

# Monitoring Avian Productivity and Survivorship on Navarre Marsh and Habitat Response 1992-2014

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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 long term programs provided data on productivity and survivorship that could account for changes in the population.

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*). At a local level, species associations can be linked with habitat type and management assessed by species response.

Species prioritization of Ohio birds by the Ohio working group of Partners in Flight have identified grassland and wetland habitats of highest concern (Earnst and Dettmers 1995). 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. Navarre provides a valuable site to compare breeding bird activities and a major migration stopover site.

The cumulative look over the 23 years raises considerable question on bird populations and response to habitat change. Data suggest the beach ridge habitats that comprise the study site is relatively stable over time but unique events and bird communities may still affect numbers and variety. 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.

This report is to give indications of bird community direction and 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 Navarre MAPS station annually. 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.

## Results

### Mist Netting

Banding was conducted seven days a year for a total of 420.0 net hours in each of the 23 years of this study. The lone exception was 1998 when a massive tornado hit the area resulting in considerable tree fall and net lane damage. The total number of birds banded each year is shown in (Table 1). Birds per 100 net hours have averaged from 64.3 in 2003 to 31.0 in 2009. This represents an insignificant decrease per year over the 23 years (Figure 1). A total of 70 species have been captured to date at the site. Dominant species captured have been Gray Catbird (816), Yellow Warbler (*Dendroica petechia*) (649), Red-winged Blackbird (*Agelaius phoeniceus*) (392), Common Grackle (*Quiscalus quiscula*) (294), American Robin (*Turdus migratorius*) (268), Common Yellowthroat (180), House Wren (*Troglodytes aedon*) (178), Northern Cardinal (*Cardinalis cardinalis*) (171), Downy Woodpecker (132), Song Sparrow (106).

A wide variety of species have been confirmed or are suspected breeders on or adjacent to the study area (Table 2). The speciation is reflective of the proximity of wetlands as well as heavy scrub-shrub. Site fidelity of breeding birds represents a good parameter 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. Navarre MAPS has a relatively small acreage per net coverage. Tables 3-23 show returning birds by year. Long term studies like this one also provide for rare looks at longevity of breeding birds. Of the 586 returns recorded in the 23 years there have been four yellow warblers, four Gray Catbird, three Common Yellowthroat, three Northern Cardinal, and one Common Grackle that have been captured six or more years after the original capture (Table 24).

Seven species have been captured every year of the study. These include Downy Woodpecker, Red-winged Blackbird, Northern Cardinal, Yellow Warbler, Common Yellowthroat (one year by return only), Gray Catbird, and House Wren. In addition the American Robin has been missed on only one occasion. Over the duration of the study Blue Jay, Common Grackle, Prothonotary Warbler, Black-capped Chickadee, and American Robin have demonstrated significant increases in abundance. Linear regression over time for the Common Grackle indicates a positive slope and  $R^2 = .55$ . Willow Flycatcher, Indigo Bunting, White-eyed Vireo, Common Yellowthroat, and American Redstart have shown decreasing abundance during the study. In contrast to the grackle, Red-eyed Vireo regression on time indicates a negative slope and  $R^2 = .47$ . Both Song Sparrow and Common yellowthroat indicate negative slopes over time but are greatly affected by the 1998 tornado event. Song Sparrow indicates a  $R^2 = .04$  for the entire study but a  $R^2 = .52$  since 1998. The Common Yellowthroat has an  $R^2 = .05$  for the entire study but an  $R^2 = .44$  since the tornado. Breeding of the White-eyed Vireo has not been documented since 2007.

### Discussion

This long-term study has been successful in gathering information of breeding avian use of Navarre Marsh. There have been abundance and diversity changes over the 23 years of the study to date. It is believed that surrounding habitat has had little effect on long-term communities in Navarre. The tornado of 1998 definitely resulted in short-term affects on the avian community both in diversity and abundance. There has been little change in the immediate landscape around the station.

