attributed specifically to the park unit. Additionally, no systematic migration monitoring appears to be taking place for any species group at the Staten Island unit.

Literature and Data Review

Land Birds/Passerines

A review of NatureBib resources revealed five references for passerines or near-passerines (e.g., hummingbirds, woodpeckers; Table 2). One of these does not appear to have any relevance to the park (Huntington 1952), one appears to be a report of casual observations (Siebenheller and Siebenheller 1976), and another represents one year of banding data (1987) from Fort Tilden.

An additional 12 citations were identified by Fabre (2003) as relevant to land birds/passerines. Several of these were integral to our work on the NPSpecies database. They were of little use, however, in determining inventory and monitoring needs, except that they pointed to a general lack of information for this group. Seven of these are more than 25 years old and two are at least 15 years old.

Most of them are general inventories of various intensities (e.g., checklists *versus* systematic surveys). For example, the Davis et al. (1996) and Bourque et al. (1994) are checklists that cover JBWR and Floyd Bennett Field respectively. In contrast, Burger (1979) and Post (1979) are systematic studies of the avifauna throughout the park, although they are clearly dated.

The best existing data on breeding passerine use of the park are multi-year studies by Lent and Litwin (1989), and Elbin and Koontz (1998). The latter report was not found in NatureBib, but it and earlier versions (Elbin and Koontz 1996, Koontz and Elbin 1997) were located in an online bibliographic database developed and compiled by GATE Division of Natural Resource staff as part of the Jamaica Bay Research and Management Information Network (JBIMIN, <http://nbii-nin.ciesin.columbia.edu/jamaicabay/resources/>).

Both studies represent important contributions. They describe systematic monitoring efforts conducted for approximately six years between 1984 and 1997. These data, however, are only pertinent to Floyd Bennett Field. This site, a part of the JBBP unit, is a 579-hectare (1,448-acre) historic civic aviation facility dominated by human-made structures and runways, but with extensive areas of open space between the runways. It includes a 57 hectare (140 acre) restored grassland area maintained by the National Park Service and New York City Audubon Society.

Specifically, studies by Lent and Litwin (1989), and Elbin and Koontz (1998) provide a detailed assessment of breeding passerines at Floyd Bennett Field with a particular focus on grassland species. The latter study had greater focus on species that likely benefitted from a grassland restoration project that began in 1985, such as Savannah Sparrow (*Passerculus sandwichensis*), Grasshopper Sparrow (*Ammodramus savannarum*), Horned Lark (*Eremophila alpestris*), and Eastern Meadowlark (*Sturnella magna*).

Elbin and Koontz (1998) document a significant increase in the breeding Savannah Sparrow population, but show declines or absence of use in the other species since 1978. Careful review of this document could be useful in developing future management goals and objectives regarding the restoration site.

Two of the focal species, Grasshopper Sparrow and Horned Lark, are "special concern" species in New York. Additionally, a resumption of data collection at survey points used by both studies could help understand the effects of ecological succession on target grassland bird species. Importantly, though, Floyd Bennett Field is atypical of GATE. Grassland habitats, other than those associated with emergent herbaceous wetlands, are rare at other sites within the park.

Species that use other early successional habitat types (e.g., scrub/shrub), like Brown Thrasher (*Toxostoma rufum*), Eastern Towhee (*Pipilo erythrophthalmus*), and Field Sparrow (*Spizella pusilla*), were observed by Lent and Litwin on the site. These three species are listed in the PIF MACP plan and the BCR 30 plan as "high regional concern" species (2/2A in Table 3, see Appendix L for priority tier and action level descriptions). Only Eastern Towhee, however, is listed as "priority" species (2A) in the PIF SONE plan (Table 3). The other two species are not listed in this plan.

The results of a breeding bird survey conducted in 1997 are presented in a document compiled by John Zuzworsky, a park employee, that provides an overview of monitoring efforts throughout the JBBP unit. Documentation from the survey includes information on breeding occurrences of passerines (e.g., species, location) during 1997 and also from one conducted in 1982. Although the breeding bird survey appears to be widespread throughout the unit, it is not clear what protocols were followed. Additionally, the work does not appear to provide measures of relative abundance, or frequency of occurrence throughout the park. Interestingly, our searches of NatureBib did not reveal this source because it was not entered with keywords. The document (NatureBib ID143349) was provided by NPS I&M Program staff.

Another systematic effort to monitor breeding land bird populations at GATE proper appears to be a MAPS (Monitoring Avian Productivity and Survival) study conducted since 1997 by Dr. Richard Veit (College of Staten Island) at Fort Tilden and Great Kills Park. MAPS is a program developed and administered by the Institute of Bird Population Studies (IBPS) (<http://www.birdpop.org/maps.htm>) to assess and monitor vital rates and population dynamics of approximately 120 species of North American landbirds using constant-effort mist netting and banding at a continent-wide network of monitoring stations. These data should be obtained by the park directly from the investigator. A summary of the species detected during the studies are available at the IBPS web site.

Veit was also the principal investigator in a one-year study of avian abundance and distribution at nine marsh restoration sites located in Jamaica Bay but outside JBWR (Veit et al. 2002). The study was conducted throughout the year (i.e., 24 surveys) along predetermined transects at each site. Numbers of birds of each species observed were recorded, which allowed comparisons of species richness, abundance and seasonal occurrences among the sites. Although the work was not conducted on park property, it can give insight into the relative abundance and distribution of avian species in the greater Jamaica Bay watershed. Additionally, the protocols followed are those generally recommended for assessing measures of avian abundance and distribution. This source was obtained from GATE Natural Resource staff and was not found in NatureBib.

Clearly, the need to conduct multi-year, spatially comprehensive, and systematic abundance and distribution inventory and monitoring programs throughout GATE exists. For the appropriate

Table 3. State, Partners-in-Flight (PIF), and Bird Conservation Region (BCR) plan rankings for priority near-passerine and passerine landbirds that likely breed in Gateway National Recreation Area habitats.

Common Name	Scientific Name	State Status ^a	PIF SONE ^b		PIF - MACP ^c		BCR 30 ^d	
			Priority Tier*	Action Level**	Priority Tier*	Action Level**	Priority Tier*	Action Level**
Whip-poor-will	<i>Caprimulgus vociferus</i>	NY (SC)	5	4	--	--	2A	3,5
Chimney Swift	<i>Chaetura pelagica</i>		2	3	2	6	2A	3
Northern Flicker	<i>Dryocopus pileatus</i>		--	--	--	--	2A	3
Eastern Wood-peewee	<i>Contopus virens</i>		2A	3	1B	4	2A	3
Great-crested Flycatcher	<i>Myiarchus crinitus</i>		--	--	--	--	2A	3
Eastern Kingbird	<i>Tyrannus tyrannus</i>		--	--	--	--	2A	NA
White-eyed Vireo	<i>Vireo griseus</i>		--	--	1B	4	--	--
Horned Lark	<i>Eremophila alpestris</i>	NY(SC), NJ (SC)	--	--	--	--	5	4
Marsh Wren	<i>Cistothorus palustris</i>		--	--	--	--	2A	NA
Wood Thrush	<i>Hylocichla mustelina</i>		1A	3	1B	4	1A	3
Gray Catbird	<i>Dumatella carolinensis</i>		--	--	2	2	--	--
Brown Thrasher	<i>Toxostoma rufum</i>		--	--	2	4	2A	3
Prairie Warbler	<i>Dendroica discolor</i>		1A	3	1B	4	1A	3
Yellow-breasted Chat	<i>Icteria virens</i>	NY(SC), NJ (SC)	5	4	2	4	--	3
Eastern Towhee	<i>Pipilo erythrophthalmus</i>		2A	3	2	4	2A	3
Field Sparrow	<i>Spizella pusilla</i>		--	--	2	4	2A	3
Seaside Sparrow	<i>Ammodramus maritimus</i>	NY (SC)	1A	2	1B	4	1A	4,5
Saltmarsh Sharp-tailed Sparrow	<i>A. caudacutus</i>		1A	4	1A	6	1A	2,5
Grasshopper Sparrow	<i>A. savannarum</i>	NJ (T)	--	--	--	--	2C	3
Savannah Sparrow	<i>Passerculus sandwichensis</i>	NJ (T)	--	--	--	--	5	3
Eastern Meadowlark	<i>Sturnella magna</i>	NJ (SC)	--	--	--	--	5	3

^a T=Threatened, SC=Special Concern

^b Southern New England physiographic region (#9)

^c Mid-Atlantic Coastal Plain physiographic region (#44)

^d Bird Conservation Region 30 encompasses areas covered by SONE and MACP PIF plans

* PIF Priority Tiers (see Appendix K for detailed descriptions or priority categories): 1A-High continental priority/high regional responsibility; 1B High overall priority/low regional responsibility; 2A-High regional concern; 2B-High regional responsibility, 2C-High regional threats, 3-Additional Watch list species; 4-Additional federally listed species, 5-species of local management interest

** PIF Action Levels (see Appendix K for detailed descriptions or priority categories): 1-Crisis recovery needed, 2-immediate management, 3-management to reverse or stabilize populations, 4-long term planning is needed, 5-investigations are needed to better define threats, 6-monitor population changes only

habitats, information on several state-listed species, and high priority species listed in BCR 30, PIF SONE and MACP plans (Table 3) could be obtained. This could be accomplished, in part, by establishing permanent point count survey routes throughout the park and establishing additional MAPS stations through the IBPS.

Natural resource staff also expressed the opinion that more focused monitoring of land birds at the park was needed. Suggestions included additional MAPS, focused monitoring of upland and scrub/shrub habitats using point counts or transect survey methods, and monitoring songbird migration, especially Neotropical migrant songbirds.

More focused inventory and monitoring could be accomplished for Seaside Sparrow (*Ammodramus maritimus*) and Saltmarsh Sharp-tailed Sparrow (*Ammodramus caudacutus*), two species identified by MACP, SONE, and BCR 30 plans as "high continental concern," "high regional responsibility" (i.e., 1A; Table 3). They are confirmed breeders in the JBBP unit, and Saltmarsh Sharp-tailed Sparrow is a "probable" breeder in atlas blocks that include areas in the Staten Island unit (NYBBA 1985, 2000). Seaside and Saltmarsh Sharp-tailed Sparrow nest in emergent herbaceous marsh habitats, although the latter is more likely to be found in the higher, drier portions of the marsh (Greenlaw and Rising 1994, Post and Greenlaw 1994). Both species are susceptible to the effects of sea level rise and mosquito control practices that bring higher tide water levels to nesting areas in the marsh (e.g., open marsh water management, Greenlaw and Rising 1994, Post and Greenlaw 1994).

Several established survey and monitoring techniques, can provide much needed information on the abundance and distribution of these species (e.g., limited area searches, point counts, Ralph et al. 1995), and nesting density, reproductive success, and survival (e.g., distance sampling, spot-mapping, mark-recapture, Ralph et al. 1995). This work would also provide similar information for Marsh Wren (*Cistothorus palustris*), another species that inhabits emergent herbaceous marshes in the park and identified as a "high priority" species (2A, Table 3) by the BCR 30 plan.

Prairie Warbler (*Dendroica discolor*) is another passerine species identified as "high continental concern" in all relevant land bird conservation plans that may breed in GATE. This species is typically associated with open scrub-shrub habitats (Nolan et al. 1999) and was reported as a probable breeder in the vicinity of the Staten Island unit during the 1985 NYBBA (Andrle and Carroll 1985). The breeding status of Prairie Warbler in the park should be established, and if found, they should be monitored. They are usually conspicuous vocally, and population viability indicators, like reproductive success, survival and recruitment, can be monitored using the standard survey techniques (e.g., distance sampling, spot-mapping, mark-recapture).

GATE is also an important site for land birds during en route migration stopovers between breeding and wintering areas. The energy required to complete the northbound or southbound phase of migration is considerable. Small migrating songbirds generally cannot store enough energy to fly nonstop between wintering and breeding destinations. Consequently, they must stop frequently along the migration route to rest and replenish energy stores.

The availability of suitable "stopover" habitats that can provide the food resources necessary for birds to accumulate energy quickly and safely is critical to their ability to complete migration successfully. Recently, the importance of high quality habitats for migrating passerines, especially "Neotropical" migrants, has been recognized (cf Moore 2000). Neotropical songbirds are not only susceptible to alterations in breeding and wintering habitats, but to habitats used during en route stopovers between seasonal destinations.

All three units of the park are likely used by migrant land birds during north and southbound migrations. Evidence from several studies suggests that migrant land birds select habitats in relation to food availability (Moore and Aborn 2000, Moore et al. 1995). Monitoring efforts that include mist-netting and transect surveys could provide valuable information regarding the importance of GATE to migrating land birds, and the habitats they use during migration.

Diurnal/Nocturnal Raptors

A search of NatureBib returned 36 unique citations related to raptors (Table 2). Fifteen of these reference the monitoring of Osprey (*Pandion haliaetus*) populations. Osprey continues to be listed as "threatened" in New Jersey and as "special concern" in New York.

Most of the work relevant to Ospreys in GATE is documented as internal NPS reports from the 1970s and 1980s by Griffin (1974a, b, 1975a, b), Cummins (1974, 1975), McArthur (1986), and Salesman et al. (1989), and as New Jersey Division of Fish and Wildlife (NJDFW) reports by Clark (1991, 1992) and Clark et al. (1995). Searches of other databases did not reveal any other potential references.

Our review suggests, however, that recent information on Osprey populations at GATE is absent from NatureBib. Work by NJDFW biologists has continued since the last citation entry from 1995. The NJDFW program is an excellent long-term effort that involves assessment of productivity and marking young birds. The data sets gives a profile of changing numbers of nesting birds and their reproductive output in recent years. Recent analyses of New Jersey Osprey data suggest a stable population, but an overall decline in breeding productivity.

In our review of current GATE scientific collecting permit applications, we found a report titled "Osprey Management Plan" (Unknown Author 2000), that provides an excellent overview of Osprey monitoring at Sandy Hook unit. It appears that data from NPS and NJDFW efforts were incorporated to provide a synthesis of nesting activity and productivity data from 1974 to 2000. Reports or data from NJDFW efforts since 2000 should be acquired, entered into the NatureBib database, and reviewed for recent information pertinent to Osprey management at the Sandy Hook unit. These data can be acquired through Kathleen Clark, Principal Zoologist, NJDFW, Endangered and Non Game Species Program (ENSP).

Reports by Cummins (1974) and Griffin (1975) appear to document early Osprey monitoring efforts in the JBBP unit. In 1993, the NPS and New York City Department of Environmental Protection (NYCDEP) developed a collaborative raptor management program (Nadareski and Riepe 1997a) to monitor breeding Osprey. A scientific collecting permit application dated

1 January 2003, and submitted by principal investigators Nadareski and Riepe, suggests that this work is current and ongoing. Attached to the application was a table documenting the numbers of nests, hatched young, and young banded.

This kind of long-term effort is important for tracking changes in the Osprey population in the unit. A concerted effort should be made to incorporate this and other documents pertaining to the Nadareski and Riepe Osprey work into NatureBib, and to assess trends in Osprey population metrics (e.g., number of nesting pairs, hatching success) based on these data. Finally, natural resource staff indicated that Ospreys nesting in the Staten Island unit were being monitored, although we could not find any references to the work. These data, if they exist, should be incorporated into park-wide evaluations of this species status.

Interestingly, Northern Harrier (*Circus cyaneus*), a species listed as "endangered" in New Jersey, and "threatened" in New York, has received little, if any, focused attention at GATE. In addition to its state listed status, Northern Harrier is identified as a focal species for maritime marsh habitats in the PIF SONE and BCR 30 plans, and listed as a "local concern" in the MACP plan (Table 4). No citations exist within NatureBib that refer to any inventory or monitoring efforts for this species. Clearly, this is a gap in information that should be addressed.

Although Northern Harriers are not known to breed at the Sandy Hook unit, they are confirmed breeders (Andrle and Carroll 1985) in the JBBP unit. They most likely nest in the emergent herbaceous marsh habitats that make up a large part of the unit and possibly in the grassland habitats at Floyd Bennett Field. Given their status, determining the abundance and distribution of nesting pairs and, where possible, monitoring productivity, is important. NJAS previously conducted surveys of breeding Northern Harriers in New Jersey's Barnegat Bay and along the Delaware Bay shore, and are experienced with reliable data collection methods for this species (Mizrahi and Elia 2001).

The park is also likely to be an important wintering area for Northern Harrier. They are recorded regularly during CBCs conducted within the park. Monitoring winter populations, and their use of habitats within the park, can provide important information to direct resource management strategies that might enhance winter survival.

American Kestrel (*Falco sparverius*) is another raptor species that may require a focused inventory and monitoring effort at GATE. They are cavity nesters and are well known for their ability to use nest boxes (Smallwood and Bird 2002). They typically breed in complex open habitat types that are often a mix of grasslands, early successional shrublands, and forest edge and are generally tolerant of low levels of human development (Smallwood and Bird 2002).

Much of GATE, especially Floyd Bennett Field and Fort Tilden, provides suitable nesting habitat for this species. According to the New York Breeding Bird Atlas (BBA), they are "confirmed" breeders in the JBBP unit and in atlas blocks that include portions of the Staten Island unit (Andrle and Carroll 1985).

Table 4. State, Partners-in-Flight (PIF), and Bird Conservation Region (BCR) plan rankings for priority diurnal and nocturnal raptors that likely breed in Gateway National Recreation Area habitats.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status^a</u>	<u>PIF SONE^b</u>		<u>PIF - MACP^c</u>		<u>BCR 30^d</u>	
			Priority Tier*	Action Level**	Priority Tier*	Action Level**	Priority Tier*	Action Level**
Osprey	<i>Pandion haliaetus</i>	NY (SC), NJ (T)	5	--	5	5	4	4
Northern Harrier	<i>Circus cyaneus</i>	NY (SC), NJ (E)	5	6	5	4	4	4
American Kestrel	<i>Falco sparverius</i>	NJ (SC)			2	4	5	3
Short-eared Owl	<i>Asio flammeus</i>	NY (E), NJ (E)	2C	5	2	4	1B	3,5
Common Barn Owl	<i>Tyto alba</i>	NJ (SC)	2	3	5	4	4	3,5

^a T=Threatened, SC=Special Concern

^b Southern New England physiographic region (#9)

^c Mid-Atlantic Coastal Plain physiographic region (#44)

^d Bird Conservation Region 30 encompasses areas covered by SONE and MACP PIF plans

* PIF Priority Tiers (see Appendix K for detailed descriptions or priority categories): 1A-High continental priority/high regional responsibility; 1B High overall priority/low regional responsibility; 2A-High regional concern; 2B-High regional responsibility, 2C-High regional threats, 3-Additional Watch list species; 4-Additional federally listed species, 5-species of local management interest

** PIF Action Levels (see Appendix K for detailed descriptions or priority categories): 1-Crisis recovery needed, 2-immediate management, 3-management to reverse or stabilize populations, 4-long term planning is needed, 5-investigations are needed to better define threats, 6-monitor population changes only

This species is listed as "special concern" in New Jersey, but is not listed in New York (Table 4). Consequently, the BCR 30 plan classifies it as a species of local management concern (5, Table 4) that requires management to reverse or stabilize populations. In the PIF MACP plan, American Kestrel is considered a species of "high regional priority" that requires long-term management planning (Table 4). The SONE plan, interestingly, does not classify American Kestrel at any priority level.

According to the Breeding Bird Survey (Sauer et al. 2003), American Kestrels are experiencing significant declines in New York and across the entire northeast region over the last 20 years. Additionally, over the last 25-30 years, this species has shown significant declines at coastal hawk migration watch sites (Mizrahi, unpublished data), and dramatic declines in winter populations over the last 30 years in New York and New Jersey, including areas pertinent to the park (<http://audubon2.org/birds/cbc/>).

JBBP natural resource staff stated that American Kestrel is currently extirpated in the unit as a breeder, and declining during other seasons. Because of their propensity to use nest boxes, a program to provide artificial cavities throughout appropriate habitats in GATE could be beneficial for American Kestrels and should be explored as a management strategy to recover the species locally.

Among nocturnal/crepuscular raptors, two species, Short-eared Owl (*Asio flammeus*) and Barn Owl (*Tyto alba*), may require specific inventory and monitoring attention at GATE. Short-eared Owls are listed as "endangered" in New Jersey and New York. However, they are not known to breed in the Sandy Hook unit (Walsh et al. 1999), and may be extirpated as breeders in New Jersey. The last known breeding record was in 1989 (Walsh et al. 1999).

They were listed as "confirmed breeders" in four of the NYBBA survey blocks that occur in the JBBP unit (Andrle and Carroll 1985). These occurrences represented 80% of the confirmed breeding records in the state. Possibly, however, these sightings represent late migrants. Their occurrence should be verified during the current NYBBA effort, or by more focused efforts to establish their status in the park.

In the PIF MACP plan, Short-eared Owl received a total score of 19, and is identified as a focal species in salt marsh habitats. Its total score is also 19 in the SONE plan, but is only listed as species experiencing "high regional threats" (i.e., 2C, Table 4). The low priority scores are attributable to the fact that the MACP and SONE regions are not within the core breeding range of the species.

The park is also likely to be an important wintering area for Short-eared Owl. It is known to inhabit coastal marshes throughout the region during the non breeding periods, and has been recorded during CBCs relevant to the park. Monitoring winter populations, and their use of habitats within the park, can provide important information to direct resource management strategies.

Barn Owl is a "special concern" species in New Jersey and New York. It is a cavity nester that frequently uses nest boxes (Marti 1992). Typically, it nests in areas adjacent to open habitat

types (Marti 1992) similar to American Kestrel. It is not known to breed at the Sandy Hook unit (Walsh et al. 1999), but is a "confirmed" breeder in the JBBP unit, and in NYBBA atlas blocks that include the Staten Island unit (Andrle and Carroll 1985). Although it is not listed as a priority species in the PIF SONE or the BCR 30 plans, it is identified as a focal species in early successional and grassland/agricultural habitats (Table 4). The PIF MACP plan identifies this species as "high regional priority" requiring management to reverse or stabilize population trends (Table 4).

