

Petty's Island State of the Birds Report: 2016-2017 Biodiversity Monitoring Results



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HIGHLIGHTS

- Over 1,600 individual birds of 88 species were observed during survey visits between 31 August 2016 – 13 July 2017.
- The cumulative bird list from all survey years (2014-2017) contains 118 species, with seven new species added in the current year: American Kestrel, American Wigeon, Blackburnian Warbler, Lesser Scaup, Prairie Warbler, Red-breasted Nuthatch, and Ruby-throated Hummingbird.
- Bald Eagles (state-listed Endangered) continue to be observed regularly at the site, including at least once during each of the four monitoring seasons in fall 2016 – summer 2017. Sightings included both juveniles and adults, singly and in pairs.
- Red-shouldered Hawk (state-listed Endangered) also continues to be regularly observed at the site, including calling individuals sighted in March, May, and June 2017.
- Birding checklists for Petty’s Island are beginning to appear on eBird.org facilitated by guided bird walks led by New Jersey Audubon staff. These will be monitored moving forward to provide supplemental information about bird species usage of the site.

GOALS AND OBJECTIVES

Petty’s Island is a 304-acre island in the Delaware River between Camden, New Jersey and Philadelphia, Pennsylvania with a long history of industrial use. In 2009, the property was donated by Citgo to the New Jersey Natural Lands Trust (NJNLT) for the purposes of environmental conservation and education. The gift included a \$3 million fund in support of these goals. A container shipping facility continues to operate on the northern portion of the island until its lease runs out in 2017, after which restoration work will begin. New Jersey Audubon (NJA) has partnered with the NJNLT to provide educational programming, stewardship guidance, and wildlife monitoring at the site. Currently, the primary area of focus is the 76 forested acres at the southwestern end of the island. For the purposes of this report, NJA’s goal is 1) to collect and evaluate information on wildlife populations on the island and surrounding habitat, 2) use this information to guide future management and aid in designing educational programming, and 3) assess the effects of stewardship activities at the site. NJA commenced regular surveys in the 76-acre woodland at the southern tip of the island in July 2014. In July 2017, we completed the third full year of year-round baseline monitoring surveys there. The focus has been on birds, but we also recorded information on any amphibians, reptiles, mammals, or unusual plant species encountered during site visits. This report summarizes the third full year of surveys; results from previous years are available elsewhere (Allen and Tsipoura 2015, 2016).

INTRODUCTION

New Jersey Audubon (NJA) is a privately supported, not-for profit, statewide membership organization that aims to foster environmental awareness and a conservation ethic among citizens; protect New Jersey’s birds and other wildlife, especially endangered and threatened species; and promote the preservation of natural habitats. These objectives are realized through

Education and Programming, Research and Wildlife Monitoring, Conservation, Stewardship, and Environmental Advocacy. The New Jersey Natural Lands Trust (NJNLT) is an independent agency created in 1968 and affiliated with the state Department of Environmental Protection. Its primary purpose is the acquisition of open space for environmental conservation and public enjoyment. NJNLT acquired Petty's Island through a donated conservation easement from Citgo in 2009, to be fully restored and transferred to the trust by 2020. Citgo committed \$2 million to NJNLT for stewardship and restoration of the island, and \$1 million for an environmental center near the site. NJNLT has contracted with NJA to provide educational programming, as well as stewardship and wildlife monitoring guidance at the site.

Due to its size, isolation, and location within the Delaware River on the Atlantic Flyway, Petty's Island supports an impressive diversity of birds and other wildlife. Contributing to this is a diverse array of habitats including grasslands, forests, wetlands, several large ponds, and a 140-acre fringe of tidal flats that host migratory shorebirds and several rare plant species (NJNLT 2015). Its location within a large urbanized landscape increases its value to migrating birds which may have few other options for stopover and refueling sites (Pennington et al. 2008, Seewagen et al. 2010). Bald Eagles nested on Petty's Island until recently, and continue to nest nearby and to use the island for roosting and foraging (McCort et al. 2010, Allen and Tsipoura 2015, 2016).

Petty's urban surroundings and industrial history make its current ecological importance both surprising and encouraging. Its proximity to the large urban centers of Camden, New Jersey and Philadelphia, Pennsylvania also makes this a unique opportunity to connect large numbers of people with nature who may not have otherwise had the chance. In recent years, NJA has led numerous public tours and litter clean-ups on the island, partnered with local community groups, and assessed the site for its restoration potential.

In July 2014, NJA began conducting bird surveys on the site throughout the year within the 76 acres of forest and wetlands at the southwestern end of the island. Other animal and plant sightings were also recorded. Surveys were initiated to obtain baseline data on the existing natural resources at the site, similar to a monitoring program NJA has been conducting at another urban reserve (Linden's Hawk Rise Sanctuary) since 2010 (Munafò and Tsipoura 2011, Allen and Mylecraine 2017) as well as at other urban sites (Mizrahi et al. 2007, Tsipoura and Mylecraine 2010). As NJNLT continues to move forward with the restoration of Petty's Island, robust and repeatable baseline survey data will be valuable for comparisons with post-management data to determine the impact of stewardship activities on wildlife populations. Surveys could also aid in identifying areas in need of additional restoration and will provide guidance for educational and interpretive activities on the site. A fourth year of surveys is ongoing, but here we mainly present results from the third full year of the survey, covering the period August 2016 to July 2017.

METHODOLOGY

Bird Survey Methods

Surveys were conducted using a combination of standardized point count and line transect surveys. Following standardized and scientifically rigorous protocols allows for repeatability of surveys through time and detailed analyses. In addition, all surveys include methods that will allow for future distance analyses, occupancy modeling and/or time removal sampling to account and adjust data for imperfect detectability. Spring migration and breeding season bird surveys were conducted following standard point count methodology (Ralph et al. 1995). During these time periods, birds are vocalizing and are therefore likely to be more detectable on point counts than other time periods. Winter and fall migration surveys were conducted using 200-meter line transect surveys (Buckland et al. 2006). Line transect surveys may be more effective for migration surveys (Wilson et al. 2000), and are particularly useful during fall and winter surveys when birds are less vocal. Detailed survey methodologies for point count and transect surveys are presented below. All surveys were performed by one observer (M. Allen).

Point and transect locations

Spring and breeding season point count locations were established based on standard protocols for avian surveys (Ralph et al. 1995). We initially created a 300 m x 300 m grid of points, rotated to allow a maximum number of points to fall within the 76-acre wooded area at the southwestern end of the island. Points were then moved as needed to avoid edges or inaccessible flooded areas while maintaining a spacing of at least 200 m to avoid duplicate counting of individuals (Ralph et al. 1995; Table 1 and Figures 1 and 2). A total of 7 survey points were mapped covering a variety of upland and wetland forested habitats. Fall and winter transects were established based on the existing point count locations where possible. Some transects were then moved slightly to maximize coverage area and avoid flooded areas. A total of six transects were established, each 200 m long (Table 1 and Figures 1 and 2). All survey locations have remained in the same locations throughout the study.

Survey methodology

Point count and transect surveys were conducted following standard protocols (Ralph et al. 1995, Buckland 2006). All surveys were conducted between one half hour before sunrise and four hours after sunrise, on days with no precipitation and wind speeds less than 12 mph (Beaufort 3).

During spring migration and breeding season surveys, observers conducted 10-minute point counts at each location, recording all birds heard or seen. We conducted three surveys during spring migration 2017 between 1 April and 15 May, and three surveys during the 2017 breeding season between 25 May and 15 July (see Table 2 for list of survey dates). To account for biases in population measures resulting from imperfect detectability, data collection methods were designed to allow future distance sampling (Buckland et al. 2001) and time-depletion (removal) analyses (Farnsworth et al. 2002). Repeated surveys will also allow the use of occupancy modeling (MacKenzie et al. 2006) in future analyses. Observers recorded all birds heard or seen in ten one-minute intervals, and measured exact distance, when possible, using a laser rangefinder.

Transect surveys were conducted four times during 2016 fall migration between 15 August and 15 November, and four times during winter 2016-2017 between 15 December and 31 March (see Table 2 for list of survey dates). Data collection methods were designed to allow future distance analyses (Buckland et al. 2001, Buckland 2006). Observers walked along the transect line, and recorded exact distance, when possible, and direction to each bird. During both point count and transect surveys, observers also recorded observation type (heard, seen, heard and seen, or over-flight) for each detection, as well as basic weather information (wind speed, temperature, sky condition) and time of day.

Data Analysis

Results presented here are a simple tabulation and summary of observations, but the data collection methods used will also allow more detailed analyses that take into account detection probabilities, such as occupancy modeling (MacKenzie et al. 2006), distance (Buckland et al. 2001) and removal analyses (Farnsworth et al. 2002).

At the site level, we created a list of all bird species observed during 2016-2017 fall migration, winter, spring migration, and breeding season surveys. We calculated species richness, including the total number of species observed, and total number of state Endangered, Threatened, and Special Concern species observed during each season. For each species and season, we also calculated frequency of occurrence by point, total number of individuals observed per point, and relative abundance. Frequency of occurrence by point was calculated as the number of points at which a species was observed divided by the total number of points surveyed. Relative abundance was calculated as the total number of observations of the species of interest divided by the total number of observations for all species combined. The total number of observations represents the sum of all individuals counted at each point/transect, across all surveys and locations. We also tabulated the number of birds observed during each survey, and calculated the maximum number of individuals recorded, across all points/transects, on any one survey.

RESULTS AND DISCUSSION

2016-2017 Bird Survey Results

A total of 88 bird species were observed by New Jersey Audubon research staff at Petty's Island between August 2016 and July 2017. We counted 1,683 individuals of 71 species on point count and transect surveys, and observed an additional 17 species incidentally, outside of official surveys (Tables 2 and 3). Survey data for each season in 2016-2017, by point/transect and survey, are presented in Tables 4-15. Year three of the survey brings our total 2014-2017 list of bird species to 118, with the following seven species added this year: American Kestrel, American Wigeon, Blackburnian Warbler, Lesser Scaup, Prairie Warbler, Red-breasted Nuthatch, and Ruby-throated Hummingbird (Table 16).