The tornado of 1998 was expected to result in considerable affects of bird speciation and abundance. The loss of nearly 75% of the canopy opened a large part of the study site to increased sunlight to the ground. Immediate response indicated a shift from Yellow Warbler to Common Yellowthroat as the dominant warbler of the site. This observation had pretty much returned to pre-tornado conditions within 7-8 years post disturbance. The Common Yellowthroat and Song Sparrow showed an increase following the tornado for 7-8 years and then began declining. Red-winged Blackbird, Baltimore Oriole, Carolina Wren, and House Wren all have increased since 1998. Yellow-breasted Chat showed a strong response to the habitat alteration and became part of the community. Red-eyed Vireo, White-eyed Vireo, and American Redstart have all declined since the tornado. It is possible that the reduction in canopy has resulted in some species being more vulnerable to the nets but species behaviors such as the Vireos do not support this as a major factor.

1998 was also a very strange migration spring. Data supports that the large fires of Mexico and Central America had resulted in delaying migrants and greatly affected their survival in trans-gulf migration. Large numbers of birds were reported landing on Gulf oil rigs and dying (Dr. Frank Moore pers. comm.). Spring migration results at Navarre supported this with poor numbers of all species known for trans-gulf migration. Overall bandings was reduced nearly 50% that spring and indications were that occurred over the entire eastern part of the continent. Delayed migration was supported by strict migration species showing up along the Lake Erie coast well into late June when late passage is by the 7 June. Late migrants such as Yellow-bellied Flycatcher, Mourning Warbler, Wilson's Warbler, Canada Warbler, and Gray-cheeked Thrush

were all encountered on the MAPS station that June. Operation of this breeding bird station in combination with the Navarre migration station provides additional insight on migratory species of concern.

Species abundance changes appear to support changes that have been observed at the migration site. This suggests that local trends may be important to analysis both for migration and breeding periods.

### **Management Recommendations**

Birds are a good indicator of management success and resource allocation for natural resource preservation. The beach ridge habitat of the western basin marshes has been under rated in its importance to regional bird communities and their health. This habitat, one of the rarest in the state provides important migration stopover habitat, breeding habitat, and dispersal habitat for an unknown population of birds.

### **Acknowledgments**

Black Swamp Bird Observatory would like to thank First Energy Corporation and the U.S. Fish and Wildlife Service 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. 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 Navarre. The author would also like to thank members of the BSBO Scientific Editorial Board of Dr. Kristin Mylecraine, Dr. Elliot Tramer, Dr. Robert Gates, Keith Lott, and Dr. Andy Jones for review of the manuscript.

### **Literature Citations**

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Table 1. Banding totals for Navarre Marsh MAPS station, 1992-2014.

Species	1992	1993	1994	1995	1996	1997	1998 *	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
American Woodcock		1	1	1		1			1		1			1		1					1			9
Eastern Screech Owl				1							2									2	1		1	7
Yellow-billed Cuckoo	1								1	1	1					1							2	7
Hairy Woodpecker																							1	1
Downy Woodpecker	14	5	7	7	6	9	2	8	4	4	2	7	4	4	4	5	8	3	3	8	8	3	7	132
Red-bell. Woodpecker												1												1
Yellow-Sh. Flicker	1							2		1		1						3		1	1		1	9
Ruby-Th. Humming.								3	2		1					1								7
Eastern Kingbird	1					1									1									3
Great-cr. Flycatcher		2			1	1	3	3																10
Eastern Phoebe				1	1			1	3	1	1	2					1							11
Eastern Wood-Pewee	2		2	1			1					1										1		8
Yel.-bell. Flycatcher		3	1	2	1		6	1				1		9	2			1				2		29
Acadian Flycatcher				1	1	3										3	1							9
Traill's Flycatcher	3	1		1	1	3	2	1	4	1	1	11	1	5		4		2	1			1		43
Least Flycatcher									1					1										2
Blue Jay						1		1		2	1	2		1		2	1	2	1	1	2		3	20
Red-wing. Blackbird	18	7	4	16	3	18	2	21	28	12	20	4	17	19	17	34	19	10	35	21	23	12	32	392
Orchard Oriole												8			6									14
Baltimore Oriole				1	3	4	1	19	17	11	2	1	2	5	1	2	5	1	4	5	4	6	3	97
Common Grackle	3	1	6	16	3	5	3	1		2	3	1		24	3	26	18	15	33	33	31	19	48	294
Purple Finch							1																	1
American Goldfinch	2	4	3		2	2	1		1		5	23		1						1			1	46
White-th Sparrow																		1						1
Field Sparrow												13												13
Song Sparrow	4	6	3	3	1	4		6	8	13	7	14	10	6	7	1	2		2	1	3	1	3	106