Breeding Barn Owls have received considerable attention at GATE. In 1984, a report was filed by an NPS District Ranger about a Barn Owl nest box program at JBWR. A stated previously, the NPS and NYCDEP developed a collaborative raptor management program in 1993 (Nadareski and Riepe 1997b) to monitor Barn Owls in the JBBP unit. The Barn Owl project focused primarily on birds nesting in human-made nest boxes. George Frame, NPS Natural Resources staff, provided a table from this project for 1999 that included breeding information (e.g., the number of boxes occupied, number of young present). The scientific collecting permit referred to earlier (i.e., Nadareski and Riepe) included a table with similar information for 2003.

These documents indicate that the Barn Owl Nest Box program has been ongoing for at least 10 years. Long-term data sets like this one are uncommon, and are extremely important for tracking changes in the JBBP Barn Owl population. A concerted effort to incorporate these documents into NatureBib, and to assess trends in Barn Owl population metrics (e.g., number of nesting pairs, hatching success) based on the data collected by Nadareski and Riepe is paramount. Finally, natural resource staff indicated that Barn Owl nesting in the Staten Island unit were being monitored, although we could not find any references to the work. These data, if they exist, should be incorporated into park-wide evaluations of this species status.

GATE is also along a major raptor migration route and is likely an important stopover for several species during both north and southbound movements. Over the last twenty years, two diurnal raptor migration watches (i.e., hawk watches) have been conducted at GATE. Citations in NatureBib indicate that Steve Walter conducted a fall hawk count at Fort Tilden from 1990 through 1994. Don Riepe, former manager of JBWR indicated that the count was ongoing. From 1978 through 1994, a spring hawk watch was conducted at Sandy Hook. This project was reinstated in 2001 and continues to be a source of data on raptors migrating northward through the park. NPS should obtain recent data for these projects to evaluate changes in diurnal raptors populations migrating through the park.

Although these efforts give some indication of the raptor species that might use the park, the information they provide is generally circumstantial. Determining what habitats diurnal raptors are using at GATE during migration is important in understanding habitat needs of several "priority" species and would require surveys to determine which areas and habitats in the park raptors use for foraging during migration.

Shorebirds

Not surprisingly, inventory and monitoring efforts for shorebirds at GATE are dominated by work on the federally threatened Atlantic Coast population of Piping Plover (*Charadrius melodus*). Twenty-six of the 41 citations retrieved from NatureBib (Table 2) were related to this species. This work, which appears to begin during the mid 1980s, is widespread throughout the park (e.g., Sandy Hook, JBBP).

Specifically, the work conducted by Goldin during her graduate thesis work in the late 1980s and early 1990s represents a comprehensive study of Piping Plovers at the Breezy Point unit (Goldin et al. 1988, 1989, 1990, Goldin 1993). Work by several NPS Natural Resource staff (e.g., Hake 1980, 1981, Basmagy-Salesman 1987, 1988, 1989, Hickman and Grant 1994) provide important information regarding the long-term efforts to monitor and manage Piping Plovers at the Sandy Hook unit.

Recent literature on monitoring and management efforts at GATE, however, is lacking in NatureBib. Citations covering work later than 1994 were not revealed by our searches of the database. The Long Island Colonial Waterbird and Piping Plover Survey is conducted annually by NYSDEC. Although survey reports by various authors covering the period between 1983-1994 are in NatureBib, current information on the status of breeding populations should be included in NatureBib, and made available to GATE resource managers, if necessary.

An important study funded by the NPS on nesting Piping Plovers at Breezy Point (Lauro and Tanacredi 2002) assesses productivity from 1986-1996, the causes of egg and chick loss from 1992-1996, and reports the results of an artificial nest study conducted in 1996 to quantify and identify potential predators. Interestingly, this citation was not found in NatureBib, but was part of the JBIMIN online bibliographic database (see section on *Landbirds/Passerines*).

Several other studies on Piping Plovers, though not necessarily specific to the park, provide important insight into factors that affect nest site selection (Burger 1987), their foraging behavior (Burger 1991), habitat use (Burger 1994), and how human disturbance affects these aspects of their ecology (Burger 1991, 1994). Another important study (Elias-Gerken et al. 2000) focuses on several aspects of brood foraging ecology (e.g., food types, habitat use, behavior) and examines the importance of interdune habitats for Piping Plovers.

A report on reducing gull breeding in close proximity to nesting Piping Plovers at Breezy Point (Olinjnyk and Brown 1999) is also pertinent and worthy of review by resource managers. Interestingly, this citation was not found in NatureBib though Olinjnyk is NPS Natural Resource staff.

Clearly, the inventory and monitoring efforts focused on Piping Plover, given their status and the tremendous threats to their viability, are warranted. Several other "high priority" breeding shorebird species, such as Upland Sandpiper (*Bartramia longicauda*), American Oystercatcher (*Haematopus palliatus*), American Woodcock (*Scolopax minor*), and Willet (*Catoptrophorus semipalmatus*), may also need comprehensive inventory and monitoring efforts at GATE (Table 5). Our search of NatureBib revealed no specific information on these species.

Table 5. State, Partners-in-Flight (PIF), Bird Conservation Region (BCR), and U.S. Shorebird Conservation (USSCP) plan rankings for priority shorebirds that may breed in, or migrate through, Gateway National Recreation Area.

Common Name	Scientific Name	State Status ^a	PIF SONE ^b		PIF - MACP ^c		BCR 30 ^d		USSCP ^e
			Priority Tier*	Action Level**	Priority Tier*	Action Level**	Priority Tier*	Action Level**	
Piping Plover ^f	<i>Charadrius melodus</i>	NY(E), NJ(E)	1A	2	1A	4	1A	2	5
Upland Sandpiper	<i>Bartramia longicauda</i>	NY(T), NJ(E)	1B	3	--	--	2C	3	4
American Oystercatcher	<i>Haematopus palliatus</i>		1A	3	1B	3	1A	3	5
Willet	<i>Catoptrophorus semipalmatus</i>		--	--	3	6	2B	4	4
American Woodcock	<i>Scolopax minor</i>	NY(SC)	1A	3	--	--	2A	3	5
Red Knot ⁺	<i>Calidris canutus rufa</i>		--	--	--	--	--	--	5
Whimbrel ⁺	<i>Numenius phaeopus</i>		--	--	--	--	--	--	5
Hudsonian Godwit ⁺	<i>Limosa haemastica</i>		--	--	--	--	--	--	5
Semipalmated Sandpiper ⁺	<i>Calidris pusilla</i>		--	--	--	--	--	--	4

^a T=Threatened, SC=Special Concern

^b Southern New England physiographic region (#9)

^c Mid-Atlantic Coastal Plain physiographic region (#44)

^d Bird Conservation Region 30 encompasses areas covered by SONE and MACP PIF plans

^e Continental scores (i.e., do not reflect regional concerns, scoring scheme similar to PIF)

^f Federally threatened

* PIF Priority Tiers (see Appendix K for detailed descriptions or priority categories): 1A-High continental priority/high regional responsibility; 1B High overall priority/low regional responsibility; 2A-High regional concern; 2B-High regional responsibility, 2C-High regional threats, 3-Additional Watch list species; 4-Additional federally listed species, 5-species of local management interest

** PIF Action Levels (see Appendix K for detailed descriptions or priority categories): 1-Crisis recovery needed, 2-immediate management, 3-management to reverse or stabilize populations, 4-long term planning is needed, 5-investigations are needed to better define threats,

6-monitor population changes only

⁺ Migrant. Not typically covered in PIF or BCR plans

Upland Sandpiper has been known to breed in the restored grassland habitats at Floyd Bennett Field (Elbin and Koontz 1998) and at John F. Kennedy Airport, which is adjacent to JBWR. However, it appears as though breeding occurrences at Floyd Bennet Field have declined since completion of the grasslands restoration.

Although Upland Sandpiper is listed as "endangered" in New Jersey and "threatened" in New York (Table 5), generally, the mid-Atlantic region is not a stronghold for the species. Consequently, the SONE and BCR 30 plans identify this species as "regionally threatened" (i.e., 2C, Table 5), while the MACP plan does not list it under any priority category. In contrast, the North Atlantic Region USSCP, lists Upland Sandpiper as a "high priority" (i.e., 4 out of a possible 5 score).

These somewhat equivocal interpretations of conservation priority status, however, should not preclude inventory and monitoring activities to assess current status in the park and adjacent areas. These data are necessary to develop management strategies for the grassland restoration areas at Floyd Bennett Field. Elbin and Koontz (1998) indicate that Upland Sandpiper was present at Floyd Bennett Field in 1992. Their report can provide some insight into the needs of this species relative to other grassland associated species.

At GATE, American Oystercatcher likely nests in many of the same open beach, barrier island habitats used by Piping Plover. Given this, oystercatchers are subject to many of the same threats and perturbations that endanger plovers. Current winter population estimates across its entire range (i.e., mid-Atlantic - Gulf of Mexico, Nol and Humphrey 1994) are slightly over 10,000 individuals (Brown et al. 2003). The species is known to breed at the Sandy Hook (Walsh et al. 1999) and JBBP units (Andrle and Carroll 1985) and likely use both the outer beach and sandy back bay areas.

Both relevant PIF plans (i.e., MACP, SONE), and the BCR 30 plan identify American Oystercatcher as a "high continental concern/high regional responsibility" species (Table 5). Additionally, the USSCP, North Atlantic Region plan (Clark and Niles 2000) lists the species in the "very high priority" (i.e., 5 out of a possible 5 score) category. Because it nests at many of the same sites as Piping Plovers, inventory and monitoring of American Oystercatchers should be relatively easy to accomplish. Breeding individuals are conspicuous, which facilitates survey efforts, at least in open beach habitats. However, surveying this species can be difficult in the more inaccessible intracoastal waterway sites it is also known to use.

In addition to identifying areas with high nesting densities, efforts should also focus on productivity, survivorship, and site fidelity, similar to efforts afforded to Piping Plover. Currently, the American Oystercatcher working group helps to coordinate coast-wide inventory and monitoring efforts (http://www4.ncsu.edu/~simons/AMOYworkinggroup_2003.htm).

American Woodcock is a game species that nests in upland areas at the interface of open fields and woodlands. It is a "confirmed" breeder in the JBBP unit, and NYBBA blocks that include portions of the Staten Island unit (Andrle and Carroll 1985).

Its priority ranking among bird conservation plans is a mixed bag, possibly because of its status as a game species. The PIF SONE plan lists American Woodcock as a "high continental/high regional responsibility species" that requires management to reverse or stabilize populations (Table 5), while the MACP plan, in contrast, does not list the species as a priority. The BCR 30 plan considers American Woodcock a species of "high regional concern" and one that requires management to reverse or stabilize populations (Table 5). The USSCP considers this species a "very high priority" for the North Atlantic Region (Clark and Niles 2000).

Courtship behavior of male American Woodcock at dawn and dusk are conspicuous and can be used to assess potential nesting densities and habitat use during these displays. Nest monitoring, which is a more difficult task, would be necessary to evaluate GATE's contribution to regional population viability.

Willet commonly nests in tidal salt marshes throughout the mid-Atlantic region. It is a "confirmed" breeder in appropriate habitats at the JBBP unit, but only listed as a "possible" breeder at the Sandy Hook unit. Before the 1960s, it was not known to breed anywhere on Long Island (Bull 1964), but during the last 40 years this species has expanded its breeding range and become widespread.

Although it has an overall score of 20 in the PIF MACP plan, it is not ranked as a high priority species. Its inclusion in the plan results from its appearance on the PIF Watch List of species. Willet is not included as a priority under any category in the PIF SONE plan. The BCR 30 plan, however, identifies this species as a "high regional responsibility" that requires long-term management planning. Similarly, the USSCP/North Atlantic Region (Clark and Niles 2000) considers Willet a "high priority" species (i.e., 4 out of a possible 5 score).

Because of its use of tidal marsh habitats for nesting, Willet is generally a difficult species to inventory and monitor. Presence/absence data similar to what is collected during breeding bird atlases are attainable. Nesting density, productivity, and survival data, however, are far more difficult to collect.

GATE is also a regionally important stopover area for shorebirds as they migrate between wintering and breeding grounds (Harrington and Perry 1995, Senner and Howe 1984). In addition to the large areas of natural habitat in and around the park, the two impounded areas at JBWR can provide important foraging and roosting habitat for migrant shorebirds, if managed for this use. Impoundment management and its effect on shorebird stopover site use is a high research and habitat management objective identified in the national and North Atlantic Region USSCP (Brown et al. 2001, Clark and Niles 2000, Oring et al. 2000).

The refuge should develop strategies that maximize the benefits of the impoundments for migrating shorebirds, while also considering the needs of other organisms (e.g., waterfowl, amphibians). Burger (1984a) provides an important overview of abiotic factors (e.g., tide, weather) and human activities (Burger 1986) that affect shorebird site use during migration, factors that must be considered when developing management strategies for this diverse group of species.

Good data on shorebird abundance during fall migration exist for JBWR, especially for the impounded ponds (Davis 1982, 1983, 1984, Morris 1985, 1986, 1987a, 1987b). Beginning in 1984, data were collected at JBWR impoundments and other accessible areas for the International Shorebird Survey. Although this effort continued at least through 1992 and summary results were published in the *Kingbird*, only citations up to 1987 (Morris 1985, 1986, 1987a, 1987b) appear in NatureBib.

Data later than 1992, if they exist, can be obtained from Manomet Observatory for Conservation Science, which manages the International Shorebird Survey. Although the data collected on migrant shorebird populations between 1981-1992 are limited to JBWR, they were collected by highly qualified volunteer observers. A synthesis of this long-term data set can provide much needed insight into population fluctuations at JBWR. However, information on shorebird use during spring migration, and for the rest of the park is lacking.

The Jamaica Bay complex, which includes much of the JBBP unit, is a primary location for a new round of shorebird migration surveys conducted under a program called PRISM (Program for Regional and International Shorebird Monitoring, Bart et al. 2002). PRISM is being implemented by a Canada-U.S. Shorebird Monitoring and Assessment Committee formed in 2001 by the Canadian Shorebird Working Group and the U.S. Shorebird Council. The park should facilitate, to the best of its ability, collection of these data. They will be important for assessing long-term changes in shorebird populations, both at the park and regionally. They can be used to identify possible threats (e.g., human disturbance) to migrant shorebirds using the refuge, and to modify site management strategies (e.g., impoundment water levels). During the last decade, an increase in the harvest of horseshoe crabs (*Limulus polyphemus*) during their spawning season is likely affecting shorebirds migrating through the JBBP unit in spring. Several migrant shorebird species, such as Red Knot (*Calidris canutus*), Ruddy Turnstone (*Arenaria interpres*), Sanderling (*C. alba*), and Semipalmated Sandpiper (*C. pusilla*) rely on the eggs to build up the energy reserves needed to complete their migration to Arctic breeding grounds. Rates of crude mass gain have declined in Delaware Bay during the same period.

The horseshoe crab harvest quota for New York waters is approximately 350,000 individuals/year (Fishery Management Plan for Horseshoe Crab Addendum III, 2004), many of which are taken from Jamaica Bay. Recently, however, the state voluntarily agreed to reduce their harvest to 150,000 individuals per year.

Red Knot and Semipalmated Sandpiper are identified by the USSCP/North Atlantic Region plan (Clark and Niles 2000) as species of "very high" and "high" priority, respectively (Table 5). Red Knot, in particular, has shown dramatic declines that may be related in part to the decline of horseshoe crab eggs available during spring migration stopovers in the region.

Efforts should be made to monitor these and other species during spring migration to better understand their distribution throughout the park in relation to distributions of spawning horseshoe crabs. Additionally, weight gain in migrant shorebirds stopping in the park should be monitored to establish whether birds are accumulating sufficient reserves to complete their migration. Similar studies have been conducted in Delaware Bay since 1995.

Waterfowl

GATE and the marine habitats associated with the park are some of the most important areas for waterfowl in the region. The Raritan Bay, a large, shallow-water estuary whose southeastern boundary is defined by Sandy Hook, has been identified by the USFWS as an important focus area for wintering waterfowl on the Atlantic Coast (Figure 3). Specifically, the bay appears to support the largest winter concentration of Greater Scaup (*Aythya marila*) on the east coast. The USFWS has also identified Jamaica Bay as an important focus area (Figure 4). Besides the large number of waterfowl using marine habitats associated with JBWR, the two impounded ponds on the refuge provide freshwater habitats for a variety of waterfowl during migration and in winter.

Several species occurring at GATE during winter are considered priority conservation targets by the North American Waterfowl Management Plan (Table 6) for Waterfowl Conservation Region (WCR) 30, the region relevant to the park. The geographic extent of WCR 30 (Figure 5) is similar to that of BCR 30, which encompasses the spatial extent of the PIF MACP and SONE physiographic regions.

Our search of NatureBib revealed only 13 inventory and monitoring citations for waterfowl. However, one of these citations refers to winter waterfowl surveys at JBWR from 1979 through 1996. These likely represent data from the Winter Waterfowl Survey conducted by the NYSOA and NYSDEC. The survey continues through 2003 and data by survey region is available at the following website: <http://www.nybirds.org/ProjWaterfowl.htm>. Region 10, which covers the entire coast and inland waters of Long Island and the New York City metropolitan area, is the relevant region for GATE. The survey is ground-based, so is susceptible to bias related to the inability to access all locations used by waterfowl. Overall, however, the data are collected systematically and over a long period, making them invaluable for assessing population trends in target species.

Three citations in NatureBib (Johnson 1993, 1994, 1995) specifically address winter waterfowl occurrences in Staten Island. This suggests that data may exist for specific areas pertinent to GATE, which are important for refining waterfowl management strategies. Whether or not Winter Waterfowl Survey data are available on a finer spatial scale for other areas of GATE should be explored.

As part of USFWS's Atlantic Flyway Mid-Winter Waterfowl Survey, NJDFW also conducts a winter waterfowl survey, but from a small, fixed-wing airplane. This survey has been conducted annually each January since 1955. A single citation from 1974 is likely related to this effort. Ted Nichols, game biologist with New Jersey Division of Fish and Wildlife, is the contact for the survey and likely can provide specific data relevant to the Sandy Hook unit and Raritan Bay.

Clearly, a wealth of data exists for wintering waterfowl at GATE and its environs. Information on the abundance and distribution of waterfowl during migration periods, however, appears to be absent. Furthermore, information on factors that are responsible for determining patterns of abundance and distribution (e.g., food resources) is important. Burger et al. (1983, 1984) provide important insight, but more current information could be valuable. Factors affecting the

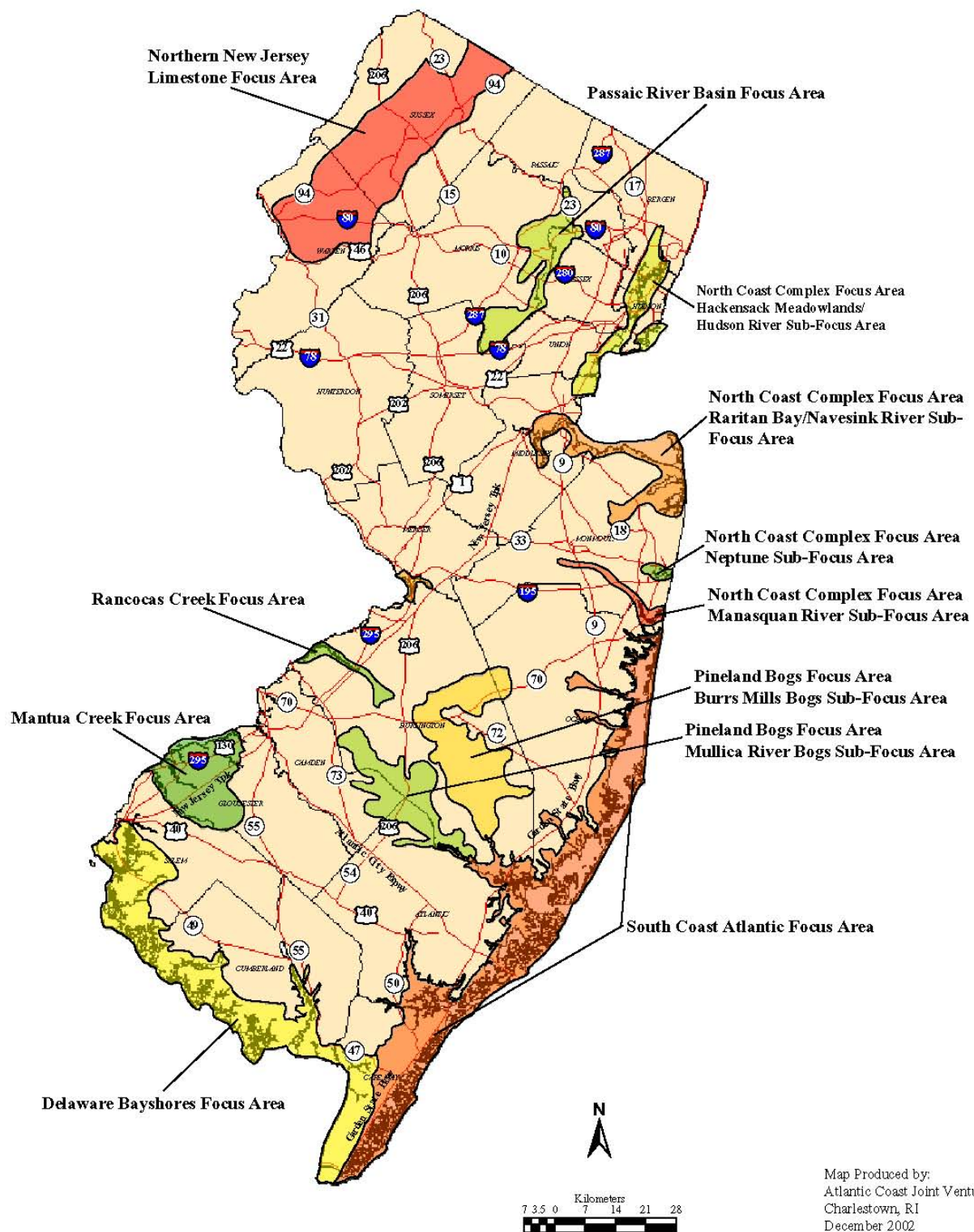


Figure 3. New Jersey waterfowl focus areas designated by USFWS/Atlantic Coast Joint Venture.

