These documents were prepared by New York City Audubon conservation staff. This summary benefited greatly from discussions with members of the Birders Coalition for Gateway*, an ad hoc group composed of birders representing nonprofit bird conservation groups and universities in New York City. In addition, Futuyma and Baksh wrote sections of the West Pond history as well as historic species accounts included in this paper.

We gratefully acknowledge the Leon Levy Foundation for its leadership support of science and conservation.

* Members of the Birders Coalition include Brooklyn Bird Club (Rob Bate, Sandy Paci); Queens Bird Club (Seth Ausubel, Lou Widerka); NY State Ornithological Association (Seth Ausubel, Andrew Baksh, Doug Futuyma, Angus Wilson); Staten Island Bird Club and Protectors of Pine Oak Woods (Clifford Hagen); Linnaean Society (Andrew Rubenfeld, Jeff Nulle); Littoral Society (Don Riepe); NYC City Audubon and Audubon Chapters of New York (Harry Maas, Peter Post, David Speiser, Lloyd Spitalnik, Judy Craig, John Shemilt).
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FOR THE WEST POND

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Cover photo: The West Pond Breach ©Andrew Baksh
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At the beginning of the 20th century, Jamaica Bay consisted of open water and marshes, with the exception of the upland island of Ruffle Bar (Black 1981). Since that time, the area has changed dramatically. In the 1950s, Park Commissioner Robert Moses commissioned the creation of two large freshwater ponds: East Pond and West Pond. Since that time, these two freshwater ponds have provided nesting, foraging, and loafing habitat for many of the 330 species of birds found in Jamaica Bay.

For a variety of reasons, the East and West Ponds have had their issues: Invasive plant species have moved in, valves and pipes that help drain the ponds have malfunctioned, and salt water has been seeping into the ponds, turning them brackish. While over 80% of New York City’s salt marsh has been lost over the last hundred years, nearly 99% of the freshwater marsh has also been lost, creating a significant shortage of fresh water. Today the Jamaica Bay system has an order of magnitude less freshwater habitat compared to comparable systems in the region.

Jamaica Bay Wildlife Refuge, including the East and West Ponds, was heavily impacted in 2012 by hurricane Sandy. Both ponds were breached and connected tidally to the Bay. By May 30, 2013, the structural features of the East Pond were restored to pre-Sandy condition, and a train subway service was reconnected. The 100’ plus channel that connects the West Pond to the bay, however, was left unrepaired.

Restoration of the refuge needs to progress quickly, while federal funding is still available, but with planning and forethought. An ecosystem-based approach needs to be applied. Mitigation for the loss of freshwater resources in the region is possible, in part, through restoration of the West Pond to fresh water.

NYC Audubon has proposed a set of goals for restoring the West Pond, including reestablishing fresh water at the West Pond to as large an area as can be successfully maintained. We recommend that the pond have an irregular shoreline, creating additional edge habitat as well as places for wildlife to find shelter from wind and people. In addition, we suggest a restoration of the former tern nesting area, and establishment of additional fringe marsh to protect against future major storm events. Because Jamaica Bay is an international destination for bird-watching, we propose installing observational viewing blinds and nature trails around the West Pond area that will enhance the visitor experience while protecting the wildlife that depend on the pond and surrounding marshes to survive.
A timeline of major events in the development of the Jamaica Bay Wildlife Refuge is presented in Table 1 and Figures 1 and 2.
### Timeline of Key Events in the Establishment of Jamaica Bay Wildlife Refuge

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1878</td>
<td>Secretary of War George W. McCrary and the city government of New York petition to establish Jamaica Bay as a major seaport, initiating a series of major landscape modification projects. Numerous channels are dug throughout the bay, and the dredging spoils are used to fill in marshes in order to create raised lands for docks and piers.</td>
</tr>
<tr>
<td>1880</td>
<td>The New York, Woodhaven, and Rockaway Railroad constructs a railway extending across Jamaica Bay, connecting the Glendale neighborhood located north of the bay to the Hammels neighborhood located on the Rockaway peninsula. Construction of the line results in the filling of a number of marshes and small waterways in the middle of the bay. These areas begin to form what will eventually become the eastern edge of the Jamaica Bay Wildlife Refuge.</td>
</tr>
<tr>
<td>1923</td>
<td>The Cross Bay Boulevard is constructed. The project results in the filling of much of Big Egg Marsh and surrounding marshes and islands. Additional marsh filling takes place during subsequent development projects and begins to form a long, contiguous island, the southern portion of which is occupied by Broad Channel.</td>
</tr>
<tr>
<td>1938</td>
<td>After decades of heavy development and pollution, Mayor LaGuardia and Robert Moses agree to collaborate on efforts to protect the natural ecology of Jamaica Bay.</td>
</tr>
<tr>
<td>1943</td>
<td>Construction is begun on Idlewild Airport, renamed John F. Kennedy International Airport in 1963, destroying hundreds of acres of marshland, including both freshwater and salt marshes.</td>
</tr>
<tr>
<td>1948</td>
<td>Management of Jamaica Bay is placed under the jurisdiction of the New York City Department of Parks.</td>
</tr>
<tr>
<td>1951</td>
<td>The Jamaica Bay Wildlife Refuge is founded, occupying the portion of the island north of Broad Channel. At the urging of Robert Moses, additional land filling takes place in order to form two freshwater impoundments, the East and West Ponds.</td>
</tr>
<tr>
<td>1974</td>
<td>Management of Jamaica Bay is transferred to the National Park Service, as Jamaica Bay becomes part of the Gateway National Recreation Area.</td>
</tr>
<tr>
<td>2012</td>
<td>On October 29th, the East and West Ponds are breached during Hurricane Sandy, effectively transforming them into tidal lagoons.</td>
</tr>
<tr>
<td>2013</td>
<td>The breach in the East Pond is repaired as part of the project to restore service to the A and S subway lines.</td>
</tr>
</tbody>
</table>
Figure 1

