

Neotropical Migrant Indicators Research
Final Report
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Project Design and Methods

The purpose of this study was to estimate change in species richness and abundance of Neotropical migrants and other passerines breeding in New Jersey. Point count surveys, conducted from 1994 through 1998, were performed along roadsides in four habitat types (forest, wetland, open/grassland, developed). In 2002, we repeated point count surveys at nearly 50 percent of the original survey locations. We attempted to expand baseline data on avian species in New Jersey by adding survey points in critical habitats, determined by Landscape Project mapping, in areas not surveyed in 1994/95/98 and with little biological data, (e.g., Piedmont Landscape). A total of 6,471 survey points were plotted throughout the Highlands, Piedmont, and Delaware Bay Landscapes; only 47 percent of these were surveyed.

USGS quadrangle maps (7.5 minute) were divided into six blocks. Each point count location was plotted using ArcView (geographic information system software) and given a unique six-digit site identification number comprised of the quad number (three digits), block number (one digit) and point number (two digits).

Survey points were located at least 600 meters apart along secondary roadways and in undeveloped areas. Each contracted employee was assigned a specific number of points to be completed within the three-week period of peak breeding/territorial behavior, May 25 to June 15, 2002. Surveys were conducted between official sunrise and 9:30 a.m. Count duration for the 2002 survey was five-minutes, and contractors recorded all birds seen or heard. The 2002 count period was increased to five minutes to detect greater species richness in critical habitats. Observers recorded data in two periods, the first three-minute period and the last two-minute period, for statistical comparability to 1994/95/98 three-minute point counts.

Quality Assurance

Each contracted employee had experience and knowledge in bird identification by both sight and sound. If points were relocated, the habitat type and distance between points were kept the same as the original point. Point count surveys were only done during favorable conditions (no rain or high winds).

Overall Results

Lack of a sufficient number of qualified people reduced our ability to cover all survey locations. Only 3,045 (47 percent) of the 6,471 points were surveyed throughout the state (Figures 1 and 2). Endangered species were observed at 21 points (one percent), threatened species at 103 points (three percent), and species of special concern at 421 points (14 percent). Species of regional priority were

observed in over 75 percent (2,322) of the 2002 survey locations, and almost all survey locations (3,032/3,045) had observations of at least one common species. (Figure 3, Table 1).

New Jersey Passerine Survey Locations in 2002

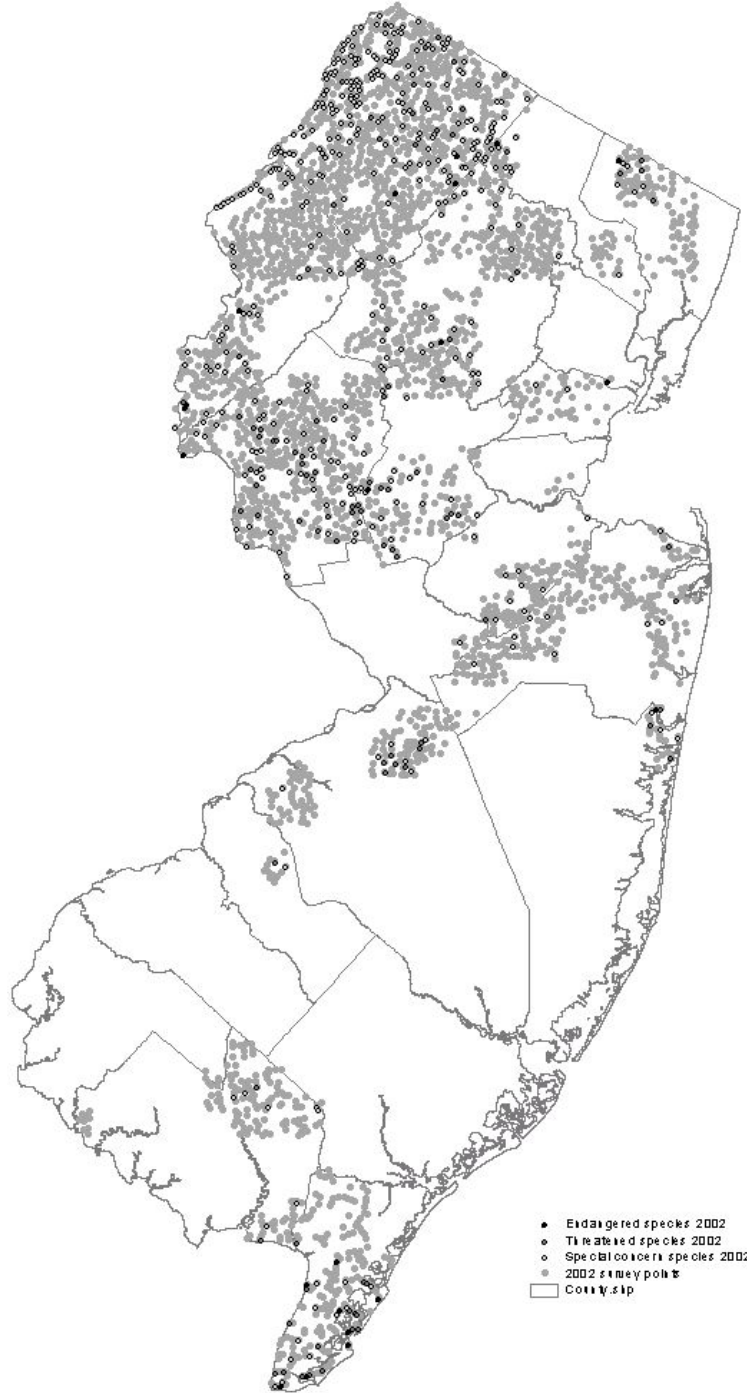


Figure 1. Map of the 3,045 avian point count locations surveyed in 2002 in New Jersey including observations of endangered, threatened, and special concern avian species.

Change Analysis

Of the entire 3,849 points surveyed between 1994 and 1998, 1,874 (49 %) of the survey points were revisited in 2002: 61 percent (1,552/2,518) were in the Highlands region and 24 percent (322/1,331) in the Delaware Bay region (Figure 4). Only locations where species were detected during the first three minutes of the survey were used in the analyses.

A signed-ranks test revealed significant declines in species richness at each of the survey points in both the Delaware Bay ($S = -5,332.5$; $P < 0.001$) and Highlands Landscapes ($S = -182,330$; $P < 0.001$) during the period 1994/95/98 to 2002 (Figures 5 and 6). The total number of individuals at each of the survey points also declined in 2002 in the Highlands Landscape ($S = -246,962$; $P < 0.001$), but did not change significantly between years in the Delaware Bay Landscape ($S = 1,193$; $P = 0.444$) (Figures 5 and 6).

Species characteristics. – The difference in the abundance of species of conservation concern at each point between 1994/95/98 and 2002 increased in the Delaware Bay Landscape and decreased in the Highlands Landscape (Figure 7). In the Delaware Bay Landscape, there was no significant change in abundance of endangered, threatened, or introduced species at each point, but the abundance of special concern, priority, and common species at survey locations increased in 2002 (Table 2). In the Highlands Landscape, there was also no significant change in abundance of threatened or introduced species and an increase of abundance of common species at each survey location in 2002. Unlike Delaware Bay, however, there was a decrease in abundance of threatened and special concern species in the Highlands Landscape in 2002 (Figure 7, Table 2).

