

**MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP
IN NEW RIVER GORGE NATIONAL RIVER,
WEST VIRGINIA¹**

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PROJECT SUMMARY

The first three seasons of the Monitoring Avian Productivity and Survivorship (MAPS) Program at Sandstone Falls, Raleigh and Summers counties are reported. The report provides a brief review of the background, objectives, and methodology of the project and a rationale for continuation. The MAPS banding station at Sandstone Falls is the first MAPS station established in West Virginia and is one of over 400 continent-wide stations. Field assistants and I captured 398 birds in 1996, 395 in 1997, and 323 birds in 1998. The total of 1,116 birds represented 59 species, but as many as 94 species were noted by point counts.

We captured significant numbers of Carolina Wrens, Blue-gray gnatcatchers, American Robins, Gray Catbirds, Red-eyed Vireos, Yellow Warblers, American Redstarts, Yellow-breasted Chats, Northern Cardinals, Indigo Buntings, and Song Sparrows. Population trends, productivity, survivorship, and recruitment will be computed for these target species in the fifth year of the study.

The project was funded by the New River Gorge National River (NERI) and produced a peer-reviewed publication (Stover et al. 1999 - in press, which can be forwarded to the NERI after it is published).

INTRODUCTION

Background

Numerous studies have strongly indicated that populations of many species of migratory birds in North America are declining. This has generated vigorous research on population dynamics among different species and determining the factors underlying these declines (Askins et al. 1990; Greenberg 1992; Hagan and Johnston 1992; Rappole 1995; Sauer et al. 1996). These studies are useful in provided population status or assessments for various species, monitoring relationships between population status and ecological and demographic patterns, and for identifying future directions and conservation goals. Several approaches have been employed, which include breeding bird surveys (BBS), point counts of breeding populations, mist-netting of birds at migration stopovers, Christmas bird counts (CBCs), and studies of banded birds on both wintering and breeding grounds.

A relatively new and robust protocol for assessing causes and consequences of avian species decline is the Monitoring Avian Productivity and Survivorship (MAPS) Program. MAPS is a continent-wide, constant-effort mist netting research project that started in 1989. The MAPS program provides long-term demographic data on landbirds and is sponsored by the Institute for Bird Populations, IBP (see Desante et al. 1996). MAPS was initiated to help halt the decline of neotropical migrant landbirds and has obtained a reputable status as a robust conservation effort. MAPS has also been endorsed by the USDI Bird Banding Laboratory (BBL) and the Monitoring Working Group of the

Neotropical Migratory Bird Conservation Initiative, "Partners in Flight" (PIF). MAPS has grown to over 400 stations and the National Park Service (NPS) has been a major contributor to the program. Other federal agencies such as the USDA, BBL, Forest Service, and Department of Defense have supported MAPS projects across the country. This is because MAPS provides a feature not inherent in population-trend studies, such as point counts, the BBS, and CBCs. Specifically, MAPS provides demographic data such as productivity, survivorship, immigration, and emigration estimates. These latter four parameters shed information as to what stage(s) in the life cycle control(s) the population declines.

Objectives and Goals

DeSante et al. (1993a, b, 1995, 1996) describe the primary goals of the MAPS program. The objectives of MAPS are to provide **long-term** population and demographic data on target landbird species at various spatial scales by providing: (1) annual indices and long-term trends in adult population size and postfledging productivity from analyses of numbers and proportions of adult and young birds captured during the breeding season; and (2) annual estimates and long-term trends of adult survivorship, adult population size, and recruitment into the adult population from analyses of mark-recapture data. According to DeSante et al. (1996) these indices and estimates can be used to: (1) aid in identifying the proximate causes of population changes in the target species; (2) aid in identifying conservation and management actions to reverse the population trends of declining species, and (3) aid in evaluating the effectiveness of the conservation and management strategies implemented.

Objectives and goals of the Sandstone Falls MAPS station are:

- to provide a baseline dataset on breeding bird population trends in a riparian habitat
- to estimate productivity of resident and neotropical migrant species
- to assess recruitment and survivorship of breeding bird populations in a riparian habitat.

All these objectives fit within the objectives of the continent-wide MAPS program, and provide landowners with background data necessary for management of important bird areas.

METHODS

The design and implementation of the Sandstone Falls MAPS station followed the standard MAPS protocol (DeSante et al. 1993a, b). The methods are similar to those recommended by Ralph et al. (1993). Field assistants (provided by NPS), subpermit banders, and I ran ten mist nets typically from 0600-1200 h. Typical black, nylon, 12-m, 30-mm mesh nets were used and net localities were kept constant after the first year of

the study. Data were collected once every ten days, which were kept constant during the study (May 21, 31, June 10, 20, 30, July 10, 20, and 30). Annual reports were submitted to IBP in 1996-1998, and Robert Sullivan of the NPS provided a station MAP (see enclosed) and vegetation analyses.

