

Monitoring Avian Productivity, Survivorship and Response to Habitat Change on Blue Heron Reserve - 1994-2006

Preliminary Report 2006

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Introduction

Many of the long-term monitoring programs for landbirds indicate declining population trends in migrant species in eastern North America (Robbins et al. 1989, Terborgh 1989). While many trends have been downward, none of the existing long-term programs have provided data on productivity and survivorship that could account for these population changes.

The Monitoring Avian Productivity and Survivorship (MAPS) program is a cooperative effort to provide critical long term data on population parameters for landbird species throughout the continent (DeSante and Burton 1994). Adult population size and post-fledgling productivity are estimated at regional levels. Standardization from year to year and continuation of the study for at least twenty consecutive years at each station are necessary in order to provide reliable estimates of annual variations in productivity and survivorship. Regional target species of MAPS include Downy Woodpecker (*Picoides pubescens*), Gray Catbird (*Dumetella carolinensis*), Red-eyed Vireo (*Vireo olivaceus*), Common Yellowthroat (*Geothlypis trichas*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Song Sparrow (*Melospiza melodia*), and American Goldfinch (*Carduelis tristis*).

MAPS banding stations can also provide valuable information at state and local scales. At the state level, the Ohio working group of Partners in Flight has prioritized grassland and wetland species at the highest level of concern (Earnst and Dettmers 1995). Banding stations contribute valuable information that can be used to assess and understand the causes of statewide population trends in these species. At a local level, species responses can be linked to changes in habitat type and management, and this information can then be used to guide future management decisions.

With this in mind, the Black Swamp Bird Observatory initiated a project that would not only meet national concerns but be able to address state and local questions. The succession field of Blue Heron Reserve, along with neighboring riparian and wet woods, provides a valuable site to investigate species of grassland and edge on these various geographic levels.

The cumulative examination over the first 13 years raises considerable questions about bird populations and their response to habitat change. Data suggest that the variety of habitats represented on this site has provided for a diverse bird community. Habitat succession that has occurred during the study provides some insight into the potential effects that various management regimes chosen by the Park District may have on the avian community. Interpretation of wildlife data always leaves many unknowns and assumptions. Many environmental and manmade effects can result in similar responses from wildlife populations and communities. How to tease these apart is the challenge to land managers and researchers.

The purpose of this report is to give an indication of bird community change through time, and to set the stage for an in depth analysis of community response to habitat change and recommendations on potential land management decisions.

Methods

The banding station was sited in a location that permitted the capture of substantial numbers of targeted species. The site also met the requirements of being dominated by one major habitat type. The breeding season (June 1 - August 10 at this latitude) was divided into 10 day periods. Field work was conducted during seven periods on the Blue Heron Reserve annually between 1994 and 2006.

Constant effort mist netting was the survey method utilized. Ten 12-meter mist nets were operated for six hours once during each ten-day period with at least six days separating each sample date (DeSante and Burton 1995). Nets were checked as often as possible for captured birds, with each bird being removed and placed in a holding bag. All birds were processed at a centralized banding location and released. Data collected on each bird included band number, species, age, how aged, sex, how sexed, status, date, time of capture, station, net number, skull pneumatization, adult breeding condition, flight feather molt, and wing chord.

The study site was mapped to determine vegetation type and distribution in the study area. Vegetation was characterized at the beginning of the study period and then once every five years. This will detect changes in vegetation over time which could affect bird populations and demographic parameters, as well as be comparable to other MAPS stations. Vegetation was described at two levels. First a scaled map delineating major habitat types was developed; and secondly, an estimation of stand characteristics was conducted at each point count location to provide a more precise and quantitative assessment of each habitat's vegetation. The stand characteristics were gathered by placing a 25-meter radius circle at each point. Data on four layers of vegetation (tree canopy, sub-canopy, shrubs, and ground cover) were collected.

Results

Mist Netting

Banding was conducted on seven days for a total of 420.0 net hours in each of the 13 years of this study. A total of 4,458 birds of 70 species have been captured to date at the site (Table 1). Dominant species captured have been American Goldfinch (753); Yellow Warbler (*Dendroica petechia*) (526); Common Yellowthroat (436); Song Sparrow (429); Gray Catbird (428); Field Sparrow (*Spizella pusilla*) (358); Indigo Bunting (*Passerina cyanea*) (282); Traill's Flycatcher (*Empidonax traillii*) (255); House Wren (*Troglodytes aedon*) (131); and American Robin (*Turdus migratorius*) (96). A total of 39 species have been documented as confirmed breeders on the site for at least one year of the study, and an additional 10 species were confirmed as probable breeders (Table 2).