GIS MAP of Pre-Sandy Habitat at Jamaica Bay Wildlife Refuge

JAMAICA BAY UNIT
JAMAICA BAY WILDLIFE REFUGE
PRIORITY HABITAT

Legend:
- Freshwater
- High Salt Marsh
- Beach
- Low Salt Marsh
- Trees
- Shallow Emergent Marsh
- Mudflat

Courtesy of USGS
Figure 2

Jamaica Bay Wildlife Refuge Before and After Hurricane Sandy

Jamaica Bay Wildlife Refuge, Pre-Hurricane Sandy - 6/23/2012

Jamaica Bay Wildlife Refuge, Post-Hurricane Sandy - 11/4/2012

Channelization of the West Pond into the Bay resulting from a breach (indicated by the red arrow).
EVALUATION OF NEED FOR FRESHWATER RESOURCES IN A SALTMARSH HABITAT

FRESH WATER

Natural freshwater wetlands are among the most threatened habitats on earth (Froneman et al. 2001). Constructed ponds can play a role in providing this critical resource, especially to freshwater aquatic invertebrates and to waterbirds, as was illustrated in a study conducted on 59 farms ponds in the Cape Province, South Africa. Surface area of the pond, as well as vegetation in and around the ponds, were good predictors of waterbird occurrence. The high number of ponds created a matrix of freshwater habitat that correlated with high biodiversity of waterbird species (Froneman et al. 2001).

Although the central island of Jamaica Bay Wildlife Refuge was itself once salt marsh, surrounding areas of the bay were once rich in freshwater wetland habitat which has since been filled in and developed. The created freshwater ponds at the Refuge have thus played an important role in providing this important habitat for SGCNs. When compared with other similar salt marsh systems on Long Island in terms of freshwater resources, Jamaica Bay comes up short. Based on GIS analysis of habitat from the National Wetlands Inventory data (USFWS), the proportion of fresh:salt water is as follows:

- Peconic Bay freshwater wetlands: 3,974 acres/1,608 ha or 9%
- Great South Bay freshwater wetlands: 2,88 acres/1,167 ha or 6%
- Jamaica Bay Unit freshwater wetlands: 135 acres/54 ha or 0.9%

In Jamaica Bay, freshwater wetlands constitute 0.9% of the habitat, an order of magnitude lower than comparable systems. Hence there is a need to improve the freshwater marshes and ponds that exist in Jamaica Bay, including the East and West Ponds of the Refuge. Based on these ratios, even if the West and the East Ponds were completely restored to fresh water, Jamaica Bay would still require additional freshwater resources; thus we support plans such as a Wetlands Institute for Floyd Bennett Field, but not at the expense of the loss of freshwater in other places in the Bay.

Moreover, because so little fresh water is available, the quality of the water must be measured and maintained at a high level. Based on unpublished data collected by Dr. Katie Schneider of New York University, the post-Sandy water quality at Big John’s Pond, East Pond, and West Pond are significantly different than before Hurricane Sandy. As expected, salinity ranged from 0 (Big John’s Pond) to 27.5 ppt (East Pond) to 29 ppt (West Pond), salinity levels that will not support freshwater species. Even before the onslaught from Hurricane Sandy, we believe the National Parks Service had neglected its responsibility for this fundamental resource of the park. Water quality data needs to be analyzed for the three ponds over the past 20-year management period.
In addition, many species use both fresh and salt water, so that the proximity of one to the other, the mixture of environments, has been an important factor in the extraordinary avian richness of JBWR. Such species include glossy ibis (as mentioned above), common and Forster’s terns, black skimmer, many migrant shorebirds such as semipalmated sandpiper, and many migrant and wintering waterfowl, such as common goldeneye and greater scaup.

In other similar ecosystems, it has been shown that increasing the amount of available fresh water results in a larger and more diverse array of breeding birds and other wildlife. The importance is redundancy: Given the scarcity of freshwater habitat, the loss of a single breeding site for a particular species can (ultimately) result in the loss of a whole population segment (Haffner 1997). A diversity of wetland types—including freshwater wetlands—is needed for wading birds to survive (Hafner 1997).

**WATER DEPTH**

In addition to providing a matrix of wetlands, a mosaic of differing water depths within freshwater systems is important for waterbirds. In a study by Gawlick (2002) it was shown that white ibis and snowy egrets, which use a tactile foraging strategy, favor shallower water levels, while those species that are visual feeders—great egrets, great blue herons, little blue herons—forage at deeper depths (Frederick and Spalding 1994; Gawlick 2002). A mosaic of water depths provides the opportunity for species to partition available resources, allowing species to segregate within a pond—to distribute prey as well as predators across the landscape so that individuals of different species are not competing with each other (Meyerriecks 1960; Kushlan 1976). In Figure 3 (p.11), Zhijun et al. (2010) illustrate how different species are found in association with water depths ranging from <5 cm to >25 cm.

The need for freshwater resources for waterbirds is well documented. As adults, white ibis consume prey from saltwater or freshwater habitats. However, when breeding, white ibis will fly up to 25 miles inland to find freshwater prey for their developing young (Bildstein 1993). Within the Jamaica Bay population of colonial waterbirds, glossy ibis are also known to raise their young on freshwater prey (Elizabeth Craig, stable isotope data, Harbor Herons Working Group meeting 2011). In the Jamaica Bay system, NYC Audubon has documented a decline in the number of glossy ibis breeding in the Bay—nesting in the whole harbor—from a high of 350 pairs in 2004 to fewer than half of that in 2013 (n=152, harbor-wide). Although other factors such as disturbance and predators are surely contributing to the decline, it is noteworthy that the number of breeding pairs in Jamaica Bay (pre-Sandy data) has declined by nearly half (58%) since 2004: from 350 pairs on 2 islands in 2004 to 148 pairs on 3 islands in 2012 (New York City Audubon Harbor Herons nest survey data).