Species	1992	1993	1994	1995	1996	1997	1998 *	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Lincoln's Sparrow																1								1
Swamp Sparrow	1	1																						2
Northern Cardinal	9	6	11	9	5	15	2	7	7	5	9	9	10	7	5	10	8	8	6	6	5	4	8	171
Rose-br. Grosbeak										1											1			2
Indigo Bunting	8	8	4	4	5	4		5	3	4	4	17	9	2		2	1			2	1	4	1	88
Scarlet Tanager			1																					1
Tree Swallow									2			2									1			5
Cedar Waxwing	12	2	6			2		1	7	1		10												41
Red-eyed Vireo	2	4	2	6	7	4	2	1	1	1	1	2	1						1	1	1			37
Warbling Vireo	2	2	4	2	4	3		1	1		1	2			1							4	3	30
Wh.-eyed Vireo	3		3	4	4	2	1	2					1			2								22
Bl. and Wh. Warbler	1	1		6	2	6			2	1	4		1	1	1	3	1	1	2		1	1	1	36
Prothonotary Warbler	2	3	2		2	8	1	1	1					3	3	3	3	2	6	3	5	7	9	64
Worm-eating Warbler			1		1																	1		3
Blue-winged Warbler		1	1																					2
Tennessee Warbler		2																						2
Yellow Warbler	63	38	32	78	47	31	3	25	28	3	22	30	15	8	30	8	13	15	25	30	26	52	27	649
Black-th-blue Warbler			1																					1
Myrtle Warbler																					1			1
Magnolia Warbler				1			2		1		1			1										6
Chest.-sided Warbler		2		1		1		1																5
Blackpoll Warbler											1													1
Bl.-th-green Warbler															1									1
Ovenbird			1	1		1	2		1						2	1								9
No. Waterthrush			2	2													1				1	1		7
Mourning Warbler	1		1	1	3	1	5		1		1			5		2		1	1			1		24
Com. Yellowthroat	4	11	8	5	2	8	2	8	17	16	19	33	14	10	2	3	3	1	2	5		6	1	180
Yellow-br. Chat									2	2		2			1		1							8

Species	1992	1993	1994	1995	1996	1997	1998 *	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total	
Hooded Warbler			1																					1	
Wilson's Warbler		1	1			1	3		1							1					1			9	
Canada Warbler		2		3		1	4	1														1		12	
American Redstart	2	2	1	3	6	2	3	1	2		2	1		1			1						1	28	
Gray Catbird	36	46	43	54	35	36	8	21	21	40	43	45	64	27	27	29	41	38	28	35	32	27	40	816	
Brown Thrasher	4	1				2		4	1				1	3			2	1	1	2				22	
Carolina Wren	4	2		2	2	3		11	5	14	7		12	2	6	7	7	1	2		3	3	2	95	
House Wren	14	8	19	9	5	7	3	22	11	10	9	8	9	2	4	3	6	9	8	1	2	6	3	178	
Tufted Titmouse			2																					2	
Black-cap. Chickadee			1			1		3	2			2								2	6	2	1	20	
Ruby-cr. Kinglet																	1							1	
Wood Thrush			1	1	2	2						4	3	5	3	2		1	2	4			2	32	
Veery	2					1		1			1						1		1				1	8	
Gray-cheeked Thrush											1			1										2	
Swainson's Thrush	3	1	1	3		1	1		2		1		1	1		2		3	1		2			23	
American Robin	2	2		9	4	18	7	5	18	5	8	13	21	8	5	17	11	11	15	36	26	13	14	268	
Total	224	176	177	255	159	213	72	188	207	151	181	270	196	163	132	176	156	130	180	200	193	174	216	4,189	
Net Hours	420	420	420	420	420	420	120	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	9,360
Birds/Net Hours	.53	.42	.42	.61	.38	.51	.60	.45	.49	.36	.43	.64	.47	.39	.31	.42	.37	.31	.43	.48	.46	.41	.51	.45	

\* Season interrupted by tornado after second field session.



Table 2. Confirmed and probable breeders on study site Navarre MAPS, 1992-2014.