Two other sources exist to supplement our knowledge of the island's recent birdlife: a report by Herpetological Associates, Inc. (McCort et al. 2010), and data from a relatively recent 'hotspot'

created in eBird.org ('Petty Island') where birdwatchers can submit checklists of species seen (Sullivan et al. 2014). The Herpetological Associates, Inc. survey encompassed the entire island (and surrounding wetlands/water) and took place over eight full days in March-June 2010. The result was a list of 141 avian species, and included 42 species not found on our list, primarily spring migrants and species typical of non-forested habitats (i.e., the river and the northern two-thirds of the island; see Table 17; McCort et al. 2010). The eBird hotspot currently contains two complete checklists in the period summer 2014-2017: one from April 2016 and April 2017. While these are not standardized data, the observations are included in Table 16 to fill in gaps, labeled 'e' so they can be easily distinguished from survey data. Only one species (Forster's Tern) was reported to eBird that had not already been recorded during our survey visits, though it was reported by McCort et al. (2010). Thus, the grand total of bird species from all three sources (our surveys, eBird, and the 2010 report) from spring 2010 to summer 2017 is 160 species.

State-listed Species

During the 2016-2017 surveys, we observed two state-Endangered species (Bald Eagle and Red-shouldered Hawk) during multiple visits throughout the year, and one state-Threatened species (American Kestrel) during winter (Table 3). We observed seven species that are of Special Concern during the breeding season (Blackburnian Warbler, Black-throated Blue Warbler, Great Blue Heron, Northern Parula, Veery, Winter Wren, and Wood Thrush; Table 3), though, of these, only Great Blue Heron has a history of breeding on the site (McCort et al 2010).

Red-shouldered Hawks are considered state-Endangered during the breeding season and of Special Concern during the non-breeding seasons. We have encountered them on the island during 9 of the 13 consecutive seasons we have surveyed (Table 16), including multiple observations of calling and territorial adults (e.g., chasing a Red-tailed Hawk) and possible begging calls by juveniles (Allen and Tsipoura 2015, 2016). In 2016-2017, we observed them calling and flying in multiple locations throughout the study area on 22 December (juvenile; seen and heard), 25 March (heard), 12 May (seen and heard), and 4 June (seen and heard; Tables 4-15). Though we have not found a nest, the territorial behavior observed, coupled with repeated observations during the summer months is strong evidence of potential breeding on the island or on the nearby mainland where they have also been heard calling (Allen and Tsipoura 2015, 2016). McCort et al. (2010) did not find Red-shouldered Hawk during their 2010 survey, but cite an observation on the island sometime during 2004-2006.

Bald Eagles are considered state-Endangered during the breeding season and Threatened during the non-breeding season. They are known to nest on the New Jersey shore of the Delaware River directly across from Petty's Island, after having previously nested in a tree on the island (McCort et al. 2010). In 2016-2017, we had sightings of Bald Eagles on the island on 14 September (heard calling in trees along edge of island), 28 January (juvenile flying over bridge to island), 30 April (juvenile perched along edge of island), and 4 June (two adults perched along edge of island; Tables 4-15). The relatively low frequency of sightings (Table 16) despite a known nest in the vicinity is likely due to their large home range and the fact that our surveys take place in the forest with few clear views of the river from the transect lines and points.

Pied-billed Grebe is an endangered species in New Jersey during the breeding season and of special concern in the non-breeding season. One was recorded in spring 2016 (18 March), though

no evidence of nesting was found (Allen and Tsipoura 2016). However, this and other secretive and/or nocturnal marsh species cannot be ruled out as nesters, especially as the large interior pond complex (e.g., between transects 02 and 03) represents potentially suitable nesting habitat (e.g., see NJDEP habitat description: <http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/pbgrebe.pdf>).

Great-blue Heron, a state species of special concern during the breeding season with a history of breeding at the site, was sighted in low numbers (one or two) in all four survey seasons in 2015-2016 (Allen and Tsipoura 2016). In 2016-2017, the only sightings close to the breeding season were 30 April (a fly over) and 31 August (foraging in the large ponds). This species was confirmed nesting in trees within the ponds on the site in 2004 (5 nests) and 2010 (2 nests; McCort et al. 2010). We observed no evidence of nesting on the site in 2014-2017 despite active searches. A nest of another species of special concern, Spotted Sandpiper, was also found in 2010 (McCort et al. 2010). We observed one Spotted Sandpiper foraging at an interior pond on August 17, 2014, but did not confirm breeding status. No Spotted Sandpipers have been observed since, during surveys or in eBird checklists. We also found no evidence for nesting by Cooper's Hawks in 2014-2017, despite presumed nesting on the site in 2010 (McCort et al. 2010). Other state-listed species recorded are likely to be transients due to the season they were observed in and the ranges and habitat requirements of the species (Walsh et al. 1999, Boyle 2011).

Fall Migration

During four 2016 fall migration visits, we recorded a total of 404 individual birds of 37 different species on transect surveys (Tables 4 and 5) and observed 10 additional species at the site outside of the surveys (Table 6). Notable observations include two Red-breasted Nuthatches (a first for the site) and an Eastern Towhee (an uncommon species at the site).

The following species were observed at the greatest frequency during fall migration, occurring at all six of the surveyed transects: American Robin, Carolina Wren, Northern Cardinal, Warbling Vireo, and Yellow-rumped Warbler (Table 4). Five other species were recorded at 5 of the 6 transects: Carolina Chickadee, Downy Woodpecker, Golden-crowned Kinglet, House Wren, and White-throated Sparrow. The most abundant species recorded was White-throated Sparrow (55 individuals recorded). Other abundant species included Canada Goose (39), Green-winged Teal (36), Yellow-rumped Warbler (28), and Carolina Wren (27). The number of species observed per transect ranged from 17 at PETT_T03 to 22 at PETT_T05 (Figure 3).

Winter

During the four winter 2016-2017 visits, we recorded 568 individual birds of 36 different species on transect surveys (Tables 7 and 8). We observed 9 additional species during site visits between transect surveys (Table 9). Notable sightings included the Red-shouldered Hawk heard calling at point 04 on 25 March, and several species of waterfowl both in the Delaware River and the interior ponds: American Black Duck, American Wigeon, Bufflehead, Canada Goose, Common Merganser, Gadwall, Green-winged Teal, Mallard, and Wood Duck (Tables 7-9).

American Robin, Carolina Wren, Downy Woodpecker, and Northern Cardinal were observed at the greatest transect frequency, occurring at all six transects (100% frequency). American Goldfinch, Carolina Chickadee, and House Finch were observed at 5 of the 6 survey transects (Table 7). American Robin accounted for the greatest number of individuals observed (98) and was followed by American Black Duck (82), Canada Goose (64), Red-winged Blackbird (48) and White-throated Sparrow (24; Table 7). The number of species observed per transect (across the four surveys) ranged from 12, recorded at PETT_T04, to 24 species, recorded at PETT_T01 (Table 7 and Figure 4).

Spring Migration

During three site visits in spring 2017, we recorded 415 individual birds of 43 different species on point count surveys (Tables 10 and 11). An additional 13 species were observed at the site, but not recorded during point count surveys (Table 12), for a total of 56 species. Notable sightings included 11 species of wood warblers, several other neotropical migrants, as well as Red-shouldered Hawk and Bald Eagle (see ‘State-listed Species’ above).

American Robin, Brown-headed Cowbird, House Wren, Warbling Vireo, and Yellow Warbler were observed at the greatest point frequency, occurring at all seven of the points surveyed (100% frequency); followed by American Goldfinch, Baltimore Oriole, Blue-gray Gnatcatcher, Carolina Chickadee, and Gray Catbird, which were recorded at 6 of 7 survey points (Table 10). The most abundant species recorded were Laughing Gull (51 observations), Yellow Warbler (39), American Robin (38), American Goldfinch (30), and Canada Goose (29). The number of species observed per point ranged from 15 at PETT_04 to 24 at PETT_06 and 07 (Table 10 and Figure 5).

Breeding Season

A total of 296 individual birds of 37 species were counted on the three point count survey visits in the summer breeding season in 2017 (Tables 13 and 14). Nine additional species were observed at the site, but not recorded on point count surveys (Table 15). Notable sightings included Red-shouldered Hawk and Bald Eagle (as discussed above), and a calling Yellow-billed Cuckoo on 13 July (Table 15). Yellow-billed Cuckoo was also heard during the July 2014 survey and could potentially breed at the site.

In the 2017 breeding season, American Robin, Cedar Waxwing, Gray Catbird, House Wren, and Yellow Warbler were found at the greatest frequency, each occurring at all 7 of the survey points (100%). American Goldfinch, Carolina Wren, and Downy Woodpecker were recorded on at least 6 of the 7 survey points (Table 13). The most abundant species recorded were American Robin (44 total observations), Gray Catbird (43), Yellow Warbler (40), House Wren (28), and Cedar Waxwing (24). The number of species observed per point ranged from 10 at PETT_01 to 22 at PETT_03 (Table 15 and Figure 6). We did not attempt to confirm breeding status of any species, though we did find direct evidence of breeding by the following species during the survey visits (2014-2017): American Robin, Canada Goose, Gray Catbird, House Finch, Northern Cardinal, and Yellow Warbler.