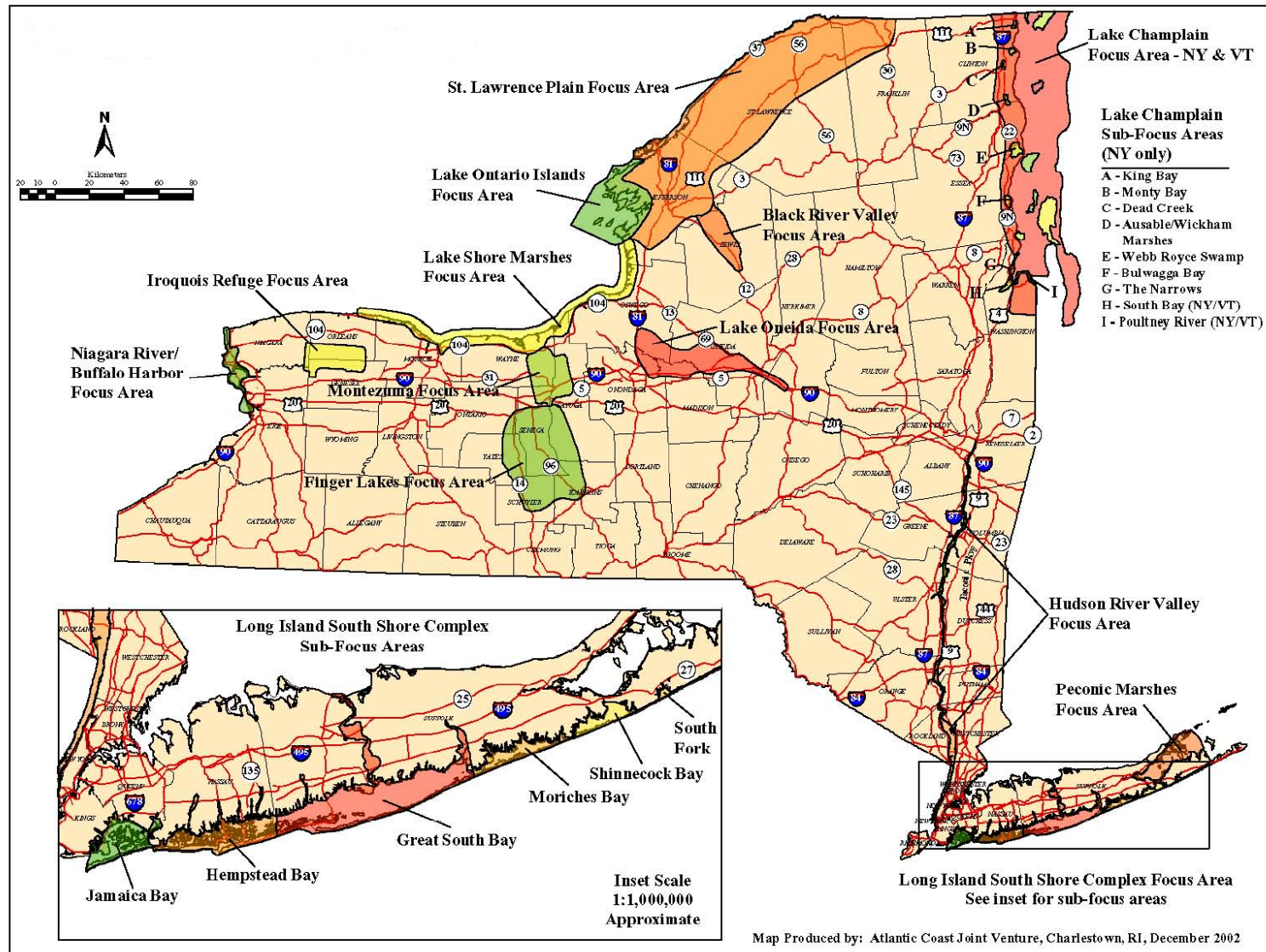


Figure 4. New York waterfowl focus areas designated by USFWS/Atlantic Coast Joint Venture.

Table 6. Waterfowl species identified as priority conservation targets by the North American Waterfowl Management Plan for Waterfowl Conservation Region (WCR) 30.

<u>Common name</u>	<u>Scientific name</u>	<u>Priority Status (WCR 30)</u>	
		Breeding	Non Breeding
Canada Goose (migratory Atlantic race)	<i>Branta canadensis</i>		high
Atlantic Brant	<i>Branta bernicla</i>		high
Mallard	<i>Anas platyrhynchos</i>	Moderate	high
American Black Duck	<i>Anas rubripes</i>	High	highest
Canvasback	<i>Aythya valisineria</i>		high
Greater Scaup	<i>Aythya marila</i>		high
Lesser Scaup	<i>Aythya affinis</i>		high
King Eider	<i>Somateria spectabilis</i>		moderate high
Common Eider	<i>Somateria mollissima</i>		highest
Harlequin Duck	<i>Histrionicus histrionicus</i>		high
Black Scoter	<i>Melanitta nigra</i>		high
White-winged Scoter	<i>Melanitta fusca</i>		high
Surf Scoter	<i>Melanitta perspicillata</i>		high
Long-tailed Duck	<i>Clangula hyemalis</i>		high
Bufflehead	<i>Bucephala albeola</i>		high
Common Goldeneye	<i>Bucephala clangula</i>		moderate high

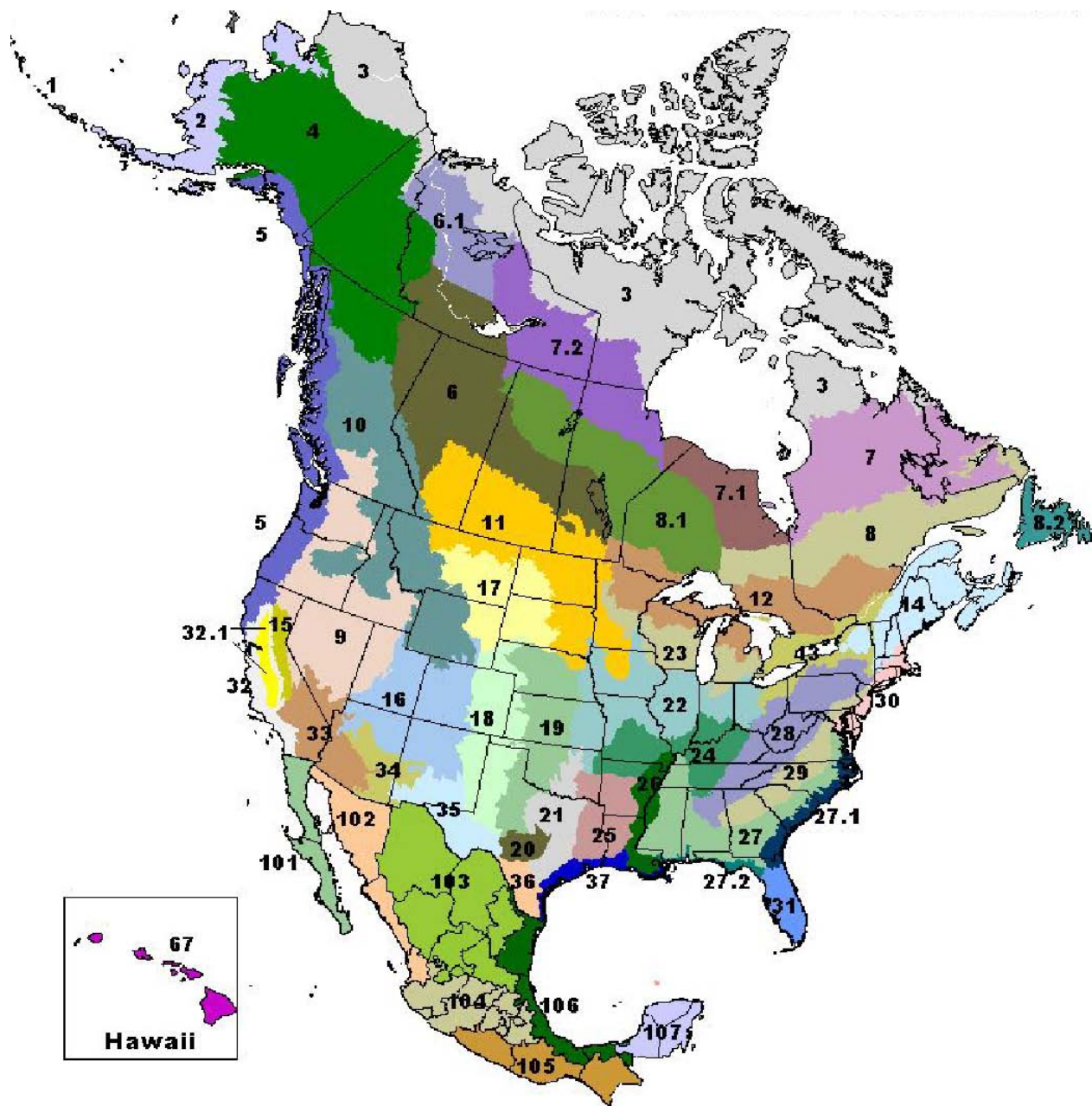


Figure 5. North American waterfowl management planning regions (from the North American Waterfowl Conservation Plan). Gateway National Recreation Area is within Waterfowl Conservation Region 30, which encompasses the mid-Atlantic/Southern New England coastal plain.

distribution and abundance of waterfowl 20 years ago may have changed, including the distribution of resources that underlie patterns of bird habitat use.

For breeding waterfowl species, American Black Duck (*Anas rubripes*), is the consensus "species of greatest concern" among bird conservation plans relevant to the park. However, PIF, BCR, and WCR plans differ somewhat in their priority categorization for the species. The MACP and SONE PIF plans consider the species high continental concern/low regional responsibility, and regionally threatened, respectively. The BCR 30 plan and the WCR plans, maybe the most regionally relevant plans, classify American Black Duck in their highest priority categories.

Although American Black Ducks are known to nest in a variety of habitats, they reach their highest densities in emergent marsh habitats associated with coastal zones (Longcore et al. 2000). This tendency means that it is likely to breed in appropriate habitats throughout GATE. The park and surrounding appropriate habitats may be an important stronghold for the species in the NPS Northeast Coastal and Barrier Network.

Given its status, the park should consider developing a focused inventory and monitoring program for American Black Duck. This could include efforts to determine distribution and abundance, reproductive success, survival, recruitment, and threats to habitats used by this species throughout the park. Collaboration with agencies that have experience monitoring waterfowl populations, like NYSDEC, NJDFW, and USFWS/Atlantic Coast Joint Venture, could provide expertise and possibly logistic support for the work.

Waterbirds

Colonial Nesters: More avian-related inventory and monitoring work at GATE has been conducted on waterbirds than any other group. Nearly a third (101) of the 322 unique citations extracted from NatureBib for the park deal specifically with this group (Table 2). More than half (59), however, are 20 or more years old. One-third (116) of the citations we uncovered during our NatureBib searches provide a general treatment of avian distribution and abundance. Many of these "Miscellaneous" (Table 2) citations likely provide some information on waterbirds.

The large amount of information on colonial waterbirds found in Naturebib is in part the result of work by Paul and Francine Buckley (13 citations in Naturebib), and Joanna Burger (13 citations in Naturebib). Work by the Buckleys tends to take a broad view of waterbird ecology and conservation (e.g., Buckley and Buckley 1980a, 1980b, 1983, 1984). Burger, on the other hand, tends to have a narrower geographic focus, with much of her work taking place in Jamaica Bay or in similar areas in New Jersey (e.g., Burger 1981a, 1981b, 1982, 1983a, 1983b), and on specific species (e.g., Burger 1982, 1984a).

Although these authors provide important information on the habitat associations, foraging strategies, and factors that affect the distribution and abundance of colonial waterbirds, the majority of their work was conducted in late 70s and early 80s. Factors affecting the distribution

and abundance of waterfowl may have changed since these studies were conducted, including the distribution of resources that underlie patterns of bird habitat use.

Another major emphasis of work (i.e., 10% of waterbird citations in NatureBib) conducted on colonial waterbirds in and around the JBBP unit focuses on the potential of aircraft collisions with birds at John F. Kennedy International Airport. Most often this work is specifically associated with how to control Laughing Gull (*Larus atricilla*) and Herring Gull (*Larus argentatus*) in and around the airport.

The information contained in the publications found in NatureBib (13) and other sources range from determining the best ways to survey gull populations (Belant and Dolbeer 1996, Dolbeer et al. 1997), how to remove (e.g., shooting, oiling eggs) or repel them effectively (Dolbeer et al. 1993, 1998, Ickes et al. 1998, Blackwell et al. 2000, 2002). The ongoing program to reduce aircraft/bird interactions at the airport has resulted in numerous annual reports by principal investigators (e.g., Dolbeer). These generally give an overview of activities, but most important, they provide information on the abundance and distribution of target species nesting or foraging near the airport, including areas in JBWR like JoCo marsh.

Alternative perspectives to reducing bird/aircraft interactions (e.g., modifying habitats around the airport to reduce breeding suitability) are presented in Buckley and McCarthy 1994. Brown et al. (1999a, 2001a) provide a critique of current gull management practices and suggest that shooting has been ineffective at reducing overall bird collisions with commercial aircraft. The park, in its capacity to manage wildlife on its property, must be well informed regarding the outcomes of gull management in the area, and consider alternatives to current practices.

Much of the available information about colonial waterbirds at GATE results from the efforts of New York and New Jersey's fish and wildlife agencies. Since 1982, data on the distribution and abundance of colonial waterbirds on Long Island, including areas in the JBBP unit, have been collected by NYSDEC (i.e., Long Island Colonial Waterbird and Piping Plover survey). NJDFW has conducted aerial surveys of colonial waterbirds every 3-5 years along the state's Atlantic coast since the mid 1980s (Jenkins, personal communication).

These efforts provide valuable data on the abundance and distribution of colonial waterbirds at GATE, and can be used to evaluate population trends. Although these surveys have continued to the present, citations after 1994 were not found for the Long Island Colonial Waterbird and Piping Plover survey, and only one reference to surveys conducted in New Jersey (Kane and Farrar 1976). Searches of NYSDEC and NJDFW did not reveal a source for these data. NPS should make a concerted effort to obtain these data sets or the results of trend analyses for GATE sites directly from these agencies.

Many of the species monitored through these annual survey efforts breed at GATE (Table 7) and are conservation priority species. Long-legged wading species like Tricolored Heron (*Egretta tricolor*), and Little Blue Heron (*Egretta caerulea*), are considered special concern species in New Jersey (Table 8). In the pertinent PIF plans, however, these two species are not classified as conservation priorities (Table 8). The BCR 30 plan identifies them as "local management interest" species (Table 8). The North American Waterbird Conservation Plan (NAWCP)

Table 7. Colonial nesting waterbirds known to breed at Gateway National Recreation Area during the last 10 years. Based on review of Breeding Bird Atlas data from New York (1985, 2000) and New Jersey (1999), Kerlinger (2001, 2002), and Brown et al. (2001).

<u>Common Name</u>	<u>Scientific Name</u>
Great Egret	<i>Ardea alba</i>
Snowy Egret	<i>Egretta thula</i>
Little Blue Heron	<i>Egretta caerulea</i>
Tricolored Heron	<i>Egretta tricolor</i>
Cattle Egret	<i>Bubulcus ibis</i>
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>
Yellow-crowned Night Heron	<i>Nyctanassa violacea</i>
Glossy Ibis	<i>Plegadis falcinellus</i>
Laughing Gull	<i>Larus atricilla</i>
Herring Gull	<i>Larus argentatus</i>
Great Black-backed Gull	<i>Larus marinus</i>
Common Tern	<i>Sterna hirunda</i>
Least Tern	<i>Sterna antillarum</i>
Black Skimmer	<i>Rhynchops niger</i>

Table 8. State, Partners-in-Flight (PIF), Bird Conservation Region (BCR), and North American Waterbird Conservation (NAWCP) plan rankings for priority waterbirds that likely breed in Gateway National Recreation Area.

Common Name	Scientific Name	State Status ^a	PIF - SONE ^b		PIF - MACP ^c		BCR 30 ^d		NAWCP ^e
			Priority Tier*	Action Level**	Priority Tier*	Action Level**	Priority Tier*	Action Level**	
Pied-billed Grebe	<i>Podilymbus podiceps</i>	NY (T), NJ (E)	5	5	5	6	5	4,5	NA ^f
American Bittern	<i>Botaurus lentiginosus</i>	NY (SC), NJ (E)	5	4	2	5	5	4,5	NA
Least Bittern	<i>Ixobrychus exilis</i>	NY (T), NJ (SC)	5	4	2	5	5	4,5	NA
Tricolored Heron	<i>Egretta tricolor</i>	NJ (SC)	--	--	--	--	5	3	2A
Little Blue Heron	<i>Egretta caerulea</i>	NJ (SC)	--	--	--	--	5	3	2A
Yellow-crowned Night Heron	<i>Nycticorax violaceus</i>	NJ (T)	5	5	5	6	5	4	3
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	NJ (T)	5	5	--	--	5	4	3B
Glossy Ibis	<i>Plegadis falcinellus</i>	--	--	--	--	--	2B	4	4C
Clapper Rail	<i>Rallus longirostris</i>	--	--	--	1B	4	2B	4	NA
Black Rail	<i>Laterallus jamaicensis</i>	NY(E), NJ(T)	1B	2	1B	5	1A	2,5	NA
Common Tern	<i>Sterna hirunda</i>	NY (T), NJ (SC)	5	4	--	--	2A	3	4B
Least Tern	<i>Sterna antillarum</i>	NY (T), NJ (E)	5	4	2	4	2A	3	2A
Black Skimmer	<i>Rhynchops niger</i>	NY (SC), NJ (T)	5	?	2	3	2A	3	2A

^a T=Threatened, SC=Special Concern

^b Southern New England physiographic region (#9)

^c Mid-Atlantic Coastal Plain physiographic region (#44)

^d Bird Conservation Region 30 encompasses areas covered by SONE and MACP PIF plans

^e Continental scores (i.e., do not reflect regional concerns, scoring scheme similar to PIF)

^f NA-Priority scores currently are not available for solitary-nesting waterbirds covered in the NAWCP

* PIF Priority Tiers (see Appendix K for detailed descriptions or priority categories): 1A-High continental priority/high regional responsibility;

1B High overall priority/low regional responsibility; 2A-High regional concern; 2B-High regional responsibility, 2C-High regional threats,

3-Additional Watch list species; 4-Additional federally listed species, 5-species of local management interest

** PIF Action Levels (see Appendix K for detailed descriptions or priority categories): 1-Crisis recovery needed, 2-immediate management,

3-management to reverse or stabilize populations,4-long term planning is needed, 5-investigations are needed to better define threats,

6-monitor population changes only

considers both species "high concern" (2A, Table 8, see Appendix L for NAWCP classification definitions).

Yellow-crowned Night Heron (*Nycticorax violaceus*), and Black-crowned Night Heron (*Nycticorax nycticorax*) are listed as "threatened" in New Jersey (Table 8) and identified as "local management interest" (Table 8) by PIF MACP and SONE plans, and by the BCR 30 plan. The NAWCP plan considers both species as "moderate concern."

In contrast, Glossy Ibis (*Plegadis falcinellus*) is not afforded any conservation priority status by New York or New Jersey, or in either of the pertinent PIF plans. Similarly, it is considered a "low concern" species by the NAWCP. In the BCR 30 plan, however, it is classified as a "high regional responsibility" species (2B, Table 8).

Three species in Family Sternidae, Least Tern (*Sterna antillarum*), Common Tern (*Sterna hirundo*), and Black Skimmer (*Rynchops niger*) that breed in GATE are considered conservation priorities in both New Jersey and New York (Table 8). The PIF and BCR plans, however, are equivocal regarding the status of these species. Although the SONE plan classifies them as "local management interest," the MACP and BCR 30 plans rank them as "high regional concern" (Table 8). Common Tern is considered a "low concern" species by the NAWCP, while Least Tern and Black Skimmer are classified as "high concern."

We found several important studies that focus on the ecology and conservation of colonial nesting terns pertinent to GATE. Burger (1984b) provides an overview of Least Tern colony stability and population trends (Burger 1989) in coastal New Jersey. She and her colleagues also investigate determinates of colony and nest site selection in Least Tern (Kotliar and Burger 1986, Burger and Gochfield 1991, respectively), information that is pertinent to management of the species in the park.

Other studies we reviewed focus on the effects of predation on productivity (O'Connell and Beck 2003, Erwin et al. 2001), methods to decrease predation rates (Rimmer and Deblinger 1992), and how dredge spoil characteristics affect nest site selection (Mallach and Leberg 1999). These issues are relevant to regional resource managers for developing effective conservation strategies for this species.

Common Tern studies we reviewed, although not specific to GATE, nonetheless are relevant to managing the species at the park. Studies on the effects of predation on productivity (e.g., O'Connell and Beck 2003, Erwin et al. 2001, Guillemette and Brousseau 2001, Nocera and Kress 1996, Sheeler and Kress 1991) and the extent of contaminant loads (e.g., Burger and Gochfield 1993, Becker et al. 1993) in this species are worthwhile reviewing. Several of these studies (e.g., O'Connell and Beck 2003, Erwin et al. 2001, Mallach and Leberg 1999) also address these issues as they pertain to Black Skimmer, which regularly nest sympatrically with Common Terns.