There have been a number of drastic changes in the avian community over the first 13 years of this study. The total number of birds banded each year is shown in Table 1. The

number of birds captured per net hour has declined from an average of 1.41 in 1994 to .47 in 2006, representing an approximate 9% decrease per year over the 13 years (Figure 1). The diversity of species has also declined from 36 species captured in 1994 to 19 captured in 2006 (Figure 2). The total number of individuals banded per year has declined for a number of species associated with open habitats, such as American Goldfinch, Field Sparrow, Song Sparrow, Indigo Bunting, Common Yellowthroat, Traill's Flycatcher, Red-winged Blackbird (*Agelaius phoeniceus*) (Figure 3 and Table 1). This is likely the result of habitat closure of the old field succession habitat (see Vegetation Mapping below). A number of other species, such as Northern Cardinal (*Cardinalis cardinalis*), Gray Catbird, and American Robin, have shown stable captures throughout the study period (Table 1). Grassland species were banded early in the study, including Grasshopper Sparrow (*Ammodramus savannarum*), Savannah Sparrow (*Passerculus sandwichensis*) and Dickcissel (*Spiza Americana*), but were not captured in later years; however, most of these species continue to be documented in the adjacent grassland.

Site fidelity is an important indicator of community stability. A stable community will have good return rates of breeding birds year to year. Annual rates can vary greatly even in the most intense study. Blue Heron has a relatively large acreage per net coverage. This can result in a low percentage of study site birds being encountered on an individual year. Tables 3-15 show returning birds by year, and Figure 4 shows minimum return rates of commonly recaptured birds at Blue Heron.

Long term studies like this one also provide for rare looks at longevity of breeding birds. Of the 495 returns recorded in the 13 years there have been three yellow warblers, two American Goldfinches, two Field Sparrows, and one each Song Sparrow and Common Yellowthroat that have been captured six years after the original capture. Additional outstanding records include a five year old Indigo Bunting and four year old Traill's Flycatcher, Gray Catbird, and Red-eyed Vireo. Ultimately, returns can permit the assemblage of life tables for more commonly captured species.

Vegetation Mapping

Four major habitats were classified on the study site: wet woods, riparian woods, dogwood thicket, and old field succession. Vegetation within each habitat was categorized once every five years.

1. Wet woods: The wet woods has a heavy canopy dominated by elm (*Ulmus spp.*), pin oak (*Quercus palustris*), white ash (*Fraxinus americana*). The main sub-canopy consists of hawthorne (*Crataegus spp.*), and the shrub layer was composed of dogwood (*Cornus spp.*). The herbaceous layer was dominated by forbs. No major changes have been observed during the study years.

2. Riparian woods: The canopy of the riparian woods has been dominated by cottonwood (*Populus deltoides*) and black willow (*Salix nigra*). White ash was the most common sub-canopy species. The main shrub was dogwood with a variety of forbs and grasses making up the herbaceous layer. There has been little succession during the study.

3. Dogwood thicket: The dogwood thicket had no canopy layer, but did have a small amount of white ash as sub-canopy at the beginning of the study. Goldenrod (*Solidago spp.*) was the dominant forb. Considerable succession has occurred in this habitat in the 13 years of study.

Ash and oak have encroached from the woodlands and have resulted in the formation of a broken canopy. This habitat closure has left few remaining openings in the habitat, resulting in considerably more dense vegetation coverage and a reduction in the forbs layer.

4. Old field succession: At the beginning of the study, the shrub layer was the tallest layer, and it consisted mainly of dogwood. The herbaceous layer had a tremendous variety of fleabane (*Erigeron spp.*), goldenrod, and grasses. This habitat has succeeded to be similar to the dogwood thicket. Dogwood has spread through the area closing in most openings.

Discussion

This long-term study has been successful in gathering information of avian use of the Blue Heron Reserve. There have been significant changes in the abundance and diversity of the avian community over the 13 years of the study to date, and this is likely the result of local habitat changes on the Reserve. It is believed that surrounding habitat has had little effect on communities on the Reserve. There has been little change in the immediate landscape around the Park. At the initiation of the study the majority of the habitat base of the study site was of late old field succession. This was typified by grass/forbs habitat with varying amounts of scrub-shrub intermixed. This habitat has gradually changed to a shrub-scrub thicket with a few forbs/grass openings. This “closure” of the habitat would be expected to result in some species and community changes. Reduction in capture rates of American Goldfinch, Traill’s Flycatcher, Indigo Bunting, and Field Sparrow would be expected with this habitat change. Conversely steady populations of Northern Cardinal and Gray Catbird represent the increase in shrub density. It is possible species such as these didn’t show population increases due to possible changes in territory size with denser vegetation. This would also affect return rates calculated by band recaptures. If the needs of an individual are being met in more concentrated habitat, territory size can be smaller resulting in more territories of birds and the increased population not being reflected in capture rates as a smaller percentage of the population is available to the net lanes.

Grassland sparrows were all encountered in the first half of the period studied. Most species continue to be documented in the adjacent grassland. One of the most interesting species captured is Clay-Colored Sparrow (*Spizella pallida*) which was encountered in each of the past two years.