**WETLAND SIZE**

Wetland size has been shown to correlate with avian diversity: an increase in wetland size generally correlates with an increase in bird abundance, species richness, and species diversity (Gonzalez-Gajardo et al. 2009). Although wetland patch size and proximity to similar patches are positively correlated with species richness (Shriver et al. 2004), other parameters within the landscape (cover, nest site availability, lack of human disturbance) are also important in maintaining successful waterbird populations. For example, seasonal water depth changes attract different species of birds (Powell 1987). Moreover in a study by Dlugolecki (2012), there was no strong correlation between freshwater pond size and avian diversity: the significant correlation was between water flow and diversity. Whatever the specific characteristics of the fresh water pond, the importance of managing wetlands is to provide a matrix of fresh water and salt water, to provide a range of water depths, and to provide appropriate screening vegetation. This cannot be overstated.
Variation of water depths at foraging sites among waterbird groups. Small shorebirds (such as sandpipers) forage in water less than 5 cm deep; large shorebirds (such as godwits) forage in water up to 15 cm deep; dabbling ducks (such as teals and mallards) and large waders (such as herons, egrets, and ibis) forage in water up to 30 cm deep. Diving waterbirds (such as cormorants and grebes) require a minimum water depth of >25 cm and can forage in water up to several meters deep. (Refer to data in Pöysä 1983; Baldassarre and Fischer 1984; Fredrickson and Reid 1986; Accurso 1992; Davis and Smith 1998; Elphick and Oring 1998; Ntiamo-Baidu et al. 1998; Colwell and Taft 2000; Isola et al. 2002; Bolduc and Afton 2004.)

Redrawn from Zhijun et al. 2010.
OTHER HABITAT FEATURES

In addition to a wetlands matrix that includes adequate freshwater elements, other habitat features are critical to the success of waterbird species. Zhijun et al. (2010) illustrate these elements in a diagram of inter-connectedness between water quality, water depth, salinity, vegetation, and prey availability for waterbirds (Figure 4). In Table 2 we summarize some of the most important aquatic and terrestrial variables for the West Pond system at Jamaica Bay.

These environmental variables are important because they affect the way a bird can access the resource (water depth, water level fluctuation, topography, sloping sides) and also what type and how many of aquatic prey the water will support (sediment depth and water quality).

CHANGES IN SPECIES OCCURRENCE AND DIVERSITY AT JAMAICA BAY

Some freshwater species that once bred at the West Pond no longer do so, almost certainly because of the loss of freshwater habitat. These species include least bittern, blue-winged teal, ruddy duck, and common moorhen. In the case of the ruddy duck, one or two pairs were seen in Jamaica Bay in 2004. But the “well-established” breeding population, possibly the only one in the state of New York, disappeared in the 1990s, correlating with the decline of fresh water in the West Pond (McGowan and Corwin 2008). Still more species no longer successfully nest or feed at the West Pond because of mismanagement of the former tern nesting area, including common terns, American oystercatchers, and diamondback terrapins.

### Table 2

<table>
<thead>
<tr>
<th>Habitat Features Important to Foraging and Nesting Waterbirds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water depth</td>
</tr>
<tr>
<td>Water level fluctuation</td>
</tr>
<tr>
<td>Adjacent vegetation</td>
</tr>
<tr>
<td>Connectivity to other wetland patches</td>
</tr>
<tr>
<td>Sediment depth</td>
</tr>
<tr>
<td>Range of water depths</td>
</tr>
<tr>
<td>Gently sloping banks</td>
</tr>
<tr>
<td>Water quality</td>
</tr>
<tr>
<td>Oxygen levels</td>
</tr>
<tr>
<td>Salinity</td>
</tr>
<tr>
<td>Clarity</td>
</tr>
<tr>
<td>pH</td>
</tr>
<tr>
<td>Temperature</td>
</tr>
</tbody>
</table>

Glossy Ibis ©Lloyd Spitalnik
Interactions between the major habitat variables affecting habitat use of waterbirds at wetlands in situ. The directions of arrows indicate the directions of influences. Examples of these influences include: 1: Water depth affecting the distribution of aquatic plants and animals serving as food for waterbirds; 2: Water depth limiting food availability of waterbirds; 3: Increase of salinity when water recedes; 4: Water depth affecting the distribution of vegetation; 5: Food size affecting its availability to waterbirds; 6: Vegetation supporting aquatic animals as food for waterbirds; 7: Dense vegetation obstructing the foraging of waterbirds; 8: Vegetation functionally affecting topography because some waterbirds can walk on top of vegetation; 9: Topography affecting the distribution of vegetation in water body; 10: Topography affecting the variability of water depth; 11: Water level fluctuation affecting the growth of plants and the vegetation physiognomy and structure; 12: Water level fluctuation resulting in the changes of water depth; 13: Water level fluctuation affecting the growth of aquatic plants as food for waterbirds; 14: Water level fluctuation caused by precipitation and evaporation affecting water salinity; 15: Salinity affecting the distribution of plants; 16: Salinity affecting the aquatic plants and animals as food for waterbirds.

Redrawn from Zhijun et al. 2010
Appendix I includes an annotated list of bird species and an historic overview. A narrative of their habitat needs is included for those species of conservation need. This list includes bird species that have been recorded at the Jamaica Bay Wildlife Refuge (JBWR) and other sites in the National Park Service’s Jamaica Bay Unit. Many of these species were noted by the National Audubon Society in their designation of Jamaica Bay as a global Important Bird Area (IBA). Some of the species are listed by the New York State Department of Environmental Conservation as Endangered, Threatened, or of Special Concern, or as Species of Greatest Conservation Need, and some species reach the border of their geographic breeding range at or near the New York City/Long Island area (e.g., Forster’s tern, boat-tailed grackle). For several species, JBWR is one of the few places or the only place in the New York City area in which the species has been regularly found nesting (e.g., ruddy duck, blue-winged teal, least bittern). And for some species, JBWR provides a habitat in which large numbers congregate at one or more seasons of the year (e.g., American black duck, great egret). This list does not include all of the nearly 300 other species that have been observed at the JBWR.