Confirmed breeders

Mallard	Eastern Wood Pewee	Yellow-throated Vireo
Wood Duck	Willow Flycatcher	White-eyed Vireo
Canada Goose	Blue Jay	Black-and-white Warbler
Virginia Rail	European Starling	Prothonotary Warbler
Sora	Brown-headed Cowbird	Yellow Warbler
American Woodcock	Red-winged Blackbird	Ovenbird
Spotted Sandpiper	Orchard Oriole	Common Yellowthroat
Killdeer	Baltimore Oriole	Yellow-breasted Chat
Mourning Dove	Common Grackle	Hooded Warbler
Cooper's Hawk	American Goldfinch	American Redstart
Red-tailed Hawk	Song Sparrow	Gray Catbird
Bald Eagle	Swamp Sparrow	Brown Thrasher
Eastern Screech-Owl	Northern Cardinal	Carolina Wren
Great-horned Owl	Rose-breasted Grosbeak	House Wren
Yellow-billed Cuckoo	Indigo Bunting	Marsh Wren
Downy Woodpecker	Barn Swallow	Tufted Titmouse
Red-bellied Woodpecker	Tree Swallow	Black-capped Chickadee
Yellow-shafted Flicker	Cedar Waxwing	Blue-gray Gnatcatcher
Ruby-throated Hummingbird	Red-eyed Vireo	Wood Thrush
Eastern Kingbird	Warbling Vireo	American Robin
Great-crested Flycatcher		

Probable breeders

King Rail	Scarlet Tanager	Hooded Warbler
Black-billed Cuckoo	Worm-eating Warbler	White-breasted Nuthatch
Hairy Woodpecker	Chestnut-sided Warbler	Veery
Eastern Phoebe	Mourning Warbler	

Table 3. Birds captured from previous years, Navarre MAPS, 1994.

Species	1993	1992	1991	Total
American Woodcock			1	1
Red-winged Blackbird	2			2
American Goldfinch	1	1		2
Northern Cardinal	1			1
Indigo Bunting	2	1		3
White-eyed Vireo		1		1
Yellow Warbler	6	1		7
Common Yellowthroat	1	2		3
Gray Catbird	7	3		10
TOTAL	20	9	1	30

Table 4. Birds captured from previous years, Navarre MAPS, 1995.

Species	1994	1993	1992	Total
Downy Woodpecker	1			1
Yellow-shafted Flicker			1	1
Eastern Wood Pewee	1			1
Northern Cardinal	2			2
Indigo Bunting		1		1
White-eyed Vireo			2	2
Yellow Warbler	7	1	4	12
Gray Catbird	13	2	2	17
House Wren	3	1	1	5
TOTAL	27	5	10	42

Table 5. Birds captured from previous years, Navarre MAPS, 1996.

Species	1995	1994	1993	1992	Total
Downy Woodpecker	2				2
Red-winged Blackbird	1				1
Northern Cardinal	1	3	1		5
Red-eyed Vireo	2	3			5
White-eyed Vireo	1				1
Prothonotary Warbler		1			1
Yellow Warbler	7	2	3	1	13
Common Yellowthroat		1			1
Gray Catbird	1	2	4		7
House Wren	1				1
American Robin	1		1		2
TOTAL	17	12	9	1	39

Table 6. Birds captured from previous years, Navarre MAPS, 1997.

Species	1996	1995	1994	1993	1992	Total
Downy Woodpecker		2				2
Northern Cardinal	1					1
Indigo Bunting				1		1
Red-eyed Vireo		2	2			4
Warbling Vireo			1			1
White-eyed Vireo		1				1
Yellow Warbler	1	7	1		2	11
Gray Catbird	1					1
House Wren		1				1
TOTAL	3	13	4	1	2	23

Table 7. Birds captured from previous years, Navarre MAPS, 1998.

Species	1997	1996	1995	Total
Blue Jay	1			1
White-eyed Vireo			1	1
Prothonotary Warbler		1		1
Yellow Warbler		1		1
American Redstart		1		1
Gray Catbird	6	1	1	8
Carolina Wren	1	1		2
TOTAL	8	5	2	15

Table 8. Birds captured from previous years, Navarre MAPS, 1999.

Species	1998	1997	1996	1995	1994	1993	1992	Total
Yellow-shafted Flicker					1			1
Baltimore Oriole	1	1						2
Northern Cardinal	1	2		1				4
Indigo Bunting	1			1				2
White-eyed Vireo				1				1
Yellow Warbler	2	2	2	1			1	8
Gray Catbird	2	1		2				5
House Wren	1							1
TOTAL	8	6	2	6	1	0	1	24

Table 9. Birds captured from previous years, Navarre MAPS, 2000.