Inventory and monitoring efforts by NYC Audubon Society's Harbor Herons Program, which includes surveys of sites in JBWR by Don Riepe (Kerlinger 2001, 2002), are also valuable data sets that appear to give a finer scale evaluation of colonial waterbird status for the JBBP and Staten Island (i.e., Swinburne and Hoffman Islands) units. These reports were not referenced in

NatureBib but are important resources that the NPS should acquire. The NPS should also establish if the work is ongoing, and if so, insure that they are provided copies of future reports. If the work is not continuing, then the park should consider implementing similar studies to monitor colonial waterbirds in relevant areas.

Another important study (Brown et al. 2001) focused on changes in nesting populations of colonial waterbirds in JBWR between 1974 and 1998. The authors suggest that several species, like, Snowy Egret (*Egretta thula*), Cattle Egret (*Bubulcus ibis*), Little Blue Heron (*Egretta caerulea*), Glossy Ibis, Herring Gull, and Common Tern have experienced significant declines throughout the refuge during this period. Several other species, like Great Egret (*Ardea alba*), Laughing Gull, and Great Black-backed Gull (*Larus marinus*), have shown significant increases during the same period. We found no reference to the work in NatureBib, however, we did find a technical report submitted to the NPS (Brown et al. 1999b) in the JBIMIN bibliographic database that appears to be the basis for the peer-reviewed publication.

Andrew Bernick, a student at College of Staten Island working under the direction of Dr. Richard Veit, is conducting a study of Black-crowned Night Herons on islands throughout the park. The focus of the study is to monitor local movements of this species between roosting and foraging sites, and local changes in abundance and distribution. No reports accompanied two permits dated 1 January 2002 - 31 December 2003, and 11 March 2004 - 11 March 2005. Data from this type of study could be extremely valuable to the park in its efforts to understand the dynamics of habitat and site use of this conservation priority species.

Clearly, a wealth of information on the abundance and distribution of colonial waterbirds exists for GATE. Several ongoing efforts can provide good information on the status, distribution, and abundance of colonial waterbirds within the park. However, few of these published works evaluate changes in waterbird populations during the last 30 years, or what environmental factors may be underlying changes.

Brown et al. (2001) posit several hypotheses for declines in colonial waterbird species, however, their study was not designed to investigate them. The relationships between decreases in some species and increases in others is an important area of investigation. One important consideration is that long-legged colonial waterbirds (i.e., herons, egrets) nest in several locations throughout NYC waterways. Determining whether variation in heron and egret populations are similar to those found in JBWR, or if declines in JBWR coincide with increases in other areas, is necessary to evaluate the status of these species throughout the Jamaica Bay complex.

Declines in some species may be related to water-born toxins (Parsons and McColpin 1995, Parsons et al. 2000), changes in food abundance and distribution (MacCarone and Parsons 1993) or in habitat (MacCarone and Parsons 1994, Parsons 2002). Other factors, such as predation (Parsons et al. 2001) and disturbance (Burger 1981), must also be considered when evaluating factors that affect site occupancy, reproductive success, survival, and recruitment. All of the published works cited in this paragraph are valuable sources of information and offer direction the NPS might take to evaluate possible causes for population changes at GATE.

Solitary Nesters: Unlike colonial nesting waterbirds, solitary nesting species known to breed at GATE, like Pied-billed Grebe (*Podilymbus podiceps*), American Bittern (*Limosa haemastica*), and Least Bittern (*Ixobrychus exilis*), Black Rail (*Laterallus jamaicensis*), and Clapper Rail (*Rallus longirostris*) have received very little inventory and monitoring attention at GATE. Only one waterbird reference found in NatureBib focuses on a solitary nesting species (MacNamara and Udell 1970).

Many are secretive and enigmatic, nesting and foraging in dense stands of marsh grass (e.g., *Spartina* sp.). This makes them difficult to detect by most observers during Breeding Bird Atlases and Breeding Bird Surveys. Consequently, patterns of distribution and abundance for most species are poorly understood throughout their range, and thus, there is a need for more thorough information.

The overall absence of comprehensive information on these, and other, elusive waterbirds precludes adequate evaluation of their conservation status. This often is reflected in the "Action Levels" designations given to these species in PIF and BCR plans (Table 8). "Long-term planing necessary" (i.e., level 4), or "investigations to better define threats" (i.e., level 5) are typical of these solitary nesting waterbird species. Currently, priority rankings for solitary nesting waterbird species have not been completed by NAWCP working groups (Table 8).

Pied-billed Grebe is considered threatened in New York and special concern in New Jersey (Table 8). These state rankings are responsible for this species' inclusion as a conservation priority in the MACP, SONE, and BCR 30 plans. Pied-billed Grebe is known to breed only at the JBBP unit, probably because it nests in the marshy impoundments of JBWR.

This species is highly vocal during courtship, which should allow accurate assessments of nesting densities, especially if taped calls are played to elicit responses from breeding individuals. Unlike other solitary nesting waterbirds, Pied-billed Grebes are often conspicuous because they dive in open water to forage on fish and aquatic invertebrates (Muller and Storer 1999). When young are present they accompany foraging parents, possibly allowing for productivity estimates to be made.

New Jersey lists American Bittern as endangered, while New York considers it a species of special concern (Table 8). Similar to Pied-billed Grebe, the PIF SONE and BCR 30 plans include American Bittern as a conservation priority species because of its state protected status in the region. The MACP PIF plan, however, lists it as a "high regional responsibility" species that requires study to identify threats (2, Table 8).

In GATE, this species is only known as a "probable" breeder in the Sandy Hook unit. Despite this, efforts to establish its status in the park should be made. American Bittern breeds in tall, dense vegetation at the edges of fresh or brackish marshes, making many areas of GATE potentially suitable breeding habitat. During courtship and territory defense, males advertise using a distinctive "booming" call (Gibbs et al. 1992). They are much more difficult to detect when foraging because they typically stand and wait for prey, or slowly stalk along the edges of dense vegetation.

The conservation priority status of Least Bittern is strikingly similar to its larger cousin, American Bittern. Its inclusion in the SONE and BCR 30 plans results from its state protected status in New York and New Jersey (Table 8). Furthermore, Least Bittern, like American Bittern, is considered a "high regional responsibility" (2, Table 8) species that requires study to identify threats in the MACP PIF plan.

Interestingly, Least Bittern is only known to breed in the JBBP unit, and this is likely at JBWR. This species is more typical of freshwater marshes, but will nest in brackish water situations (Gibbs et al. 1992). During the breeding season, it is most vocal at dawn and dusk, but its call is not as conspicuous as American Bittern. Additionally, Least Bittern, unlike other herons, does not wade through water while foraging. Instead it climbs through vegetation and hangs over the water to grab prey (Gibbs et al. 1992). These characteristics mean it is a difficult species to detect and could easily be missed by BBA and BBS surveyors.

Of the solitary nesting species that likely breed at GATE, Black Rail is the species of greatest conservation importance. This inconspicuous species is listed as "endangered" in New York while in New Jersey it is considered "threatened." The regional bird conservation plans are unequivocal regarding Black Rail's status. The SONE and MACP plans rank it as a "high overall priority/low regional priority" (1B) species that requires immediate management attention (Table 8). The BCR 30 plan assigned Black Rail to the highest conservation priority tier (i.e., 1A-high continental priority/high regional responsibility) and considers it a species requiring immediate management action.

Black Rail is a high marsh species, inhabiting areas dominated by cordgrass (*Spartina patens*), black rush (*Juncus gerardi*), and salt grass (*Distichlis spicata*) (Eddleman et al. 1994). High marsh habitats currently are threatened by sea level rise attributed to global warming, marsh management practices to restore tidal flow to impounded areas, and current mosquito control strategies (e.g., open marsh water management, OMWM). Consequently, Black Rail and other high marsh species are threatened by dramatic flux in their primary habitat.

Currently, Black Rail is not known to breed in the park. They are, however, highly secretive. They are rarely seen and most often heard during surveys. Given this, they are best surveyed by playing their calls to elicit responses from breeding individuals.

Clapper Rail is a ubiquitous breeder in the tidal marshes of the mid-Atlantic. The species is not listed by New York or New Jersey, nor is it identified by the SONE PIF plan as a conservation priority species. In contrast, the MACP PIF and BCR 30 plans consider this species a "high regional responsibility" that requires long-term planning (Table 8).

The Sandy Hook and JBBP units are both confirmed breeding sites for Clapper Rails. Generally, the species nests predominantly in salt marshes, and infrequently in brackish areas. They are highly vocal during most of the breeding season, and throughout the day (Eddleman and Cox 1998), making them more easily surveyed than other secretive waterbirds of the marshes. Generally, the best way to survey these species is to play their tape recorded breeding calls along transects through or alongside marshes, and listen for responses. Approximate locations of calling individuals can be mapped in the field, and then in a GIS. These data can provide a

mechanism for deriving density estimates. Given their secretive nesting habits and the difficulty surveying open marsh habitats, collecting demographic data (e.g., nest productivity, survival, recruitment) is challenging. However, highly reliable abundance and distribution data can be used to understand nesting habitat and landscape characteristics that support high densities of these species.

Resource managers can use these data to direct restoration of degraded habitats, manage existing high quality habitats, and identify and abate threats. New Jersey Audubon Society has extensive experience using these techniques to assess densities of secretive waterbirds. Currently, we are conducting taped call playback surveys at Cape May National Wildlife Refuge under contract with USFWS, using their standardized data collecting protocol.

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Appendix A. References Used for NPSpecies Database Review Gateway National Recreation Area.

Jamaica Bay/Breezy Point Unit

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These two checklists are the references that provided the majority of the seasonal abundance information. For species that occur on both checklists, the greater seasonal abundance is entered into the abundance details field in the database.

National Audubon Society. 2003. <http://www.audubon.org/bird/cbc/>. Christmas Bird Count Lists. NYBR Circle. Counts 60 to103.

This CBC Circle is almost entirely within the park and includes the area of Breezy Point. The data is used to supplement winter abundance information.

Andrle, R. F., J. R. Carroll. 1988. The Atlas of Breeding Birds in New York State.

New York Breeding Bird Atlas. 2004. <http://www.dec.state.ny.us/apps/bba/results/index.cfm>. Species lists from Blocks 5848A, 5848B, 5849B, 5849D, 5949A, 5949B, 5949C, 5949D and 5950C.

These two references provide the majority of the breeding confirmations. The atlas is the published summary of the specific information from the species lists from the web site. The web site provides a detailed summary of breeding confirmations by atlas block with accompanying topographic maps. The web site provides species lists for both the published atlas, as well as current findings for the atlas update that is in progress.

Zuzworsky, John. 1997. Jamaica Bay I & M 1997: An Inventory and Monitoring Report for Gateway National Recreation Area's Breezy Point Jamaica Bay Unit.

This report includes a list of species that have been sighted by park personnel in Breezy Point and the results of a breeding bird survey conducted at Breezy Point. The reference was used to further confirm the presence of a species within the park. The breeding bird information was used to supplement the breeding bird confirmations from the atlas data. This report provided some confirmations not found in the atlas data.

Appendix A. References Used for NPSpecies Database Review Gateway National Recreation Area (continued).

Kerlinger, P. 2002. New York City Audubon Society's Harbor Herons Project:: 2002 Nesting Survey. New York Audubon Society, New York, N.Y.

This report includes a breeding survey for several species of waterbirds on several uninhabited islands, including two locations within the Jamaica Bay/Breezy Point unit. The data was used to supplement the breeding bird confirmations from the atlas data. This report provided an additional confirmation not found in the atlas information.

Elbin, Susan B., Koontz, Fred W. 1998. Status of Grassland Birds Breeding on Restored Grasslands at Floyd Bennett Field, Gateway National Recreation Area: Wildlife Conservation Society.

Lent, Richard A., Litwin, Thomas S. 1989. Bird-habitat relationships as a guide to ecologically-based management at Floyd Bennett Field, Gateway National Recreation Area. Part II, post management evaluation: Seatuck Research Program, Cornell University Laboratory of Ornithology.

These references are specific to floyd Bennett Field and were used to confirm the presence of a species within the park. There were no discrepancies between any data in this report and data from the checklists and breeding bird atlas.

U.S. Fish and Wildlife Service. 1997. Significant Habitats and Habitat Complexes of the New York Bight Watershed. Jamaica Bay and Breezy Point COMPLEX #16. Southern New England-New York Bight Coastal Ecosystems Program, Charlestown, Rhode Island. pp. 531-549.

This document provides a list of Species of Special Emphasis for each ecological complex within the New York Bight Watershed. Since the complex that encompasses Jamaica Bay/Breezy Point includes a significant amount of habitat beyond the park boundaries, this reference cannot be used as a final determination of any status for a species. However, if a species on this list is confirmed as present by other references for the park, this reference is added to the database to provide further information about the occurrence of this species within this ecological complex.

Levine, E., B. B. Lincoln, and S. R. Lincoln. 1998. Bull's Birds of New York State. Comstock Publishing Associates, A division of Cornell University Press, Ithaca and London.

This book is an account of species occurring in the state of New York. It reference is used to add to the interpretation of some abundance information and to verify accounts of vagrants at Jamaica Bay Wildlife Refuge.

Appendix A. References Used for NPSpecies Database Review Gateway National Recreation Area (continued).

American Ornithologists' Union. 1998. Check-list of North American Birds. 7th edition. American Ornithologists' Union, Washington, D.C.

American Ornithologists' Union. 2000. Forty-second supplement to the American Ornithologists' Union Check-list of North American Birds. The Auk 117:847-858.

Banks, R. C., C. Cicero, J. L. Dunn, A. W. Kratter, P. C. Rasmussen, J.V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2002. Forty-third Supplement to the American Ornithologists' Union Check-list of North American Birds. The Auk 119:897-906.

Banks, R. C., C. Cicero, J. L. Dunn, A. W. Kratter, P. C. Rasmussen, J.V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2003. Forty-fourth Supplement to the American Ornithologists' Union Check-list of North American Birds. The Auk 120:923-931.

The Check-list of North American Birds and its three supplements were used to determine if an avian species is native or non-native to North America. In addition, these references provide current and historical taxonomic classification. They also provide the most current Common Name for each species.

Sandy Hook Unit

Barnes, S. 2004. Checklist of the Birds of Sandy Hook. New Jersey Audubon Society, Bernardsville, New Jersey.

This recently completed checklist by the senior naturalist at the New Jersey Audubon Society Sandy Hook Bird Observatory provides the seasonal abundance information. It also provides some further breeding confirmations to the atlas data (see next reference).

Walsh, J., V. Elia, R. Kane, and T. Halliwell. 1999. Birds of New Jersey. New Jersey Audubon Society, Bernardsville, New Jersey.

New Jersey Audubon Society. 1999. Species lists for Birds of New Jersey atlas project. Blocks 074NE, 074CE, 074SE.

These two references provide the breeding confirmations. The atlas is the published summary of the specific information from the species lists.

Appendix A. References Used for NPSpecies Database Review Gateway National Recreation Area (continued).

U.S. Fish and Wildlife Service. 1997. Significant Habitats and Habitat Complexes of the New York Bight Watershed. Raritan Bay – Sandy Hook Bay Complex COMPLEX #17. Southern New England-New York Bight Coastal Ecosystems Program, Charlestown, Rhode Island. pp. 551-570.

This document provides a list of Species of Special Emphasis for each ecological complex within the New York Bight Watershed. Since the complex that encompasses Sandy Hook includes a significant amount of habitat beyond the park boundaries, this reference cannot be used as a final determination of any status for a species. However, if a species on this list is confirmed as present by other references for the park, this reference is added to the database to provide further information about the occurrence of this species within this ecological complex.

Cole, Richard C. 1977. Sandy Hook - Urban Wilderness: Philip Freneau Press.

Note that although this reference was used for the original data entry for the GATE database, this reference has been deleted. The reference did not contain enough information to determine if the species list was reliably compiled. The Checklist of the Birds of Sandy Hook provides a more accurate and current inventory of species at the Sandy Hook Unit.

Staten Island Unit

Note that only one reference provides conclusive data for a few avian species within the Staten Island Unit. In order to provide a base of information, breeding bird data from the New York Breeding Bird Atlas was entered for blocks that encompass any of the Staten Island Unit.

Kerlinger, P. 2002. New York City Audubon Society's Harbor Herons Project:: 2002 Nesting Survey. New York Audubon Society, New York, N.Y.

This report includes a breeding survey for several species of waterbirds on several uninhabited islands, including two locations within the Staten Island unit. This information for eleven species is the only conclusive information for breeding currently available.

Andrle, R. F., J. R. Carroll. 1988. The Atlas of Breeding Birds in New York State.

New York Breeding Bird Atlas. 2004. <http://www.dec.state.ny.us/apps/bba/results/index.cfm>. Species lists from Blocks 5648B, 5748A, 5749A, 5749C, 5749D.

These two references provide the breeding confirmations for blocks that encompass the Staten Island Unit. The atlas is the published summary of the specific information from the species lists from the web site. The web site provides a detailed summary of breeding confirmations by atlas block with accompanying topographic maps. The web site provides species lists for both the published atlas, as well as current findings for the atlas update that is in progress.

Appendix A. References Used for NPSpecies Database Review Gateway National Recreation Area (continued).

U.S. Fish and Wildlife Service. 1997. Significant Habitats and Habitat Complexes of the New York Bight Watershed. Arthur Kill Complex COMPLEX #18. Southern New England-New York Bight Coastal Ecosystems Program, Charlestown, Rhode Island. pp. 577-591.

This document provides a list of Species of Special Emphasis for each ecological complex within the New York Bight Watershed. Since the complex that encompasses the Staten Island Unit includes a significant amount of habitat beyond the park boundaries, this reference cannot be used as a final determination of any status for a species. However, if a species on this list is confirmed as present by other references for the park, this reference should be added to the database to provide further information about the occurrence of this species within this ecological complex. (Note that there are currently no entries in the database for the Staten Island Unit for this reference since there are not yet any species certified as Present in Park)

American Ornithologists' Union. 1998. Check-list of North American Birds. 7th edition. American Ornithologists' Union, Washington, D.C.

American Ornithologists' Union. 2000. Forty-second supplement to the American Ornithologists' Union Check-list of North American Birds. The Auk 117:847-858.

Banks, R. C., C. Cicero, J. L. Dunn, A. W. Kratter, P. C. Rasmussen, J.V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2002. Fortythird Supplement to the American Ornithologists' Union Check-list of North American Birds. The Auk 119:897-906.

Banks, R. C., C. Cicero, J. L. Dunn, A. W. Kratter, P. C. Rasmussen, J.V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2003. Forty-fourth Supplement to the American Ornithologists' Union Check-list of North American Birds. The Auk 120:923-931.

The Check-list of North American Birds and its three supplements are used to determine if an avian species is native or non-native to North America. In addition, these references provide current and historical taxonomic classification. They also provide the most current Common Name for each species.

Appendix B. Protocols for Assigning Values to "Residency" and "Abundance" Fields and for Documenting Information in "Details" Fields in the NPSpecies, Gateway National Recreation Area.

Avifauna are highly mobile throughout the annual cycle, and their residency and abundance status at a particular site can change throughout the annual cycle. Consequently, accurate assignment of a single residency or abundance status to a species can be difficult. Given this, we developed a systematic method for assigning primary residency status for each species that occurs in the park in multiple periods during the annual cycle. We also developed a standardized method for detailing important information about a species' residency status outside the primary residency period, which is provided in the "Residency Details" field of the database. Additionally, we provide standardized accounting of abundance to adequately portray a species' occurrence throughout the year. This information is provided in the "Abundance Details" field of the database. In each case, these methods were developed with consultation from NPS Inventory and Monitoring staff.

The following is the protocol, in order of decision priority, used to choose Residency and the associated Abundance values for the database. Each case is followed by examples of species records found in the database.

(1) If a species is determined to be a breeder, then the Residency Status of Breeder is always chosen. References to supporting documentation (e.g., Breeding Bird Atlas data) are included in the Residency Details field. The Abundance Value selected is the abundance that matches the breeding season. If the species also occurs during other parts of the annual cycle (e.g., migration, winter), the Residency and Abundance Details fields would then include a statement that reflect its status and associated abundances during relevant periods.

174505 Pied-billed Grebe Residency: Breeder Abundance: Uncommon
Abundance Details: Spring=uncommon; Summer=uncommon; Late Fall=uncommon;
Winter=uncommon
Residency Details: **Also winter resident and spring and fall migrant.**
Confirmed breeder in the NYBBA online species lists for blocks:
1985 5949A.
Probable breeder in 2003 5949A.
This block has high probability that breeding confirmations occur within park boundaries.

175096 Northern Shoveler Residency: Breeder Abundance: Rare
Abundance Details: Spring=common; Summer=rare; Early Fall=uncommon; Late Fall=common;
Winter=common
Residency Details: **Also occurs predominately as winter resident and spring and fall migrant.**
Confirmed breeder in the NYBBA online species lists for block:
1985 5949A.
Probable breeder in 1985 5949C.
These blocks have high probability that breeding confirmations occur within park boundaries.

Appendix B. Protocols for Assigning Values to "Residency" and "Abundance" Fields and for Documenting Information in "Details" Fields in the NPSpecies, Gateway National Recreation Area (continued).

(2) If a species is a non-breeder, then its status was reviewed to determine if it occurs predominately as a migrant or a resident. If summer or winter abundance is rare or occasional and the spring/fall abundances are uncommon, common or abundant, then the residency status "migratory" was chosen. The Abundance value selected was the highest occurring during the migration season. Residency Details statements reflect when the species is present as a migrant, and whether it also occurs as a resident during the rest of the year. Note that several species are migratory in summer. In these cases, Residency Details will reflect when summer abundance was evaluated to determine "migratory" or "resident" status.