Other wildlife observations

Throughout the 2014-2017 survey visits, NJA staff kept records of other wildlife species observed on site; however, systematic surveys were not conducted, and this is not a full representation of wildlife using the site. In the current year, we found evidence for all six species of mammal that we had previously documented at the site (Allen and Tsipoura 2015, 2016): Raccoon (*Procyon lotor*; sightings, tracks), Eastern Gray Squirrel (*Sciurus carolinensis*; sightings), American Beaver (*Castor canadensis*; evidence: chewed trees), Groundhog (*Marmota monax*), White-tailed Deer (*Odocoileus virginianus*; many sightings), and Red Fox (*Vulpes vulpes*; tracks). No reptiles or amphibians were observed in the current survey year, but previous observations include Redbelly Turtle (*Pseudemys rubriventris*), Common Snapping Turtle (*Chelydra serpentina*), Green Frog (*Lithobates clamitans*), Bullfrog (*Lithobates catesbeiana*), Fowler's Toad (*Anaxyrus fowleri*), Northern Gray Tree Frog (*Hyla versicolor*), and Spring Peeper (*Pseudacris crucifer*). McCort et al. (2010) surveyed intensively for reptile and amphibian species and present a more inclusive list, although they did not observe Northern Gray Tree Frog or Spring Peeper. The newly-discovered Atlantic Coast Leopard Frog (*Rana kauffeldi*) should be searched for in future visits as Petty's Island is within its currently known range (Feinberg et al. 2014).

Two native plants of note that were encountered in the interior wetlands of the survey site include Rosy Meadowsweet (*Spirea tomentosa*) and an unidentified species of Lady's Tresses Orchid (*Spiranthes* sp.; Allen and Tsipoura 2015). The orchid was only seen by us in September 2014. Seven flowering individuals of *Spiranthes vernalis* were found growing in a ditch on the northern part of the island by McCort et al. (2010), and this could be the same species.

CONCLUSIONS

Petty's Island contains multiple habitat types, from extensive forested wetlands to dry grasslands, within its approximately 300-acre boundaries plus an additional 140+ acres of ecologically important tidal mudflats and marshes surrounding it. Its potential importance for connecting the urban population centers of Camden and Philadelphia to nature is also highly significant. This report summarizes the third year of standardized bird surveys at the site. As NJNLT and partners move forward with habitat restoration at the site, these data, along with the fourth year of surveys already begun, will serve as a valuable baseline. Continued post-management surveys, performed in a consistent and similarly rigorous manner, will be useful to detect any changes in bird use. Ultimately, the use of analyses that correct for observer biases (e.g., occupancy modeling, distance analysis) will enhance our ability to identify any changes through time.

Our primary survey area, the 76-acre forested southwestern end, contains significant areas of wetlands and is home to a diverse bird community typical of riparian forest and wetlands. During the breeding season, songbirds such as Yellow Warbler and Warbling Vireo are common, while in migration the island is host to an array of wetland-dependent migrants such as Rusty Blackbird and Northern Waterthrush as well as forest generalists. The state-listed Red-shouldered Hawk (endangered) appears to be breeding at or nearby the site based on multiple observations during the nesting season. The Great Blue Heron (a species of special concern)

formerly bred at the site and has been observed multiple times during the late spring and summer months. Numerous waterfowl, including Pied-billed Grebe, American Wigeon, Blue-winged Teal, Green-winged Teal, Hooded Merganser, American Black Duck, Wood Duck, and Gadwall, frequent the central ponds during migration, while other, deeper-water species such as Bufflehead, Common Loon, Scaup, and Common Merganser occur along the shorelines. Spotted Sandpipers (a state species of special concern) forage in the mud of the ponds and have bred at the site (McCort et al. 2010). The state of these forested wetlands is remarkable given the location within a large urbanized landscape, and even more so considering that historical aerial photos show the area was heavily disturbed and partially non-existent (a yet-to-be filled area of the river) as recently as the 1930s (Figure 1).

The recovery of the forested area since the 1930s speaks to the great potential for planned forest and grassland restoration efforts on the remaining two-thirds of the island. While these areas were not surveyed in the first three years of the study due to safety concerns, we observed numerous species of wildlife using the area while travelling across the island. Red-tailed Hawks and Red Foxes were frequently observed hunting the grassy areas between oil-storage tanks. Wild Turkey, American Kestrel, Eastern Kingbird, and large mixed flocks of blackbirds were also seen in this habitat, and McCort et al. (2010) even found obligate-grassland species during migration, including Grasshopper Sparrow and Bobolink (Table 17). Overall, we believe there is great potential for grassland and forest restoration efforts planned in these areas (NJNLT 2015).

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TABLE 1. Survey point (a) and transect (b) coordinates, and number of surveys conducted between August 2016 and July 2017 at the south end of Petty’s Island, Pennsauken, NJ. See also Figure 2.

a. Point Count Locations (Spring Migration and Breeding Surveys)

Point ID	Latitude	Longitude	# of Surveys	
			Spring	Breeding
PETT_01	39.96141	-75.10546	3	3
PETT_02	39.96191	-75.10934	3	3
PETT_03	39.96338	-75.11151	3	3
PETT_04	39.96525	-75.11117	3	3
PETT_05	39.96432	-75.11401	3	3
PETT_06	39.96267	-75.11664	3	3
PETT_07	39.96214	-75.11367	3	3

b. Transect Locations (Winter and Fall Migration Surveys)

Transect ID	'A' End		'B' End		# of Surveys	
	Latitude	Longitude	Latitude	Longitude	Winter	Fall
PETT_T01	39.96178	-75.10471	39.96103	-75.10621	4	4
PETT_T02	39.96122	-75.10933	39.96260	-75.10934	4	4
PETT_T03	39.96453	-75.11083	39.96324	-75.11149	4	4
PETT_T04	39.96458	-75.11272	39.96383	-75.11424	4	4
PETT_T05	39.96268	-75.11621	39.96235	-75.11447	4	4
PETT_T06	39.96222	-75.11273	39.96185	-75.11100	4	4

TABLE 2. Summary of surveys conducted at Petty’s Island, Pennsauken, NJ, August 2016 through July 2017, including a) a tabulation of winter, spring and fall migration and breeding bird surveys, and b) a list of survey dates.

a.

	Fall 2016	Winter 2016 - 2017	Spring 2017	Breeding 2017	Total 2016-17
Points/transects surveyed	0/6	0/6	7/0	7/0	7/6
# of survey visits	4	4	3	3	14
Species recorded on point/transect counts	37	36	43	37	71
Total species observed	47	45	56	46	88
T&E species	1	3	2	2	3
Special Concern species	2	2	5	0	7
Total individuals counted	404	568	415	296	1,683

b.

	Fall 2016	Winter 2016- 2017	Spring 2017	Breeding 2017
	8/31/2016	12/22/2016	4/14/2017	6/4/2017
	9/14/2016	1/28/2017	4/30/2017	6/23/2017
Survey Dates	10/14/2016	2/27/2017	5/12/2017	7/13/2017
	11/2/2016	3/25/2017		

TABLE 3. Full list of bird species observed at Petty’s Island, Pennsauken, NJ between August 2016 and July 2017, during winter, spring and fall migration, and breeding season surveys. “Obs” refers to species only observed during travel between survey points/transects. State-listed species are in red (Endangered), blue (Threatened), or green (Special Concern).

	Fall 2016		Winter 2016/17		Spring 2017		Breeding 2017	
	Survey	Obs	Survey	Obs	Survey	Obs	Survey	Obs
American Black Duck			x			x		
American Crow			x					
American Goldfinch	x		x		x		x	
American Kestrel				x				
American Redstart					x		x	
American Robin	x		x		x		x	
American Wigeon				x				
Bald Eagle ^{Br, T(NB)}		x		x		x		x
Baltimore Oriole	x				x		x	
Barn Swallow					x			
Blackburnian Warbler ^{Br}						x		
Black-and-white Warbler						x		
Black-throated Blue Warbler ^{Br}					x			
Blue Jay					x		x	
Blue-gray Gnatcatcher		x			x		x	
Brown-headed Cowbird			x		x		x	
Bufflehead				x				
Canada Goose	x		x		x		x	
Carolina Chickadee	x		x		x		x	
Carolina Wren	x		x		x		x	
Cedar Waxwing				x	x		x	
Chimney Swift	x				x		x	
Common Grackle	x				x		x	
Common Merganser				x				
Common Yellowthroat					x		x	
Dark-eyed Junco	x		x					
Double-crested Cormorant		x			x			x
Downy Woodpecker	x		x		x		x	
Eastern Kingbird						x	x	
Eastern Phoebe			x					
Eastern Towhee	x							
Eastern Wood-Pewee							x	
European Starling		x	x					x
Fish Crow							x	
Gadwall			x					
Golden-crowned Kinglet	x		x					
Gray Catbird	x				x		x	
Great Black-backed Gull				x				
Great Blue Heron ^{Br}	x		x			x		
Great Crested Flycatcher					x		x	
Great Egret		x						
Green Heron		x						
Green-winged Teal	x		x					
Hairy Woodpecker	x		x		x		x	
Hermit Thrush	x							
Herring Gull		x	x					
House Finch	x		x		x		x	
House Wren	x				x		x	

TABLE 3. (cont'd)

	Fall 2016		Winter 2016/17		Spring 2017		Breeding 2017	
	Survey	Obs	Survey	Obs	Survey	Obs	Survey	Obs
Killdeer		x						
Laughing Gull		x			x			
Lesser Scaup				x				
Mallard	x		x			x		x
Mourning Dove	x		x				x	
Northern Cardinal	x		x		x		x	
Northern Flicker	x		x		x			
Northern Mockingbird	x							x
Northern Parula ^{Br}					x			
N. Rough-winged Swallow	x							
Northern Waterthrush						x		
Orchard Oriole					x		x	
Ovenbird					x			
Prairie Warbler						x		
Red-bellied Woodpecker	x		x		x		x	
Red-breasted Nuthatch	x							
Red-eyed Vireo					x		x	
Red-shouldered Hawk ^{Br, SC(NB)}			x		x		x	
Red-tailed Hawk			x				x	
Red-winged Blackbird			x		x			x
Ring-billed Gull		x	x		x			
Rose-breasted Grosbeak					x			
Ruby-crowned Kinglet	x		x					
Ruby-throated Hummingbird							x	
Song Sparrow	x		x			x	x	
Swainson's Thrush						x		
Tree Swallow					x		x	
Tufted Titmouse	x		x		x		x	
Veery ^{Br}	x							
Warbling Vireo	x				x		x	
White-breasted Nuthatch	x		x					
White-throated Sparrow	x		x		x			
Wild Turkey	x		x			x		x
Willow Flycatcher							x	
Winter Wren ^{Br}				x				
Wood Duck	x		x		x			x
Wood Thrush ^{Br}						x		
Yellow Warbler					x		x	
Yellow-billed Cuckoo					x			x
Yellow-rumped Warbler	x		x		x			

^{Br} = breeding season status only

^{SC(NB)} = Special Concern status in non-breeding seasons

^{T(NB)} = Threatened status in non-breeding seasons

TABLE 4. Total species list and number of individuals observed during 2016 fall migration transect surveys at Petty’s Island, Pennsauken, NJ, by transect. Frequency (freq.) is the proportion of transects at which a species was observed. Relative abundance is the number of individuals of that species divided by the total number of individuals of all species. State-listed species are in red (E), blue (T), or green (SC).