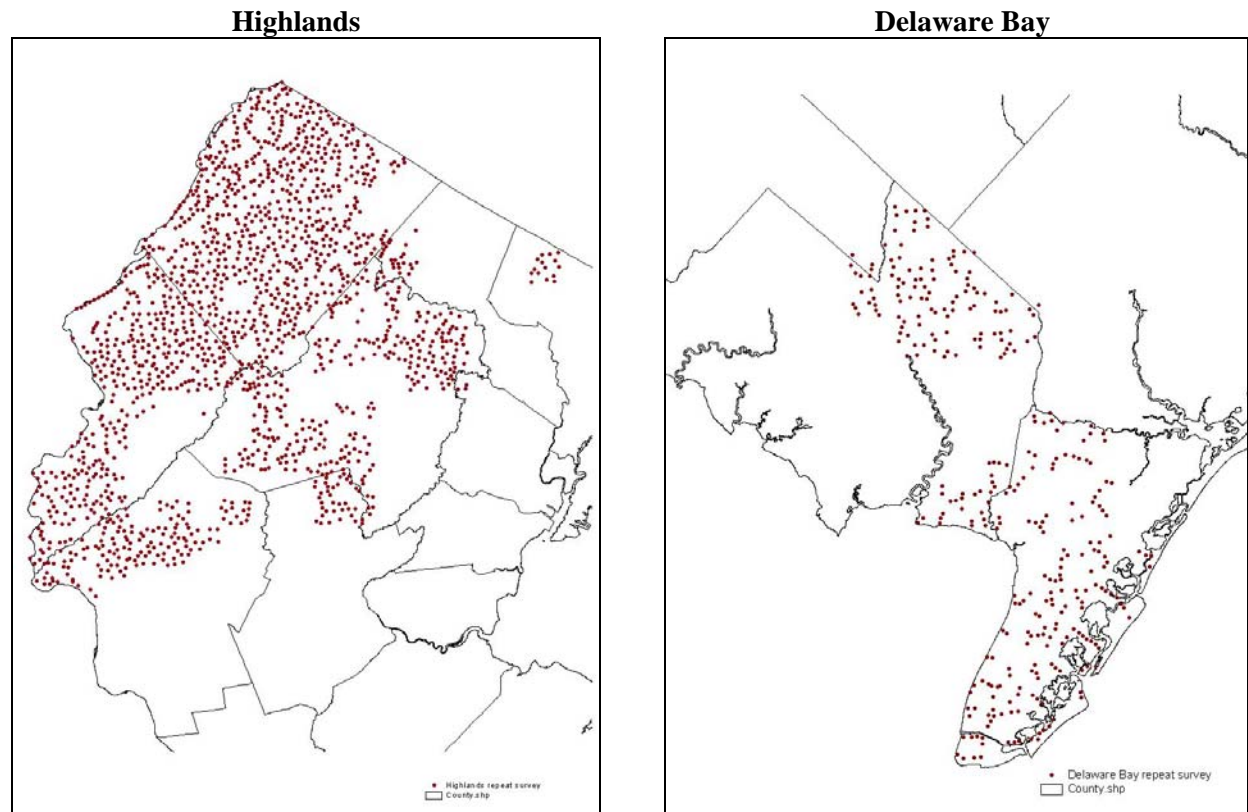


Figure 4. Maps of the avian point count locations repeated from the 1994/95/98 survey in 2002 for Highlands and Delaware Bay Landscapes.

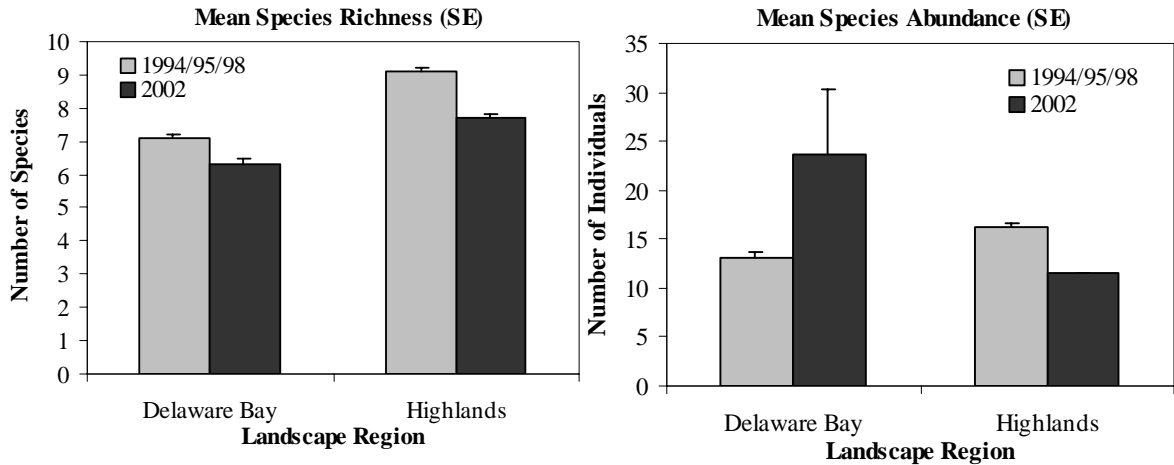


Figure 5. Average number of species (species richness) and individuals (species abundance) per survey location (\pm SE) for both the 2002 and 1994/95/98 survey periods in the Delaware Bay and Highlands Landscapes.

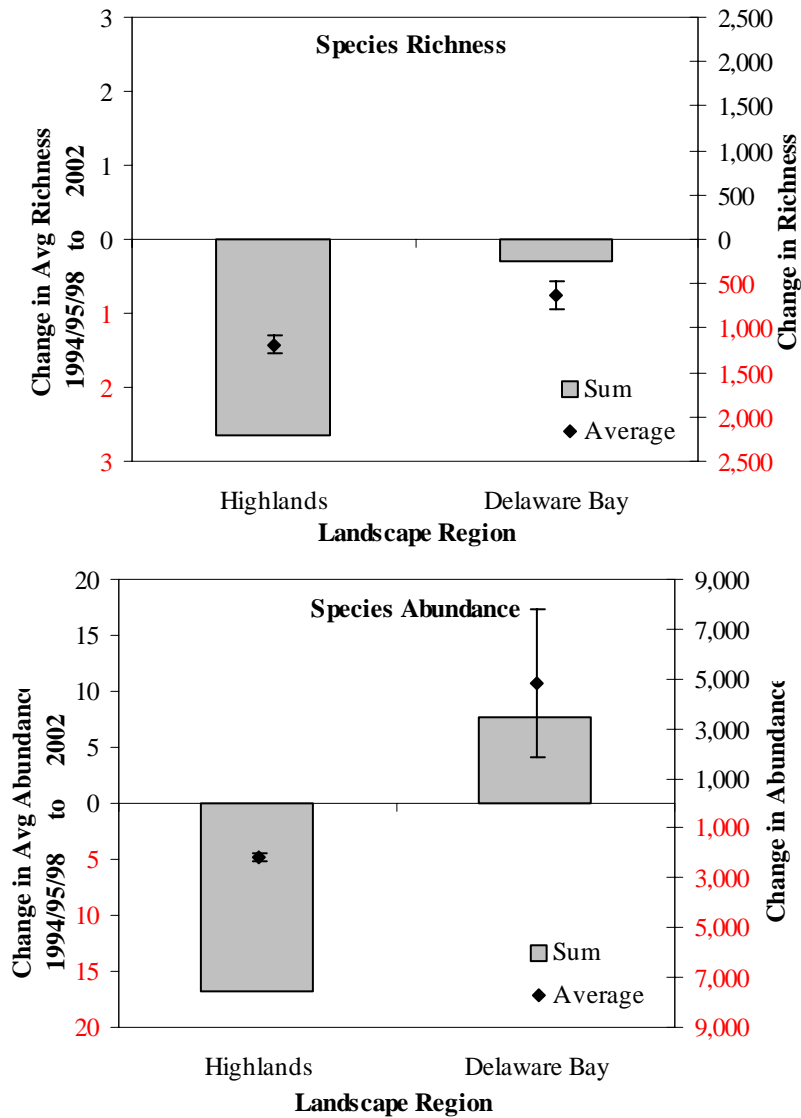


Figure 6. Mean change (\pm SE) and sum change in the number of species (richness) and individuals (abundance) at each point from the 1994/95/98 to the 2002 surveys for Highlands and Delaware Bay landscape regions. A value of zero means no change in abundance of species at each point between the two survey years, a positive value indicates an increase in the 2002 survey, and a negative value indicates a decrease in the 2002 survey.