JAMAICA BAY’S SPECIES OF CONSERVATION NEED (SCGN)

A list of Avian SCGNs can be found in Appendix II. Many of these SCGNs spend a significant proportion of their life cycle in association with the fresh water of the West Pond.

HUMAN DIMENSIONS AND THE VISITOR EXPERIENCE

Since its creation in 1951, the Jamaica Bay Wildlife Refuge has attracted many thousands of visitors, including local residents who enjoy a family outing to a peaceful locale with stunning scenery and throngs of birds; nature enthusiasts who enjoy wildlife photography, identifying plants, or spotting butterflies; and dedicated birders from the New York City region and throughout the United States and the world. The Refuge has a long-established, worldwide reputation as one of the richest locales for birds and other wildlife in the New York City region, and indeed in New York State. Because it serves as a habitat for large congregations of many species of birds at all seasons, including species listed by the state Department of Conservation as Threatened or as Species of Greatest Conservation Need, the Refuge has been designated an Important Bird Area at the Global (i.e., highest) level by the National Audubon Society.

Among the components of the Refuge, the West Pond is by far the most used by visitors because it was designed to be most accessible. It is adjacent to the Refuge’s principal parking area, from which visitors walk through the Visitor Center to a gravel path atop the berm which encloses the West Pond. (We describe the experience as it was before the berm was breached by Sandy.) The Visitor Center, rebuilt and improved several years ago, provides information and exhibits that themselves provide outstanding environmental education, and which prepare the visitor to notice and appreciate the environment and wildlife of the Refuge. More such information is posted along the path that encircles the West Pond. This circuit provides opportunities for environmental education that are unparalleled within New York City, and are rare in any other urban center in the United States.
What can the interested visitor see in a circuit of the West Pond? At least six major wildlife habitats: the Pond itself, with extensive reed beds along some of its border; salt marsh; mudflats and beach along the edge of Jamaica Bay, which are exposed at low tide; dry, sandy expanses with scattered vegetation along the outer rim of the berm; the open waters of Jamaica Bay, with scattered islands and salt marsh in the distance; and the thickets and shaded “gardens” that lie between the Pond and the roadway to the east. In the distance, the Manhattan skyline provides an unforgettable contrast, and emphasizes the sense of quiet, of peaceful escape from crowds and frenetic human activity. The visitor may feel that this is a refuge not only for wildlife.

NYC AUDUBON DESIGN RECOMMENDATIONS FOR THE WEST POND

A landscape ecology approach is the key to restoration of the West Pond as an integral component of the Jamaica Bay Wildlife Refuge, an Important Bird Area of global importance. The restoration solution designed to accomplish this goal is a landscape mosaic of wetland and upland. In Figure 5 (p.16), we capture habitat features important to restoration goals:

- Provide better habitat for SGCNs, especially through fresh water and seasonal availability of mudflats (regulated water levels)
- Reduce impacts on SGCNs of invasive species by replacing invasive plants with native vegetation
- Reduce impacts to SGCNs from subsidized predators (native & non-native) by creating barriers to sensitive nesting sites for terrapins and terns
- Enhance protection of the refuge from severe storm events through marsh restoration
- Provide better wildlife viewing access while improving protection from human disturbance by creating an irregularly-shaped pond with native freshwater plantings and building observation blinds and footpaths into the habitat.

In addition to providing a critical resource (fresh water), the re-establishment of the West Pond must include protection of the pond from storm surges. Freshwater marsh habitat created and maintained around the pond will help protect and buffer the area from future storm surges and provide other ecosystem benefits by:

- Anchoring the shoreline and trapping sediment, slowing erosion of soil during storm-related events
- Trapping sediments and filtering water before it is released into the Bay.
- Providing habitat for birds, fish, and other wildlife

NYC Audubon recommends the following design guidelines for the freshwater portion of the refuge, which we consider essential to the health of the system:

- Create a mosaic of freshwater wetlands with varying water regimes and depths.
- Include a mix of open water and marsh
- Maximize shoreline with an irregular edge
- Maximize total freshwater area given ecological, hydrological, management and budget constraints. Quality of fresh water is as important as area.
- Include seasonally exposed mudflats and shallows
- Improve system flushing
- Improve outflow—provide natural outflow for extreme rain and surge events, provide salt marsh filter for outflow
- Improve quantity and quality of freshwater inputs. Investigate use of existing City water supply and best-management-practices for stormwater sources.
- Raise the height of the protecting berm to account for extreme surge events.
If site conditions permit after meeting freshwater needs, the following features are recommended:

- Restore historic tern colony area to island with limited access to create “Terrapin Island”
- Add or preserve mudflats on bay side of berm
- Add or expand salt marsh buffer on bay side of the berm
- Restore uplands damaged by salt intrusion post-Sandy.

The following features will both improve the visitor experience and protect wildlife from human disturbance:

- Blinds for wildlife viewing (See Appendix III for eBird data of potential use in determining blind locations).
- Boardwalks over newly constructed marsh
- Loop path at a level or accessible grade
- Interpretive signage
- Gathering places for guided interpretation
- Screening vegetation to frame views and provide visual clues for visitors as well as provide shelter and privacy for wildlife.

**Figure 5**

NYC Audubon Concept Drawing for the West Pond

All elements of the drawing are not to scale but represent key elements that need to be included in the restoration.

Additional concept drawings for the West Pond restoration have been submitted by members of the Birders Coalition for Gateway. These drawings are presented in Appendix IV.


APPENDIX I.

Annotated List of Bird Species of Special Concern for Jamaica Bay

References to “breeding” refer to the Jamaica Bay Unit unless otherwise specified. An asterisk (*) after the species name indicates species that depend wholly or in part on freshwater habitat. The list was compiled in November 2013 by Douglas J. Futuyma and Andrew Baksh and includes species that spent significant portions of their life cycle within the JBWR wetlands area.