	# of		Transect ID						Rel.	
	Transects	Freq	01	02	03	04	05	06	Total	Abundance
American Goldfinch	3	0.50	2		1		3		6	0.015
American Robin	6	1.00	5	10	1	3	1	3	23	0.057
Baltimore Oriole	1	0.17		1					1	0.002
Canada Goose	3	0.50			3		31	5	39	0.097
Carolina Chickadee	5	0.83	1	1		3	3	6	14	0.035
Carolina Wren	6	1.00	1	4	4	5	5	8	27	0.067
Chimney Swift	4	0.67	5	2			2	1	10	0.025
Common Grackle	2	0.33		1			1		2	0.005
Dark-eyed Junco	3	0.50	3	5	8				16	0.040
Downy Woodpecker	5	0.83	3	1		3	3	2	12	0.030
Eastern Towhee	1	0.17					1		1	0.002
Golden-crowned Kinglet	5	0.83	4		4	3	4	3	18	0.045
Gray Catbird	4	0.67		1		1	5	7	14	0.035
Great Blue Heron ^{Br}	2	0.33			2	1			3	0.007
Green-winged Teal	1	0.17			36				36	0.089
Hairy Woodpecker	1	0.17				1			1	0.002
Hermit Thrush	2	0.33	1	1					2	0.005
House Finch	2	0.33	4			6			10	0.025
House Wren	5	0.83		1	1	2	1	1	6	0.015
Mallard	1	0.17			2				2	0.005
Mourning Dove	1	0.17				1			1	0.002
Northern Cardinal	6	1.00	3	4	1	5	5	6	24	0.059
Northern Flicker	3	0.50		2		2	2		6	0.015
Northern Mockingbird	1	0.17					1		1	0.002
N. Rough-winged Swallow	1	0.17	2						2	0.005
Red-bellied Woodpecker	4	0.67		1	2		2	1	6	0.015
Red-breasted Nuthatch	1	0.17				2			2	0.005
Ruby-crowned Kinglet	3	0.50				1	2	1	4	0.010
Song Sparrow	3	0.50		1	1		1		3	0.007
Tufted Titmouse	2	0.33		1				1	2	0.005
Veery ^{Br}	1	0.17	1						1	0.002
Warbling Vireo	6	1.00	2	1	2	2	3	3	13	0.032
White-breasted Nuthatch	3	0.50	1		1			1	3	0.007
White-throated Sparrow	5	0.83	14	11		8	13	9	55	0.136
Wild Turkey	4	0.67	1	2			1	5	9	0.022
Wood Duck	1	0.17			1				1	0.002
Yellow-rumped Warbler	6	1.00	1	8	4	4	5	6	28	0.069
Total # of Individuals			54	59	74	53	95	69	404	
Total # of Species			18	20	17	18	22	18	37	

TABLE 5. Total species list and number of individuals observed during 2016 Fall Migration transect surveys at Petty’s Island, Pennsauken, NJ, by survey. Maximum represents the maximum number of individuals observed on any one survey (across all points). State-listed species are in red (E), blue (T), or green (SC).

	<u>Survey Date</u>				<u>Total</u>	<u>Max per Survey</u>
	<u>8/31/16</u>	<u>9/14/16</u>	<u>10/14/16</u>	<u>11/2/16</u>		
American Goldfinch	1	2		3	6	3
American Robin	3	7	1	12	23	12
Baltimore Oriole	1				1	1
Canada Goose			39		39	39
Carolina Chickadee		5	3	6	14	6
Carolina Wren	6	9	4	8	27	9
Chimney Swift	1	9			10	9
Common Grackle		2			2	2
Dark-eyed Junco			4	12	16	12
Downy Woodpecker	3	3	3	3	12	3
Eastern Towhee			1		1	1
Golden-crowned Kinglet			10	8	18	10
Gray Catbird	6	6	2		14	6
Great Blue Heron ^{Br}	1	2			3	2
Green-winged Teal			22	14	36	22
Hairy Woodpecker				1	1	1
Hermit Thrush				2	2	2
House Finch				10	10	10
House Wren		6			6	6
Mallard			2		2	2
Mourning Dove		1			1	1
Northern Cardinal	7	7	4	6	24	7
Northern Flicker		1	2	3	6	3
Northern Mockingbird		1			1	1
N. Rough-winged Swallow		2			2	2
Red-bellied Woodpecker	1	3		2	6	3
Red-breasted Nuthatch		1	1		2	1
Ruby-crowned Kinglet			2	2	4	2
Song Sparrow				3	3	3
Tufted Titmouse				2	2	2
Veery ^{Br}	1				1	1
Warbling Vireo	2	11			13	11
White-breasted Nuthatch			2	1	3	2
White-throated Sparrow			28	27	55	28
Wild Turkey	1	1	7		9	7
Wood Duck		1			1	1
Yellow-rumped Warbler			17	11	28	17
Total # of Individuals	34	80	154	136	404	
Total # of Species	13	20	19	20	37	

^{Br} = breeding season status only.

TABLE 6. Additional species observed at Petty’s Island, Pennsauken, NJ during 2016 Fall Migration surveys, but not recorded on transect surveys. State-listed species are in red (E), blue (T), or green (SC).

Species	Notes
Bald Eagle ^{Br, T(NB)}	Perched and calling in a tree along the river between transects 05-06 on 9/14/2016
Blue-gray Gnatcatcher	Between transects 05-06 on 9/14/2016
Double-crested Cormorant	In river during the 9/14 and 10/14/2016 survey visits
European Starling	Seen 9/14 and 11/2/2016 between transects 01-02 and 02-03
Great Egret	Two in the large pond between transects 03-02 on 8/31/2016
Green Heron	One in the large pond between transects 03-02 on 8/31/2016
Herring Gull	In river on 9/14/2016
Killdeer	Heard overhead between transects 01-06 on 10/14/2016
Laughing Gull	10 flew over, calling, between transects 04-05 on 10/14/2016
Ring-billed Gull	Up to 25 individuals on river on 8/31, 10/14, and 11/2/2016

^{Br} = breeding season status only

^{T(NB)} = Threatened status in non-breeding season

TABLE 7. Total species list and number of individuals observed during Winter 2016-2017 transect surveys at Petty’s Island, Pennsauken, NJ, by transect. Frequency (freq.) was calculated as the number of points at which a species was observed divided by the total number of points surveyed. Relative abundance was calculated as the number of individuals of that species divided by the total number of individuals of all species. State-listed species are in red (E), blue (T), or green (SC).

	# of Transects	Freq	Transect ID						Total	Rel.
			01	02	03	04	05	06		Abundance
American Black Duck	3	0.50	27	53	2				82	0.144
American Crow	1	0.17					4		4	0.007
American Goldfinch	5	0.83	3	2	2	1	1		9	0.016
American Robin	6	1.00	17	33	3	9	20	16	98	0.173
Brown-headed Cowbird	3	0.50	1	1			3		5	0.009
Canada Goose	4	0.67	28		8		3	25	64	0.113
Carolina Chickadee	5	0.83	5	2		1	8	7	23	0.040
Carolina Wren	6	1.00	2	3	1	5	5	4	20	0.035
Dark-eyed Junco	4	0.67	6	2			6	4	18	0.032
Downy Woodpecker	6	1.00	3	2	1	4	3	3	16	0.028
Eastern Phoebe	1	0.17			1				1	0.002
European Starling	2	0.33	1	5					6	0.011
Gadwall	1	0.17						4	4	0.007
Golden-crowned Kinglet	4	0.67	2	1			2	3	8	0.014
Great Blue Heron ^{Br}	1	0.17			1				1	0.002
Green-winged Teal	2	0.33			6			13	19	0.033
Hairy Woodpecker	3	0.50	1	2		1			4	0.007
Herring Gull	3	0.50	1	4				1	6	0.011
House Finch	5	0.83	3	2		1	1	2	9	0.016
Mallard	3	0.50	4	6	4				14	0.025
Mourning Dove	1	0.17	1						1	0.002
Northern Cardinal	6	1.00	1	4	4	2	6	2	19	0.033
Northern Flicker	3	0.50				1	1	1	3	0.005
Red-bellied Woodpecker	1	0.17		1					1	0.002
Red-shouldered Hawk ^{Br, SC(NB)}	1	0.17				1			1	0.002
Red-tailed Hawk	1	0.17		1					1	0.002
Red-winged Blackbird	4	0.67	1	43	2			2	48	0.085
Ring-billed Gull	2	0.33	10	12					22	0.039
Ruby-crowned Kinglet	1	0.17					1		1	0.002
Song Sparrow	3	0.50	1	2			1		4	0.007
Tufted Titmouse	1	0.17					1		1	0.002
White-breasted Nuthatch	3	0.50	1			1	2		4	0.007
White-throated Sparrow	4	0.67	4	8			9	3	24	0.042
Wild Turkey	2	0.33	2	7					9	0.016
Wood Duck	2	0.33			1			2	3	0.005
Yellow-rumped Warbler	4	0.67	1		3	8	3		15	0.026
Total # of Individuals			126	196	39	35	80	92	568	
Total # of Species			24	22	14	12	19	16	36	

^{Br} = breeding season status only

^{SC(NB)} = Special Concern status in non-breeding season

TABLE 8. Total species list and number of individuals observed during winter 2016-2017 transect surveys at Petty’s Island, Pennsauken, NJ, by survey. Maximum represents the maximum number of individuals observed on any one survey (across all points). State-listed species are in red (E), blue (T), or green (SC).