The abundance of avian species observed at each point in 2002, regardless of migratory strategy (resident, short-distant, Neotropical), significantly decreased in the Highlands Landscape but did not change in the Delaware Bay Landscape (Table 3, Figure 8). Those species classified in “other” (species that utilize New Jersey as a stopover for migration, accidental species) also decreased in the Highlands Landscape in 2002, but increased in the Delaware Bay Landscape. Furthermore, the abundance of species with low to moderate tolerance to fragmentation at each point also significantly decreased in 2002 in both the Highlands and Delaware Bay Landscapes, but there was no change in abundance of species with no tolerance or high tolerance to fragmentation at survey locations in either landscape region. However, the abundance of species that are area sensitive at each point significantly decreased in the Highlands Landscape and did not change in the Delaware Bay Landscape (Table 3, Figure 9).

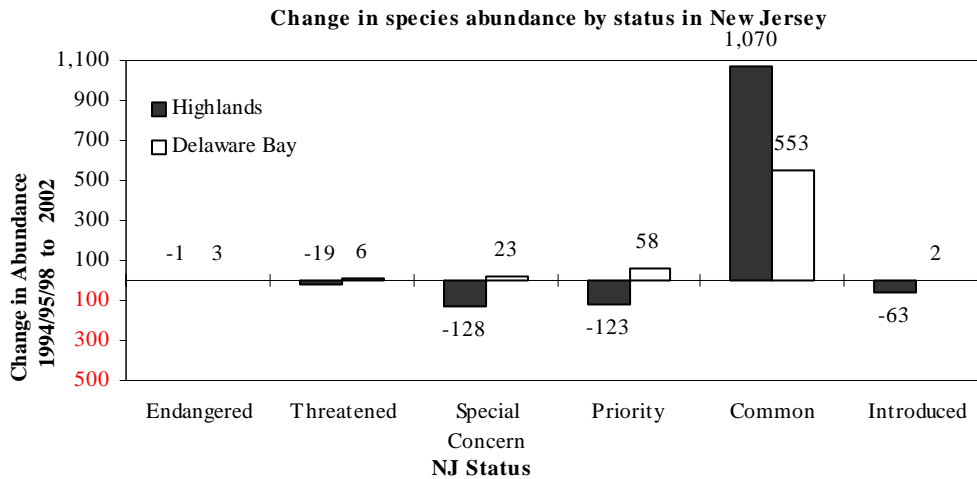


Figure 7. Change in abundance of species varying by status at each survey point for the Delaware Bay and Highlands Landscapes from the 1994/95/98 to the 2002 surveys. A value of zero means no change in abundance of species at each point between the two survey years, a positive value indicates an increase in the 2002 survey, and a negative value indicates a decrease in the 2002 survey.

Table 2. Results of signed-ranks analyses for each species status between the 2002 and 1994/95 survey within Highlands and Delaware Bay Landscapes.

Species Status	Highlands		Delaware Bay	
	S	P value	S	P value
Endangered	-4.0	1.000	7.5	0.817
Threatened	-299.5	0.032	34.5	0.248
Special Concern	-11,386.5	<0.001	181.5	0.007
Priority	-22,241.0	0.043	1,922.0	0.015
Common	104,543.5	<0.001	11,585.5	<0.001
Introduced	-6,847.0	0.080	34.0	0.927

Table 3. Results of signed-rank analyses on avian species varying by migratory strategies, tolerance to fragmentation, and area sensitivity.

	Highlands		Delaware Bay	
	S	P value	S	P value
Migratory Strategy				
Neotropical	-172,826.0	<0.001	-1,884.0	0.079
Short-distance	-190,467.0	<0.001	-2,025.5	0.154
Resident	-73,720.5	<0.001	1,824.5	0.153
Other	3,813.0	<0.001	5,076.5	<0.001
Tolerance to Fragmentation				
None	-4,678.0	0.088	32.0	0.762
Low	-57,233.5	<0.001	-1,340.5	0.007
Moderate	-76,538.5	<0.001	-1,567.0	0.047
High	-15.5	0.074	N/A	N/A
Unknown	570,402.5	<0.001	25,520.0	<0.001
Area Sensitive				
Unknown	-118,796.0	<0.001	-10.5	0.992
	561,375.5	<0.001	24,258.0	<0.001

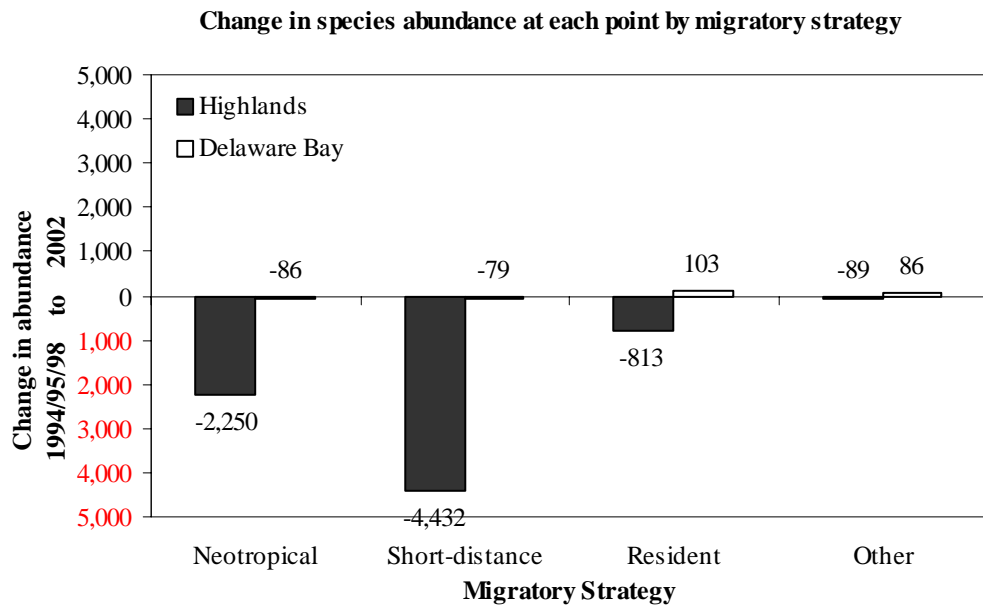


Figure 8. Change in abundance of species with varying migratory strategy at each survey point for the Delaware Bay and Highlands Landscapes from the 1994/95/98 to the 2002 survey. A value of zero means no change in abundance of species at each point between the two survey years, a positive value indicates an increase in the 2002 survey, and a negative value indicates a decrease in the 2002 survey.

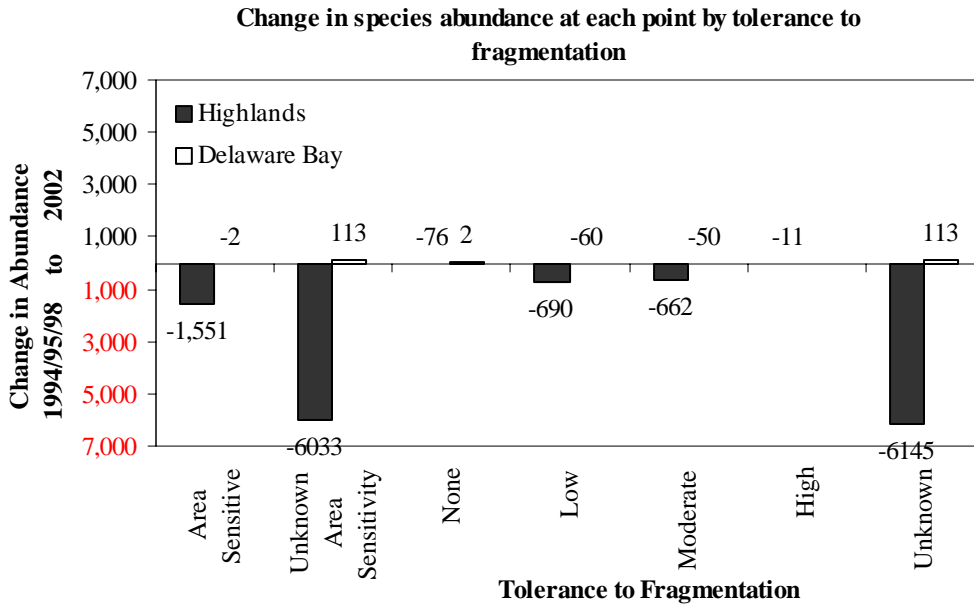


Figure 9. Change in abundance of species with varying tolerance to habitat fragmentation at each survey point for the Delaware Bay and Highlands Landscapes from the 1994/95/98 to the 2002 survey. A value of zero means no change in abundance of species at each point between the two survey years, a positive value indicates an increase in the 2002 survey, and a negative value indicates a decrease in the 2002 survey.