Species	1999	1998	1997	1996	1995	1994	Total
Great-Crested Flycatcher		1					1
Baltimore Oriole	1	2					3
Song Sparrow	1						1
Prothonotary Warbler				1			1
Yellow Warbler					2	1	3
Common Yellowthroat	2	1					3
Gray Catbird	1	1	1		1		4
Carolina Wren	3						3
House Wren	1	1					2
TOTAL	9	6	1	1	3	1	21

Table 10. Birds captured from previous years, Navarre MAPS, 2001.

Species	2000	1999	1998	1997	1996	1995	1994	1993	1992	Total
Red-winged Blackbird	1									1
Baltimore Oriole	2									2
Northern Cardinal	2									2
Indigo Bunting	1									1
Yellow Warbler	1			1			1		1	4
Common Yellowthroat	3									3
Carolina Wren		1								1
House Wren	2									2
Gray Catbird	4	2		1						7
TOTAL	16	3	0	2	0	0	1	0	1	23

Table 11. Birds captured from previous years, Navarre MAPS, 2002.

Species	2001	2000	1999	Total
Downy Woodpecker	1			1
Red-winged Blackbird	1			1
Song Sparrow		1		1
Northern Cardinal	1	2		3
Common Yellowthroat	2	1		3
Gray Catbird	1			1
Carolina Wren	1			1
House Wren			1	1
TOTAL	7	4	1	12

Table 12. Birds captured from previous years, Navarre MAPS, 2003.

Species	2002	2001	2000	1999	1998	1997	Total
Red-winged Blackbird			1				1
Song Sparrow		1	1				2
Northern Cardinal	2		3			1	6
Yellow Warbler	1	1					2
Common Yellowthroat	5		1				6
Gray Catbird	6		1				7
Carolina Wren		2					2
TOTAL	14	4	7	0	0	1	26

Table 13. Birds captured from previous years, Navarre MAPS, 2004.

Species	2003	2002	2001	2000	1999	1998	Total
Yellow-shafted Flicker	1						1
Red-winged Blackbird	1						1
Baltimore Oriole	1						1
Northern Cardinal	3	2		1			6
Indigo Bunting	1						1
Yellow Warbler	1	1					2
Common Yellowthroat						1	1
Gray Catbird	1	5				1	7
Carolina Wren	3		1				4
House Wren	2						2
American Robin				1			1
TOTAL	14	8	1	2	0	2	27

Table 14. Birds captured from previous years, Navarre MAPS, 2005.

Species	2004	2003	2002	2001	2000	Total
Downy Woodpecker		1		1		2
Baltimore Oriole			1			1
Northern Cardinal			1		1	2
Yellow Warbler	1	1				2
Common Yellowthroat	6	1	1	1		9
Gray Catbird	7	3	2			12
Carolina Wren		1				1
Black-capped Chickadee	1					1
American Robin					1	1
TOTAL	15	7	5	2	2	31

Table 15. Birds captured from previous years, Navarre MAPS, 2006.

Species	2005	2004	2003	2002	2001	2000	Total
Downy Woodpecker	1						1
Red-winged Blackbird	1						1
Northern Cardinal	2		1	1		1	5
Common Yellowthroat	1	2			1		4
Gray Catbird	6	4	1				11
Brown Thrasher					1		1
House Wren	1						1
Black-capped Chickadee		1					1
Wood Thrush	2			1			3
American Robin	2						2
TOTAL	16	7	2	2	2	1	30

Table 16. Birds captured from previous years, Navarre MAPS, 2007.

Species	2006	2005	2004	2003	2002	2001	2000	Total
Downy Woodpecker		1						1
Yellow-shafted Flicker	1							1
Red-winged Blackbird	1	1						2
Song Sparrow		1		1				2
Northern Cardinal		3					1	4
Yellow Warbler	1							1
Common Yellowthroat		1						1
Gray Catbird	6	2	1	1	1			11
Carolina Wren	1							1
American Robin	1							1
TOTAL	11	9	1	2	1	0	1	25



Table 17. Birds captured from previous years, Navarre MAPS, 2008.