	Survey 1 12/22/2016	Survey 2 1/28/2017	Survey 2 2/27/2017	Survey 3 3/25/2017	Total	Max per Survey
American Black Duck	53	2	27		82	53
American Crow			4		4	4
American Goldfinch	5	1		3	9	5
American Robin	20	36	2	40	98	40
Brown-headed Cowbird			1	4	5	4
Canada Goose	21		10	33	64	33
Carolina Chickadee	5	8	5	5	23	8
Carolina Wren	8	2	5	5	20	8
Dark-eyed Junco	6		8	4	18	8
Downy Woodpecker	4	5	4	3	16	5
Eastern Phoebe				1	1	1
European Starling		4	1	1	6	4
Gadwall				4	4	4
Golden-crowned Kinglet	2		3	3	8	3
Great Blue Heron ^{Br}	1				1	1
Green-winged Teal			2	17	19	17
Hairy Woodpecker	1	2	1		4	2
Herring Gull		4	1	1	6	4
House Finch	2		2	5	9	5
Mallard	6	2	4	2	14	6
Mourning Dove				1	1	1
Northern Cardinal	9	1	7	2	19	9
Northern Flicker	2			1	3	2
Red-bellied Woodpecker	1				1	1
Red-shouldered Hawk ^{Br, SC(NB)}				1	1	1
Red-tailed Hawk		1			1	1
Red-winged Blackbird		38	2	8	48	38
Ring-billed Gull	10	10	2		22	10
Ruby-crowned Kinglet				1	1	1
Song Sparrow		1	2	1	4	2
Tufted Titmouse				1	1	1
White-breasted Nuthatch	2	1		1	4	2
White-throated Sparrow	12	4	2	6	24	12
Wild Turkey		7	2		9	7
Wood Duck			1	2	3	2
Yellow-rumped Warbler	7	3	4	1	15	7
Total # of Individuals	177	132	102	157	568	
Total # of Species	20	19	24	28	36	

^{Br} = breeding season status only

^{SC(NB)} = Special Concern status in non-breeding season

TABLE 9. Additional species (a) observed at Petty’s Island, Pennsauken, NJ during winter 2016 - 2017, but not encountered on transect surveys. State-listed species are in red (E), blue (T), or green (SC).

Species	Notes
American Kestrel	On wire near oil tanks along road to the parking site, 12/22/2016
American Wigeon	Four in large pond on 2/27/2017
Bald Eagle ^{Br, T(NB)}	Seen flying over bridge to island on 1/28/2017
Bufflehead	Up to four seen in river on 1/28 and 2/27/2017
Cedar Waxwing	Observed between transects 06-01 on 12/22/2016
Common Merganser	Four flying over river on 1/28/2017
Great Black-backed Gull	Up to five on mudflat in river on 1/28, 2/27, and 3/25/2017
Lesser Scaup	40-50 on far (NJ) side of river on 2/27 and 3/25/2017
Winter Wren ^{Br}	Between transects 03-04 on 12/22/2016

^{Br} = breeding season status only

^{T(NB)} = Threatened status in non-breeding season

TABLE 10. Total species list and number of individuals observed during 2017 Spring Migration surveys at Petty’s Island, Pennsauken, NJ, by transect. Frequency (freq.) was calculated as the number of transects at which a species was observed divided by the total number of transects surveyed. Relative abundance was calculated as the number of individuals of that species divided by the total number of individuals of all species. State-listed species are in red (E), blue (T), or green (SC).

	# of Points	Freq	Point ID							Total	Rel. Abundance
			01	02	03	04	05	06	07		
American Goldfinch	6	0.86	9	5	4	2	7		3	30	0.072
American Redstart	1	0.14							1	1	0.002
American Robin	7	1.00	8	5	3	5	9	4	4	38	0.092
Baltimore Oriole	6	0.86	2	3	3		2	4	4	18	0.043
Barn Swallow	1	0.14		1						1	0.002
Black-throated Blue Warbler ^{Br}	2	0.29					1		1	2	0.005
Blue Jay	3	0.43		2		1		3		6	0.014
Blue-gray Gnatcatcher	6	0.86	1	2	4		2	4	2	15	0.036
Brown-headed Cowbird	7	1.00	2	5	1	2	5	1	1	17	0.041
Canada Goose	5	0.71	1	6	13	3		6		29	0.070
Carolina Chickadee	6	0.86	1		5	1	1	1	2	11	0.027
Carolina Wren	5	0.71	3		1	1	3	1		9	0.022
Cedar Waxwing	1	0.14	1							1	0.002
Chimney Swift	2	0.29		4					5	9	0.022
Common Grackle	2	0.29			1	1				2	0.005
Common Yellowthroat	2	0.29						1	1	2	0.005
Double-crested Cormorant	2	0.29		7				2		9	0.022
Downy Woodpecker	4	0.57			1		1	1	3	6	0.014
Gray Catbird	6	0.86	4	3	3	4	4	2		20	0.048
Great Crested Flycatcher	1	0.14	1							1	0.002
Hairy Woodpecker	1	0.14	1							1	0.002
House Finch	3	0.43	1					2	1	4	0.010
House Wren	7	1.00	4	2	3	2	3	4	4	22	0.053
Laughing Gull	3	0.43			35	12			4	51	0.123
Northern Cardinal	4	0.57	4	1		2		1		8	0.019
Northern Flicker	3	0.43		2	1			1		4	0.010
Northern Parula ^{Br}	4	0.57		1			1	1	3	6	0.014
Orchard Oriole	1	0.14			1					1	0.002
Ovenbird	1	0.14					1			1	0.002
Red-bellied Woodpecker	3	0.43				1		1	1	3	0.007
Red-eyed Vireo	1	0.14					1			1	0.002
Red-shouldered Hawk ^{Br, SC(NB)}	1	0.14							1	1	0.002
Red-winged Blackbird	2	0.29			2				2	4	0.010
Ring-billed Gull	1	0.14						1		1	0.002
Rose-breasted Grosbeak	1	0.14							1	1	0.002
Tree Swallow	3	0.43			7			4	4	15	0.036
Tufted Titmouse	1	0.14						1		1	0.002
Warbling Vireo	7	1.00	2	3	2	2	2	1	1	13	0.031
White-throated Sparrow	3	0.43		1			1		4	6	0.014
Wood Duck	1	0.14		2						2	0.005
Yellow Warbler	7	1.00	6	9	4	4	4	7	5	39	0.094

^{Br} = breeding season status only; ^{SC(NB)} = Special Concern status in non-breeding season.

TABLE 10. (continued)

	# of Transects	Freq	Point ID							Total	Rel. Abundance
			01	02	03	04	05	06	07		
Yellow-billed Cuckoo	2	0.29		1					1	2	0.005
Yellow-rumped Warbler	1	0.14							1	1	0.002
Total # of Individuals			51	65	94	43	48	55	59	415	
Total # of Species			17	20	19	15	17	24	24	43	

Br = breeding season status only; ^{SC(NB)} = Special Concern status in non-breeding season.

TABLE 11. Total species list and number of individuals observed during 2017 Spring Migration point count surveys at Petty’s Island, Pennsauken, NJ, by survey. Maximum represents the maximum number of individuals observed on any one survey (across all transects). State-listed species are in red (E), blue (T), or green (SC).

	Survey 1 4/14/2017	Survey 2 4/30/2017	Survey 3 5/12/2017	Total	Max per Survey
American Goldfinch	23		7	30	23
American Redstart			1	1	1
American Robin	20	9	9	38	20
Baltimore Oriole		10	8	18	10
Barn Swallow			1	1	1
Black-throated Blue Warbler ^{Br}			2	2	2
Blue Jay	1	2	3	6	3
Blue-gray Gnatcatcher	4	8	3	15	8
Brown-headed Cowbird	8	4	5	17	8
Canada Goose	11	7	11	29	11
Carolina Chickadee	8	1	2	11	8
Carolina Wren	5	2	2	9	5
Cedar Waxwing	1			1	1
Chimney Swift		4	5	9	5
Common Grackle	1		1	2	1
Common Yellowthroat		2		2	2
Double-crested Cormorant		9		9	9
Downy Woodpecker	2	1	3	6	3
Gray Catbird		9	11	20	11
Great Crested Flycatcher			1	1	1
Hairy Woodpecker		1		1	1
House Finch	3		1	4	3
House Wren	4	11	7	22	11
Laughing Gull		39	12	51	39
Northern Cardinal	4	3	1	8	4
Northern Flicker	4			4	4
Northern Parula ^{Br}		1	5	6	5
Orchard Oriole			1	1	1
Ovenbird		1		1	1
Red-bellied Woodpecker		1	2	3	2
Red-eyed Vireo			1	1	1
Red-shouldered Hawk ^{Br, SC(NB)}			1	1	1
Red-winged Blackbird	3	1		4	3
Ring-billed Gull	1			1	1
Rose-breasted Grosbeak			1	1	1
Tree Swallow	6	5	4	15	6
Tufted Titmouse	1			1	1
Warbling Vireo		6	7	13	7
White-throated Sparrow	3	3		6	3
Wood Duck	2			2	2
Yellow Warbler		19	20	39	20

^{Br} = breeding season status only

^{SC(NB)} = Special Concern status in non-breeding season

TABLE 11. (continued)

	Survey 1	Survey 2	Survey 3		Max per
	4/14/2017	4/30/2017	5/12/2017	Total	Survey
Yellow-billed Cuckoo		2		2	2
Yellow-rumped Warbler			1	1	1
Total # of Individuals	115	161	139	415	
Total # of Species	21	26	31	43	

^{Br} = breeding season status only

^{SC(NB)} = Special Concern status in non-breeding season

TABLE 12. Additional species observed at Petty’s Island, Pennsauken, NJ during 2017 spring migration surveys, but not encountered on transect surveys. State-listed species are in red (E), blue (T), or green (SC).