Habitat utilization. – In the Highlands Landscape, all types of habitat, except wetlands, maritime marsh, and beach/dune, had a significant decrease in the abundance at each point of species utilizing that habitat in 2002. There was no change in abundance at each point in wetlands, an increase in 2002 in maritime marsh, and no species recorded utilizing beach/dune habitat. In the Delaware Bay Landscape, however, none of the points in the Delaware Bay Landscape had significant changes in species abundance based on habitat utilization (Table 4, Figure 10).

Individual species. – In the Highlands Landscape, the abundance per point of all of the nine species analyzed changed between years (Table 5); all but the American redstart decreased in 2002 (Figure 11). In the Delaware Bay Landscape, the veery was not present either year, and all species abundance, except the American Redstart, changed significantly at the survey locations between years. The white-breasted nuthatch was the only species with a significant increase in 2002; all other species with significant changes between years decreased in 2002 (Table 5, Figure 11).

Table 4. Results of signed-rank analyses on avian species utilizing specified habitats.

Habitat Type	Highlands		Delaware Bay	
	S	P value	S	P value
Forest Interior	-63,888.5	<0.001	-449.0	0.299
Forest interior-edge	-112,797.0	<0.001	267.5	0.816
Shrub-scrub/barrens	-104,353.0	<0.001	-1,413.5	0.082
Grassland	-1,077.5	<0.001	-0.5	1.000
Wetland-open water	-4,639.5	0.160	479.5	0.090
Maritime Marsh	-156,371.0	<0.001	-61.5	0.493
Beach/dune	N/A	N/A	-31.5	0.734
Urban	-1,077.5	<0.001	-508.0	0.664
Other	14.0	0.016	12,155	<0.001

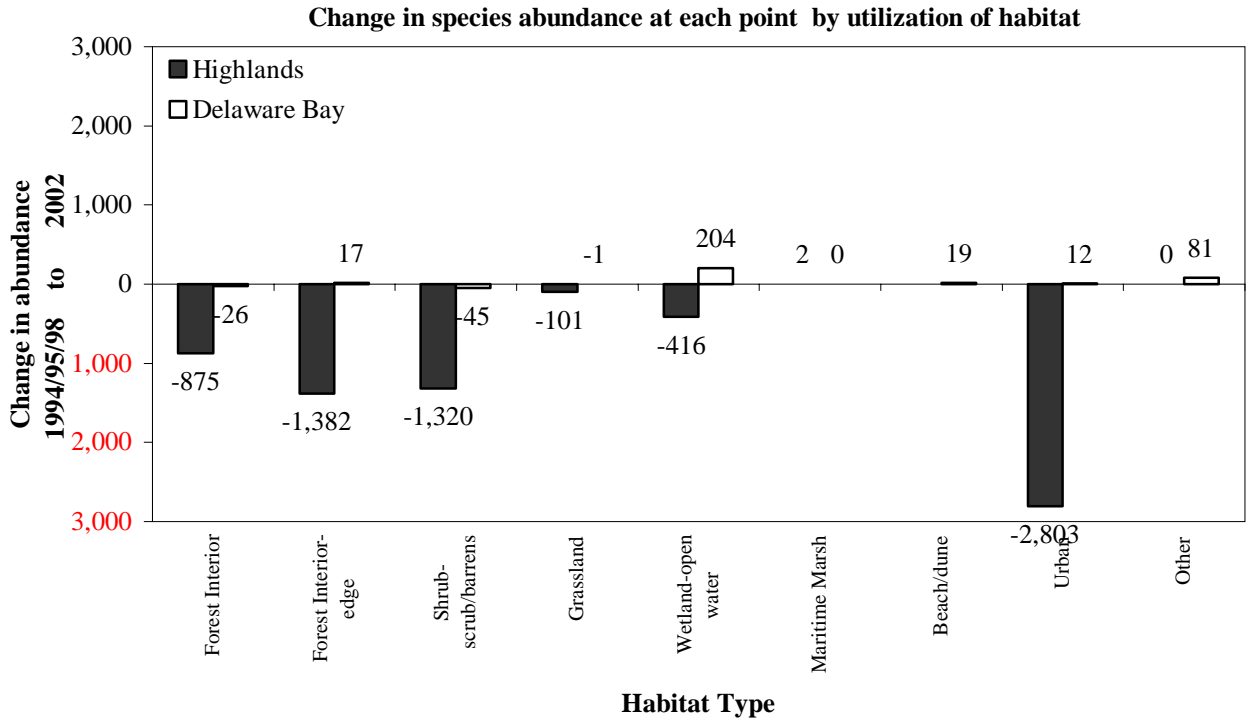


Figure 10. Change in abundance of species with varying utilization of habitat at each survey point for the Delaware Bay and Highlands Landscapes from the 1994/95/98 to the 2002 survey. A value of zero means no change in abundance of species at each point between the two survey years, a positive value indicates an increase in the 2002 survey, and a negative value indicates a decrease in the 2002 survey.

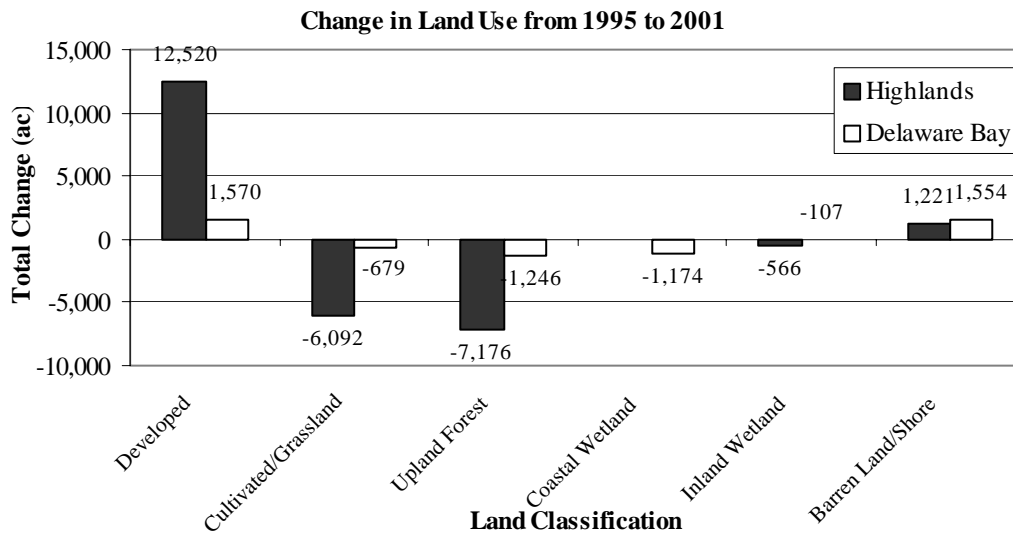


Table 5. Results of signed-rank analyses on avian species by species.