The following abbreviations are used:
B64: Birds of the New York Area (1964, Dover ed. 1975)
BNA: Birds of North America (online)
C: Confirmed
GNRA: Gateway National Recreation Area
JBWR: Jamaica Bay Wildlife Refuge
NYS: New York State
SGCN: Species of Greatest Conservation Need (NY DEC: www.dec.ny.gov/animals)

Atlantic Brant (SGCN)
   Arctic breeder, almost entirely coastal in migration and winter; fly directly from Arctic (James Bay) to LI and NJ, overwinter along coast from New York to Chesapeake Bay; GNRA and western LI (south shore) are a major overwintering area.

Gadwall*
   1A, 2A: C Breeding (c. 25 other sites on LI and Staten Island; in NYS, otherwise in scattered sites near Great Lakes; Maximum density of breeders in NYS in 1965 was in JBWR (B74). Near northern edge of Atlantic coastal breeding range, and of winter range (BNA). Ponds.

American Wigeon*
   Recorded breeding at JBWR 1961 (B74); very rarely breeds in NYS; overwinters in large numbers in JBWR (e.g., 8000 in 1959; B74). Mostly on ponds.

American Black Duck (SGCN) *
   1A, 2A: C Breeding (major decline in number of breeding sites in NYS during this period, and in winter counts along Atlantic Flyway [2A]; overwinter in GNRA unless ponds freeze). Nests on freshwater or low-salinity ponds; winters also in salt marsh.

Northern Pintail* (SGCN) *
   In migration and winter, on fresh or low-salinity bodies of water; in small numbers on JBWR ponds.

Blue-Winged Teal* (SGCN)
   1A: C breeding nearby; past nesting records from JBWR (B74); fairly abundant migrant; uses fresh or low-salinity ponds. Major decline in NYS since 1980 (2A).
Northern Shoveler*  
Breeding 1956 (B74)(near northern edge of coastal breeding range); 1A: C breeding; 2A: not recorded breeding. Common in migration and winter, especially on fairly open freshwater ponds and lakes (BNA).

Green-Winged Teal*  
Breeding (B74, 1A); not in 2A; small numbers in migration and winter (until ponds freeze). Most on ponds.

Canvasback*  
Small numbers on West Pond in winter (if not frozen). Population counts in NY region fluctuate substantially (2A).

Redhead  
Small numbers in winter.

Greater Scaup (SGCN) *  
Winter; formerly very abundant in JBWR (23,000 in 1856: B74). In recent years, several thousand usually on West Pond, winter (when not frozen).

Lesser Scaup (SGCN) *  
Small numbers in winter, on West Pond.

Common Goldeneye (SGCN)  
Winter; hundreds on Bay; 100 or more typically roost on West Pond.

Bufflehead  
Winter; hundreds on Bay.

Hooded Merganser*  
1A: C breeding nearby; small numbers on JBWR ponds in winter.

Red-Breasted Merganser  
Winter: hundreds on Bay.

Ruddy Duck* (SGCN)  
Breeding JBWR West Pond, records 1955-1965 up to 40 broods (B74); 1A: C breeding. (JBWR the only significant breeding population in state); 2A: no breeding. Nests in freshwater wetlands. Now occurs fairly commonly in migration and winter, on JBWR Ponds.

Common Loon (SGCN)  
In migration and winters in coastal waters; in considerable numbers on Jamaica Bay in winter.

Horned Grebe (SGCN)  
In migration and winters in coastal waters; in considerable numbers on Jamaica Bay in winter.

Pied-Billed Grebe* (NYS Listed: Threatened)  
Breeding: 40 pairs in 1961 (B74); 1A: C breeding (one of two confirmed sites in NYC-LI region); 2A: No reported breeding at JBWR; a few “possible” sites in LI. Requires freshwater wetlands for breeding.
American Bittern* (NYS Listed: Special Concern; SGCN)
Breeds in freshwater wetlands; breeding recorded on LI (B74, 1A, 2A), but not in JBWR. In migration and winter, occurs also in salt marsh, frequently recorded in JBWR in low-salinity ponds and in salt marsh.

Least Bittern* (NYS Listed: Threatened)
Breeding: at least 6 pairs in 1960 (B74); 1A: C breeding (one of two confirmed sites in NYC-LI region; several probable sites); 2A: Probable breeding (also several probable LI sites).

Great Egret (SGCN)
1A: C breeding (and at ca. 20 LI sites; not elsewhere in NYS); 2A: C breeding (as for 1A). Nests on Bay islands.

Snowy Egret (SGCN)
1A: C breeding (and at ca. 20 LI sites; not elsewhere in NYS); 2A: C breeding (as for 1A). Nests on Bay islands.

Little Blue Heron (SGCN)
First NYS breeding record 1958, on LI; first breeding record in JBWR 1960, on Canarsie Pol (B74). 1A: Probable breeding (and at 8 LI sites, not elsewhere in NYS); 2A: Breeding nearby (and several LI sites). NYC/LI is near northern limit of breeding range. Thought to be in decline throughout US (2A).

Tricolored Heron (SGCN)
Very rare in NYS before 1980s. First NYS breeding record was in JBWR in 1955. Breeding: C JBWR 1955, 1966; 1A: Probable breeding (confirmed at 4 LI sites, not elsewhere in NYS); 2A: C breeding (confirmed also at 4 other sites and probable at 8 more, all in NYC/LI). NYC/LI is near northern limit of breeding range. Considered at high risk throughout US range (2A).

Cattle Egret (SGCN)
1A: C breeding (and at 5 other sites in Staten Island and LI); 2A: C breeding nearby. Populations increased in NYS in 1960s and 1970s, have declined steadily until 2005 (2A), and probably have declined further since.

Black-Crowned Night-Heron (SGCN)
1A: C breeding (and at other sites on LI and upstate, especially near Great Lakes); 2A: same, but decline in number of sites on LI. Populations in NYS and northeastern US have declined by 50% since 1970 (2A).

Yellow-Crowned Night-Heron (SGCN)
Breeding: First recorded at JBWR 1953 (B74); 1A: Probable breeding (confirmed at 11 LI sites and probable at others; not elsewhere in NYS); 2A: same. Small numbers are seen in summer in JBWR, feeding in salt marsh and West Pond.