Management Recommendations

It is hoped that the avian information gathered in this study will be beneficial to the Sandusky County Park District in both short and long-term management decisions. Recommendations presented here must be looked at in the context of objectives and goals of the Park District for the Blue Heron Reserve. Birds are a good indicator of management success and resource allocation for natural resource preservation. The study area of Blue Heron provides a wide variety of habitats that increases the diversity of bird life that can exist on area of that size. For maintaining this diversity it would be advantageous to secure a habitat complex management plan. A plan that treats the wet woods, riparian corridor, shrub field, wetland, and grassland as components of

the complex will ensure diverse avian communities. The two wooded habitats would be best served by protecting understory and periodic vegetation monitoring for invasives. The wetland is a new habitat to the site and should be monitored for water retention and invasives. The main management effort would be to maintain the grassland successional stage. This is best done through the use of fire, if available. Mowing would be a second choice but favors exotics plant species and removes important perch sites for territory defense. The backbone of the area is the shrub-scrub habitat block. This has been the main area studied and has shown considerable community shifting over the 13 years. Consideration should be made to maintain openings that allow for increased diversity.

Acknowledgments

Black Swamp Bird Observatory would like to thank the Sandusky County Park District for providing the opportunity to look at northern Ohio breeding birds and response to habitat change and management. It is long-term studies such as this that gives insight into better management for the avian fauna. The authors would also like to thank the principal investigators that preceded Kim at the site, Dan Ragen, Tom Dorobek and Julie West. It is also with great appreciation that we acknowledge the considerable effort of all the volunteers that only donated their time but considerable amounts of blood to the invertebrate fauna of the Reserve.

Literature Citations

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Figure 1. Number of birds per net hour banded at Blue Heron Reserve, 1994-2006.

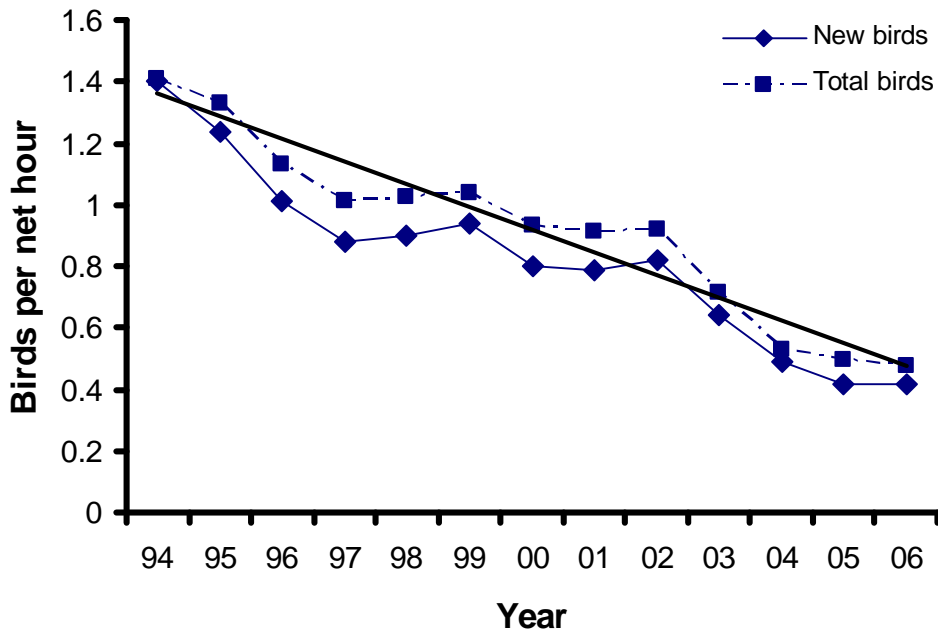


Figure 2. Total number of species banded each year at Blue Heron Reserve, 1994-2006.