Species	2007	2006	2005	2004	2003	2002	2001	Total
Yellow-shafted Flicker		1						1
Common Grackle	2							2
Northern Cardinal	2		3					5
Yellow Warbler	1							1
Common Yellowthroat	1		1	1			1	4
Gray Catbird	8	4	1	2	1	1		17
Carolina Wren	1	1						2
American Robin	1			1	1			3
TOTAL	16	6	5	4	2	1	1	35

Table 18. Birds captured from previous years, Navarre MAPS, 2009.

Species	2008	2007	2006	2005	2004	Total
Common Grackle			1		1	2
Northern Cardinal	3					3
Prothonotary Warbler	1					1
Common Yellowthroat		1				1
Gray Catbird	5	4	1	1	1	12
American Robin	1	2				3
TOTAL	10	7	2	1	2	22

Table 19. Birds captured from previous years, Navarre MAPS, 2010.

Species	2009	2008	2007	2006	2005	2004	Total
Blue Jay	1						1
Red-winged Blackbird	1	1					2
Common Grackle			1	1		1	3
Northern Cardinal	4		1				5
Prothonotary Warbler		1					1
Yellow Warbler	3		1				4
Common Yellowthroat						1	1
Gray Catbird	3	5	3	1			12
Brown Thrasher	1						1
House Wren	1	1					2
American Robin	1		1	1			3
TOTAL	15	8	7	3	0	2	35

Table 20. Birds captured from previous years, Navarre MAPS, 2011.

Species	2010	2009	2008	2007	2006	Total
Red-winged Blackbird	2	1				3
Yellow Warbler	1	1	1			3
Common Yellowthroat	1					1
Gray Catbird	8		1	4		13
House Wren	1					1
American Robin		1			1	2
TOTAL	13	3	2	4	1	23

Table 21. Birds captured from previous years, Navarre MAPS, 2012.

Species	2011	2010	2009	2008	Total
Downy Woodpecker	1				1
Red-winged Blackbird	1	1	1		3
Baltimore Oriole	1			1	2
Northern Cardinal	2	1			3
Yellow Warbler	2	2			4
Common Yellowthroat		1			1
Gray Catbird	11	4		1	16
Black-capped Chickadee	2				2
TOTAL	20	9	1	2	32

Table 22. Birds captured from previous years, Navarre MAPS, 2013.

Species	2012	2011	2010	2009	2008	2007	2006	2005	2004	Total
Downy Woodpecker		1								1
Common Grackle	1		1							2
Northern Cardinal		3	1							4
Yellow Warbler	2	1		1						4
Common Yellowthroat	1									1
Gray Catbird	3	6	4	1		1			1	16
American Robin	2	7	2		1					12
TOTAL	9	18	8	2	1	1	0	0	1	40