Species	Notes
American Black Duck	In river (near shore) between points 01-02 on 4/14/2017
Bald Eagle ^{Br, T(NB)}	Immature bird perched in tree on edge of island near point 07, 4/30/2017
Blackburnian Warbler ^{Br}	Encountered between points 02-03 on 4/30/2017
Black-and-white Warbler	Encountered between points 05 and 06 on 4/30/2017
Eastern Kingbird	Perched along road leading to the parking area, 4/30/2017
Great Blue Heron ^{Br}	Flew over between points 06-07 on 4/30/2017
Mallard	In river and ponds on 4/14, 4/30, and 5/12/2017
Northern Waterthrush	Encountered between points 05-06 on 4/30/2017
Prairie Warbler	Encountered between points 02-03 on 4/30/2017
Song Sparrow	Encountered between points 01-07 on 4/30/2017
Swainson’s Thrush	Encountered between points 05-06 on 4/30/2017
Wild Turkey	Encountered between points 02-03 on 4/30/2017
Wood Thrush ^{Br}	Encountered between points 05-06 on 4/30/2017

^{Br} = breeding season status only

^{T(NB)} = Threatened status in non-breeding season

TABLE 13. Total species list and number of individuals observed during 2017 Breeding Season surveys at Petty’s Island, Pennsauken, NJ, by transect. Frequency (freq.) was calculated as the number of transects at which a species was observed divided by the total number of transects surveyed. Relative abundance was calculated as the number of individuals of that species divided by the total number of individuals of all species. State-listed species are in red (E), blue (T), or green (SC).

	# of Points	Freq	Point ID							Total	Rel. Abundance
			01	02	03	04	05	06	07		
American Goldfinch	4	0.57		3	3		2	1		9	0.030
American Redstart	1	0.14					1			1	0.003
American Robin	7	1.00	10	4	6	1	8	7	8	44	0.149
Baltimore Oriole	4	0.57	2	4	1		2			9	0.030
Blue Jay	2	0.29				1			1	2	0.007
Blue-gray Gnatcatcher	3	0.43		1	1		1			3	0.010
Brown-headed Cowbird	2	0.29		4	1					5	0.017
Canada Goose	4	0.57		5	2			2	2	11	0.037
Carolina Chickadee	4	0.57		1	3	2			2	8	0.027
Carolina Wren	3	0.43				3	1		1	5	0.017
Cedar Waxwing	7	1.00	6	6	2	2	1	6	1	24	0.081
Chimney Swift	1	0.14				1				1	0.003
Common Grackle	2	0.29			2		3			5	0.017
Common Yellowthroat	2	0.29					1	1		2	0.007
Downy Woodpecker	4	0.57		2	1			2	4	9	0.030
Eastern Kingbird	2	0.29				1	1			2	0.007
Eastern Wood-Pewee	1	0.14							2	2	0.007
Fish Crow	1	0.14			1					1	0.003
Gray Catbird	7	1.00	9	5	9	7	6	6	1	43	0.145
Great Crested Flycatcher	3	0.43	1		2				1	4	0.014
Hairy Woodpecker	1	0.14					2			2	0.007
House Finch	1	0.14							1	1	0.003
House Wren	7	1.00	4	1	5	3	4	4	7	28	0.095
Mourning Dove	1	0.14						1		1	0.003
Northern Cardinal	5	0.71	2	1	1			1	3	8	0.027
Orchard Oriole	1	0.14			1					1	0.003
Red-bellied Woodpecker	3	0.43	1	2			1			4	0.014
Red-eyed Vireo	1	0.14		1						1	0.003
Red-shouldered Hawk Br. SC(NB)	1	0.14			1					1	0.003
Red-tailed Hawk	1	0.14							1	1	0.003
Ruby-throated Hummingbird	1	0.14					1			1	0.003
Song Sparrow	1	0.14			1					1	0.003
Tree Swallow	2	0.29			1				1	2	0.007
Tufted Titmouse	1	0.14	1							1	0.003
Warbling Vireo	6	0.86		2	3	2	1	3	1	12	0.041
Willow Flycatcher	1	0.14			1					1	0.003
Yellow Warbler	7	1.00	5	6	3	5	7	9	5	40	0.135
Total # of Individuals			41	48	51	28	43	43	42	296	
Total # of Species			10	16	22	11	17	12	17	37	

Br = breeding season status only

SC(NB) = Special Concern status in non-breeding season

TABLE 14. Total species list and number of individuals observed during 2017 Breeding Season point count surveys at Petty’s Island, Pennsauken, NJ, by survey. Maximum represents the maximum number of individuals observed on any one survey (across all transects). State-listed species are in red (E), blue (T), or green (SC).

	Survey 1	Survey 2	Survey 3		Max per Survey
	6/4/2017	6/23/2017	7/13/2017	Total	
American Goldfinch	5	2	2	9	5
American Redstart	1			1	1
American Robin	11	15	18	44	18
Baltimore Oriole	5	4		9	5
Blue Jay		1	1	2	1
Blue-gray Gnatcatcher		1	2	3	2
Brown-headed Cowbird	1	1	3	5	3
Canada Goose	9		2	11	9
Carolina Chickadee		3	5	8	5
Carolina Wren	1	1	3	5	3
Cedar Waxwing	11	5	8	24	11
Chimney Swift	1			1	1
Common Grackle	5			5	5
Common Yellowthroat	1	1		2	1
Downy Woodpecker	3	3	3	9	3
Eastern Kingbird	1	1		2	1
Eastern Wood-Pewee	1		1	2	1
Fish Crow		1		1	1
Gray Catbird	13	14	16	43	16
Great Crested Flycatcher	3		1	4	3
Hairy Woodpecker		2		2	2
House Finch	1			1	1
House Wren	7	7	14	28	14
Mourning Dove			1	1	1
Northern Cardinal	3	2	3	8	3
Orchard Oriole		1		1	1
Red-bellied Woodpecker	1	2	1	4	2
Red-eyed Vireo	1			1	1
Red-shouldered Hawk ^{Br, SC(NB)}	1			1	1
Red-tailed Hawk		1		1	1
Ruby-throated Hummingbird		1		1	1
Song Sparrow	1			1	1
Tree Swallow	2			2	2
Tufted Titmouse			1	1	1
Warbling Vireo	5	3	4	12	5
Willow Flycatcher	1			1	1
Yellow Warbler	18	13	9	40	18
Total # of Individuals	113	85	98	296	
Total # of Species	27	23	20	37	

^{Br} = breeding season status only

^{SC(NB)} = Special Concern status in non-breeding season

TABLE 15. Additional species observed at Petty’s Island, Pennsauken, NJ during 2017 breeding season, but not encountered on point count surveys. State-listed species are in red (E), blue (T), or green (SC).

Species	Notes
Bald Eagle ^{Br, T(NB)}	Two adults flushed from trees on edge of island between points 01-07, 6/4/2017
Double-crested Cormorant	In river on 6/4/2017
European Starling	Between points 01-07 on 6/4 and 7/13/2017
Mallard	In river on 6/4/2017
Northern Mockingbird	Along road near parking area (near point 1) on 7/13/2017
Red-winged Blackbird	Between points 02-03 and 03-04 on 6/4 and 6/23/2017
Wild Turkey	Encountered between parking area (near point 01) and point 07 on 6/4, 6/23, and 7/13/2017
Wood Duck	Male and female in pond between points 02-03 on 6/4/2017
Yellow-billed Cuckoo	Calling at point 05 after count on 7/13/2017

^{Br} = breeding season status only

^{T(NB)} = Threatened status in non-breeding season.

TABLE 16. Full list of bird species observed at Petty’s Island, Pennsauken, NJ during the first three years of baseline surveys (2014-2017). State-listed species are in red (E), blue (T), or green (SC) text. ‘x’ indicates detection during a point count or transect survey, “*” denotes incidental detections between surveys, and “e” denotes a report from the Petty Island eBird hotspot (two checklists¹ from late April 2016 and 2017).