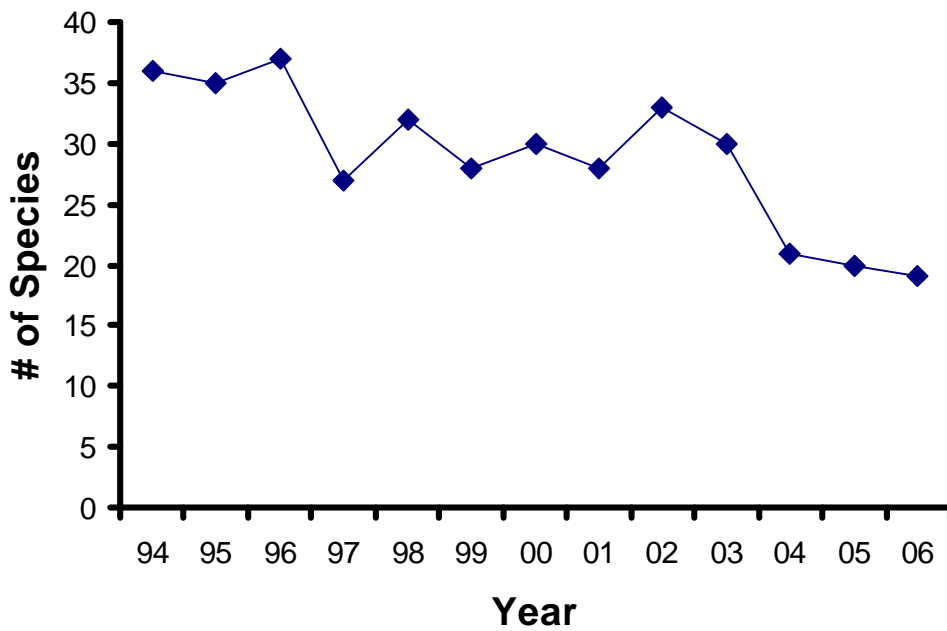


Figure 3. Trends in common species associated with open habitats at Blue Heron Reserve, 1994-2006: (a) American Goldfinch, (b) Field Sparrow, (c) Song Sparrow, (d) Indigo Bunting, (e) Common Yellowthroat, and (f) Traill's Flycatcher.