175128 Ring-necked Duck Residency: Migratory Abundance: Rare
Abundance Details: Spring=rare; Late Fall=rare; Winter=occasional
Residency Details: **Present predominately as spring and late fall migrant; Also occasional winter resident.**

176506 Semipalmated Plover Residency: Migratory Abundance: Abundant
Abundance Details: Spring=abundant; Summer=abundant; Early Fall=abundant; Late Fall=uncommon; Winter=rare
Residency Details: **Present predominately as spring, summer and fall migrant; Also rare winter resident.**

178844 Black-and-white Warbler Residency: Migratory Abundance: Uncommon
Abundance Details: Spring=uncommon; Early Fall=uncommon; Late Fall=rare
Residency Details: Present spring and fall.

(3) If a species is a non-breeder and has a summer or winter abundance of uncommon, common or abundant, then the Residency Status of "resident" was chosen. The Abundance value selected is the abundance that matches the season the species occurs as a resident. The Residency Details state whether the species is a non-breeding summer or winter resident, and then any occurrence of the species as a migrant during the rest of the year.

174469 Common Loon Residency: Resident Abundance: Common
Abundance Details: Spring=uncommon; Late Fall=uncommon; Winter=common
Residency Details: **Winter resident; Also spring and fall migrant.**

176924 Caspian Tern Residency: Resident Abundance: Rare
Abundance Details: Spring=rare; Summer=rare; Early Fall=rare
Residency Details: **Non-breeding summer resident; Also spring, summer and fall migrant.**
Not listed as a breeder because there is no breeding record in the NYBBA online species list for any of the blocks within the park unit boundaries.

(4) Some non-breeding species have abundances that are the same across the seasons. In those cases the Residency Status of migratory or resident was chosen based on the field knowledge of the experts that reviewed all species' records in the database.

Appendix B. Protocols for Assigning Values to "Residency" and "Abundance" Fields and for Documenting Information in "Details" Fields in the NPSpecies, Gateway National Recreation Area (continued).

174987 Tundra Swan Residency: Resident Abundance: Rare
Abundance Details: Late Fall=rare; Winter=rare
Residency Details: **Winter resident; Also late fall migrant.**

178262 Hairy Woodpecker Residency: Migratory Abundance: Occasional
Abundance Details: Spring=occasional; Early Fall=occasional; Late Fall=occasional;
Winter=occasional
Residency Details: **Present predominately spring and fall; Also occasional winter resident.**

Appendix C. Protocols and Data Sources used to Determine Avifauna Breeding Status in Gateway National Recreation Area.

Jamaica Bay/Breezy Point Unit

The Atlas of Breeding Birds in New York State and the associated website, <http://www.dec.state.ny.us/apps/bba/results/index.cfm>, were used as the foundation of breeding confirmations for this unit. The topographic maps on the website were examined to ascertain all atlas blocks that included any part of the park. Each block was reviewed to determine how much area is within park boundaries. Also important was the evaluation of the type of habitat that occurs outside of the park limits. Based on this examination, it was decided which blocks were most likely to have the breeding confirmations occur within park boundaries.

The website provides two lists of species for each atlas block. The first list includes the confirmations from 1980 to 1985. This is the information used for the published atlas. The atlas is currently being updated and the information starting from 2000 is also available. The data was reviewed as of 2003 for this project. If a species has Probable or Confirmed breeding status within a block that is likely to have breeding occur within park boundaries, then that species is given a residency status of Breeder. Any species with just a Possible breeding status is not considered a breeder; however, comments detailing the possibility of breeding are included within the Residency Details field.

The report *Jamaica Bay I & M 1997 An Inventory and Monitoring Report for Gateway National Recreation Area's Breezy Point Jamaica Bay Unit* includes a breeding bird survey as of 1998. This information was used to refine the breeding information from the atlas data. As a result of the survey work in Breezy Point, some species were confirmed as breeders that were only listed as Possible breeders in the atlas data and some species were confirmed as extirpated as breeders by 1998 based on this report.

Additionally, the report *New York City Audubon Society's Harbor Herons Project: 2002 Nesting Survey* was checked for any additional breeding confirmations. One more species was confirmed as a breeder from the data in this report.

Review of the references *Status of Grassland Birds Breeding on Restored Grasslands at Floyd Bennett Field, Gateway National Recreation Area* and *Bird-habitat relationships as a guide to ecologically-based management at Floyd Bennett Field, Gateway National Recreation Area* determined that there were no discrepancies between either of the references and the atlas data. Therefore while these two papers were included in the list of references for any species documented in the reports, information from the reports was not included in the Residency Details field.

The Residency Details field includes complete information on which resource the status as Breeder is based. Note that entered atlas information includes block, year (1985 or 2003), and type of breeding confirmation, which allows additional references or surveys that may become

Appendix C. Protocols and Data Sources used to Determine Avifauna Breeding Status in Gateway National Recreation Area (continued).

available to be checked against the base criteria used to assess the status of a species as a breeder.

The following is a description of each atlas block that includes any part of the Jamaica Bay/Breezy Point unit and the decision of whether the block could be used to definitively designate a species as a breeder.

5848A – This block includes the very tip of Rockaway Barrier Beach, i.e. Breezy Point. The rest of the block is open water. Therefore any breeding bird information from this block is wholly within park boundaries.

5848B – This block includes the western part Rockaway Barrier Beach except for the point (see Block 5848A). Approximately 50% of the block is within park boundaries. The rest of the block appears by map to include relatively undeveloped area of the beach. The usefulness of this block may be minimal since it is not possible to determine where within the block confirmed breeding occurs and it appears there is likely habitat other than the park where breeding could occur.

5849B – This block includes the northern tip of Floyd Bennett Field, Canarsie Pier, and Bergen Beach. Approximately 25% of the block is within park boundaries. But the majority of the rest of the block is urban except for a very small portion of a city park. Therefore it is likely breeding bird confirmations are from the park.

5849D – This block includes most of Floyd Bennett Field; Fort Tilden and part of Jacob Riis Park and a good portion of Rockaway barrier beach that is within park boundaries. Approximately 75% of the block falls within park boundaries. Perhaps another additional 10% of the block is Atlantic beachfront, the rest is urban. There is a high probability that breeding bird confirmations occur within the park boundaries.

5949A – This block is almost wholly within the Jamaica Bay Wildlife Refuge. It encompasses the islands west of Cross Bay Blvd. Cross Bay Blvd. divides the islands of the Jamaica Bay Wildlife Refuge east and west. A small part of the Brooklyn shoreline, which is outside of the park, is also within the block. But it is likely that breeding confirmations occur within park boundaries for this block.

5949B – This block includes the islands in Jamaica Bay east of Cross Bay Boulevard. This comprises approximately 25% of the block. Although this block contains a significant portion of the Jamaica Bay Wildlife Refuge, there is additional good habitat beyond the park boundaries for breeding birds. A part of JFK Airport and part of Bayswater State Park are also in this block. Unfortunately, the usefulness of this block may be minimal since it is not possible to determine where within the block confirmed breeding occurs.

Appendix C. Protocols and Data Sources used to Determine Avifauna Breeding Status in Gateway National Recreation Area (continued).

5949C – This block includes three islands of the Jamaica Wildlife Refuge west of Cross Bays Blvd and the eastern part of Jacob Riis Park. Approximately 40% of this block occurs within park boundaries. Most of the rest of the block is developed but it includes the beach strip along the Atlantic Ocean. It is probable that most of the confirmed breeding are within park boundaries, but beach nesting species could occur outside of park boundaries.

5949D – Includes only the tip of a small island located east of Cross Bay Blvd in Jamaica Bay Estuarine System. Only 5% (if that) of this block occurs within park boundaries. The block also includes less developed areas such as the beachfront along Rockaway Beach and Bayswater State Park. The usefulness of this block is probably minimal considering a greater percentage of breeding habitat other than the national park occurs within the block boundaries.

5950C – Approximately 5% of this block falls within park boundaries along the Brooklyn shoreline. Another 10% of shoreline in this block is habitat other than urban. The park area looks more accessible than the rest of the shoreline, but it is not entirely possible to determine if the breeding confirmations are more probable to occur within the park boundaries than elsewhere in the block.

Sandy Hook Unit

Birds of New Jersey and the associated species lists from atlas blocks were used as the foundation of breeding confirmations for this unit. The lists were provided by New Jersey Audubon Society. Each block was reviewed with a topographic map to determine how much of each block is within park boundaries. Since there are only three blocks that encompass any of the park and two of those blocks are wholly within park limits it was easily determined which blocks were most likely to have the breeding confirmations occur within park boundaries.

If a species has Probable or Confirmed breeding status within a block that is likely to have breeding occur within park boundaries, then that species is given a residency status of Breeder. Any species with just a Possible breeding status is not considered a breeder; however, comments detailing the possibility of breeding are included within the Residency Details field.

The *Checklist of the Birds of Sandy Hook* includes breeding information as of 2004. This information was used to refine the breeding information from the atlas data. Additional species have been confirmed to breed at Sandy Hook since the completion of the breeding bird atlas. These confirmations were made by Scott Barnes, senior naturalist at New Jersey Audubon Society's Sandy Hook Bird Observatory.

The following is a description of each atlas block that includes any part of the Sandy Hook unit and the decision of whether the block could be used to definitively designate a species as a breeder.

Appendix C. Protocols and Data Sources used to Determine Avifauna Breeding Status in Gateway National Recreation Area (continued).

074NE - This block encompasses the tip (northernmost part) of the Sandy Hook. The rest of the block is open water. Therefore any breeding bird information from this block is wholly within park boundaries.

074CE – This block encompasses the mid-section of the Sandy Hook peninsula and some open water. Therefore any breeding bird information from this block is wholly within park boundaries.

074SE – This block encompasses the very southern part of the Sandy Hook unit. Less than 5% of the park falls into this block. In addition, the area that falls within park boundaries is less than 5% of the land area within the park. Therefore species recorded as breeding solely in this block cannot be designated as a Breeder without additional confirmation from another source.

Staten Island Unit

The Atlas of Breeding Birds in New York State and the associated website, <http://www.dec.state.ny.us/apps/bba/results/index.cfm>, were used as the foundation of data entry for this unit. The topographic maps on the website were examined to ascertain all atlas blocks that included any part of the park. Each block was reviewed to determine how much of each block is within park boundaries. Also important was the evaluation of the type of habitat that occurs outside of the park limits. Unfortunately, this examination showed that all the blocks that included any part of the Staten Island Unit also included possible breeding habitat outside of the park limits.

The report *New York City Audubon Society's Harbor Herons Project: 2002 Nesting Survey* is presently the only definitive source of breeding information. Hoffman Island and Swinburne Island, both of which are part of the Staten Island unit, are surveyed for this report. Data in the report allowed the confirmation of breeding for eleven species.

Since there are no other references at the present to provide park status, abundance or residency information for this unit, we decided to enter the atlas information for each species that occurs within a block that encompasses any part of this park unit to provide a base for further data entry. The website provides two lists of species for each atlas block. The first list includes the confirmations from 1980 to 1985. This is the information used for the published atlas. The atlas is currently being updated and the information starting from 2000 is also available. The data was reviewed as of 2003 for this project.

The Residency Details field includes complete information on which resource the status as Breeder is based. The entered atlas information includes block, year (1985 or 2003), and type of breeding confirmation. When additional references or surveys become available for actual confirmation of a species status within the park, the atlas data can be maintained as possible further verification of a species' status.

Appendix C. Protocols and Data Sources used to Determine Avifauna Breeding Status in Gateway National Recreation Area (continued).

The following is a description of each atlas block that includes any part of the Staten Island unit and the decision of whether the block could be used to definitively designate a species as a breeder.

5648B – This block includes Great Kills Park. The park makes up about 20% of the block. It is likely that breeding records would occur within the park boundaries; however, approximately 15% of the block is wooded. These wooded areas also show some development, but are not completely urban. Therefore, it is not possible to say that breeding categorically occurs within the park.

5748A – This block includes the beachfront edge that runs north from Great Kills Park to about Miller Field. The park includes only the beachfront. The map for the block shows a greater percentage of undeveloped land outside the park than within the park.

5749A – This block includes the northern portion of Ft. Wadsworth. Also within park boundaries is part of Arthur von Briesen Park, which runs along the water's edge. However, there are areas of fragmented woodland, lakes, and part of a reservoir that occur outside of park boundaries.

5749C – This block includes Miller Field, the beachfront strip up to Ft. Wadsworth, southern part of Ft. Wadsworth, and the western edge of Hoffman Island. However, there is also an undeveloped area approximately two times the size of Miller Field outside of the park boundaries.

5749D – This block, which is mostly water, includes the very tip of Ft. Wadsworth, and most of Hoffman and Swinbourne Islands. Although the amount of land within the park is small, it is the least developed part of the block,. The tip of Coney Island and a small but highly urban area of Brooklyn make up the rest of the land within this block. The block is not productive for breeding bird species overall. There are only 16 species recorded in 1985 and 17 species in 2003 for this block.

Appendix D. Description of Christmas Bird Count Data Used to Determine Winter Status and Abundance at Gateway National Recreation Area.

There are four Christmas Bird Count (CBC) circles that include some part of Gateway National Recreation Area (GATE). Data for each circle was extracted from the web site <http://www.audubon.org/bird/cbc/> for the count years 60 to 103. The circles are:

LI Brooklyn (NYBR)

4036N 7656W – 42 years of data 60-103, no count for years 70 and 99

The NYBR CBC includes most of the Jamaica Bay unit of Gateway National Recreation Area. Specifically, it includes Floyd Bennett Field, Rockaway Beach, Breezy Point, and most of the islands that were part of Jamaica Bay Wildlife Refuge. Excluded is the eastern (approximately 25%) part of the islands of the refuge.

LI Queens (NYQU)

4042N 7345W – 39 years of data 65-103

The NYQU CBC includes the eastern part of the islands that were part of Jamaica Bay Wildlife Refuge.

Staten Island (NYSI)

4035N 7409W – 44 years of data 60-103

The NYSI CBC includes most of Staten Island. Therefore all of the Staten Island park unit is within the circle.

Sandy Hook (NJSH)

4028N 7400W – 29 years of data 76-103

The NJSH CBC includes all of Sandy Hook within the circle.

Appendix E. Interviewees and Sample Questions used to Assess Inventory and Monitoring Needs at Gateway National Recreation Area.

Name	Affiliation	Position
David Avrin	Jamaica Bay/Breezy Pt. Unit	Assistant Superintendent
Dave Taft	Jamaica Bay/Breezy Pt. Unit	District Ranger
Kim Tripp	Jamaica Bay/Breezy Pt. Unit	Research Coordinator, Natural & Cultural Resources
Christopher Olijnyk	Jamaica Bay/Breezy Pt. Unit	Natural Resource staff
Jackie Duhon	Staten Island Unit	Natural Resource staff
Douglas Adamo	Gateway NRA	Chief, Division of Natural Resources
Bruce Lane	Sandy Hook Unit	Chief, Natural Resources
George Frame	Gateway NRA	Natural Resource staff
Don Riepe		Former Jamaica Bay Wildlife Refuge manager

Sample Questions

(1) Are you aware of any additional avian work in the <Park/Unit Name> that may be absent from the database, including current projects?

(2) What avian research should be done in the future? What about breeding bird censuses for species of scrub-shrub habitat?

(3) Any thoughts on future research on the productivity of breeding birds of coastal scrub-shrub passerines or secretive marsh species?

(4) Do you think that data on the productivity of breeding species in the <Park/Unit Name> is valuable?

(5) Do you think it is important to evaluate the effects of recreational activities on species viability? Is this an important area of study for Gateway?

(6) What kinds of recreation are compatible with birds? Is there a need to understand the affects of certain types of recreational activities with wildlife?

Appendix F. Responses to Questions Asked by Scott Barnes, New Jersey Audubon Society, during interviews with Gateway National Recreation Area Staff.

Question 1: Are you aware of any additional avian work on Great Kills that may be absent from the database including current projects?

Staten Island

Current data includes Osprey monitoring, Barn Owl monitoring, CBC data. Informal data exists on migratory species that use the park and on breeders. The unit has a bird species list that needs some updating.

A pair of American Oystercatcher nests in the park and is monitored every year.

Hoffman and Swinburne Islands are the responsibility of the Staten Island Unit of Gateway. The islands have breeding populations of Double-crested Cormorant, Black-crowned Night-Heron (?), WHAT OTHER SPS. BREED?

Andrew Bernick (College of Staten Island) is studying Black-crowned Night-Herons for the New York Harbor Herons Project and probably has data on the species within the Staten Island Unit of Gateway

JBBP

Floyd Bennett Field Unit has a resource library for publications, informal studies, and other data related to Gateway's natural resources.

Paul Kerlinger should have data on colonial waterbird numbers; staff not sure if this information is given to the state DEC.

Gateway participates in the Long Island Colonial Waterbird Census (herons, egrets, shorebirds, gulls, & terns)

Fall Hawkwatch is still conducted at Fort Tilden, mostly by Steve Walter.

1-2 pairs of Peregrine Falcons nest in/near Gateway and are banded and monitored by Chris Nadareski (work phone xxxxx)

Kurt Griffin and Meryl Golden (University of Mass) published reports on management issues for nesting Piping Plover

Brooke Lauro (Saint Johns University) published reports on crow predation on Piping Plovers

US Fish & Wildlife Service (Madison Lab) has done work on Botulism at Jamaica Bay and has taken blood samples of birds for studies on West Nile Virus.

Appendix F. Responses to Questions Asked by Scott Barnes, New Jersey Audubon Society, during interviews with Gateway National Recreation Area Staff (continued).

Work with Laughing Gulls has been conducted by the FAA at JFK Airport (adjacent to JBWR) and by a Mr. Dolbeer of the USDA Wildlife Service Division (in Sandusky, Ohio). Another study color-marked LAGUs for research on breeding and dispersal patterns.

Wade Wander did a comprehensive study of the birds of Jamaica Bay (year round?) that should be in the resource library at Floyd Bennett Field.

Sandy Hook

Chris Rose did passerine banding here in the early years of the park. Bruce can check and see if they have data in their files if it doesn't turn up in our search.

Betty Knorr may also have fall passerine banding data from the 1980's. Scott will try and contact her.

Question 2: What avian research should be done in the future? What about breeding bird censuses for species of scrub-shrub habitat?

Staten Island

Great Kills Unit would be a good future location for a MAPS station, if available.

No inventory/monitoring has been done at Great Kills for shorebirds that use the park during migration (especially the sod bank and salt marsh habitats).

Transect counts have been done informally in upland habitats within Great Kills. More formal point counts or transects would be useful data to have. This includes breeding species of scrub-shrub habitat, which the park has a fair amount of.

Neotropic migrants definitely use Great Kills as a feeding and rest stop during migration. Inventory and monitoring of this group would be a good candidate for further study.

Another area for future research might be on the viability of dredge spoils created two years ago at Great Kills as nesting habitat for Piping Plover and/or Least Tern.

American Woodcock nests in the unit but no censusing of numbers has occurred. Likewise, Whip-poor-will is a suspected breeder that has not been monitored.

JBBP

Research on decrease in marsh nesting species in the east pond of JBWR

Appendix F. Responses to Questions Asked by Scott Barnes, New Jersey Audubon Society, during interviews with Gateway National Recreation Area Staff (continued).

Decrease in American Kestrel populations (extirpated as nester; declining in other seasons)

Research on overgrazing of waterfowl as it relates to the loss of tidal marsh habitat around JBWR and Floyd Bennett Field (see attachment)

Research on population density and carrying capacity for species like Barn Owl and Tree Swallow

Research on the species composition of benthic organisms (invertebrates) that are food for migratory shorebirds at JBWR

Possible participation in the Wildlife Trust study on ocean health by examining dead seabirds (Scott Newman)

Quantifying the impact of Raccoons (predation) on ground and cavity nesting birds

Monitor the populations of declining corvids

Research on the interaction between wildlife management at JBWR and safety issues at JFK Airport

Sandy Hook

Yes, breeding censuses for scrub-shrub habitats should be done. Other nesting species that research and monitoring should be done on are Northern Bobwhite (possibly extirpated—SB), American Woodcock, and Whip-poor-will.

In general, a breeding census for all birds would be a gap in data that should be filled.

Research on what kind of habitat management plan is of top priority for bird species. For instance, should certain fields or second growth be maintained at a certain stage? Or would allowing these sites to succeed back to thicker scrub-shrub or maritime forest be of higher priority as it relates to birds?

Question 3: Any thoughts on future research on the productivity of breeding birds of coastal scrub-shrub passerines or secretive marsh species?

Great Kills

Breeding censuses for all nesting species would be good data to have and does not exist. Great Kills and Miller Field contain natural and man-made wetland habitats; inventory and productivity of wetland breeders would make for excellent future research.

Appendix F. Responses to Questions Asked by Scott Barnes, New Jersey Audubon Society, during interviews with Gateway National Recreation Area Staff (continued).

Additional data on the productivity and numbers of breeding Barn Owls in the unit would be good to have.

JBBP

Any kind of research that monitors change in populations of avian species in general (excluding Piping Plover, Least Tern, and Black Skimmer) would be useful

Study the possible impact of West Nile Virus on species productivity. Does the virus act as impairment to productivity?

Research has not been done on the decline or loss of certain species as wetland breeders in the east pond of JBWR

Sandy Hook

Basically, Bruce and Doug agreed that monitoring breeders and their success (this is already done with terns and plovers) is important. I couldn't get them to elaborate much on this.

Question 4: Do you think that data on the productivity of breeding species is valuable?

Great Kills

Yes, as a measure of habitat quality, overall park management, and future land-use decision making. Gateway is currently drafting a future General Management plan for the park and this type of data is important for future natural resource management. Inventory and monitoring would be good ways to evaluate the success of restoration efforts, especially the Swamp White Oak Forest at Miller Field and dune/scrub at Crooke's Point.