Species Common Name	Highlands		Delaware Bay	
	S	P value	S	P value
Brown-headed Cowbird	11,826.5	<0.001	976.5	<0.001

European Starling	8,418.0	<0.001	1,350.5	<0.001
Black-and-white Warbler	1,139.0	<0.001	52.5	<0.001
Ovenbird	25,840.5	<0.001	1,870.5	<0.001
Scarlet Tanager	10,353.0	<0.001	45.5	<0.001
American Redstart	7,700.0	<0.001	3.0	0.250
Pine Warbler	105.0	<0.001	826.5	<0.001
White-breasted Nuthatch	3,393.0	<0.001	10.5	0.031
Veery	4,323.0	<0.001	N/A	N/A

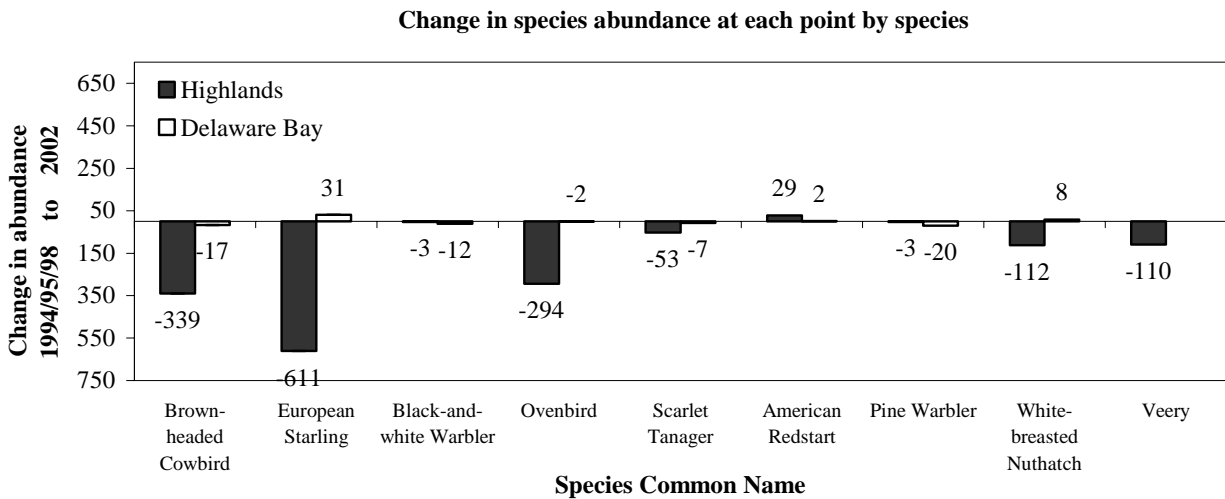


Figure 11. Change in abundance of species at each survey point for the Delaware Bay and Highlands Landscapes from the 1994/95/98 to the 2002 survey. A value of zero means no change in abundance of species at each point between the two survey years, a positive value indicates an increase in the 2002 survey, and a negative value indicates a decrease in the 2002 survey.

Conclusions

Appendix A. Definitions of species status

Species Status	Definition
Endangered	A species whose prospects for survival within the state are in immediate danger due to one or several factors. An endangered species likely requires immediate action to avoid extinction within New Jersey
Threatened	A species that may become endangered if conditions surrounding it begin to or continue to deteriorate. This species is already vulnerable
Special Concern	A species that warrants special attention because of inherent vulnerability to environmental deterioration or habitat modification that would result in their becoming threatened. This category would also be applied to species that meet the foregoing criteria and for which there is little understanding of their current population status in the state
Priority	A species that did not fall under New Jersey's Endangered, Threatened, or Special Concern list but was ranked in the Bird Conservation Plan (Partners in Flight, 2000) as being of continental or regional importance based on an index of vulnerability
Common	A species that was defined as being easily encountered and/or numerous by the New Jersey Audubon Society (1999)
Introduced	A species that is found in New Jersey but is not native to the area

Appendix B. List of species observed during the surveys and the corresponding characteristics.

Common Name	Alpha Code	Status	Habitat Utilization	Migratory Strategy	Area Sensitivity	Tolerance to Fragmentation
Acadian Flycatcher	ACFL	Priority	Forest interior	Neotropical	Yes	None
Alder Flycatcher	ALFL	Uncommon	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
American Avocet	AMAV	Migrant	Wetland-open water	Other	Unknown	Unknown
American Bittern	AMBI	Endangered	Wetland-open water	Other	Unknown	Unknown
American Black Duck	ABDU	Waterfowl	Wetland-open water	Other	Unknown	Unknown
American Black Oystercatcher	ABOY	Common	Beach/dune	Other	Unknown	Unknown
American Coot	AMCO	Migrant	Wetland-open water	Other	Unknown	Unknown
American Crow	AMCR	Common	Other	Short distance	Unknown	Unknown
American Goldfinch	AMGO	Common	shrub-scrub/barrens	Short distance	Unknown	Unknown
American Green-winged Teal	AGWT	Waterfowl	Wetland-open water	Other	Unknown	Unknown

American Kestrel	AMKE	Special Concern	Other	Short distance	Unknown	Unknown
American Oystercatcher	AMOY	Common	Beach/dune	Other	Unknown	Unknown
American Pipit	AMPI	Migrant	Other	Short distance	Unknown	Unknown
American Redstart	AMRE	Common	Forest interior	Neotropical	Yes	Low – Mod.
American Robin	AMRO	Common	Urban	Short distance	Unknown	Unknown
American Tree Sparrow	ATSP	Migrant	Other	Other	Unknown	Unknown
American White Pelican	AWPE	Transient	Wetland-open water	Other	Unknown	Unknown
American Wigeon	AMWI	Waterfowl	Wetland-open water	Other	Unknown	Unknown
American Woodcock	AMWO	Game	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Anhinga	ANHI	Accidental	Wetland-open water	Other	Unknown	Unknown
Arctic Tern	ARTE	Migrant	Beach/dune	Other	Unknown	Unknown
Ash-throated Flycatcher	ATFL	Rare Sighting	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Atlantic Brant	ATBR	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Atlantic Puffin	ATPU	Rare Sighting	Other	Other	Unknown	Unknown
Bachman's Sparrow	BACS	Priority	Forest interior-edge	Short distance	Unknown	Unknown
Baird's Sandpiper	BASA	Migrant	Other	Other	Unknown	Unknown
Bald Eagle	BAEA	Endangered	Wetland-open water	Short distance	Unknown	Unknown
Baltimore Oriole	BAOR	Priority	Other	Neotropical	Unknown	Unknown
Baltimore x Bullock's Oriole Hybrid	BBOH	Hybrid	Other	Other	Unknown	Unknown
Bank Swallow	BANS	Common	Other	Neotropical	Unknown	Unknown
Barn Owl	BNOW	Special Concern	Grassland	Short distance	Unknown	Unknown
Barn Swallow	BARS	Common	Other	Neotropical	Unknown	Unknown
Barred Owl	BDOW	Threatened	Forest interior	Resident	Unknown	Unknown
Barrow's Goldeneye	BAGO	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Bay-breasted Warbler	BBWA	Migrant	Forest interior	Neotropical	Unknown	Unknown
Bell's Vireo	BEVI	Accidental	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Belted Kingfisher	BEKI	Uncommon	Wetland-open water	Other	Unknown	Unknown
Bewick's Wren	BEWR	Accidental	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Bicknell's Thrush	BITH	Migrant	Forest interior	Neotropical	Unknown	Unknown
Black Brant	BLBR	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Black Guillemot	BLGU	Accidental	Other	Other	Unknown	Unknown
Black Rail	BLRA	Threatened	Maritime Marsh	Other	Unknown	Unknown
Black Skimmer	BLSK	Endangered	Other	Other	Unknown	Unknown
Black Tern	BLTE	Special Concern	Wetland-open water	Other	Unknown	Unknown
Black Vulture	BLVU	Uncommon	Other	Other	Unknown	Unknown
Black-and-White Warbler	BAWW	Priority	Forest interior	Neotropical	Yes	None
Black-bellied Plover	BBPL	Migrant	Other	Other	Unknown	Unknown