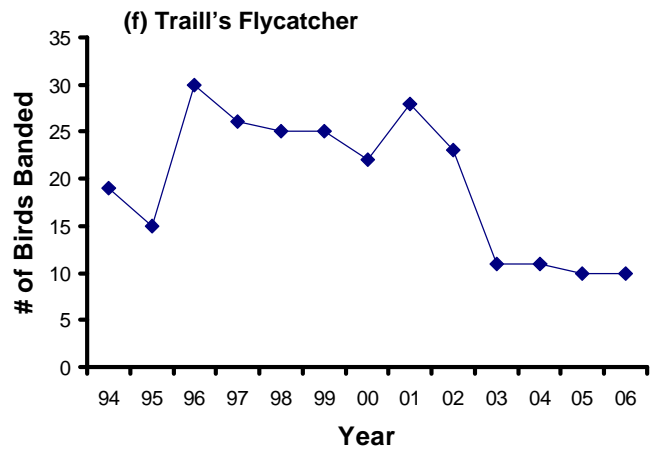
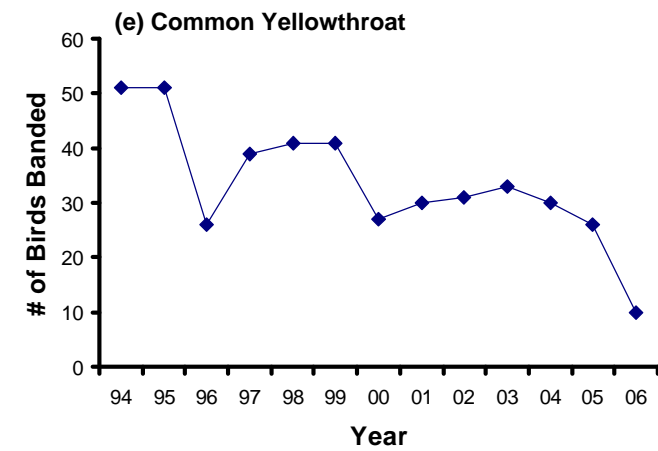
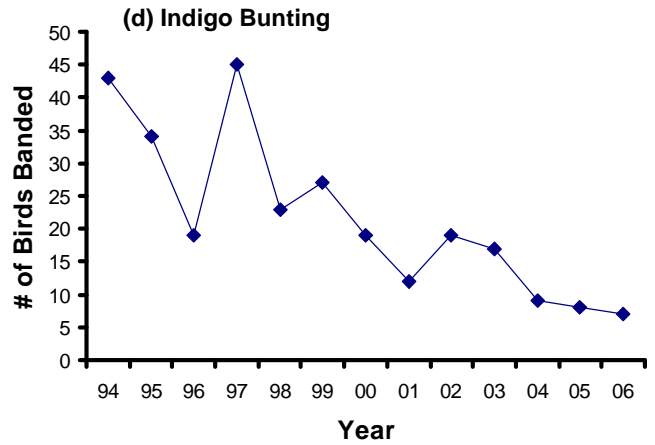
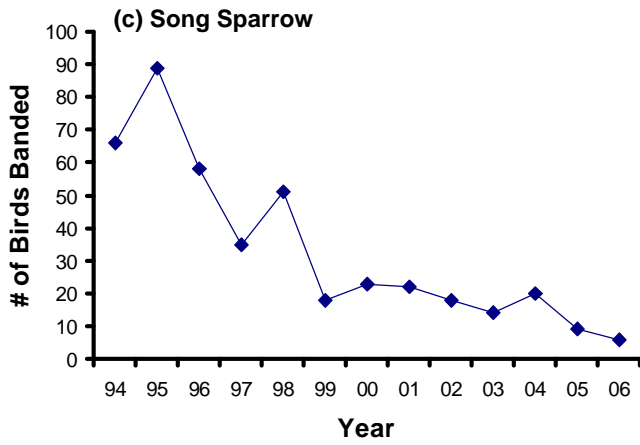
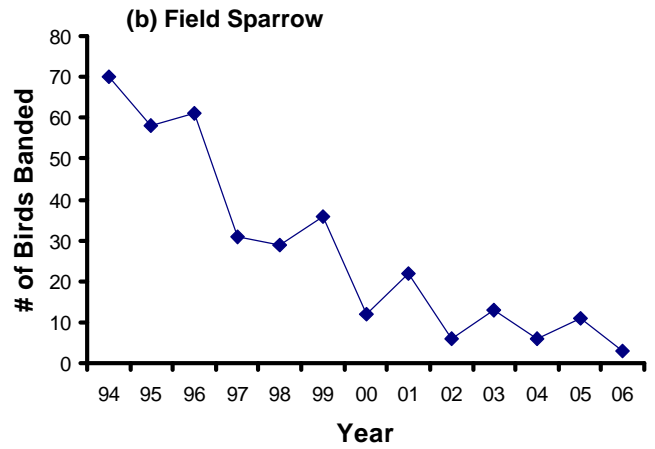
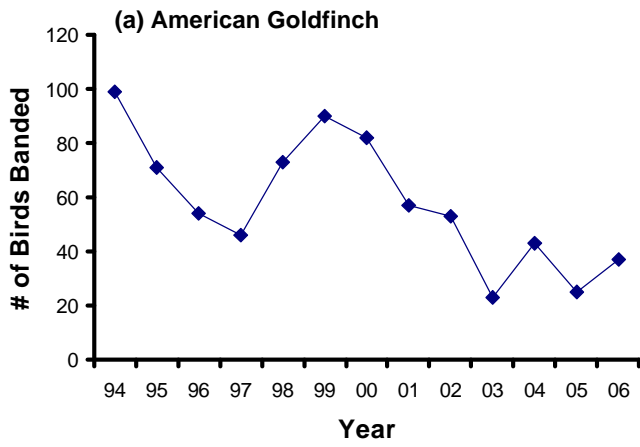