JBBP

Yes, especially on neotropical migrants

Sandy Hook

Yes, it is essential to have information on productivity for plovers and terns before any kind of project can be approved.

Research on productivity of breeding species should allow for better management of habitat for targeted species (special concern, regional responsibility)

Appendix F. Responses to Questions Asked by Scott Barnes, New Jersey Audubon Society, during interviews with Gateway National Recreation Area Staff (continued).

Yes, productivity is important to enable NPS to better evaluate which habitats have a higher value and which ones require further study or monitoring (marsh species, for example)

This would also allow NPS natural resource staff to prioritize where to spend funds on avian research.

Question 5: Do you think it is important to evaluate the effects of recreational activities on species viability? Is this an important area of study for Gateway?

Great Kills

Yes. Salt marsh disturbance exists, primarily from fisherman and beach walkers. Some human disturbance occurs at Crooke's Point. Current management strategy for human disturbance in sensitive areas is snow fencing, signage, and intermittent patrolling. Some disturbance by unleashed dogs may impact birds in the park. A small amount of feral cats are present and may increase avian mortality. The salt marsh habitat at Great Kills seems to be growing and foot traffic there probably results in some trampling of vegetation.

JBBP

Yes, as it relates to optimizing habitat for birds

Sandy Hook

A valuable project might be to monitor the difference between bird species using similar habitats with different human use/disturbance patterns (specifically the difference between the number and variety of birds using the more disturbed Plum Island habitats versus the number and variety of birds using the more protected Spermaceti Cove habitats)

This type of data should also be included in the forthcoming work on Gateway's General Management Plan.

Measuring visitor use impacts to wildlife has been raised by Gateway staff, but good parameters for doing so have not been well-defined yet; possibly measuring this through bird monitoring is one way.

What kinds of recreation are compatible with birds? Is there a need to understand the affects of certain types of recreational activities with wildlife?

Appendix F. Responses to Questions Asked by Scott Barnes, New Jersey Audubon Society, during interviews with Gateway National Recreation Area Staff (continued).

Great Kills

For Great Kills the primary recreational activity that may impact birds is the use of beach and salt marsh habitats by fishermen and walkers. To a lesser extent the impacts of unleashed dogs on bird populations has not been studied. Human impacts on the bike path or other trails within the park are probably minimal. Great Kills has a large harbor, but no mention of any affect it might have on birds was mentioned.

JBBP

Study the affects of personal watercraft and kayaks—what impacts do they have and how are they different?

Study the potential tolerance threshold for urban birds at Gateway. How far can certain species be pushed before they are adversely impacted (productivity, feeding behavior)?

Possible research on the impact of Off-Road Vehicles on beaches with respect to availability of food for shorebirds. Does the compaction of sand adversely affect benthic communities?

What is the human carrying capacity of Gateway Units and how does impact birds there?

Sandy Hook

Compatibility of recreational needs and natural resource protection needs to be included in Gateway's new General Management Plan.

Will the increase in traffic associated with the redevelopment plan for Sandy Hook result in greater numbers of car-killed birds?

Measuring the affects of the Multi-Use Pathway (a.k.a. bike path) and construction of new parking lots may be difficult to quantify. One method of addressing this may be through monitoring bird numbers, productivity, and species diversity adjacent to the MUP and parking lots versus monitoring species in the scrub-shrub interior.

Appendix G. Species, Species Groups, or Guilds Identified as Requiring Inventory and Monitoring to Address Significant Gaps in Knowledge and Information.

<u>Species/Species Group/Guild</u>	<u>Season</u>	<u>Park Unit</u>	<u>Recommended Activities</u>
Salt Marsh Sharp-tailed Sparrow	Breeding	All	Assess distribution and abundance throughout park. Monitor productivity and survival across years
Seaside Sparrow	Breeding	All	Assess distribution and abundance throughout park. Monitor productivity and survival across years
Prairie Warbler	Breeding	All	Assess distribution and abundance throughout park.
Passerine species in early successional habitats	Breeding	All	Determine species occurrence, distribution and abundance throughout park. Monitor changes in nesting density across years
Grassland passerines (e.g., Grasshopper Sparrow)	Breeding	JBBP	Continue monitoring distribution and abundance at Floyd Bennett Field. Monitor productivity and survival across years
Landbirds/passerines	Breeding	All	Determine species occurrence, distribution and abundance throughout park. Monitor productivity and survival across years (MAPS stations)
Landbirds/passerines	Breeding	Staten Island	Determine species occurrence, distribution and abundance throughout the unit
Landbirds/passerines	Migration (both seasons)	All	Determine species occurrence, distribution and abundance throughout park.

Appendix G. Species, Species Groups, or Guilds Identified as Requiring Inventory and Monitoring to Address Significant Gaps in Knowledge and Information (continued).

<u>Species/Species Group/Guild</u>	<u>Season</u>	<u>Park Unit</u>	<u>Recommended Activities</u>
Northern Harrier	Breeding		Determine distribution and abundance throughout park. Monitor productivity and survival across years
American Kestrel	Breeding	JBBP Staten Island	Determine distribution and abundance throughout park. Monitor productivity and survival across years. Establish nest box program
Upland Sandpiper	Breeding	JBBP	Assess distribution and abundance at Floyd Bennett Field. Monitor productivity and survival across years
American Oystercatcher	Breeding	JBBP Sandy Hook	Assess distribution and abundance throughout park. Monitor productivity and survival across years
Various shorebird species (e.g., Red Knot)	Spring migration	All	Assess distribution and abundance throughout park and relationship with distribution and abundance of spawning horseshoe crabs
American Black Duck	Breeding	JBBP	Assess distribution and abundance throughout park. Monitor productivity and survival across years
Various solitary nesting waterbird species (e.g., Pied-billed Grebe, American/Least Bittern, Black Rail)	Breeding	JBBP	Assess distribution and abundance throughout park.

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN) Order.

<u>TSN</u>	<u>Common Name</u>	<u>Scientific name</u>
-9728173	Ovenbird	<i>Seiurus aurocapilla</i>
-9728172	Snowy Owl	<i>Bubo scandiacus</i>
-9728171	Wilson's Snipe	<i>Gallinago delicata</i>
-9728170	Purple Gallinule	<i>Porphyrio martinica</i>
-501544	Blue Grosbeak	<i>Passerina caerulea</i>
-501473	Black Tern (subspecies)	<i>Chlidonias niger surinamensis</i>
174469	Common Loon	<i>Gavia immer</i>
174474	Red-throated Loon	<i>Gavia stellata</i>
174475	Pacific Loon	<i>Gavia pacifica</i>
174479	Red-necked Grebe	<i>Podiceps grisegena</i>
174481	Red-necked Grebe (subspecies)	<i>Podiceps grisegena holboellii</i>
174482	Horned Grebe	<i>Podiceps auritus</i>
174485	Eared Grebe	<i>Podiceps nigricollis</i>
174505	Pied-billed Grebe	<i>Podilymbus podiceps</i>
174553	Sooty Shearwater	<i>Puffinus griseus</i>
174684	White Pelican	<i>Pelecanus erythrorhynchos</i>
174685	Brown Pelican	<i>Pelecanus occidentalis</i>
174712	Northern Gannett	<i>Morus bassanus</i>
174715	Great Cormorant	<i>Phalacrocorax carbo</i>
174717	Double-crested Cormorant	<i>Phalacrocorax auritus</i>
174763	Magnificent Frigatebird	<i>Fregata magnificens</i>
174773	Great Blue Heron	<i>Ardea herodias</i>
174793	Green Heron	<i>Butorides virescens</i>
174803	Cattle Egret	<i>Bubulcus ibis</i>
174813	Snowy Egret	<i>Egretta thula</i>
174824	Reddish Egret	<i>Egretta rufescens</i>
174826	Tricolored Heron	<i>Egretta tricolor</i>
174827	Little Blue Heron	<i>Egretta caerulea</i>
174832	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>
174842	Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>
174846	Least Bittern	<i>Ixobrychus exilis</i>
174856	American Bittern	<i>Botaurus lentiginosus</i>
174897	Wood Stork	<i>Mycteria americana</i>
174924	Glossy Ibis	<i>Plegadis falcinellus</i>
174926	White-faced Ibis	<i>Plegadis chihi</i>
174985	Mute Swan	<i>Cygnus olor</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

174987	Tundra Swan	<i>Cygnus columbianus</i>
174999	Canada Goose	<i>Branta canadensis</i>
175011	Brant	<i>Branta bernicla</i>
175020	Greater White-fronted Goose	<i>Anser albifrons</i>
175038	Snow Goose	<i>Chen caerulescens</i>
175044	Black-bellied Whistling-Duck	<i>Dendrocygna autumnalis</i>
175046	Fulvous Whistling-Duck	<i>Dendrocygna bicolor</i>
175063	Mallard	<i>Anas platyrhynchos</i>
175068	American Black Duck	<i>Anas rubripes</i>
175073	Gadwall	<i>Anas strepera</i>
175074	Northern Pintail	<i>Anas acuta</i>
175081	Green-winged Teal	<i>Anas crecca</i>
175086	Blue-winged Teal	<i>Anas discors</i>
175089	Cinnamon Teal	<i>Anas cyanoptera</i>
175092	Eurasian Wigeon	<i>Anas penelope</i>
175094	American Wigeon	<i>Anas americana</i>
175096	Northern Shoveler	<i>Anas clypeata</i>
175122	Wood Duck	<i>Aix sponsa</i>
175125	Redhead	<i>Aythya americana</i>
175128	Ring-necked Duck	<i>Aythya collaris</i>
175129	Canvasback	<i>Aythya valisineria</i>
175130	Greater Scaup	<i>Aythya marila</i>
175134	Lesser Scaup	<i>Aythya affinis</i>
175135	Tufted Duck	<i>Aythya fuligula</i>
175141	Common Goldeneye	<i>Bucephala clangula</i>
175145	Bufflehead	<i>Bucephala albeola</i>
175147	Long-tailed Duck	<i>Clangula hyemalis</i>
175149	Harlequin Duck	<i>Histrionicus histrionicus</i>
175155	Common Eider	<i>Somateria mollissima</i>
175160	King Eider	<i>Somateria spectabilis</i>
175163	White-winged Scoter	<i>Melanitta fusca</i>
175170	Surf Scoter	<i>Melanitta perspicillata</i>
175171	Black Scoter	<i>Melanitta nigra</i>
175175	Ruddy Duck	<i>Oxyura jamaicensis</i>
175183	Hooded Merganser	<i>Lophodytes cucullatus</i>
175185	Common Merganser	<i>Mergus merganser</i>
175187	Red-breasted Merganser	<i>Mergus serrator</i>
175265	Turkey Vulture	<i>Cathartes aura</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

175272	Black Vulture	<i>Coragyps atratus</i>
175289	Swallow-tailed Kite	<i>Elanoides forficatus</i>
175300	Northern Goshawk	<i>Accipiter gentilis</i>
175304	Sharp-shinned Hawk	<i>Accipiter striatus</i>
175309	Cooper's Hawk	<i>Accipiter cooperii</i>
175350	Red-tailed Hawk	<i>Buteo jamaicensis</i>
175359	Red-shouldered Hawk	<i>Buteo lineatus</i>
175365	Broad-winged Hawk	<i>Buteo platypterus</i>
175373	Rough-legged Hawk	<i>Buteo lagopus</i>
175407	Golden Eagle	<i>Aquila chrysaetos</i>
175420	Bald Eagle	<i>Haliaeetus leucocephalus</i>
175430	Northern Harrier	<i>Circus cyaneus</i>
175590	Osprey	<i>Pandion haliaetus</i>
175599	Gyr Falcon	<i>Falco rusticolus</i>
175604	Peregrine Falcon	<i>Falco peregrinus</i>
175613	Merlin	<i>Falco columbarius</i>
175622	American Kestrel	<i>Falco sparverius</i>
175863	Northern Bobwhite	<i>Colinus virginianus</i>
175905	Ring-necked Pheasant	<i>Phasianus colchicus</i>
176207	King Rail	<i>Rallus elegans</i>
176209	Clapper Rail	<i>Rallus longirostris</i>
176221	Virginia Rail	<i>Rallus limicola</i>
176242	Sora	<i>Porzana carolina</i>
176259	Yellow Rail	<i>Coturnicops noveboracensis</i>
176263	Black Rail	<i>Laterallus jamaicensis</i>
176284	Common Moorhen	<i>Gallinula chloropus</i>
176292	American Coot	<i>Fulica americana</i>
176472	American Oystercatcher	<i>Haematopus palliatus</i>
176506	Semipalmated Plover	<i>Charadrius semipalmatus</i>
176507	Piping Plover	<i>Charadrius melodus</i>
176517	Wilson's Plover	<i>Charadrius wilsonia</i>
176520	Killdeer	<i>Charadrius vociferus</i>
176564	American Golden-Plover	<i>Pluvialis dominica</i>
176567	Black-bellied Plover	<i>Pluvialis squatarola</i>
176571	Ruddy Turnstone	<i>Arenaria interpres</i>
176580	American Woodcock	<i>Scolopax minor</i>
176599	Whimbrel	<i>Numenius phaeopus</i>
176610	Upland Sandpiper	<i>Bartramia longicauda</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

176612	Spotted Sandpiper	<i>Actitis macularia</i>
176615	Solitary Sandpiper	<i>Tringa solitaria</i>
176619	Greater Yellowlegs	<i>Tringa melanoleuca</i>
176620	Lesser Yellowlegs	<i>Tringa flavipes</i>
176621	Spotted Redshank	<i>Tringa erythropus</i>
176638	Willet	<i>Catoptrophorus semipalmatus</i>
176642	Red Knot	<i>Calidris canutus</i>
176644	Red Knot (subspecies)	<i>Calidris canutus rufa</i>
176646	Purple Sandpiper	<i>Calidris maritima</i>
176652	Sharp-tailed Sandpiper	<i>Calidris acuminata</i>
176653	Pectoral Sandpiper	<i>Calidris melanotos</i>
176654	White-rumped Sandpiper	<i>Calidris fuscicollis</i>
176655	Baird's Sandpiper	<i>Calidris bairdii</i>
176656	Least Sandpiper	<i>Calidris minutilla</i>
176659	Rufous-necked Stint	<i>Calidris ruficollis</i>
176659	Red-necked Stint	<i>Calidris ruficollis</i>
176660	Curlew Sandpiper	<i>Calidris ferruginea</i>
176661	Dunlin	<i>Calidris alpina</i>
176667	Semipalmated Sandpiper	<i>Calidris pusilla</i>
176668	Western Sandpiper	<i>Calidris mauri</i>
176669	Sanderling	<i>Calidris alba</i>
176670	Little Stint	<i>Calidris minuta</i>
176675	Short-billed Dowitcher	<i>Limnodromus griseus</i>
176679	Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>
176684	Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>
176686	Marbled Godwit	<i>Limosa fedoa</i>
176690	Hudsonian Godwit	<i>Limosa haemastica</i>
176695	Ruff	<i>Philomachus pugnax</i>
176700	Common Snipe	<i>Gallinago gallinago</i>
176721	American Avocet	<i>Recurvirostra americana</i>
176726	Black-necked Stilt	<i>Himantopus mexicanus</i>
176734	Red Phalarope	<i>Phalaropus fulicarius</i>
176735	Red-necked Phalarope	<i>Phalaropus lobatus</i>
176736	Wilson's Phalarope	<i>Phalaropus tricolor</i>
176792	Pomarine Jaeger	<i>Stercorarius pomarinus</i>
176793	Parasitic Jaeger	<i>Stercorarius parasiticus</i>
176808	Glaucous Gull	<i>Larus hyperboreus</i>
176811	Iceland Gull	<i>Larus glaucoides</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

176815	Great Black-backed Gull	<i>Larus marinus</i>
176821	Lesser Black-backed Gull	<i>Larus fuscus</i>
176824	Herring Gull	<i>Larus argentatus</i>
176825	Herring Gull (subspecies)	<i>Larus argentatus smithsonianus</i>
176830	Ring-billed Gull	<i>Larus delawarensis</i>
176835	Black-headed Gull	<i>Larus ridibundus</i>
176837	Laughing Gull	<i>Larus atricilla</i>
176839	Bonaparte's Gull	<i>Larus philadelphia</i>
176840	Little Gull	<i>Larus minutus</i>
176875	Black-legged Kittiwake	<i>Rissa tridactyla</i>
176877	Black-legged Kittiwake (subspecies)	<i>Rissa tridactyla tridactyla</i>
176887	Forster's Tern	<i>Sterna forsteri</i>
176888	Common Tern	<i>Sterna hirundo</i>
176889	Common Tern (subspecies)	<i>Sterna hirundo hirundo</i>
176890	Arctic Tern	<i>Sterna paradisaea</i>
176891	Roseate Tern	<i>Sterna dougallii</i>
176894	Sooty Tern	<i>Sterna fuscata</i>
176922	Royal Tern	<i>Sterna maxima</i>
176923	Least Tern	<i>Sterna antillarum</i>
176924	Caspian Tern	<i>Sterna caspia</i>
176926	Gull-billed Tern	<i>Sterna nilotica</i>
176959	Black Tern	<i>Chlidonias niger</i>
176971	Razorbill	<i>Alca torda</i>
176978	Thick-billed Murre	<i>Uria lomvia</i>
176985	Black Guillemot	<i>Cepphus grylle</i>
177071	Rock Pigeon	<i>Columba livia</i>
177125	Mourning Dove	<i>Zenaidura macroura</i>
177723	Monk Parakeet	<i>Myiopsitta monachus</i>
177831	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
177834	Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
177851	Barn Owl	<i>Tyto alba</i>
177884	Great Horned Owl	<i>Bubo virginianus</i>
177896	Snowy Owl	<i>Nyctea scandiaca</i>
177932	Long-eared Owl	<i>Asio otus</i>
177935	Short-eared Owl	<i>Asio flammeus</i>
177942	Northern Saw-whet Owl	<i>Aegolius acadicus</i>
177961	Whip-poor-will	<i>Caprimulgus vociferus</i>
177979	Common Nighthawk	<i>Chordeiles minor</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

178001	Chimney Swift	<i>Chaetura pelagica</i>
178032	Ruby-throated Hummingbird	<i>Archilochus colubris</i>
178119	Belted Kingfisher	<i>Ceryle alcyon</i>
178154	Northern Flicker	<i>Colaptes auratus</i>
178156	Northern Flicker (subspecies)	<i>Colaptes auratus luteus</i>
178186	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
178195	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
178202	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
178259	Downy Woodpecker	<i>Picoides pubescens</i>
178262	Hairy Woodpecker	<i>Picoides villosus</i>
178279	Eastern Kingbird	<i>Tyrannus tyrannus</i>
178287	Western Kingbird	<i>Tyrannus verticalis</i>
178309	Great Crested Flycatcher	<i>Myiarchus crinitus</i>
178329	Eastern Phoebe	<i>Sayornis phoebe</i>
178338	Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>
178339	Acadian Flycatcher	<i>Empidonax virescens</i>
178340	Alder Flycatcher	<i>Empidonax alnorum</i>
178341	Willow Flycatcher	<i>Empidonax traillii</i>
178344	Least Flycatcher	<i>Empidonax minimus</i>
178359	Eastern Wood Pewee	<i>Contopus virens</i>
178431	Tree Swallow	<i>Tachycineta bicolor</i>
178436	Bank Swallow	<i>Riparia riparia</i>
178443	Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
178448	Barn Swallow	<i>Hirundo rustica</i>
178455	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
178460	Cave Swallow	<i>Petrochelidon fulva</i>
178464	Purple Martin	<i>Progne subis</i>
178511	Northern Shrike	<i>Lanius excubitor</i>
178515	Loggerhead Shrike	<i>Lanius ludovicianus</i>
178532	Cedar Waxwing	<i>Bombycilla cedrorum</i>
178541	House Wren	<i>Troglodytes aedon</i>
178547	Winter Wren	<i>Troglodytes troglodytes</i>
178581	Carolina Wren	<i>Thryothorus ludovicianus</i>
178605	Sedge Wren	<i>Cistothorus platensis</i>
178608	Marsh Wren	<i>Cistothorus palustris</i>
178620	Northern Mockingbird	<i>Mimus polyglottos</i>
178625	Gray Catbird	<i>Dumetella carolinensis</i>
178627	Brown Thrasher	<i>Toxostoma rufum</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

178654	Sage Thrasher	<i>Oreoscoptes montanus</i>
178699	Black-capped Chickadee	<i>Parus atricapillus</i>
178700	Black-capped Chickadee (subspecies)	<i>Parus atricapillus atricapillus</i>
178775	White-breasted Nuthatch	<i>Sitta carolinensis</i>
178784	Red-breasted Nuthatch	<i>Sitta canadensis</i>
178803	Brown Creeper	<i>Certhia americana</i>
178844	Black-and-white Warbler	<i>Mniotilta varia</i>
178846	Prothonotary Warbler	<i>Protonotaria citrea</i>
178850	Worm-eating Warbler	<i>Helmitheros vermivorus</i>
178852	Golden-winged Warbler	<i>Vermivora chrysoptera</i>
178853	Blue-winged Warbler	<i>Vermivora pinus</i>
178855	Tennessee Warbler	<i>Vermivora peregrina</i>
178856	Orange-crowned Warbler	<i>Vermivora celata</i>
178861	Nashville Warbler	<i>Vermivora ruficapilla</i>
178868	Northern Parula	<i>Parula americana</i>
178878	Yellow Warbler	<i>Dendroica petechia</i>
178879	Yellow Warbler (subspecies)	<i>Dendroica petechia aestiva</i>
178886	Magnolia Warbler	<i>Dendroica magnolia</i>
178887	Cape May Warbler	<i>Dendroica tigrina</i>
178888	Black-throated Blue Warbler	<i>Dendroica caerulescens</i>
178891	Yellow-rumped Warbler	<i>Dendroica coronata</i>
178896	Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
178897	Townsend's Warbler	<i>Dendroica townsendi</i>
178898	Black-throated Green Warbler	<i>Dendroica virens</i>
178903	Cerulean Warbler	<i>Dendroica cerulea</i>
178904	Blackburnian Warbler	<i>Dendroica fusca</i>
178905	Yellow-throated Warbler	<i>Dendroica dominica</i>
178911	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>
178912	Bay-breasted Warbler	<i>Dendroica castanea</i>
178913	Blackpoll Warbler	<i>Dendroica striata</i>
178914	Pine Warbler	<i>Dendroica pinus</i>
178918	Prairie Warbler	<i>Dendroica discolor</i>
178921	Palm Warbler	<i>Dendroica palmarum</i>
178922	Palm Warbler (subspecies)	<i>Dendroica palmarum palmarum</i>
178923	Palm Warbler (subspecies)	<i>Dendroica palmarum hypochrysea</i>
178927	Ovenbird	<i>Seiurus aurocapillus</i>
178931	Northern Waterthrush	<i>Seiurus noveboracensis</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