Glossy Ibis* (SGCN)
Breeding first recorded in NYS at JBWR, 1961 (B74); 1A: C breeding (and at ca. 20 LI sites, not elsewhere in NYS); 2A: confirmed at fewer colonies than in 1A. Feeds in diverse wetland habitats, nests in heron colonies, especially on islands with dense vegetation (B74, 2A). Decline in population in coastal NY and neighboring areas since 1970s (2A).
Osprey (NYS Listed: Special Concern)
Substantial recovery from severe population decrease in mid-twentieth century; e.g., “practically unknown on Long Island west of Peconic Bay” (B64); no breeding in or near JBWR in 1970s (B74); 1A: Not reported breeding at JBWR; most breeding sites in eastern LI and Adirondack region; 2A: C breeding (also throughout coastal LI and much of NYS).

Northern Harrier (NYS Listed: Threatened)
Inhabits open habitats, e.g., fields, marshes, dunes. 1A: C breeding (and many sites in coastal and eastern LI, also northern and western NYS); 2A: probable breeding (and at fewer confirmed sites in LI and NYS).

Sharp-Shinned Hawk (SGCN)
Nests in woodlands throughout NYS, including LI, but few breeding records on LI, none in JBWR (1A, 2A). Migrates in numbers along coast, feeding on small birds en route; significant numbers pass through GNRA, and small numbers stay through winter.

Cooper’s Hawk (SGCN)
Nests in woodlands throughout NYS, including LI, but not recorded nesting in JBWR (1A, 2A). Migrates in numbers along coast, feeding on small birds en route; significant numbers pass through GNRA, and small numbers stay through winter.

Red-Shouldered Hawk (SGCN)
Nests in woodlands in NYS, including a few LI sites (2A). Small numbers occur in GNRA in migration and winter.

American Kestrel
1A: C breeding (and at many sites in LI and much of NYS); 2A: Probable breeding nearby (confirmed breeding sites much fewer than in 1A throughout LI and NYS). Many migrate along coast, passing through GNRA; a few overwinter, especially at Floyd Bennett Field. Although not yet Listed, regional populations, including NYS; may be declining due to widespread habitat loss (2A).

Peregrine Falcon (NYS Listed: Endangered)
Breeding: extirpated as a breeder in NYS by 1958 (B74), substantial recovery since. 1A: no reported breeding near JBWR (2 C sites in LI-NYC region); 2A: C at 1 nearby site; increased number of breeding sites in coastal LI, NYC, Hudson valley). Migrates along coast, passing through GNRA; resident and migrating peregrines feed on birds (especially migrant shorebirds) in JBWR.

Clapper Rail
Breeding: in salt marsh. 1A: C breeding (and at various coastal LI and Staten Island sites); 2A: same.

Virginia Rail*
1A: Probable breeding (confirmed scattered sites throughout LI and NYS); 2A: same.

Sora*
Migrant; fresh (or slightly brackish) marshes and ponds.

Common Moorhen*
Breeding: in freshwater marshes. Four nesting pairs in JBWR (West Pond) 1959, at least 8 pairs 1960 (B74); 1A: C breeding (and at 6 other sites in NYC-LI region; scattered NYS sites); 2A: No breeding (far fewer sites in NYS-LI region and in NYS than in 1A).
American Coot
Breeding: Fresh water (B74); 1A: C breeding (and at 1 Staten Island site, not otherwise in southern NYS); 2A: No reported breeding (1 confirmed site is southern NYS, in eastern LI)

Piping Plover (NYS and US Listed: Endangered)
Nests on beaches. 1A: C breeding (and at LI coastal sites); 2A: same. Population stability depends on protection efforts (2A). May benefit from small freshwater pools during nesting season.

Black-Bellied Plover (SGCN)
During spring and fall migration it is locally common on all three coasts of North America and on the Great Plains, less common elsewhere across the continent (BNA). Coastal Maxima: Spring: 1,200 JBWR, May 17, 1939. Fall JBWR: 1,203, August 18, 1983; 1,193, August 31, 1988; 1,159, Sep 4, 1987.

American Golden-Plover (SGCN)
Uncommon to fairly common fall migrant throughout the state, much less numerous in the spring. Considered rare in the spring for the downstate area. Habitat: Prefers short grass areas, plowed fields, airports, golf courses, salt meadows and dry dredge-spoil areas. Coastal maxima: Spring: 9 JBWR, Apr 23, 1957 (B74); Fall: 9 JBWR, Sep 7, 1983 (eBird).

American Oystercatcher (SGCN)
Formerly rare in NY, first recorded breeding 1957 (B74); 1A: C breeding (and at LI coastal sites); 2A: same. Population expansion and increase in north is associated with nesting in salt marsh; also nests in sand dunes, as it typically does in south (2A).

Ruddy Turnstone (SGCN)

Upland Sandpiper (SGCN)
Breeding: old pastures, hayfields, airports, and other similarly mowed areas. Loss of land and the increased planting of corn has resulted in a decline in those areas. Second breeding atlas showed a significant decline in the species in many blocks where it was numerous (down 65% percent overall) and it had virtually disappeared from a former stronghold extending from the St. Lawrence Plains to the Champlain Transition. The species is listed as threatened in New York. (2A); Spring record 1 Edgemere Landfill 23 Jun, 2013. Thought to be a bird displaced by mowing at a nearby airport which remains one of few remaining reliable habitats holding this species (eBird).