Figure 4. Minimum return rates for commonly captured species at Blue Heron Reserve, 1994-2006: (a) American Goldfinch and Indigo Bunting, (b) Field Sparrow and Song Sparrow, (c) Yellow Warbler and Common Yellowthroat, and (d) Trail's Flycatcher and Gray Catbird.

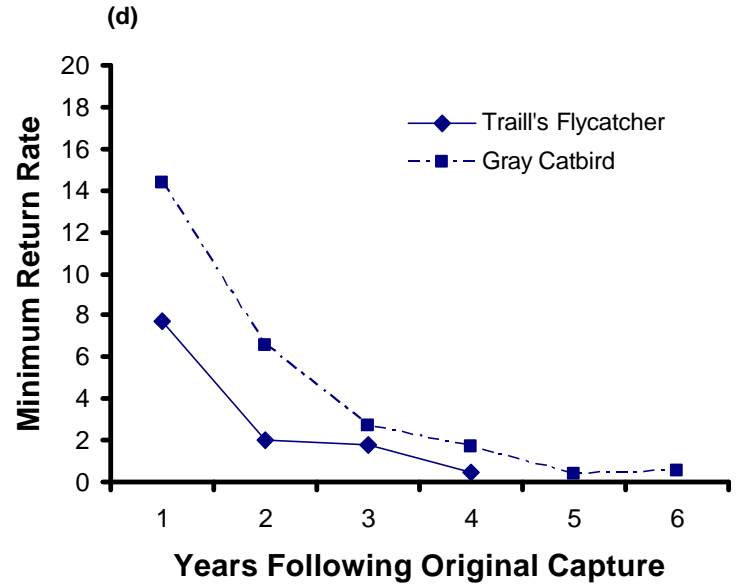
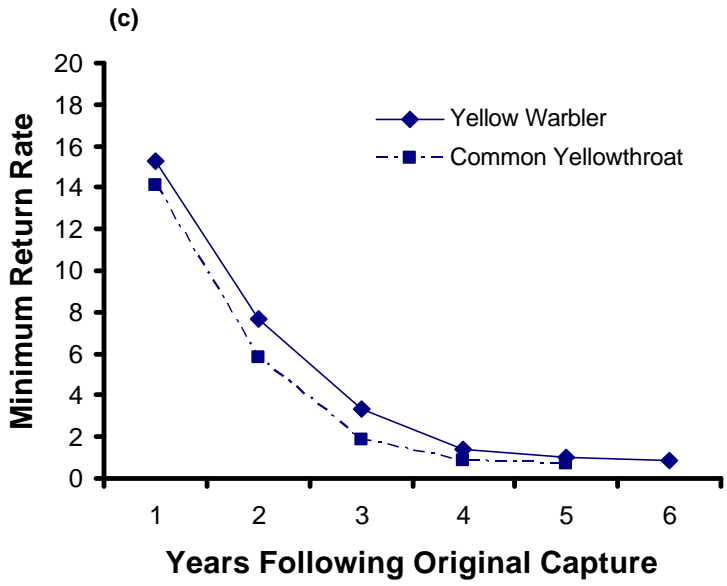
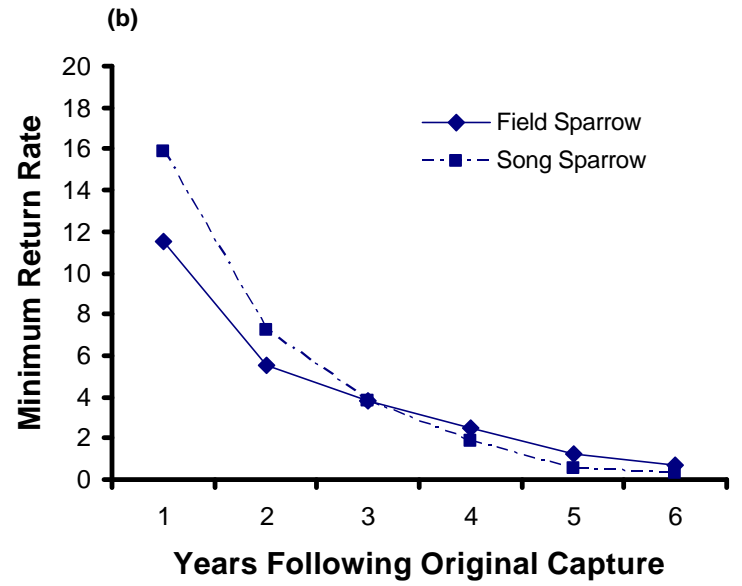
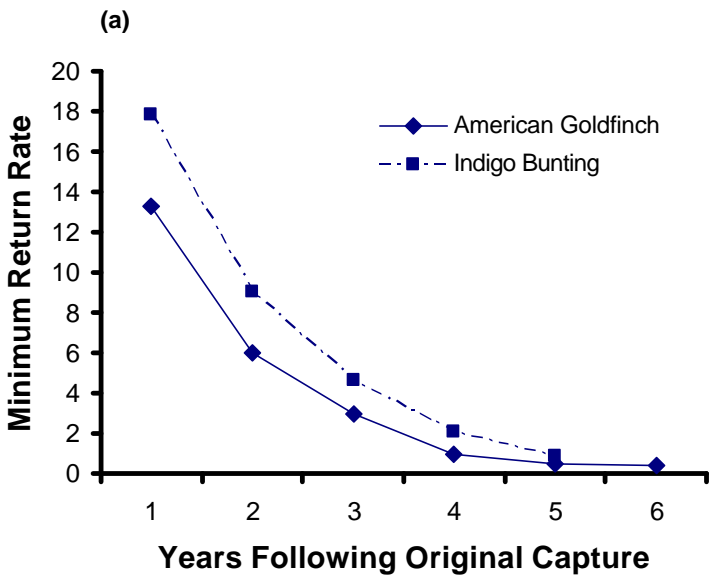


Table 1. Banding totals for Blue Heron Reserve, 1994-2006.

Species	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Mourning Dove		1	1											2
Cooper's Hawk									1					1
Yellow-billed Cuckoo									1					1
Black-billed Cuckoo	3	1	1				3							8
Hairy Woodpecker													1	1
Downy Woodpecker	8	2	1	2	4	5	4	6	2	7	5		3	49
Red-bellied Woodpecker										1				1
Yellow-shafted Flicker	1	1	1		1	1		2	1	1	2	3	1	15
Ruby-throated Hummingbird						6								6
Great-crested Flycatcher		1										1		2
Eastern Phoebe						9	1			2				12
Eastern Wood-pewee			2	3	2			3	2	1	1		1	15
Yellow-bellied Flycatcher						1		2	1	1			1	6
Traill's Flycatcher	19	15	30	26	25	25	22	28	23	11	11	10	10	255
Least Flycatcher	2	1			1	1							1	6
Blue Jay	3	5	1	2		1		3	6	2		1		24
European Starling			1	11										12
Brown-headed Cowbird				7	2	1	1	1						12
Red-winged Blackbird	22	26	7	14	1	1	1	1	3	4				80
Orchard Oriole	3	12	5	10	4	5	1	2	6	8				56
Baltimore Oriole	11	4	7	5	4	1	4		2	1	2	4	1	46
Common Grackle	3	1	4			1			2	1				12
House Finch	6		13				1							20
American Goldfinch	99	71	54	46	73	90	82	57	53	23	43	25	37	753
Vesper Sparrow					1		1							2
Savannah Sparrow	1	1												2
Grasshopper Sparrow	3		1											4
Chipping Sparrow					1		2							3
Clay-colored Sparrow												1		1
Field Sparrow	70	58	61	31	29	36	12	22	6	13	6	11	3	358
Song Sparrow	66	89	58	35	51	18	23	22	18	14	20	9	6	429
Lincoln's Sparrow		1												1
Swamp Sparrow									1					1
Eastern Towhee	1								1					2
Northern Cardinal	8	2	6	4	3	3	2	4	5	9	5	2	6	59