Black-billed Cuckoo	BBCU	Priority	Forest interior-edge	Neotropical	Unknown	Unknown
Blackburnian Warbler	BLBW	Priority	Forest interior-edge	Neotropical	Unknown	Unknown
Black-capped Chickadee	BCCH	Common	Forest interior-edge	Resident	Unknown	Unknown
Black-crowned Night-Heron	BCNH	Threatened	Maritime Marsh	Other	Unknown	Unknown
Blackpoll Warbler	BLPW	Migrant	Forest interior-edge	Neotropical	Unknown	Unknown
Black-throated Blue Warbler	BTBW	Priority	Forest interior	Neotropical	Unknown	Unknown
Black-throated Gray Warbler	BTYW	Occasional	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Black-throated Green Warbler	BTNW	Special Concern	Forest interior	Neotropical	Unknown	Unknown
Blue Grosbeak	BLGR	Uncommon	shrub-scrub/barrens	Neotropical	Unknown	Unknown
Blue Jay	BLJA	Common	Forest interior-edge	Resident	Unknown	Unknown
Blue-gray Gnatcatcher	BGGN	Common	Forest interior-edge	Neotropical	Yes	None
Blue-headed Vireo	BHVI	Special Concern	Forest interior	Neotropical	Unknown	Unknown
Blue-winged Teal	BWTE	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Blue-winged Warbler	BWWA	Priority	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Boat-tailed Grackle	BTGR	Common	Wetland-open water	Resident	Unknown	Unknown
Bobolink	BOBO	Threatened	Grassland	Neotropical	Yes	Moderate
Brewer's Blackbird	BRBL	Rare Sighting	Other	Short distance	Unknown	Unknown
Broad-winged Hawk	BWHA	Special Concern	Forest interior-edge	Neotropical	Unknown	Unknown
Brown Creeper	BRCR	Uncommon	Forest interior	Short distance	Unknown	Unknown
Brown Pelican	BRPE	Uncommon	Other	Other	Unknown	Unknown
Brown Thrasher	BRTH	Priority	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Brown-headed Cowbird	BHCO	Common	Other	Short distance	Unknown	Unknown
Brown-headed Nuthatch	BHNU	Priority	Forest interior-edge	Resident	Unknown	Unknown
Bufflehead	BUFF	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Canada Goose	CAGO	Common	Wetland-open water	Other	Unknown	Unknown
Canada Warbler	CAWA	Special Concern	Forest interior	Neotropical	Unknown	Unknown
Cape May Warbler	CMWA	Migrant	Forest interior-edge	Neotropical	Unknown	Unknown
Carolina Chickadee	CACH	Priority	Forest interior-edge	Resident	Yes	Unknown
Carolina Wren	CARW	Common	Forest interior-edge	Resident	Unknown	Moderate
Caspian Tern	CATE	Special Concern	Wetland-open water	Other	Unknown	Unknown
Cattle Egret	CAEG	Introduced	Maritime Marsh	Other	Unknown	Unknown
Cedar Waxwing	CEDW	Common	Other	Short distance	Unknown	Unknown
Cerulean Warbler	CERW	Special Concern	Forest interior	Neotropical	Yes	None
Chestnut-sided Warbler	CSWA	Common	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Chimney Swift	CHSW	Priority	Urban	Neotropical	Unknown	Unknown
Chipping Sparrow	CHSP	Common	Urban	Neotropical	Unknown	Unknown
Chuck-will's-widow	CWWI	Priority	Shrub-scrub/barrens	Neotropical	Unknown	Unknown

Clapper Rail	CLRA	Common	Wetland-open water	Other	Unknown	Unknown
Clay-colored Sparrow	CCSP	Migrant	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Cliff Swallow	CLSW	Special Concern	Other	Neotropical	Unknown	Unknown
Common Eider	COEI	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Common Goldeneye	COGO	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Common Grackle	COGR	Common	Urban	Short distance	Unknown	Unknown
Common Ground-Dove	COGD	Accidental	Shrub-scrub/barrens	Resident	Unknown	Unknown
Common Loon	COLO	Migrant	Wetland-open water	Other	Unknown	Unknown
Common Merganser	COME	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Common Moorhen	COMO	Uncommon	Wetland-open water	Other	Unknown	Unknown
Common Murre	COMU	Rare Sighting	Other	Other	Unknown	Unknown
Common Nighthawk	CONI	Special Concern	Other	Neotropical	Unknown	Unknown
Common Raven	CORA	Rare Sighting	Other	Resident	Unknown	Unknown
Common Redpoll	CORE	Migrant	Other	Other	Unknown	Unknown
Common Snipe	COSN	Game	Wetland-open water	Other	Unknown	Unknown
Common Tern	COTE	Special Concern	Beach/dune	Other	Unknown	Unknown
Common Yellowthroat	COYE	Common	Forest interior-edge	Short distance	Unknown	Unknown
Connecticut Warbler	CONW	Migrant	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Cooper's Hawk	COHA	Threatened	Forest interior-edge	Short distance	Unknown	Unknown
Curlew Sandpiper	CUSA	Rare Sighting	Other	Other	Unknown	Unknown
Dickcissel	DICK	Rare Sighting	Grassland	Neotropical	Unknown	Unknown
Double-crested Cormorant	DCCO	Migrant	Wetland-open water	Other	Unknown	Unknown
Downy Woodpecker	DOWO	Common	Forest interior-edge	Resident	Yes	Moderate
Dunlin	DUNL	Migrant	Other	Other	Unknown	Unknown
Eastern Bluebird	EABL	Common	Other	Short distance	Unknown	Unknown
Eastern Kingbird	EAKI	Common	Other	Neotropical	Unknown	Unknown
Eastern Meadowlark	EAME	Special Concern	Grassland	Short distance	Unknown	Unknown
Eastern Phoebe	EAPH	Common	Forest interior-edge	Short distance	Unknown	Unknown
Eastern Screech-Owl	EASO	Common	Forest interior-edge	Resident	Unknown	Unknown
Eastern Towhee	EATO	Priority	Shrub-scrub/barrens	Short distance	Yes	Moderate
Eastern Tufted Titmouse	ETTI	Common	Forest interior-edge	Resident	Yes	Unknown
Eastern White-crowned Sparrow	EWCS	Migrant	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Eastern Wood-Pewee	EAWP	Priority	Forest interior-edge	Neotropical	Yes	Low – Mod.
Eurasian Collared-Dove	ECDO	Introduced	Urban	Resident	Unknown	Unknown
European Starling	EUST	Introduced	Urban	Short distance	Unknown	Unknown
European Woodcock	EUWO	Game	Other	Other	Unknown	Unknown
Evening Grosbeak	EVGR	Migrant	Forest interior	Short distance	Unknown	Unknown

Field Sparrow	FISP	Priority	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Fish Crow	FICR	Common	Other	Short distance	Unknown	Unknown
Forster's Tern	FOTE	Common	Wetland-open water	Other	Unknown	Unknown
Fox Sparrow	FOSP	Migrant	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Fulvous Whistling-Duck	FUWD	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Gadwall	GADW	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Glossy Ibis	GLIB	Common	Maritime Marsh	Other	Unknown	Unknown
Golden Eagle	GOEA	Migrant	Other	Short distance	Unknown	Unknown
Golden-crowned Kinglet	GCKI	Uncommon	Forest interior	Short distance	Unknown	Unknown
Golden-crowned Sparrow	GCSP	Accidental	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Golden-winged Warbler	GWWA	Special Concern	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Grasshopper Sparrow	GRSP	Threatened	Grassland	Neotropical	Yes	Moderate
Gray Catbird	GRCA	Priority	Forest interior-edge	Short distance	Yes (intermediate)	Mod - high
Gray-cheeked Thrush	GCTH	Special Concern	Forest interior	neotropical	Unknown	Unknown
Great Black-backed Gull	GBBG	Common	Other	Other	Unknown	Unknown
Great Blue Heron	GBHE	Special Concern	Wetland-open water	Other	Unknown	Unknown
Great Cormorant	GRCO	Winter	Wetland-open water	Other	Unknown	Unknown
Great Crested Flycatcher	GCFL	Common	Forest interior-edge	Neotropical	Yes	Moderate
Great Egret	GREG	Common	Maritime Marsh	Other	Unknown	Unknown
Great Horned Owl	GHOW	Common	Other	Resident	Unknown	Unknown
Greater Yellowlegs	GRYE	Migrant	Other	Other	Unknown	Unknown
Green Heron	GRHE	Common	Wetland-open water	Other	Unknown	Unknown
Hairy Woodpecker	HAWO	Priority	Forest interior	Resident	Yes	low
Henslow's Sparrow	HESP	Endangered	Grassland	Short distance	Unknown	Unknown
Hermit Thrush	HETH	Uncommon	Forest interior	Short distance	Unknown	Unknown
Herring Gull	HERG	Migrant	Wetland-open water	Other	Unknown	Unknown
Hoary Redpoll	HORE	Accidental	Other	Other	Unknown	Unknown
Hooded Merganser	HOME	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Hooded Warbler	HOWA	Common	Forest interior	Neotropical	Yes	Low
Horned Grebe	HOGR	Migrant	Wetland-open water	Other	Unknown	Unknown
Horned Lark	HOLA	Special Concern	Grassland	Short distance	Unknown	Unknown
House Finch	HOFI	Introduced	Urban	Short distance	Unknown	Unknown
House Sparrow	HOSP	Introduced	Urban	Resident	Unknown	Unknown
House Wren	HOWR	Common	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Hudsonian Godwit	HUGO	Migrant	Other	Other	Unknown	Unknown
Indigo Bunting	INBU	Common	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Kentucky Warbler	KEWA	Special Concern	Forest interior	Neotropical	Yes	Low