Sanderling (SGCN)
Collecting in small to large flocks on long stretches of sandy beaches. Usually feeding on substrates from the advancing and receding waves and roosting on the upper beach. Rare visitors to small ponds but do so in small numbers. As a high Arctic breed, they are generally a late migrant. Coastal maxima: Fall: 4,000 JBWR, Aug 23, 1991 (B74); 7,500 Breezy Point Tip, July 22, 2010 (eBird).
Dunlin (SGCN)
Abundant migrant on the coast; only slightly less numerous inland. Common to locally very abundant in winter on the coast; very rare inland. In the summer very rare in NYS. Maxima vary greatly from year to year in part due to the impermanence of mudflats as a geographical feature. Some areas, such as the muddy edges of the bays and inlets of the large lakes and the coastal tidelands of LI, are large enough to compensate for the vagaries of nature. Some locales also benefit from regulation of water flow by manipulation of floodgates; JBWR is one such place and is an important stopover for the species. Coastal maxima: Fall: 4,379 JBWR, Oct 27, 1984 (B74); 6,330 JBWR, Oct 11, 1984 (eBird).

Red Knot (SGCN)
Common to abundant migrant on the outer coast; fairly common in winter and present as a summering non breeder. Fairly common fall migrant along the Great Lakes and certain inland lakes. Coastal maxima for JBWR: Fall: 4,000 Aug 23, 1991 (B74); 1,685 JBWR, Jul 31, 1984 (eBird). SEPT. 27, 2013: Proposed for “threatened” status under Endangered Species Act, partly because of excessive harvesting of horseshoe crabs, the eggs of which are critical food, fueling the red knot’s long migration from southernmost South America to the Arctic.

Spotted Sandpiper*
Nests in dunes and other open habitats. 1A: C breeding (and various LI and NYS sites); 2A: C breeding nearby (same).

Semipalmated Sandpiper (SGCN)
Very abundant migrant on the coast, where it is also a regular summer nonbreeder in small numbers. Inland, common in spring and very common in fall. Coastal maxima for JBWR: 3,342, May 25, 1985; Fall: 6,000, Aug 24, 1951; 2,291, Aug 3, 1985 (B74); 5,900, Aug 17, 2010 (eBird).

Willet (SGCN)
Formerly known only as a migrant in NY (B74), now nests in salt marsh. 1A: C breeding (and sites on LI south shore); 2A: same.

American Woodcock
Nests in areas with brush and moist or soft ground. 1A: C breeding (and many other sites); 2A: same.

Bonaparte’s Gull (SGCN)
Nests primarily in Arctic; occurs in NY in migration and winter, feeding on nearshore water, including Jamaica Bay and ocean within Jamaica Bay Unit. Population trends unclear (BNA).

Laughing Gull
Extirpated as breeder in NYS in late 1800s by egg-collecting, first nesting record 1978 on LI (BNA, 2A), increased due to Migratory Bird Treaty Act. Nesting colony in Jamaica Bay, subject to control at JFK Airport. 1A: C breeding (and at 1 probable LI site); 2A: C breeding (and at 4 other LI sites).

Gull-Billed Tern
Formerly very rare southern visitor to NYS (B74), now rare breeder in coastal region. Forages along tidal flats, JBWR, summer. 1A: no confirmed breeding in JBWR, but suspected (3 confirmed sites, coastal Nassau Co.); 2A: same.
Common Tern (NYS Listed: Threatened)
Breeds on open sand and gravel near salt water. Recovered in 20th century from near-
extirpation. 1A: C breeding (and at 40 sites on coastal LI); 2A: same.

Forster's Tern (SGCN)
First recorded nesting in NYS 1981; Long Island the northernmost breeding population (except
for one pair recorded in Massachusetts). 1A: No breeding at JBWR (1 breeding pair at one LI
location). 2A: C breeding in abundance, mostly at JoCo Marsh in Jamaica Bay, where number
of pairs increased from 5 pairs in 1991 to 333 pairs in 2004 (also at 10 LI locations, in smaller
numbers). Forages in Jamaica Bay near West Pond, uses both ponds for bathing and resting.

Roseate Tern (US Listed: Endangered)
Thirteen nesting colonies in NYS in 1980-85, all in eastern LI (1A) declined to 7 colonies in
2000-2005 (2A). Especially after nesting, individuals consort with flocks of common terns at
Breezy Point and elsewhere in Jamaica Bay Unit.

Least Tern (NYS Listed: Threatened)
Nests on beaches and sand flats. 1A: Breeding in Jamaica Bay Unit (Breezy Point) and at
various coastal LI sites; 2A: same. Considerable turnover in location of breeding colonies
because of disturbance and overgrowth of nesting sites by vegetation (2A).

Black Skimmer (NYS Listed: Special Concern)
Nests in broad, open, sandy areas, but recently in salt marsh as well (B74, 2A). On islands in
JBWR, 75 nesting pairs in 1953, 120 in 1962 (B74); 1A: C breeding, (and at locations on LI
south shore); 2A: same, but within JB Unit, restricted to Breezy Point. NYC/LI colonies the
northernmost breeding location, except for small numbers in Massachusetts (BNA).

Black-Billed Cuckoo (SGCN)
Nests in woodlots with thickets. 1A: C breeding; 2A: C breeding. Population decline in recent
decades; listed as High Priority concern on Audubon WatchList for New York and southern
New England (BNA).

Barn Owl (SGCN)
Nests in boxes provided in JBWR. 1A: C breeding (breeding sites in NYS mostly coastal and
Hudson valley, scattered sites upstate); 2A: C breeding (steep decline upstate; almost all known
breeding sites on LI and Staten Island).

Long-Eared Owl (SGCN)
Nests in forest throughout NYS, with a few records on LI. In Jamaica Bay Unit, occurs in
migration and in winter, uncommonly seen in dense vegetation, especially in Floyd Bennett
Field. Observers’ common impression is of strong decline in recent decades, but no systematic
quantitative data.

Short-Eared Owl (NYS Listed: Endangered)
Inhabits grasslands, marshes, dunes; steadily declining in NYS (B74, A1, A2). Mostly in winter
in NYC/LI area; maximum of 40 on Canarsie Pol, Jamaica Bay, winter 1959 (B74). 1A: C
breeding at Floyd Bennett Field and 2 nearby sites (a few probable sites upstate); 2A: no C
breeding (1 probable site n LI; few scattered sites upstate).
Willow Flycatcher (SGCN)
Nests in brushy and scrub vegetation, including along coast. 1A, 2A: C breeding, and at fairly large number of sites in southern and western NYS.