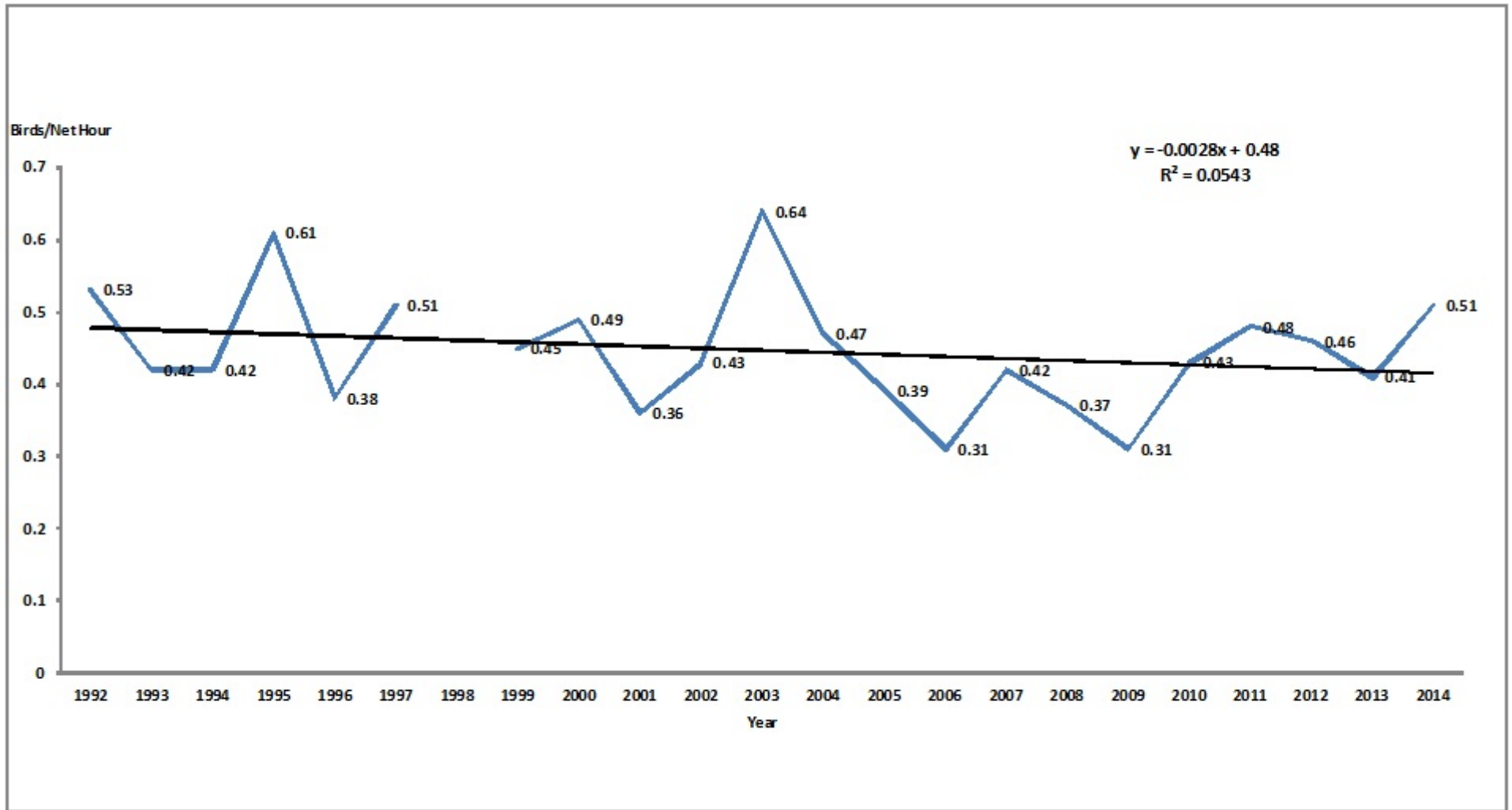
Table 23. Birds captured from previous years, Navarre MAPS, 2014.

Species	2013	2012	2011	2010	2009	2008	2007	Total
Downy Woodpecker			1					1
Red-winged Blackbird	1		1					2
Blue Jay	1							1
Song Sparrow	1							1
Northern Cardinal	1							1
Prothonotary Warbler	1			1				2
Yellow Warbler	2	1	3					6
Gray Catbird	8	4	3	1			1	17
American Robin		1						1
TOTAL	15	6	8	2	0	0	1	32

Table 24. Accumulation of birds captured in years post-banding, Navarre MAPS.

Species	Birds Captured x Years Post Banding									Total
	1	2	3	4	5	6	7	8	9	
American Woodcock			1							1
Downy Woodpecker	6	5	1	1						13
Yellow-shafted Flicker	2	1	1		1					5
Great-crested Flycatcher		1								1
Eastern Wood Pewee	1									1
Blue Jay	3									3
Red-winged Blackbird	13	4	3							20
Baltimore Oriole	6	3	1	1						11
Common Grackle	3		3	1	1	1				9
American Goldfinch	1	1								2
Song Sparrow	2	3	1	1						7
Northern Cardinal	28	16	11	3	1	2	1			62
Indigo Bunting	5	2		2						9
Red-eyed Vireo	2	5	2							9
Warbling Vireo			1							1
White-eyed Vireo	1	2	3	1						7
Prothonotary Warbler	2	3		1						6
Yellow Warbler	39	22	15	4	4	1	2		1	88
Common Yellowthroat	23	11	3	2	1	2	1			43
American Redstart		1								1
Gray Catbird	108	53	26	15	4	3	1		1	211
Brown Thrasher	1				1					2
Carolina Wren	10	6	1							17
House Wren	13	4	2							19
Black-cap. Chickadee	3	1								4
Wood Thrush	2			1						3
American Robin	9	11	4	3	4					31
TOTAL	283	155	79	36	17	9	5	0	2	586

Figure 1. Annual birds / net hour captured on Navarre MAPS, 1992-2014



1998 data not used.