Table 1. (cont'd)

Species	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Rose-breasted Grosbeak	3		1	2		1	2					4		13
Indigo Bunting	43	34	19	45	23	27	19	12	19	17	9	8	7	282
Dicksissel	10													10
Barn Swallow	2	2	1						1					6
Tree Swallow	1	9	2		1	1		2	4	2				22
Cedar Waxwing	34	10	4		11	1	7	4		10				81
Red-eyed Vireo	8	8	2	2	5	3	3	2	4	2	2			41
Warbling Vireo		1		1			2		1	2	1			8
Yellow-throated Vireo	1													1
Blue-headed Vireo					1									1
White-eyed Vireo		1			2						1			4
Nashville Warbler	1													1
Tennessee Warbler	1													1
Yellow Warbler	43	57	70	36	32	52	55	39	35	30	19	24	34	526
Magnolia Warbler			1					1						2
Blackburnian Warbler	1													1
Northern Waterthrush			1											1
Mourning Warbler		2	1			1	1		2					7
Common Yellowthroat	51	51	26	39	41	41	27	30	31	33	30	26	10	436
Yellow-breasted Chat		5		1			1	4	1	2				14
Wilson Warbler		1												1
Canada Warbler			2											2
American Redstart				5	1					1				7
House Sparrow							1							1
Gray Catbird	38	28	15	19	19	34	40	44	52	45	31	27	36	428
Brown Thrasher							3	1			1	2	2	9
Carolina Wren				1	1									2
House Wren	17	9	12	7	19	21	7	6	10	8	13	2		131
Tufted Titmouse	2	2	2	1	7		2	4						20
Black-capped Chickadee		1						1	2	2		2		8
Blue-gray Gnatcatcher			1						1					2
Wood Thrush	2		4	3	3			3	4	4	1	2	5	31
Veery					1						1			2
Swainson's Thrush			1		1									2
American Robin	2	5	5	12	7	6	6	10	8	13	2	10	10	96
Total	589	519	424	370	377	393	336	332	343	270	206	174	175	4,458

Table 2. Confirmed and probable breeders on study site at Blue Heron Reserve, 1994-2006.

Confirmed breeders

Downy Woodpecker	Barn Swallow	Tufted Titmouse
European Starling	Common Grackle	Field Sparrow
Red-winged Blackbird	Traill's Flycatcher	Song Sparrow
Baltimore Oriole	Blue Jay	Yellow Warbler
Orchard Oriole	Northern Cardinal	Common Yellowthroat
Brown-headed Cowbird	House Wren	American Goldfinch
Indigo Bunting	American Redstart	Blue-gray Gnatcatcher
Gray Catbird	American Robin	Eastern Phoebe
Ruby-throated Hummingbird	Mourning Dove	Cooper's Hawk
Yellow-billed Cuckoo	Red-bellied Woodpecker	Grasshopper Sparrow
Chipping Sparrow	Rose-breasted Grosbeak	Tree Swallow
Cedar Waxwing	Red-eyed Vireo	Warbling Vireo
Brown Thrasher	Carolina Wren	Wood Thrush

Probable breeders

Yellow-shafted Flicker	Black-billed Cuckoo	Black-capped Chickadee
Savannah Sparrow	Great-crested Flycatcher	Yellow-throated Vireo
Eastern Wood-pewee	Yellow-breasted Chat	Swamp Sparrow
Eastern Towhee		

Table 3. Birds captured from previous years, Blue Heron Reserve, 1994.

Species	1993	1992	1991	1990	Total
Traill's Flycatcher			1		1
Red-winged Blackbird			1		1
Indigo Bunting				1	1
Total			2	1	3

Table 4. Birds captured from previous years, Blue Heron Reserve, 1995.

Species	1994	1993	1992	1991	1990	Total
American Goldfinch	9					9
Field Sparrow	5					5
Song Sparrow	7					7
Indigo Bunting	5				1	6
Tree Swallow		1				1
Yellow Warbler	3					3
Common Yellowthroat	7					7
Gray Catbird	1					1
Wood Thrush	1					1
Total	38	1			1	40

Table 5. Birds captured from previous years, Blue Heron Reserve, 1996.

Species	1995	1994	Total
Traill's Flycatcher	1		1
American Goldfinch	6	3	9
Field Sparrow	4	3	7
Song Sparrow	12	3	15
Indigo Bunting	1	2	3
Tree Swallow	1		1
Yellow Warbler	6	4	10
Common Yellowthroat	2	1	3
Wood Thrush		2	2
Total	33	18	51

Table 6. Birds captured from previous years, Blue Heron Reserve, 1997.

Species	1996	1995	1994	Total
Traill's Flycatcher	5			5
Baltimore Oriole	3			3
American Goldfinch	5	3	3	11
Field Sparrow	5	1	2	8
Song Sparrow	4	3	2	9
Indigo Bunting	1	1	2	4
Yellow Warbler	4	2	3	9
Common Yellowthroat	1	2		3
Gray Catbird	1			1
American Robin	1	1		2
Total	30	13	12	55

Table 7. Birds captured from previous years, Blue Heron Reserve, 1998.