178935	Louisiana Waterthrush	<i>Seiurus motacilla</i>
178937	Kentucky Warbler	<i>Oporornis formosus</i>
178938	Connecticut Warbler	<i>Oporornis agilis</i>
178939	Mourning Warbler	<i>Oporornis philadelphia</i>
178944	Common Yellowthroat	<i>Geothlypis trichas</i>
178964	Yellow-breasted Chat	<i>Icteria virens</i>
178972	Hooded Warbler	<i>Wilsonia citrina</i>
178973	Wilson's Warbler	<i>Wilsonia pusilla</i>
178977	Canada Warbler	<i>Wilsonia canadensis</i>
178979	American Redstart	<i>Setophaga ruticilla</i>
178991	White-eyed Vireo	<i>Vireo griseus</i>
179009	Yellow-throated Vireo	<i>Vireo flavifrons</i>
179010	Blue-headed Vireo	<i>Vireo solitarius</i>
179010	Solitary Vireo	<i>Vireo solitarius</i>
179021	Red-eyed Vireo	<i>Vireo olivaceus</i>
179022	Philadelphia Vireo	<i>Vireo philadelphicus</i>
179023	Warbling Vireo	<i>Vireo gilvus</i>
179032	Bobolink	<i>Dolichonyx oryzivorus</i>
179034	Eastern Meadowlark	<i>Sturnella magna</i>
179043	Yellow-headed Blackbird	<i>Xanthocephalus</i> <i>xanthocephalus</i>
179045	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
179064	Orchard Oriole	<i>Icterus spurius</i>
179083	Baltimore Oriole	<i>Icterus galbula</i>
179091	Rusty Blackbird	<i>Euphagus carolinus</i>
179104	Common Grackle	<i>Quiscalus quiscula</i>
179108	Boat-tailed Grackle	<i>Quiscalus major</i>
179112	Brown-headed Cowbird	<i>Molothrus ater</i>
179124	Northern Cardinal	<i>Cardinalis cardinalis</i>
179139	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
179150	Indigo Bunting	<i>Passerina cyanea</i>
179165	Dickcissel	<i>Spiza americana</i>
179173	Evening Grosbeak	<i>Coccothraustes vespertinus</i>
179186	Purple Finch	<i>Carpodacus purpureus</i>
179191	House Finch	<i>Carpodacus mexicanus</i>
179205	Pine Grosbeak	<i>Pinicola enucleator</i>
179226	European Goldfinch	<i>Carduelis carduelis</i>
179230	Common Redpoll	<i>Carduelis flammea</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

179233	Pine Siskin	<i>Carduelis pinus</i>
179236	American Goldfinch	<i>Carduelis tristis</i>
179259	Red Crossbill	<i>Loxia curvirostra</i>
179268	White-winged Crossbill	<i>Loxia leucoptera</i>
179269	White-winged Crossbill (subspecies)	<i>Loxia leucoptera leucoptera</i>
179276	Eastern Towhee	<i>Pipilo erythrophthalmus</i>
179277	Eastern Towhee (subspecies)	<i>Pipilo erythrophthalmus erythrophthalmus</i>
179312	Lark Bunting	<i>Calamospiza melanocorys</i>
179314	Savannah Sparrow	<i>Passerculus sandwichensis</i>
179315	Ipswich Sparrow	<i>Passerculus sandwichensis princeps</i>
179317	Savannah Sparrow (subspecies)	<i>Passerculus sandwichensis savanna</i>
179333	Grasshopper Sparrow	<i>Ammodramus savannarum</i>
179340	Henslow's Sparrow	<i>Ammodramus henslowii</i>
179344	Saltmarsh Sharp-tailed Sparrow	<i>Ammodramus caudacutus</i>
179346	Seaside Sparrow	<i>Ammodramus maritimus</i>
179366	Vesper Sparrow	<i>Pooecetes gramineus</i>
179371	Lark Sparrow	<i>Chondestes grammacus</i>
179410	Dark-eyed Junco	<i>Junco hyemalis</i>
179432	American Tree Sparrow	<i>Spizella arborea</i>
179433	American Tree Sparrow (subspecies)	<i>Spizella arborea arborea</i>
179435	Chipping Sparrow	<i>Spizella passerina</i>
179439	Clay-colored Sparrow	<i>Spizella pallida</i>
179443	Field Sparrow	<i>Spizella pusilla</i>
179455	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
179462	White-throated Sparrow	<i>Zonotrichia albicollis</i>
179464	Fox Sparrow	<i>Passerella iliaca</i>
179488	Swamp Sparrow	<i>Melospiza georgiana</i>
179490	Swamp Sparrow (subspecies)	<i>Melospiza georgiana georgiana</i>
179492	Song Sparrow	<i>Melospiza melodia</i>
179494	Song Sparrow (subspecies)	<i>Melospiza melodia atlantica</i>
179526	Lapland Longspur	<i>Calcarius lapponicus</i>
179532	Snow Bunting	<i>Plectrophenax nivalis</i>
179628	House Sparrow	<i>Passer domesticus</i>
179637	European Starling	<i>Sturnus vulgaris</i>
179680	Blue Jay	<i>Cyanocitta cristata</i>

Appendix H. Jamaica Bay/Breezy Point Unit Species List in Taxonomic Species Number (TSN)
Order (continued).

179731	American Crow	<i>Corvus brachyrhynchos</i>
179737	Fish Crow	<i>Corvus ossifragus</i>
179759	American Robin	<i>Turdus migratorius</i>
179769	Redwing	<i>Turdus iliacus</i>
179777	Wood Thrush	<i>Hylocichla mustelina</i>
179779	Hermit Thrush	<i>Catharus guttatus</i>
179788	Swainson's Thrush	<i>Catharus ustulatus</i>
179793	Gray-cheeked Thrush	<i>Catharus minimus</i>
179796	Veery	<i>Catharus fuscescens</i>
179801	Eastern Bluebird	<i>Sialia sialis</i>
179824	Townsend's Solitaire	<i>Myadestes townsendi</i>
179853	Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>
179865	Golden-crowned Kinglet	<i>Regulus satrapa</i>
179870	Ruby-crowned Kinglet	<i>Regulus calendula</i>
179882	Western Tanager	<i>Piranga ludoviciana</i>
179883	Scarlet Tanager	<i>Piranga olivacea</i>
179888	Summer Tanager	<i>Piranga rubra</i>
202310	Seaside Sparrow (subspecies)	<i>Ammodramus maritimus</i> <i>maritimus</i>
554127	American Pipit	<i>Anthus rubescens</i>
554135	Great Egret	<i>Ardea alba</i>
554138	Tufted Titmouse	<i>Baeolophus bicolor</i>
554145	Stilt Sandpiper	<i>Calidris himantopus</i>
554221	Olive-sided Flycatcher	<i>Contopus cooperi</i>
554256	Horned Lark	<i>Eremophila alpestris</i>
554268	Mississippi Kite	<i>Ictinia mississippiensis</i>
554382	Black-capped Chickadee	<i>Poecile atricapillus</i>
554447	Black Skimmer	<i>Rynchops niger</i> ►

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order.

<u>TSN</u>	<u>CommonName</u>	<u>Scientific name</u>
-9728174	Ovenbird	<i>Seiurus aurocapilla</i>
-9728173	Snowy Owl	<i>Bubo scandiaca</i>
-9728172	Eastern Screech-Owl	<i>Megascops asio</i>
-9728171	Wilson's Snipe	<i>Gallinago delicata</i>
-9728170	Purple Gallinule	<i>Porphyrio martinica</i>
-501544	Blue Grosbeak	<i>Passerina caerulea</i>
174469	Common Loon	<i>Gavia immer</i>
174474	Red-throated Loon	<i>Gavia stellata</i>
174475	Pacific Loon	<i>Gavia pacifica</i>
174479	Red-necked Grebe	<i>Podiceps grisegena</i>
174482	Horned Grebe	<i>Podiceps auritus</i>
174485	Eared Grebe	<i>Podiceps nigricollis</i>
174505	Pied-billed Grebe	<i>Podilymbus podiceps</i>
174553	Sooty Shearwater	<i>Puffinus griseus</i>
174555	Manx Shearwater	<i>Puffinus puffinus</i>
174650	Wilson's Storm-Petrel	<i>Oceanites oceanicus</i>
174685	Brown Pelican	<i>Pelecanus occidentalis</i>
174704	Brown Booby	<i>Sula leucogaster</i>
174712	Northern Gannett	<i>Morus bassanus</i>
174715	Great Cormorant	<i>Phalacrocorax carbo</i>
174717	Double-crested Cormorant	<i>Phalacrocorax auritus</i>
174755	Anhinga	<i>Anhinga anhinga</i>
174773	Great Blue Heron	<i>Ardea herodias</i>
174793	Green Heron	<i>Butorides virescens</i>
174803	Cattle Egret	<i>Bubulcus ibis</i>
174813	Snowy Egret	<i>Egretta thula</i>
174826	Tricolored Heron	<i>Egretta tricolor</i>
174827	Little Blue Heron	<i>Egretta caerulea</i>
174832	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>
174842	Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>
174846	Least Bittern	<i>Ixobrychus exilis</i>
174856	American Bittern	<i>Botaurus lentiginosus</i>
174924	Glossy Ibis	<i>Plegadis falcinellus</i>
174985	Mute Swan	<i>Cygnus olor</i>
174987	Tundra Swan	<i>Cygnus columbianus</i>
174999	Canada Goose	<i>Branta canadensis</i>
175011	Brant	<i>Branta bernicla</i>
175038	Snow Goose	<i>Chen caerulescens</i>

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order (continued).

175063	Mallard	<i>Anas platyrhynchos</i>
175068	American Black Duck	<i>Anas rubripes</i>
175073	Gadwall	<i>Anas strepera</i>
175074	Northern Pintail	<i>Anas acuta</i>
175081	Green-winged Teal	<i>Anas crecca</i>
175086	Blue-winged Teal	<i>Anas discors</i>
175092	Eurasian Wigeon	<i>Anas penelope</i>
175094	American Wigeon	<i>Anas americana</i>
175096	Northern Shoveler	<i>Anas clypeata</i>
175122	Wood Duck	<i>Aix sponsa</i>
175125	Redhead	<i>Aythya americana</i>
175128	Ring-necked Duck	<i>Aythya collaris</i>
175129	Canvasback	<i>Aythya valisineria</i>
175130	Greater Scaup	<i>Aythya marila</i>
175134	Lesser Scaup	<i>Aythya affinis</i>
175135	Tufted Duck	<i>Aythya fuligula</i>
175141	Common Goldeneye	<i>Bucephala clangula</i>
175144	Barrow's Goldeneye	<i>Bucephala islandica</i>
175145	Bufflehead	<i>Bucephala albeola</i>
175147	Long-tailed Duck	<i>Clangula hyemalis</i>
175149	Harlequin Duck	<i>Histrionicus histrionicus</i>
175155	Common Eider	<i>Somateria mollissima</i>
175160	King Eider	<i>Somateria spectabilis</i>
175163	White-winged Scoter	<i>Melanitta fusca</i>
175170	Surf Scoter	<i>Melanitta perspicillata</i>
175171	Black Scoter	<i>Melanitta nigra</i>
175175	Ruddy Duck	<i>Oxyura jamaicensis</i>
175183	Hooded Merganser	<i>Lophodytes cucullatus</i>
175185	Common Merganser	<i>Mergus merganser</i>
175187	Red-breasted Merganser	<i>Mergus serrator</i>
175265	Turkey Vulture	<i>Cathartes aura</i>
175272	Black Vulture	<i>Coragyps atratus</i>
175289	Swallow-tailed Kite	<i>Elanoides forficatus</i>
175300	Northern Goshawk	<i>Accipiter gentilis</i>
175304	Sharp-shinned Hawk	<i>Accipiter striatus</i>
175309	Cooper's Hawk	<i>Accipiter cooperii</i>
175350	Red-tailed Hawk	<i>Buteo jamaicensis</i>
175359	Red-shouldered Hawk	<i>Buteo lineatus</i>
175365	Broad-winged Hawk	<i>Buteo platypterus</i>

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order
(continued).

175367	Swainson's Hawk	<i>Buteo swainsoni</i>
175373	Rough-legged Hawk	<i>Buteo lagopus</i>
175407	Golden Eagle	<i>Aquila chrysaetos</i>
175420	Bald Eagle	<i>Haliaeetus leucocephalus</i>
175430	Northern Harrier	<i>Circus cyaneus</i>
175590	Osprey	<i>Pandion haliaetus</i>
175599	Gyr Falcon	<i>Falco rusticolus</i>
175604	Peregrine Falcon	<i>Falco peregrinus</i>
175613	Merlin	<i>Falco columbarius</i>
175622	American Kestrel	<i>Falco sparverius</i>
175863	Northern Bobwhite	<i>Colinus virginianus</i>
175905	Ring-necked Pheasant	<i>Phasianus colchicus</i>
176177	Sandhill Crane	<i>Grus canadensis</i>
176207	King Rail	<i>Rallus elegans</i>
176209	Clapper Rail	<i>Rallus longirostris</i>
176221	Virginia Rail	<i>Rallus limicola</i>
176242	Sora	<i>Porzana carolina</i>
176284	Common Moorhen	<i>Gallinula chloropus</i>
176292	American Coot	<i>Fulica americana</i>
176472	American Oystercatcher	<i>Haematopus palliatus</i>
176506	Semipalmated Plover	<i>Charadrius semipalmatus</i>
176507	Piping Plover	<i>Charadrius melodus</i>
176520	Killdeer	<i>Charadrius vociferus</i>
176564	American Golden-Plover	<i>Pluvialis dominica</i>
176567	Black-bellied Plover	<i>Pluvialis squatarola</i>
176571	Ruddy Turnstone	<i>Arenaria interpres</i>
176580	American Woodcock	<i>Scolopax minor</i>
176599	Whimbrel	<i>Numenius phaeopus</i>
176610	Upland Sandpiper	<i>Bartramia longicauda</i>
176612	Spotted Sandpiper	<i>Actitis macularia</i>
176615	Solitary Sandpiper	<i>Tringa solitaria</i>
176619	Greater Yellowlegs	<i>Tringa melanoleuca</i>
176620	Lesser Yellowlegs	<i>Tringa flavipes</i>
176638	Willet	<i>Catoptrophorus</i> <i>semipalmatus</i>
176642	Red Knot	<i>Calidris canutus</i>
176646	Purple Sandpiper	<i>Calidris maritima</i>
176653	Pectoral Sandpiper	<i>Calidris melanotos</i>
176654	White-rumped Sandpiper	<i>Calidris fuscicollis</i>

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order (continued).

176655	Baird's Sandpiper	<i>Calidris bairdii</i>
176656	Least Sandpiper	<i>Calidris minutilla</i>
176661	Dunlin	<i>Calidris alpina</i>
176667	Semipalmated Sandpiper	<i>Calidris pusilla</i>
176668	Western Sandpiper	<i>Calidris mauri</i>
176669	Sanderling	<i>Calidris alba</i>
176675	Short-billed Dowitcher	<i>Limnodromus griseus</i>
176679	Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>
176684	Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>
176686	Marbled Godwit	<i>Limosa fedoa</i>
176690	Hudsonian Godwit	<i>Limosa haemastica</i>
176721	American Avocet	<i>Recurvirostra americana</i>
176726	Black-necked Stilt	<i>Himantopus mexicanus</i>
176734	Red Phalarope	<i>Phalaropus fulicarius</i>
176735	Red-necked Phalarope	<i>Phalaropus lobatus</i>
176736	Wilson's Phalarope	<i>Phalaropus tricolor</i>
176792	Pomarine Jaeger	<i>Stercorarius pomarinus</i>
176793	Parasitic Jaeger	<i>Stercorarius parasiticus</i>
176808	Glaucous Gull	<i>Larus hyperboreus</i>
176811	Iceland Gull	<i>Larus glaucoides</i>
176815	Great Black-backed Gull	<i>Larus marinus</i>
176821	Lesser Black-backed Gull	<i>Larus fuscus</i>
176824	Herring Gull	<i>Larus argentatus</i>
176828	Thayer's Gull	<i>Larus thayeri</i>
176830	Ring-billed Gull	<i>Larus delawarensis</i>
176835	Black-headed Gull	<i>Larus ridibundus</i>
176837	Laughing Gull	<i>Larus atricilla</i>
176839	Bonaparte's Gull	<i>Larus philadelphia</i>
176840	Little Gull	<i>Larus minutus</i>
176866	Sabine's Gull	<i>Xema sabini</i>
176875	Black-legged Kittiwake	<i>Rissa tridactyla</i>
176887	Forster's Tern	<i>Sterna forsteri</i>
176888	Common Tern	<i>Sterna hirundo</i>
176890	Arctic Tern	<i>Sterna paradisaea</i>
176891	Roseate Tern	<i>Sterna dougallii</i>
176922	Royal Tern	<i>Sterna maxima</i>
176923	Least Tern	<i>Sterna antillarum</i>
176924	Caspian Tern	<i>Sterna caspia</i>
176926	Gull-billed Tern	<i>Sterna nilotica</i>

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order
(continued).

176927	Sandwich Tern	<i>Sterna sandvicensis</i>
176958	White-winged Tern	<i>Chlidonias leucopterus</i>
176959	Black Tern	<i>Chlidonias niger</i>
176971	Razorbill	<i>Alca torda</i>
176974	Common Murre	<i>Uria aalge</i>
176978	Thick-billed Murre	<i>Uria lomvia</i>
176982	Dovekie	<i>Alle alle</i>
176985	Black Guillemot	<i>Cepphus grylle</i>
177025	Atlantic Puffin	<i>Fratercula arctica</i>
177071	Rock Pigeon	<i>Columba livia</i>
177125	Mourning Dove	<i>Zenaida macroura</i>
177831	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
177834	Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
177839	Groove-billed Ani	<i>Crotophaga sulcirostris</i>
177851	Barn Owl	<i>Tyto alba</i>
177884	Great Horned Owl	<i>Bubo virginianus</i>
177921	Barred Owl	<i>Strix varia</i>
177932	Long-eared Owl	<i>Asio otus</i>
177935	Short-eared Owl	<i>Asio flammeus</i>
177942	Northern Saw-whet Owl	<i>Aegolius acadicus</i>
177960	Chuck-will's-widow	<i>Caprimulgus carolinensis</i>
177961	Whip-poor-will	<i>Caprimulgus vociferus</i>
177979	Common Nighthawk	<i>Chordeiles minor</i>
178001	Chimney Swift	<i>Chaetura pelagica</i>
178032	Ruby-throated Hummingbird	<i>Archilochus colubris</i>
178106	Belted Kingfisher (subgenus)	<i>Megaceryle alcyon</i>
178119	Belted Kingfisher	<i>Ceryle alcyon</i>
178154	Northern Flicker	<i>Colaptes auratus</i>
178186	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
178195	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
178202	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
178259	Downy Woodpecker	<i>Picoides pubescens</i>
178262	Hairy Woodpecker	<i>Picoides villosus</i>
178279	Eastern Kingbird	<i>Tyrannus tyrannus</i>
178280	Gray Kingbird	<i>Tyrannus dominicensis</i>
178287	Western Kingbird	<i>Tyrannus verticalis</i>
178293	Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>
178309	Great Crested Flycatcher	<i>Myiarchus crinitus</i>

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order
(continued).

178316	Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
178329	Eastern Phoebe	<i>Sayornis phoebe</i>
178338	Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>
178339	Acadian Flycatcher	<i>Empidonax virescens</i>
178340	Alder Flycatcher	<i>Empidonax alnorum</i>
178341	Willow Flycatcher	<i>Empidonax traillii</i>
178344	Least Flycatcher	<i>Empidonax minimus</i>
178359	Eastern Wood Pewee	<i>Contopus virens</i>
178431	Tree Swallow	<i>Tachycineta bicolor</i>
178436	Bank Swallow	<i>Riparia riparia</i>
178443	Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
178448	Barn Swallow	<i>Hirundo rustica</i>
178455	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
178460	Cave Swallow	<i>Petrochelidon fulva</i>
178464	Purple Martin	<i>Progne subis</i>
178511	Northern Shrike	<i>Lanius excubitor</i>
178515	Loggerhead Shrike	<i>Lanius ludovicianus</i>
178529	Bohemian Waxwing	<i>Bombycilla garrulus</i>
178532	Cedar Waxwing	<i>Bombycilla cedrorum</i>
178541	House Wren	<i>Troglodytes aedon</i>
178547	Winter Wren	<i>Troglodytes troglodytes</i>
178581	Carolina Wren	<i>Thryothorus ludovicianus</i>
178605	Sedge Wren	<i>Cistothorus platensis</i>
178608	Marsh Wren	<i>Cistothorus palustris</i>
178620	Northern Mockingbird	<i>Mimus polyglottos</i>
178625	Gray Catbird	<i>Dumetella carolinensis</i>
178627	Brown Thrasher	<i>Toxostoma rufum</i>
178775	White-breasted Nuthatch	<i>Sitta carolinensis</i>
178784	Red-breasted Nuthatch	<i>Sitta canadensis</i>
178803	Brown Creeper	<i>Certhia americana</i>
178844	Black-and-white Warbler	<i>Mniotilta varia</i>
178846	Prothonotary Warbler	<i>Protonotaria citrea</i>
178850	Worm-eating Warbler	<i>Helmitheros vermivorus</i>
178852	Golden-winged Warbler	<i>Vermivora chrysoptera</i>
178853	Blue-winged Warbler	<i>Vermivora pinus</i>
178855	Tennessee Warbler	<i>Vermivora peregrina</i>
178856	Orange-crowned Warbler	<i>Vermivora celata</i>
178861	Nashville Warbler	<i>Vermivora ruficapilla</i>
178868	Northern Parula	<i>Parula americana</i>

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order
(continued).