White-Eyed Vireo
Nests in dense scrub. 1A, 2A: C breeding (also some other sites on LI and southernmost NYS counties). NYC/LI near northern breeding limit; breeds also in coastal CT and RI (BNA).

Fish Crow
1A, 2A: C breeding (breeding in NYS almost entirely limited to LI, Staten Island, lower Hudson valley). Has become more abundant in northern part of range in recent decades, still mostly coastal (BNA).

Horned Lark (NYS Listed: Special Concern)
Inhabits short-grass fields and sandy areas, e.g., dunes. 1A: C breeding (and at fair number of sites on LI and western NYS); 2A: no breeding; breeding sites on LI and western NYS, but 37% decline since 1A.

Marsh Wren®
Inhabits freshwater marshes; also, less commonly, edges of salt marsh. 1A, 2A: C breeding (and scattered sites LI, Hudson valley, upstate, esp. near Great Lakes).

Wood Thrush (SGCN)
Nests in rich woods. NYS population estimated to have been declining at 3.1 percent per year since 1980 (Sauer et al. 2005, cited in 2A). Occurs in Jamaica Bay Unit in migration, using woodlots for resting and feeding.

Black-Throated Blue Warbler
This is one of 32 species of warblers that occur, probably annually, regularly in the Jamaica Bay Unit during migration, using woodlots and thickets for resting and feeding. Among these, 3 breed regularly within the Unit, and one occurs throughout much of the winter. The black-throated blue warbler nests in closed-canopy forest in mainland NYS, where the Breeding Bird Survey indicates a decline of 2.3 percent per year from 1980 to 2006 (Sauer et al., cited in 2A). Within the Jamaica Bay Unit, it is most frequently encountered during migration in the “gardens” adjoining the West Pond in JBWR.

Prairie Warbler (SGCN)

Canada Warbler (SGCN)
Nests in mixed deciduous-coniferous forest in NYS. Occurs in Jamaica Bay Unit during migration. Has been declining throughout its range since 1960s, at a rate of 5 per cent per year in New York since 1966 (Sauer et al. 2007, cited in 2A).

Scarlet Tanager (SGCN)
Nests in deciduous and mixed deciduous-coniferous forests throughout NYS, including LI. Occurs in Jamaica Bay Unit during migration, using woodlots for resting and feeding. Has been declining since at least 1966, at rate of 2.4 percent per year since 1980 (Sauer et al. 2005, cited in 2A).
Saltmarsh Sparrow (SGCN)
Nests in Spartina salt marsh from Maine to Virginia; has declined due to coastal marsh drainage and shoreline development (2A). 1A, 2A: C breeding (restricted in NYS to coastal marshes on LI, Staten Island, Westchester Co.).

Grasshopper Sparrow (SGCN)
Nests in open grassland, usually with bare patches of ground. Breeds at scattered locations throughout NYS, including LI, but number of breeding sites declined 42 percent from first Breeding Bird Atlas (1A) to second (2A), largely due to habitat loss. In NYS Breeding Bird Survey, declined at 9.4 percent per year from 1966 to 2005 (Sauer et al. 2005, cited in 2A). Formerly nested in Jamaica Bay Unit (1A), mostly at Floyd Bennett Field. Occurs now as occasional migrant.

Seaside Sparrow (NYS Listed: Special Concern)
As for saltmarsh sparrow, restricted in NYS to salt marsh on LI, Staten Island, Westchester Co. Decline due to habitat loss and alteration results in listing as Species of Special Concern (2A).1A, 2A: C breeding in Jamaica Bay Unit.

Bobolink (SGCN)
Nests in grassy hayfields and meadows in NYS; a few former breeding sites on LI (1A), only one in 2000-2005 Atlas (2A). Has declined in much of its breeding range (2A). Occurs in GNRA in migration, sometimes feeding in open fields.

Eastern Meadowlark (SGCN)
Inhabits open, grassy fields. Steadily declining population in NYS (2A) and throughout breeding range at 2.9 percent per year (Sauer et al. 2005, cited in 2A). 1A: C breeding, mostly in Floyd Bennett Field. 2A: No breeding in Jamaica Bay Unit. Number of breeding sites on LI declined by about half between first and second atlases.

Boat-Tailed Grackle
Nests in salt marshes. Has spread northward in historic times: first NYS record 1967; first NYS breeding record 1981, JBWR (1A). Now well established. NYC and Long Island are the northern limit of its breeding range at this time, with JBWR holding one of the largest breeding concentrations in NYS. 1A: C breeding (and at one other site in NYS, in southern Nassau Co.); 2A: C breeding (and at about 27 other sites in Staten Island and LI).

Sources for SGCN information
## APPENDIX II.

### Species of Greatest Conservation Need Known to Occur in Jamaica Bay


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<th>Species</th>
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<td><strong>Reptiles</strong></td>
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<td>Kemp's or Atlantic Ridley sea turtle</td>
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<td>Winter flounder</td>
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APPENDIX III.

Areas within Jamaica Bay Wildlife Refuge Used for eBird Reports (February 2012-2013)

Areas for installation of Jamaica Bay Wildlife Refuge viewing sites could be selected using current viewing patterns, as recorded in eBird geo-referenced data.

©eBird
APPENDIX IV.

Additional Concept Drawings for Restoration and Redesign of the West Pond (Submitted by Members of the Birders Coalition for Gateway)

ALTERNATE WEST POND CONCEPT DRAWING 1

©Doug Futuyma
West Pond Schema #2
As for Schema #1, but
- leave existing berm as is, with open breach;
- create small tidal mudflat
  by adding new berm at area across southern end
- This may have additional blind(s)
Top row: Hooded Mergansers, Lloyd Spitalnik; Snowy Egret, David Speiser;
Middle row: American Oystercatchers, Marsh Wren, Semipalmated Sandpiper, David Speiser;
Bottom row: Northern Pintail, Ellen Michaels; Common Tern, David Speiser.