Species	1997	1996	1995	1994	Total
Brown-headed Cowbird	1				1
Orchard Oriole	1				1
Baltimore Oriole	1				1
American Goldfinch	7	3	2	1	13
Field Sparrow		1	1	2	4
Song Sparrow	2	3	3	2	10
Indigo Bunting	5				5
Red-eyed Vireo			1		1
Yellow Warbler	3	3	3	1	10
Common Yellowthroat	5				5
Gray Catbird		2			2
Total	25	12	10	6	53

Table 8. Birds captured from previous years, Blue Heron Reserve, 1999.

Species	1998	1997	1996	1995	1994	Total
Downy Woodpecker		1				1
Eastern Wood-pewee	1					1
Traill's Flycatcher	2	1				3
Baltimore Oriole	1		1			2
American Goldfinch	4	2		1		7
Field Sparrow	3				2	5
Song Sparrow	2		1	1		4
Indigo Bunting	4	4			1	9
Red-eyed Vireo				1		1
Yellow Warbler	1	1	1			3
Common Yellowthroat	2	1				3
Gray Catbird			1			1
House Wren	1					1
Tufted Titmouse	1					1
Total	22	10	4	3	3	42

Table 9. Birds captured from previous years, Blue Heron Reserve, 2000.

Species	1999	1998	1997	1996	1995	1994	Total
Traill's Flycatcher	1	1					2
American Goldfinch	12	3	2	1	1		19
Field Sparrow	3						3
Song Sparrow	1			1	1	1	4
Indigo Bunting	3	2	1				6
Yellow Warbler	6	1					7
Common Yellowthroat	1	1	1				3
Gray Catbird	8	1		1			10
Carolina Wren			1				1
Total	35	9	5	3	2	1	55

Table 10. Birds captured from previous years, Blue Heron Reserve, 2001.

Species	2000	1999	1998	1997	1996	1995	Total
Traill's Flycatcher	1		2				3
American Goldfinch	4	5	4			1	14
Field Sparrow	1						1
Song Sparrow	2	2					4
Indigo Bunting	1	2	1	2			6
Yellow Warbler	6	4			1		11
Common Yellowthroat	2	3		1			6
Gray Catbird	4	2					6
Total	21	18	7	3	1	1	51

Table 11. Birds captured from previous years, Blue Heron Reserve, 2002.

Species	2001	2000	1999	1998	1997	1996	Total
Downy Woodpecker	1						1
Traill's Flycatcher	2				1		3
Blue Jay	1						1
American Goldfinch	2	1					3
Field Sparrow			2	1			3
Song Sparrow	3	1					4
Northern Cardinal	1						1
Red-eyed Vireo				1			1
Yellow Warbler	4	2	1			1	8
Common Yellowthroat	2	4	2		1		9
Gray Catbird	3	4	1				8
American Robin	1						1
Total	20	12	6	3	1	1	43

Table 12. Birds captured from previous years, Blue Heron Reserve, 2003.

Species	2002	2001	2000	1999	Total
American Goldfinch	3				3
Field Sparrow		1			1
Song Sparrow	1	1	1		3
Northern Cardinal		1			1
Indigo Bunting	3				3
Yellow Warbler	2	2	1		5
Common Yellowthroat	3	1	1		5
Gray Catbird	4	3		1	8
Total	16	9	3	1	29

Table 13. Birds captured from previous years, Blue Heron Reserve, 2004.

Species	2003	2002	2001	2000	1999	1998	Total
Eastern Phoebe	1						1
American Goldfinch		1					1
Field Sparrow						1	1
Song Sparrow	2	1					3
Indigo Bunting	1	1					2
Yellow Warbler	1					1	2
Common Yellowthroat	3				1		4
Gray Catbird	2	1					3
Total	10	4	0	0	1	2	17

Table 14. Birds captured from previous years, Blue Heron Reserve, 2005.

Species	2004	2003	2002	2001	2000	1999	Total
Traill's Flycatcher	1						1
Baltimore Oriole	1						1
American Goldfinch	1	1	2			1	5
Field Sparrow	1			1		1	3
Song Sparrow	1	1	1				3
Northern Cardinal	1						1
Indigo Bunting		1	2				3
Yellow Warbler	2	2		1			5
Common Yellowthroat	4	1					5
Gray Catbird	4	1	1				6
Total	16	7	6	2	0	2	33

Table 15. Birds captured from previous years, Blue Heron Reserve, 2006.

Species	2005	2004	2003	2002	2001	2000	Total
American Goldfinch	1						1
Song Sparrow				1			1
Northern Cardinal			1				1
Indigo Bunting	1		1				2
Yellow Warbler		1				1	2
Common Yellowthroat	5	2					7
Gray Catbird	5	1	1	2		1	10
Total	12	4	3	3	0	2	24