Killdeer	KILL	Common	Other	Short distance	Unknown	Unknown
King Eider	KIEI	Waterfowl	Wetland-open water	Other	Unknown	Unknown
King Rail	KIRA	Special Concern	Wetland-open water	Other	Unknown	Unknown
Lapland Longspur	LALO	Migrant	Other	Other	Unknown	Unknown
Lark Bunting	LARB	Accidental	Grassland	Neotropical	Unknown	Unknown
Lark Sparrow	LASP	Migrant	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Laughing Gull	LAGU	Common	Other	Other	Unknown	Unknown
Lawrence's Warbler	LAWA	Hybrid	Other	Other	Unknown	Unknown
Le Conte's Sparrow	LCSP	Rare Sighting	Grassland	Short distance	Unknown	Unknown
Least Bittern	LEBI	Special Concern	Wetland-open water	Other	Unknown	Unknown
Least Flycatcher	LEFL	Special Concern	Forest interior	Neotropical	Unknown	Unknown
Least Sandpiper	LESA	Migrant	Other	Other	Unknown	Unknown
Least Tern	LETE	Endangered	Beach/dune	Other	Unknown	Unknown
Lesser Black-backed Gull	LBBG	Migrant	Other	Other	Unknown	Unknown
Lesser Yellowlegs	LEYE	Migrant	Other	Other	Unknown	Unknown
Lincoln's Sparrow	LISP	Migrant	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Little Blue Heron	LBHE	Special Concern	Maritime Marsh	Other	Unknown	Unknown
Loggerhead Shrike	LOSH	Endangered	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Long-billed Curlew	LBCU	Accidental	Other	Other	Unknown	Unknown
Long-billed Dowitcher	LBDO	Migrant	Other	Other	Unknown	Unknown
Long-eared Owl	LEOW	Threatened	Forest interior	Short distance	Unknown	Unknown
Louisiana Waterthrush	LOWA	Priority	Forest interior	Neotropical	Yes	None
Magnolia Warbler	MAWA	Uncommon	Forest interior-edge	Neotropical	Unknown	Unknown
Mallard	MALL	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Mallard x Black Duck Hybrid	MBDH	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Marsh Wren	MAWR	Common	Wetland-open water	Short distance	Unknown	Unknown
Merlin	MERL	Migrant	Forest interior-edge	Neotropical	Unknown	Unknown
Mississippi Kite	MIKI	Rare Sighting	Other	Neotropical	Unknown	Unknown
Mourning Dove	MODO	Common	Urban	Short distance	Unknown	Unknown
Mourning Warbler	MOWA	Migrant	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Mute Swan	MUSW	Common	Wetland-open water	Other	Unknown	Unknown
Nashville Warbler	NAWA	Uncommon	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Nelson's Sharp-tailed Sparrow	NSTS	Migrant	Wetland-open water	Short distance	Unknown	Unknown
Northern Bobwhite	NOBO	Game	Shrub-scrub/barrens	Resident	Unknown	Unknown
Northern Cardinal	NOCA	Common	Forest interior-edge	Resident	Unknown	Unknown
Northern Goshawk	NOGO	Endangered	Forest interior	Resident	Unknown	Unknown
Northern Harrier	NOHA	Endangered	Wetland-open water	Short distance	Unknown	Unknown

Northern Hawk Owl	NHOW	Accidental	Other	Other	Unknown	Unknown
Northern Mockingbird	NOMO	Common	Urban	Resident	Unknown	Unknown
Northern Parula	NOPA	Special Concern	Forest interior-edge	Neotropical	Unknown	Low
Northern Pintail	NOPI	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Northern Rough-winged Swallow	NRWS	Common	Other	Neotropical	Unknown	Unknown
Northern Saw-whet Owl	NSWO	Rare Sighting	Forest interior	Short distance	Unknown	Unknown
Northern Shoveler	NSHO	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Northern Shrike	NSHR	Migrant	Other	Other	Unknown	Unknown
Northern Waterthrush	NOWA	Uncommon	Forest interior	Neotropical	Unknown	Unknown
Northern Wheatear	NOWH	Rare Sighting	Other	Other	Unknown	Unknown
Olive-sided Flycatcher	OSFL	Migrant	Forest interior-edge	Neotropical	Unknown	Unknown
Orange-crowned Warbler	OCWA	Migrant	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Orchard Oriole	OROR	Common	Other	Neotropical	Unknown	Unknown
Osprey	OSPR	Threatened	Wetland-open water	Short distance	Unknown	Unknown
Ovenbird	OVEN	Common	Forest interior	Neotropical	Yes	Low
Painted Bunting	PABU	Rare Sighting	Other	Other	Unknown	Unknown
Palm Warbler	PAWA	Migrant	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Peacock	PEAC	Introduced	Other	Other	Unknown	Unknown
Pectoral Sandpiper	PESA	Migrant	Other	Other	Unknown	Unknown
Peregrine Falcon	PEFA	Endangered	Other	neotropical	Unknown	Unknown
Philadelphia Vireo	PHVI	Migrant	Forest interior	Neotropical	Unknown	Unknown
Pied-billed Grebe	PBGR	Endangered	Wetland-open water	Other	Unknown	Unknown
Pileated Woodpecker	PIWO	Uncommon	Forest interior	Resident	Unknown	Unknown
Pine Grosbeak	PIGR	Migrant	Forest interior	Short distance	Unknown	Unknown
Pine Siskin	PISI	Rare Sighting	Forest interior	Short distance	Unknown	Unknown
Pine Warbler	PIWA	Common	Forest interior	Short distance	Yes	low
Piping Plover	PIPL	Endangered	Beach/dune	Other	Unknown	Unknown
Prairie Warbler	PRAW	Priority	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Prothonotary Warbler	PROW	Priority	Forest interior-edge	Neotropical	Yes	Low
Purple Finch	PUFI	Priority	Forest interior-edge	Short distance	Unknown	Unknown
Purple Gallinule	PUGA	Rare Sighting	Wetland-open water	Other	Unknown	Unknown
Purple Martin	PUMA	Common	Urban	Neotropical	Unknown	Unknown
Red Knot	REKN	Threatened	Other	Other	Unknown	Unknown
Red-bellied Woodpecker	RBWO	Common	Forest interior-edge	Resident	Yes	Moderate
Red-breasted Nuthatch	RBNU	Uncommon	Forest interior	Short distance	Unknown	Unknown
Red-eyed Vireo	REVI	Common	Forest interior-edge	Neotropical	Yes	Low- Mod
Red-headed Woodpecker	RHOW	Threatened	Shrub-scrub/barrens	Short distance	Unknown	Unknown