Species	Breeding 14 ²	Fall 14	Winter 14/15	Spring 15	Breeding 15	Fall 15	Winter 15/16	Spring 16	Breeding 16	Fall 16	Winter 16/17	Spring 17	Breeding 17
American Black Duck		x	*	*			x	*	*		x	*	
American Crow		x	*			*					x		
American Goldfinch	x	x	x	x	x	x	x	x	x	x	x	x	x
American Kestrel											*		
American Redstart		x		*	x	x		x	x			x	x
American Robin	x	x	x	x	x	x	x	x	x	x	x	x	x
American Woodcock			*										
American Wigeon											*		
Bald Eagle ^{Br, T(NB)}		*	*			*			*	*	*	*	*
Baltimore Oriole		x		x	x	x		x	x	x		x	x
Barn Swallow						x		e				x	
Blackburnian Warbler												*	
Belted Kingfisher		x		x				e					
Black-and-White Warbler		x		x				x				*	
Black-throated Blue Warbler ^{Br}				*		*		x				x	
Blackpoll Warbler				x									
Blue Jay		x		*		x	x	x				x	x
Blue-gray Gnatcatcher	x	*		x	x			x	x	*		x	x
Blue-winged Teal				*				*					
Brown-headed Cowbird	x	x	x	x	x	x	x	x	x		x	x	x
Brown Creeper		x											
Bufflehead			*				*				*		
Canada Goose	x	x	x	x	x	x	x	x	x	x	x	x	x
Carolina Chickadee	x	x	x		x	x	x	x	x	x	x	x	x
Carolina Wren	x	x	x	x	x	x	x	x	x	x	x	x	x
Cedar Waxwing		x		x	x		x	x	x		*	x	x
Chimney Swift					*	x		e		x		x	x
Common Grackle	*				x	x		*	x	x		x	x
Common Loon			*										
Common Merganser			*	*			*				*		
Common Raven		x		x	x	*							
Common Tern		*											
Common Yellowthroat		x		x	*	*		x	x			x	x
Cooper's Hawk ^{Br}			x			x							
Dark-eyed Junco		x	x	*		x	x	*		x	x		
Double-crested Cormorant	*	x	x	*	*	*				*		x	*
Downy Woodpecker	x	x	x	x	x	x	x	x	x	x	x	x	x
Eastern Kingbird	x			x	x			*	x			*	x
Eastern Phoebe		x	*				x	x	x		x		
Eastern Towhee		x						x		x			
Eastern Wood-Pewee		x			x	x			x				x
European Starling	*	*		*		*	x	x		*	x	e	*
Field Sparrow							*						
Fish Crow				x	x							e	x
Forster’s Tern												e	

TABLE 16. (continued)

Species	Breeding 14 ²	Fall 14	Winter 14/15	Spring 15	Breeding 15	Fall 15	Winter 15/16	Spring 16	Breeding 16	Fall 16	Winter 16/17	Spring 17	Breeding 17
Gadwall			*								x		
Golden-crowned Kinglet		x	x			x	x			x	x		
Gray Catbird	x	x		x	x	x		x	x	x		x	x
Great Black-backed Gull			x			*	*	e	*		*	e	
Great Blue Heron ^{Br}	*	x	x	*		x	x	*	*	x	x	*	
Great Crested Flycatcher	x	x		x	x	x		x	x			x	x
Great Egret		*				x				*			
Green-winged Teal		x	*	*		x	x	*		x	x		
Green Heron		*			*	x				*			
Hairy Woodpecker		x	x	x		x	x		*	x	x	x	x
Hermit Thrush		x	x	*		x		x		x			
Herring Gull	*	x	x	*		*	*	e	*	*	x	e	
Hooded Merganser		x											
House Finch	*	x	x	x		x	x	x	x	x	x	x	x
House Wren	x	x		x	x	x		x	x	x		x	x
Indigo Bunting	x												
Killdeer	*	x						*		*			
Laughing Gull		x		x	x			x		*		x	
Least Sandpiper						x							
Lesser Scaup											*		
Magnolia Warbler		x		x									
Mallard		x	x	*	*	x	x	x		x	x	*	*
Mourning Dove	*	x			*	*			*	x	x		x
Northern Cardinal	x	x	x	x	x	x	x	x	x	x	x	x	x
Northern Flicker	*	x	x		x	x	x	x	x	x	x	x	
Northern Mockingbird		*		*				*		x		e	*
Northern Parula ^{Br}				*				*				x	
Northern Rough-winged Swallow					*			e		x		e	
Northern Waterthrush				*				x				*	
Orchard Oriole	*			x				x	*			x	x
Osprey ^{Br}				*				e				e	
Ovenbird		x						x				x	
Palm Warbler				*								e	
Prairie Warbler												*	
Pied-billed Grebe ^{Br, SC(NB)}							*						
Pine Siskin		x											
Red-bellied Woodpecker	x	x	x	x	x	x	*	x	x	x	x	x	x
Red-breasted Merganser							x						
Red-breasted Nuthatch										x			
Red-eyed Vireo		x		x								x	x
Red-shouldered Hawk ^{Br, SC(NB)}	x	x		x		x	*		x		x	x	x
Red-tailed Hawk		x	x					e	x		x	x	x
Red-winged Blackbird	x	x	x	x	x		x	x	x		x	x	*
Ring-billed Gull		*	x	*		x	x		x	*	x	x	
Ring-necked Duck			*										
Rose-breasted Grosbeak		x						x				x	
Royal Tern		*											
Ruby-crowned Kinglet		x					x	x		x	x		
Ruby-throated Hummingbird													x

TABLE 16. (continued)

Species	Breeding 14 ²	Fall 14	Winter 14/15	Spring 15	Breeding 15	Fall 15	Winter 15/16	Spring 16	Breeding 16	Fall 16	Winter 16/17	Spring 17	Breeding 17
Rusty Blackbird				X				X					
Semipalmated Sandpiper ^{Br}		*											
Sharp-shinned Hawk						*							
Solitary Sandpiper		X				X						e	
Song Sparrow	X	X	X	X	X	*	X	X	X	X	X	*	X
Sora		X											
Spotted Sandpiper ^{Br}		*											
Swainson's Thrush				X								*	
Swamp Sparrow		X		X		*							
Tree Swallow		*		X	X		X	X				X	X
Tufted Titmouse		X	X		X	X	X	X		X	X	X	X
Unidentified Warbler		X											
Veery ^{Br}						X		*		X		e	
Warbling Vireo	X	X		X	X	X		X	X	X		X	X
White-breasted Nuthatch		X	*		*					X	X		
White-eyed Vireo								X					
White-throated Sparrow		X	X	*		X	X	X	X	X	X	X	
Wild Turkey	*	X	X			X	X	X	*	X	X	*	*
Willow Flycatcher					X				X				X
Winter Wren ^{Br}		X				X	X				*		
Wood Duck	X	X	X	X	*		*	X	X	X	X	X	*
Wood Thrush ^{Br}		X										*	
Yellow Warbler	X			X	X			X	X			X	X
Yellow-billed Cuckoo	X	X		X				*				X	*
Yellow-rumped Warbler		X	X	X		X	X	X		X	X	X	

¹ Thank you to Fred Lambert for submitting the first two checklists at the site (<http://ebird.org/ebird/view/checklist/S29303210>).

² The breeding season of 2014 was a partial season with only one survey visit in mid-July

^{Br} = breeding season status only

^{T(NB)} = Threatened status in non-breeding season

^{SC(NB)} = Special Concern status in non-breeding season

TABLE 17. Additional bird species observed by McCort et al. (2010) during eight surveys in March-June 2010, but not observed during our 2014-2017 surveys.

Species	
Alder Flycatcher	Least Flycatcher
Bank Swallow	Lesser Yellowlegs
Bay-breasted Warbler	Lincoln's Sparrow
Black Vulture	Merlin
Black-throated Green Warbler	Mourning Warbler
Blue-headed Vireo	Nashville Warbler
Bobolink	Northern Bobwhite
Brown Thrasher	Peregrine Falcon
Canada Warbler	Pine Warbler
Caspian Tern	Purple Martin
Chestnut-sided Warbler	Rock Dove
Chipping Sparrow	Ruddy Duck
Cliff Swallow	Savannah Sparrow
Forster's Tern	Scarlet Tanager
Grasshopper Sparrow	Snow Goose
Gray-cheeked Thrush	Tennessee Warbler
Great Cormorant	Turkey Vulture
Greater Yellowlegs	Wilson's Snipe
Great-horned Owl	Wilson's Warbler
House Sparrow	Yellow-bellied Flycatcher
Iceland Gull	Yellow-throated Vireo

FIGURE 1. Aerial photos of Petty's Island, Pennsauken, NJ showing the industrial history of the island (top: 1930s; bottom: 2013). Bird survey locations are shown for reference (see Figure 2).