178878	Yellow Warbler	<i>Dendroica petechia</i>
178886	Magnolia Warbler	<i>Dendroica magnolia</i>
178887	Cape May Warbler	<i>Dendroica tigrina</i>
178888	Black-throated Blue Warbler	<i>Dendroica caerulescens</i>
178891	Yellow-rumped Warbler	<i>Dendroica coronata</i>
178897	Townsend's Warbler	<i>Dendroica townsendi</i>
178898	Black-throated Green Warbler	<i>Dendroica virens</i>
178903	Cerulean Warbler	<i>Dendroica cerulea</i>
178904	Blackburnian Warbler	<i>Dendroica fusca</i>
178905	Yellow-throated Warbler	<i>Dendroica dominica</i>
178911	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>
178912	Bay-breasted Warbler	<i>Dendroica castanea</i>
178913	Blackpoll Warbler	<i>Dendroica striata</i>
178914	Pine Warbler	<i>Dendroica pinus</i>
178918	Prairie Warbler	<i>Dendroica discolor</i>
178921	Palm Warbler	<i>Dendroica palmarum</i>
178927	Ovenbird	<i>Seiurus aurocapillus</i>
178931	Northern Waterthrush	<i>Seiurus noveboracensis</i>
178935	Louisiana Waterthrush	<i>Seiurus motacilla</i>
178937	Kentucky Warbler	<i>Oporornis formosus</i>
178938	Connecticut Warbler	<i>Oporornis agilis</i>
178939	Mourning Warbler	<i>Oporornis philadelphia</i>
178944	Common Yellowthroat	<i>Geothlypis trichas</i>
178964	Yellow-breasted Chat	<i>Icteria virens</i>
178972	Hooded Warbler	<i>Wilsonia citrina</i>
178973	Wilson's Warbler	<i>Wilsonia pusilla</i>
178977	Canada Warbler	<i>Wilsonia canadensis</i>
178979	American Redstart	<i>Setophaga ruticilla</i>
178991	White-eyed Vireo	<i>Vireo griseus</i>
179009	Yellow-throated Vireo	<i>Vireo flavifrons</i>
179010	Blue-headed Vireo	<i>Vireo solitarius</i>
179021	Red-eyed Vireo	<i>Vireo olivaceus</i>
179022	Philadelphia Vireo	<i>Vireo philadelphicus</i>
179023	Warbling Vireo	<i>Vireo gilvus</i>
179032	Bobolink	<i>Dolichonyx oryzivorus</i>
179034	Eastern Meadowlark	<i>Sturnella magna</i>
179043	Yellow-headed Blackbird	<i>Xanthocephalus</i> <i>xanthocephalus</i>
179045	Red-winged Blackbird	<i>Agelaius phoeniceus</i>

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order
(continued).

179064	Orchard Oriole	<i>Icterus spurius</i>
179083	Baltimore Oriole	<i>Icterus galbula</i>
179091	Rusty Blackbird	<i>Euphagus carolinus</i>
179104	Common Grackle	<i>Quiscalus quiscula</i>
179108	Boat-tailed Grackle	<i>Quiscalus major</i>
179112	Brown-headed Cowbird	<i>Molothrus ater</i>
179124	Northern Cardinal	<i>Cardinalis cardinalis</i>
179139	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
179150	Indigo Bunting	<i>Passerina cyanea</i>
179165	Dickcissel	<i>Spiza americana</i>
179173	Evening Grosbeak	<i>Coccothraustes vespertinus</i>
179186	Purple Finch	<i>Carpodacus purpureus</i>
179191	House Finch	<i>Carpodacus mexicanus</i>
179230	Common Redpoll	<i>Carduelis flammea</i>
179233	Pine Siskin	<i>Carduelis pinus</i>
179236	American Goldfinch	<i>Carduelis tristis</i>
179259	Red Crossbill	<i>Loxia curvirostra</i>
179268	White-winged Crossbill	<i>Loxia leucoptera</i>
179276	Eastern Towhee	<i>Pipilo erythrophthalmus</i>
179314	Savannah Sparrow	<i>Passerculus sandwichensis</i>
179333	Grasshopper Sparrow	<i>Ammodramus savannarum</i>
179340	Henslow's Sparrow	<i>Ammodramus henslowii</i>
179344	Saltmarsh Sharp-tailed Sparrow	<i>Ammodramus caudacutus</i>
179345	Le Conte's Sparrow	<i>Ammodramus leconteii</i>
179346	Seaside Sparrow	<i>Ammodramus maritimus</i>
179366	Vesper Sparrow	<i>Pooecetes gramineus</i>
179371	Lark Sparrow	<i>Chondestes grammacus</i>
179410	Dark-eyed Junco	<i>Junco hyemalis</i>
179432	American Tree Sparrow	<i>Spizella arborea</i>
179435	Chipping Sparrow	<i>Spizella passerina</i>
179439	Clay-colored Sparrow	<i>Spizella pallida</i>
179443	Field Sparrow	<i>Spizella pusilla</i>
179455	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
179462	White-throated Sparrow	<i>Zonotrichia albicollis</i>
179464	Fox Sparrow	<i>Passerella iliaca</i>
179484	Lincoln's Sparrow	<i>Melospiza lincolnii</i>
179488	Swamp Sparrow	<i>Melospiza georgiana</i>
179492	Song Sparrow	<i>Melospiza melodia</i>

Appendix I. Sandy Hook Unit Species List in Taxonomic Species Number (TSN) Order (continued).

179494	Song Sparrow (subspecies)	<i>Melospiza melodia atlantica</i>
179526	Lapland Longspur	<i>Calcarius lapponicus</i>
179530	Chestnut-collared Longspur	<i>Calcarius ornatus</i>
179532	Snow Bunting	<i>Plectrophenax nivalis</i>
179628	House Sparrow	<i>Passer domesticus</i>
179637	European Starling	<i>Sturnus vulgaris</i>
179680	Blue Jay	<i>Cyanocitta cristata</i>
179725	Common Raven	<i>Corvus corax</i>
179731	American Crow	<i>Corvus brachyrhynchos</i>
179737	Fish Crow	<i>Corvus ossifragus</i>
179759	American Robin	<i>Turdus migratorius</i>
179777	Wood Thrush	<i>Hylocichla mustelina</i>
179779	Hermit Thrush	<i>Catharus guttatus</i>
179788	Swainson's Thrush	<i>Catharus ustulatus</i>
179793	Gray-cheeked Thrush	<i>Catharus minimus</i>
179796	Veery	<i>Catharus fuscescens</i>
179801	Eastern Bluebird	<i>Sialia sialis</i>
179853	Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>
179865	Golden-crowned Kinglet	<i>Regulus satrapa</i>
179870	Ruby-crowned Kinglet	<i>Regulus calendula</i>
179882	Western Tanager	<i>Piranga ludoviciana</i>
179883	Scarlet Tanager	<i>Piranga olivacea</i>
179888	Summer Tanager	<i>Piranga rubra</i>
203446	Cory's Shearwater	<i>Calonectris diomedea</i>
554031	Nelson's Sharp-tailed Sparrow	<i>Ammodramus nelsoni</i>
554127	American Pipit	<i>Anthus rubescens</i>
554135	Great Egret	<i>Ardea alba</i>
554138	Tufted Titmouse	<i>Baeolophus bicolor</i>
554145	Stilt Sandpiper	<i>Calidris himantopus</i>
554148	Bicknell's Thrush	<i>Catharus bicknelli</i>
554221	Olive-sided Flycatcher	<i>Contopus cooperi</i>
554256	Horned Lark	<i>Eremophila alpestris</i>
554383	Carolina Chickadee	<i>Poecile carolinensis</i>
554447	Black Skimmer	<i>Rynchops niger</i> ►

Appendix J. Staten Island Unit Species List in Taxonomic Species Number (TSN) Order.

<u>TSN</u>	<u>CommonName</u>	<u>Scientific name</u>
-9728171	Ovenbird	<i>Seiurus aurocapilla</i>
-9728170	Eastern Screech-Owl	<i>Megascops asio</i>
174651	Wilson's Storm-Petrel (subspecies)	<i>Oceanites oceanicus oceanicus</i>
174717	Double-crested Cormorant	<i>Phalacrocorax auritus</i>
174773	Great Blue Heron	<i>Ardea herodias</i>
174793	Green Heron	<i>Butorides virescens</i>
174803	Cattle Egret	<i>Bubulcus ibis</i>
174813	Snowy Egret	<i>Egretta thula</i>
174826	Tricolored Heron	<i>Egretta tricolor</i>
174827	Little Blue Heron	<i>Egretta caerulea</i>
174832	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>
174842	Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>
174924	Glossy Ibis	<i>Plegadis falcinellus</i>
174985	Mute Swan	<i>Cygnus olor</i>
174999	Canada Goose	<i>Branta canadensis</i>
175063	Mallard	<i>Anas platyrhynchos</i>
175068	American Black Duck	<i>Anas rubripes</i>
175073	Gadwall	<i>Anas strepera</i>
175081	Green-winged Teal	<i>Anas crecca</i>
175086	Blue-winged Teal	<i>Anas discors</i>
175122	Wood Duck	<i>Aix sponsa</i>
175304	Sharp-shinned Hawk	<i>Accipiter striatus</i>
175309	Cooper's Hawk	<i>Accipiter cooperii</i>
175430	Northern Harrier	<i>Circus cyaneus</i>
175590	Osprey	<i>Pandion haliaetus</i>
175604	Peregrine Falcon	<i>Falco peregrinus</i>
175622	American Kestrel	<i>Falco sparverius</i>
175905	Ring-necked Pheasant	<i>Phasianus colchicus</i>
176136	Wild Turkey	<i>Meleagris gallopavo</i>
176209	Clapper Rail	<i>Rallus longirostris</i>
176221	Virginia Rail	<i>Rallus limicola</i>
176284	Common Moorhen	<i>Gallinula chloropus</i>
176292	American Coot	<i>Fulica americana</i>
176472	American Oystercatcher	<i>Haematopus palliatus</i>
176520	Killdeer	<i>Charadrius vociferus</i>
176580	American Woodcock	<i>Scolopax minor</i>
176610	Upland Sandpiper	<i>Bartramia longicauda</i>

Appendix J. Staten Island Unit Species List in Taxonomic Species Number (TSN) Order (continued).

176612	Spotted Sandpiper	<i>Actitis macularia</i>
176638	Willet	<i>Catoptrophorus semipalmatus</i>
176815	Great Black-backed Gull	<i>Larus marinus</i>
176824	Herring Gull	<i>Larus argentatus</i>
176837	Laughing Gull	<i>Larus atricilla</i>
177071	Rock Pigeon	<i>Columba livia</i>
177125	Mourning Dove	<i>Zenaida macroura</i>
177693	Black-hooded Parakeet	<i>Nandayus nenday</i>
177723	Monk Parakeet	<i>Myiopsitta monachus</i>
177831	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
177834	Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
177851	Barn Owl	<i>Tyto alba</i>
177884	Great Horned Owl	<i>Bubo virginianus</i>
177961	Whip-poor-will	<i>Caprimulgus vociferus</i>
177979	Common Nighthawk	<i>Chordeiles minor</i>
178001	Chimney Swift	<i>Chaetura pelagica</i>
178032	Ruby-throated Hummingbird	<i>Archilochus colubris</i>
178119	Belted Kingfisher	<i>Ceryle alcyon</i>
178154	Northern Flicker	<i>Colaptes auratus</i>
178195	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
178259	Downy Woodpecker	<i>Picoides pubescens</i>
178262	Hairy Woodpecker	<i>Picoides villosus</i>
178279	Eastern Kingbird	<i>Tyrannus tyrannus</i>
178309	Great Crested Flycatcher	<i>Myiarchus crinitus</i>
178341	Willow Flycatcher	<i>Empidonax traillii</i>
178359	Eastern Wood Pewee	<i>Contopus virens</i>
178431	Tree Swallow	<i>Tachycineta bicolor</i>
178436	Bank Swallow	<i>Riparia riparia</i>
178443	Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
178448	Barn Swallow	<i>Hirundo rustica</i>
178511	Northern Shrike	<i>Lanius excubitor</i>
178532	Cedar Waxwing	<i>Bombycilla cedrorum</i>
178541	House Wren	<i>Troglodytes aedon</i>
178581	Carolina Wren	<i>Thryothorus ludovicianus</i>
178608	Marsh Wren	<i>Cistothorus palustris</i>
178620	Northern Mockingbird	<i>Mimus polyglottos</i>
178625	Gray Catbird	<i>Dumetella carolinensis</i>
178627	Brown Thrasher	<i>Toxostoma rufum</i>

Appendix J. Staten Island Unit Species List in Taxonomic Species Number (TSN) Order (continued).

178775	White-breasted Nuthatch	<i>Sitta carolinensis</i>
178844	Black-and-white Warbler	<i>Mniotilta varia</i>
178878	Yellow Warbler	<i>Dendroica petechia</i>
178891	Yellow-rumped Warbler	<i>Dendroica coronata</i>
178898	Black-throated Green Warbler	<i>Dendroica virens</i>
178914	Pine Warbler	<i>Dendroica pinus</i>
178944	Common Yellowthroat	<i>Geothlypis trichas</i>
178964	Yellow-breasted Chat	<i>Icteria virens</i>
178979	American Redstart	<i>Setophaga ruticilla</i>
178991	White-eyed Vireo	<i>Vireo griseus</i>
179021	Red-eyed Vireo	<i>Vireo olivaceus</i>
179023	Warbling Vireo	<i>Vireo gilvus</i>
179032	Bobolink	<i>Dolichonyx oryzivorus</i>
179034	Eastern Meadowlark	<i>Sturnella magna</i>
179045	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
179083	Baltimore Oriole	<i>Icterus galbula</i>
179104	Common Grackle	<i>Quiscalus quiscula</i>
179108	Boat-tailed Grackle	<i>Quiscalus major</i>
179112	Brown-headed Cowbird	<i>Molothrus ater</i>
179124	Northern Cardinal	<i>Cardinalis cardinalis</i>
179139	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
179150	Indigo Bunting	<i>Passerina cyanea</i>
179186	Purple Finch	<i>Carpodacus purpureus</i>
179191	House Finch	<i>Carpodacus mexicanus</i>
179236	American Goldfinch	<i>Carduelis tristis</i>
179276	Eastern Towhee	<i>Pipilo erythrophthalmus</i>
179314	Savannah Sparrow	<i>Passerculus sandwichensis</i>
179344	Saltmarsh Sharp-tailed Sparrow	<i>Ammodramus caudacutus</i>
179432	American Tree Sparrow	<i>Spizella arborea</i>
179435	Chipping Sparrow	<i>Spizella passerina</i>
179443	Field Sparrow	<i>Spizella pusilla</i>
179462	White-throated Sparrow	<i>Zonotrichia albicollis</i>
179464	Fox Sparrow	<i>Passerella iliaca</i>
179488	Swamp Sparrow	<i>Melospiza georgiana</i>
179492	Song Sparrow	<i>Melospiza melodia</i>
179628	House Sparrow	<i>Passer domesticus</i>
179637	European Starling	<i>Sturnus vulgaris</i>
179680	Blue Jay	<i>Cyanocitta cristata</i>
179731	American Crow	<i>Corvus brachyrhynchos</i>

Appendix J. Staten Island Unit Species List in Taxonomic Species Number (TSN) Order
(continued).

179737	Fish Crow	<i>Corvus ossifragus</i>
179759	American Robin	<i>Turdus migratorius</i>
179777	Wood Thrush	<i>Hylocichla mustelina</i>
179779	Hermit Thrush	<i>Catharus guttatus</i>
179796	Veery	<i>Catharus fuscescens</i>
179865	Golden-crowned Kinglet	<i>Regulus satrapa</i>
179870	Ruby-crowned Kinglet	<i>Regulus calendula</i>
554135	Great Egret	<i>Ardea alba</i>
554138	Tufted Titmouse	<i>Baeolophus bicolor</i>
554256	Horned Lark	<i>Eremophila alpestris</i>
554382	Black-capped Chickadee	<i>Poecile atricapillus</i> ►

Appendix K. Partner's in Flight/Bird Conservation Region Species Prioritization Scheme and Action Level Descriptions.

Tier 1. *High Continental Concern*. -- Species on the *PIF Continental Concern List*, which are typically of conservation concern throughout their range. These are species showing high vulnerability in a number of factors, expressed as any combination of high global parameter scores, with AI ≥ 2 (so that species without manageable populations in the region are omitted).

Tier 1A. *High Continental Concern - High Regional Responsibility*. Species for which this region shares in major conservation responsibility; i.e., conservation in this region is critical to the overall health of this species. Species with AI of 3 - 5, or a high percent population (above threshold in IIB).

Tier B. *High Continental Concern - Low Regional Responsibility*. Species for which this region can contribute to rangewide conservation objectives where the species occurs. Species with AI of 2.

Tier 2. *High Regional Priority*. Species that are of moderate continental priority (not on *Continental Concern List*), but are important to consider for conservation within a region because of various combinations of high parameter scores, as defined below; total of 7 parameter scores = ≥ 19 .

Tier 2A. *High Regional Concern*. Species that are experiencing declines in the core of their range and that require short-term conservation action to reverse or stabilize trends. These are species with a combination of high area importance and declining (or unknown) population trend; total of 7 parameters ≥ 19 , with AI + PT ≥ 8 .

Tier 2B. *High Regional Responsibility*. Species for which this region shares in the responsibility for long-term conservation, even if they are not currently declining or threatened. These are species of moderate overall priority with a disproportionately high percentage of their total population in the region; total of 7 parameters ≥ 19 , with AI = 5 or % population > threshold (see Appendix 3).

Tier 2C. *High Regional Threats*. Species of moderate overall priority that are uncommon in a region and whose remaining populations are threatened, usually because of extreme threats to sensitive habitats. These are species with high breeding threats scores within the region (or in combination with high nonbreeding threats outside the region); total of 7 parameters ≥ 19 with TB + TN > 6, or local TB or TN = 5.

Tier 3. *Additional Federally Listed*. Species listed under the U.S. Endangered Species Act receive conservation attention wherever they occur.

Tier 4. *Additional State Listed*. - Species on state endangered, threatened, or special concern lists that did not meet any of above criteria. These are often rare or peripheral populations.

Appendix K. Partner's in Flight/Bird Conservation Region Species Prioritization Scheme and Action Level Descriptions (continued).

Tier 5. *Local concern* - species of justifiable local concern or interest. May represent a geographically variable population or be representative of a specific habitat or conservation concern.

Action Level Descriptions

- 1- crisis recovery needed
- 2 - immediate management or policy needed rangewide
- 3 - management to reverse or stabilize populations
- 4 - long term planning is needed
- 5 - monitoring needed for poorly known populations

Appendix L. North American Waterbird Conservation Plan Species Prioritization Scheme.

Five categories of conservation concern were developed, and species were assigned to them using a categorical approach. The categories and the series of categorization rules are presented below. Some species could not be categorized because inadequate data were available to assess risk.

1. Highly Imperiled: This includes all species with significant population declines and either low populations or some other high risk factor.

Rule 1a. PT = 5 *and* either PS, TB, TN, or BD = 5

2. High Concern: Species that are not Highly Imperiled. Populations of these species are known or thought to be declining, and have some other known or potential threat as well.

Rule 2a. PT = 4 or 5 *and* either PS, TB, TN, or BD = 4 or 5; or

Rule 2b. PS = 4 or 5 *and* either TB or TN = 4 or 5

3. Moderate Concern: Species that are not Highly Imperiled or High Concern. Populations of these species are either a) declining with moderate threats or distributions; b) stable with known or potential threats and moderate to restricted distributions; or c) relatively small with relatively restricted distributions.

Rule 3a. PT = 5 *and* either PS, TB, TN, BD, or ND > 1; or

Rule 3b. PT = 4 *and* either PS, TB, TN, BD, or ND > 2; or

Rule 3c. PT = 3 *and* either PS, TB, TN, BD, or ND = 4 or 5; or

Rule 3d. PS = 4 or 5 *and* either BD or ND > 3

4. Low Concern: Species that are not Highly Imperiled, High Concern or Moderate Concern. Populations of these species are either a) stable with moderate threats and distributions; b) increasing but with known or potential threats and moderate to restricted distributions; or c) of moderate size with known or potential threats and moderate to restricted distributions.

Rule 4a. PT = 3 *and* either PS, TB, TN, BD, or ND = 3; or

Rule 4b. PT = 2 *and* either PS, TB, TN, BD, or ND = 4 or 5; or

Rule 4c. PS = 3 *and* either TB, TN, BD, or ND = 4 or 5

5. Not Currently At Risk: All other species for which information was available.

Rule 5: Does not meet any previous rule

Information Lacking: If both Population Trend and Population Size could not be estimated, species were not ranked.

As the nation's primary conservation agency, the Department of the Interior has responsibility for most of our nationally owned public land and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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