Red-necked Phalarope	RNPH	Migrant	Other	Other	Unknown	Unknown
Red-shouldered Hawk	RSHA	Endangered	Forest interior	Short distance	Unknown	Unknown
Red-tailed Hawk	RTHA	Common	Other	Short distance	Unknown	Unknown
Red-winged Blackbird	RWBL	Common	Wetland-open water	Short distance	Unknown	Unknown
Ring-billed Gull	RBGU	Migrant	Wetland-open water	Other	Unknown	Unknown
Ring-necked Pheasant	PHEA	Game	Grassland	Resident	Unknown	Unknown
Rock Dove	RODO	Common	Urban	Resident	Unknown	Unknown
Rooster	ROOS	Introduced	Other	Other	Unknown	Unknown
Roseate Tern	ROTE	Endangered	Beach/dune	Other	Unknown	Unknown
Rose-breasted Grosbeak	RBGR	Priority	Forest interior	Neotropical	Unknown	Unknown
Rough-legged Hawk	RLHA	Migrant	Other	Other	Unknown	Unknown
Royal Tern	ROYT	Migrant	Other	Other	Unknown	Unknown
Ruby-crowned Kinglet	RCKI	Common	Forest interior-edge	Short distance	Unknown	Unknown
Ruby-throated Hummingbird	RTHU	Common	Forest interior-edge	Neotropical	Unknown	Unknown
Ruddy Duck	RUDU	Waterfowl	Wetland-open water	Other	Unknown	Unknown
Ruddy Ground-Dove	RUGD	Game	Other	Other	Unknown	Unknown
Ruddy Quail-Dove	RUQD	Game	Other	Other	Unknown	Unknown
Ruddy Turnstone	RUTU	Migrant	Other	Other	Unknown	Unknown
Ruffed Grouse	RUGR	Game	Forest interior-edge	Resident	Unknown	Unknown
Rufous Hummingbird	RUHU	Rare Sighting	Forest interior-edge	Neotropical	Unknown	Unknown
Rusty Blackbird	RUBL	Migrant	Wetland-open water	Short distance	Unknown	Unknown
Saltmarsh Sharp-tailed Sparrow	SSTS	Uncommon	Maritime Marsh	Short distance	Unknown	Unknown
Sanderling	SAND	Special Concern	Other	Other	Unknown	Unknown
Sandhill Crane	SACR	Migrant	Wetland-open water	Other	Unknown	Unknown
Savannah Sparrow	SAVS	Threatened	Grassland	Short distance	Unknown	High
Scarlet Tanager	SCTA	Priority	Forest interior	Neotropical	Yes	Low
Scissor-tailed Flycatcher	STFL	Rare Sighting	Other	Neotropical	Unknown	Unknown
Seaside Sparrow	SESP	Priority	Maritime Marsh	Short distance	Unknown	Unknown
Sedge Wren	SEWR	Endangered	Grassland	Short distance	Unknown	Unknown
Semipalmated Plover	SEPL	Migrant	Other	Other	Unknown	Unknown
Semipalmated Sandpiper	SESA	Migrant	Other	Other	Unknown	Unknown
Sharp-shinned Hawk	SSHA	Special Concern	Forest interior-edge	Short distance	Unknown	Unknown
Sharp-tailed Sparrow	STSP	Priority	Other	Other	Unknown	Unknown
Short-billed Dowitcher	SBDO	Migrant	Other	Other	Unknown	Unknown
Short-eared Owl	SEOW	Endangered	Beach/dune	Short distance	Unknown	Unknown
Slate-colored Junco	SCJU	Migrant	Other	Other	Unknown	Unknown
Snowy Egret	SENG	Common	Maritime Marsh	Other	Unknown	Unknown

Solitary Sandpiper	SOSA	Migrant	Other	Other	Unknown	Unknown
Solitary Vireo	SOVI	Special Concern	Forest interior	Neotropical	Unknown	Unknown
Song Sparrow	SOSP	Common	Shrub-scrub/barrens	Short distance	Unknown	Unknown
Sora	SORA	Scarce	Wetland-open water	Other	Unknown	Unknown
Spotted Sandpiper	SPSA	Special Concern	Wetland-open water	Other	Unknown	Unknown
Summer Tanager	SUTA	Uncommon	Forest interior	Neotropical	Unknown	Unknown
Swainson's Hawk	SWHA	Accidental	Other	Neotropical	Unknown	Unknown
Swainson's Thrush	SWTH	Migrant	Forest interior	Neotropical	Unknown	Unknown
Swainson's Warbler	SWWA	Priority	Forest interior	Neotropical	Unknown	Unknown
Swallow-tailed Kite	STKI	Accidental	Forest interior-edge	Neotropical	Unknown	Unknown
Swamp Sparrow	SWSP	Common	Wetland-open water	Short distance	Unknown	Unknown
Tennessee Warbler	TEWA	Migrant	Forest interior-edge	Neotropical	Unknown	Unknown
Townsend's Solitaire	TOSO	Accidental	Forest interior	Short distance	Unknown	Unknown
Townsend's Warbler	TOWA	Accidental	Forest interior	Neotropical	Unknown	Unknown
Tree Swallow	TRES	Common	Other	Short distance	Unknown	Unknown
Tricolored Heron	TRHE	Special Concern	Maritime Marsh	Other	Unknown	Unknown
Turkey Vulture	TUVU	Common	Other	Short distance	Unknown	Unknown
Unidentified Dark-eyed Junco	UDEJ	Common	Forest interior-edge	Short distance	Unknown	Unknown
Unknown Yellow-rumped Warbler	UYRW	Migrant	Forest interior	Short distance	Unknown	Unknown
Upland Sandpiper	UPSA	Endangered	Grassland	Neotropical	Unknown	Unknown
Varied Thrush	VATH	Rare Sighting	Forest interior-edge	Short distance	Yes	Unknown
Veery	VEER	Special Concern	Forest interior	Neotropical	Yes	None
Vesper Sparrow	VESP	Endangered	Grassland	Short distance	Unknown	Moderate
Virginia Rail	VIRA	Common	Wetland-open water	Other	Unknown	Unknown
Virginia's Warbler	VIWA	Accidental	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Warbling Vireo	WAVI	Common	Forest interior-edge	Neotropical	Unknown	Unknown
Whimbrel	WHIM	Special Concern	Other	Other	Unknown	Unknown
Whip-poor-will	WPWI	Priority	Shrub-scrub/barrens	Neotropical	Unknown	Low
White Ibis	WHIB	Rare Sighting	Wetland-open water	Other	Unknown	Unknown
White-breasted Nuthatch	WBNU	Common	Forest interior	Resident	Yes	Moderate
White-eyed Vireo	WEVI	Priority	Forest interior-edge	Short distance	Yes	Unknown
White-faced Ibis	WFIB	Rare Sighting	Wetland-open water	Other	Unknown	Unknown
White-rumped Sandpiper	WRSA	Migrant	Other	Other	Unknown	Unknown
White-throated Sparrow	WTSP	Migrant	Shrub-scrub/barrens	Short distance	Unknown	Unknown
White-winged Crossbill	WWCR	Migrant	Forest interior	Short distance	Unknown	Unknown
White-winged Dove	WWDO	Rare Sighting	Other	Short distance	Unknown	Unknown
Wild Turkey	EWTU	Game	Forest interior-edge	Resident	Unknown	Unknown

Willet	WILL	Common	Wetland-open water	Other	Unknown	Unknown
Willow Flycatcher	WIFL	Common	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Wilson's Phalarope	WIPH	Migrant	Wetland-open water	Other	Unknown	Unknown
Wilson's Plover	WIPL	Rare Sighting	Other	Other	Unknown	Unknown
Wilson's Warbler	WIWA	Migrant	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Winter Wren	WIWR	Special Concern	Forest interior-edge	Short distance	Unknown	Unknown
Wood Duck	WODU	Game	Wetland-open water	Other	Unknown	Unknown
Wood Stork	WOST	Accidental	Wetland-open water	Other	Unknown	Unknown
Wood Thrush	WOTH	Priority	Forest interior-edge	Neotropical	Yes	Low - Mod
Worm-eating Warbler	WEWA	Priority	Forest interior	Neotropical	Yes	None
Yellow Warbler	YWAR	Common	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Yellow-bellied Sapsucker	YBSA	Uncommon	Forest interior-edge	Short distance	Unknown	Unknown
Yellow-billed Cuckoo	YBCU	Common	Forest interior-edge	Neotropical	Yes	Low
Yellow-breasted Chat	YBCH	Special Concern	Shrub-scrub/barrens	Neotropical	Unknown	Unknown
Yellow-crowned Night-Heron	YCNH	Threatened	Maritime Marsh	Other	Unknown	Unknown
Yellow-headed Blackbird	YHBL	Migrant	Wetland-open water	Neotropical	Unknown	Unknown
Yellow-shafted Flicker	YSFL	Common	Forest interior-edge	Short distance	Unknown	Moderate
Yellow-throated Vireo	YTVI	Priority	Forest interior-edge	Neotropical	Yes	None
Yellow-throated Warbler	YTWA	Common	Forest interior	Neotropical	Unknown	Unknown