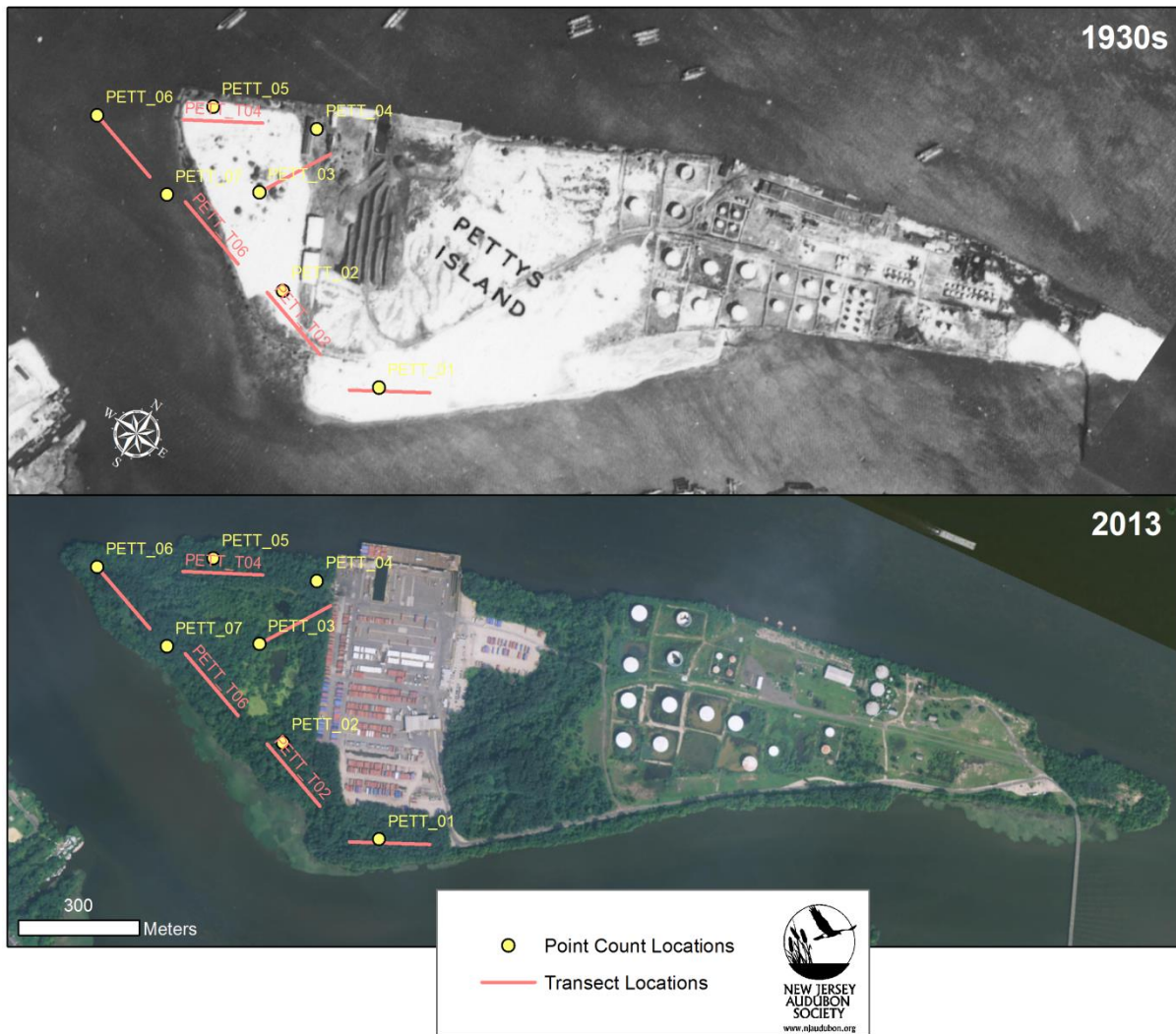


FIGURE 2. Bird survey point and transect locations at Petty's Island, Pennsauken, NJ. Transects (red lines) were surveyed during 2016 fall migration surveys and 2016-2017 winter surveys. Points (yellow circles) were surveyed during 2017 spring migration and breeding season surveys.



FIGURE 3. Bird species richness (total number of species observed), by transect, during fall 2016 bird surveys at Petty's Island, Pennsauken, NJ.



FIGURE 4. Bird species richness (total number of species observed), by transect, during 2016-2017 winter bird surveys at Petty's Island, Pennsauken, NJ.

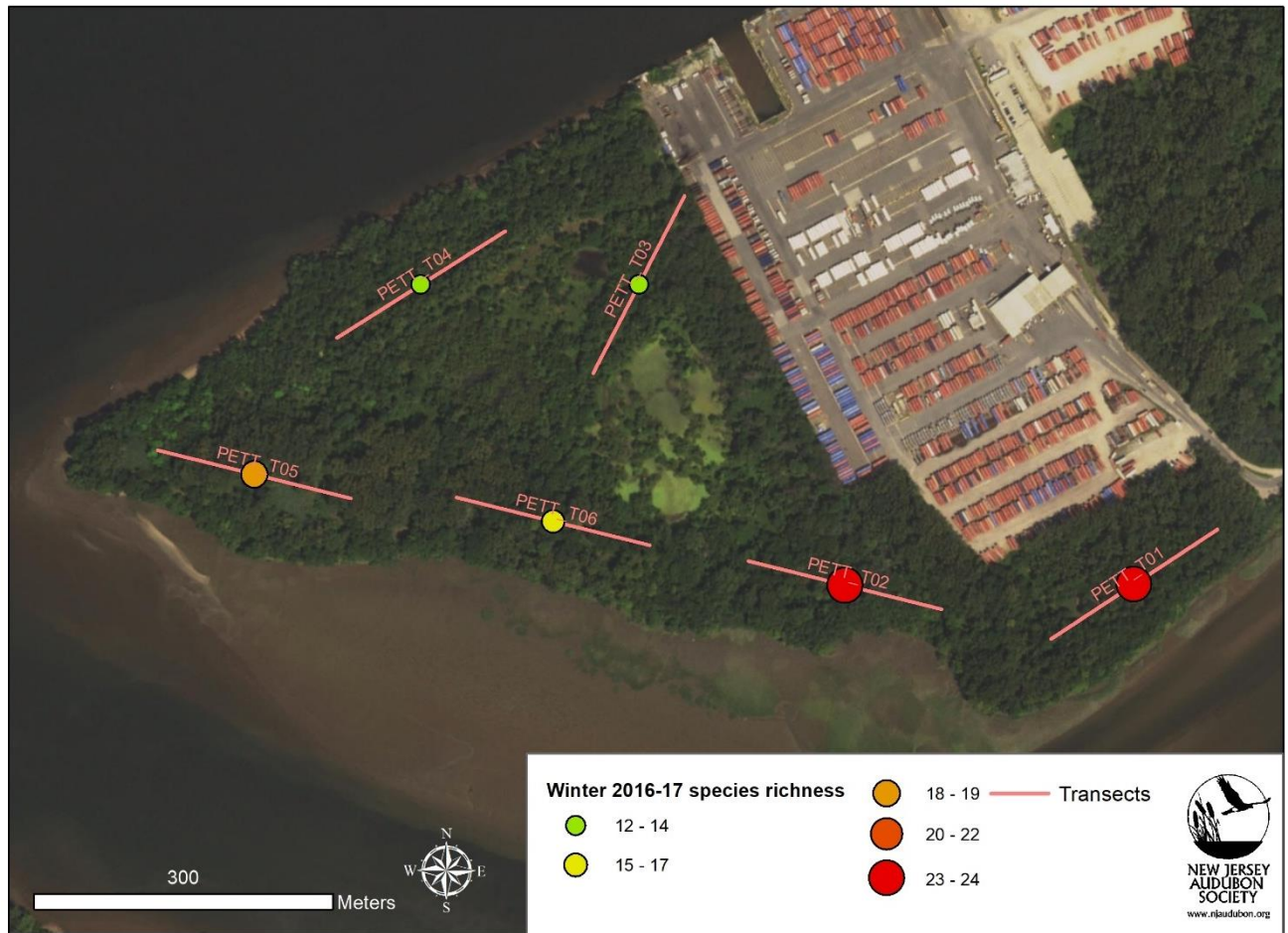


FIGURE 5. Total bird species richness (total number of species observed), by point, during 2017 spring migration bird surveys at Petty's Island, Pennsauken, NJ.

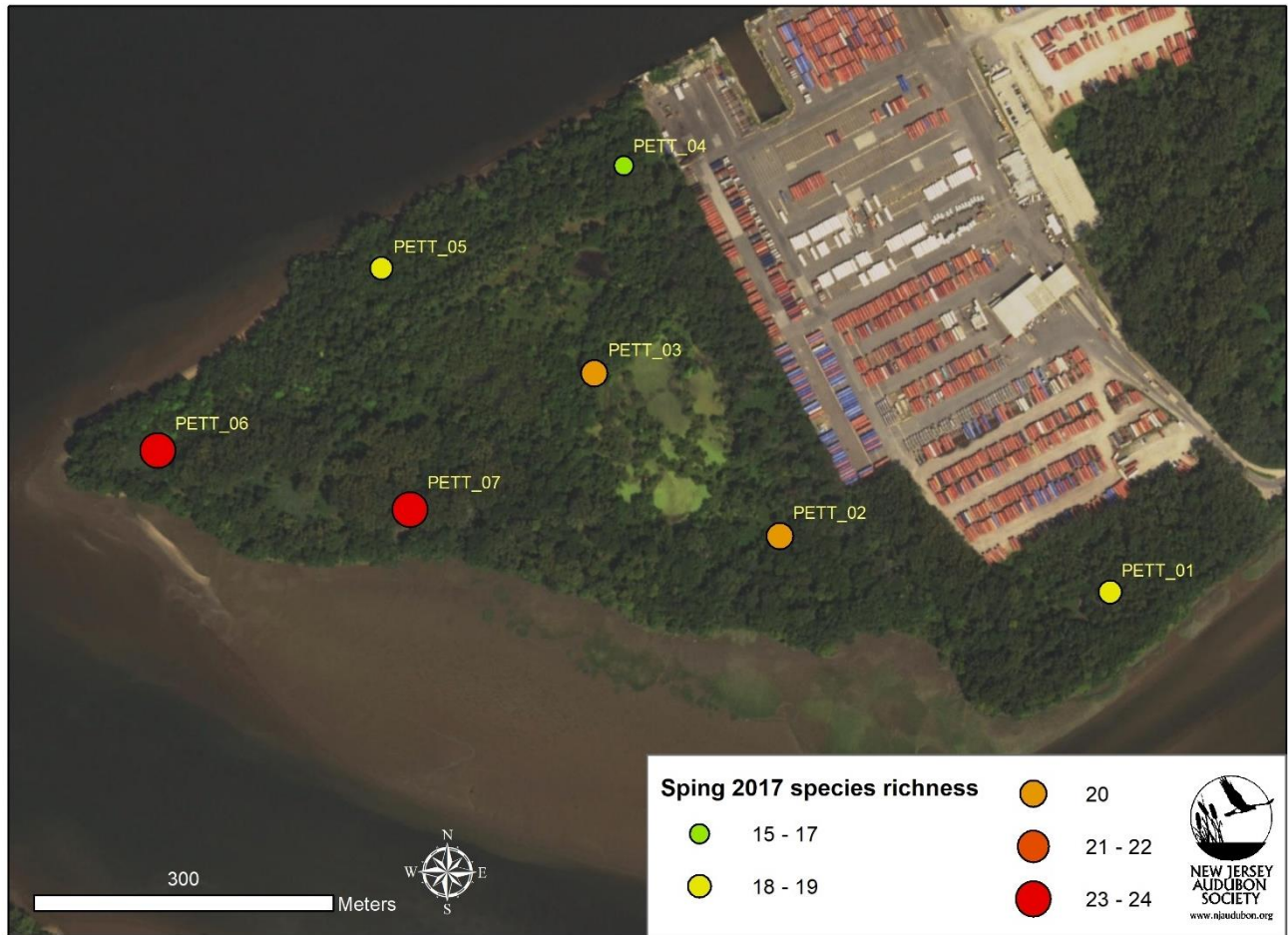


FIGURE 6. Bird species richness (total number of species observed), by point, during 2017 breeding season bird surveys at Petty's Island, Pennsauken, NJ.