Each bird captured was marked with a uniquely-numbered aluminum leg band from the BBL. Band number, captive status (new or recapture), age and sex, ageing and sexing criteria (extents of skull pneumatization, cloacal protuberance, brood patch, body and flight feather molt, primary feather wear, and juvenile plumage), date, time, and net number were recorded for each bird. Banding followed from standard protocols (e.g., see Pyle et al. 1987; Curson et al. 1994; Byers et al. 1995).

Net operation times (time of opening and closing) were used to standardize capture data. Birds were assigned a status code (breeder, transient, non-breeder, and migrant) based on banding data, singing male censuses, and point counts. Point count data were not submitted to IBP in 1997 and 1998 because they have excluded this dataset from their protocol.

Banding and assistance with operation of the station were provided by Ann McRae, Jim Meyer, Janet Meyer, Dollie Stover, Robert Sullivan, Allen Waldron, and Mindy Waldron. These individuals are licensed subpermit banders under the PI.

RESULTS

Table 1 provides a summary of captures per year. The second year of operation produced the highest capture ratio per 100 net hours and the highest number of species. Field assistants and I captured 398 birds in 1996, 395 in 1997, and 323 birds in 1998 (Table 1). Capture data are dependent upon weather and net hours (Stover et al. in press). One of us (R. Sullivan) reduced the number of net hours in 1997 and 1998. Therefore, the decrease in number of captures is believed to be due to (1) colder, wet spring weather in 1996 and 1997, (2) a heavy snowfall in January 1997 that changed the landscape by reducing the number of shrubs and plants (e.g., multiflora rose and red cedar) that produce berries eaten by many species (note in Table 2 that berry-eating birds declined, e.g., Gray Catbird and Northern Cardinal), and (3) birds learning net lanes and/or a change in net hours. This is supported by the fact that migration and breeding was late for many species such as the Indigo Bunting, and we found no reduction in numbers of birds of most species counted on point counts.

Many canopy species, such as the Cerulean and Yellow-throated warblers breed in the area, but were not captured. We captured 59 species of individuals during the three year study (Table 2). The species richness computed from point counts and singing male censuses disclosed about 94 species per year, which included 80 species of breeders (see reports submitted to R. Sullivan and IBP). Some individuals have been recaptured repeatedly. For example, a female Northern Cardinal (band number 0951-57330), a White-eyed Vireo (band number 1760-55305), and a Common Yellowthroat (band number 2070-16696) were recaptured on 5 of the 8 banding days. Twenty birds

banded in 1996 were recaptured in 1997, while 11 birds banded in 1997 were recaptured in 1998 (Table 3). More importantly, however, 10 birds banded in 1996 were recaptured in 1998. Significant number of Carolina Wrens, Blue-gray Gnatcatcher, American Robin, Gray Catbird, Cedar Waxwing, Red-eyed Vireo, Yellow Warbler, American Redstart, Yellow-breasted Chat, Northern Cardinal, Indigo Bunting, Song Sparrow, and American Goldfinch were captured in high enough numbers to warrant estimation of population size, recruitment, and survivorship. This will start in year five of the project and it is likely that additional target species can be added to the list.

Mortalities were minimal, but included 1 Cedar Waxwing, 1 American Redstart, 2 Northern Cardinals, and 2 American Goldfinches during the three summers of operation. These birds were deposited in the Carnegie Museum of Natural History.

Table 1. Summary of captures per year.

Year	Days of Total	Operation Range	Total Net Hours	B ¹	U ²	R ³	TC ⁴	Number of species
1996	10	5/21 - 8/19	566.65	286	49	63	398 (70.24)	42
1997	8	5/21 - 7/30	456.67	292	34	69	395 (86.50)	47
1998	8	5/21 - 7/30	422.81 ^a	214	48	61	323 (76.39)	37

¹ Banded birds, ² unhandled birds, ³ recaptures, and ⁴ total captures and total captures per 100 net hours in parentheses. ^a Net hours decreased due to rain spring seasons in 1996 and 1997.

Sandstone Falls during MAPS.

	1996	1997	1998	Total
<u>Species</u>				
Black-billed Cuckoo	0	1	0	1
Eastern-wood Pewee	2	3	1	6
Acadian Flycatcher	1	1	3	5
Willow Flycatcher	2	0	0	2
Great-crested Flycatcher	1	0	1	2
Eastern Phoebe	1	0	0	1
Downy Woodpecker	0	3	0	3
Yellow-shafted Flicker	0	1	2	3
Carolina Chickadee	3(3)	4	1	11
Tufted Titmouse	0	3	3(1)	7
Carolina Wren	15	11 (1)	12(5)	44
Marsh Wren*	1	0	0	1
House Wren	0	2(1)	1	4
Blue-gray Gnatcatcher	13(2)	4(2)	7(1)	29
Ruby-thr. Hummingbird	0(21)	0(7)	0(18)	46
Wood Thrush	4	3	8(2)	17
American Robin	5(2)	11(1)	8(2)	29
Gray Catbird	48(3)	37	20(4)	112
Brown Thrasher	0	1(1)	1	3
Cedar Waxwing	11	18(1)	2	32
White-eyed Vireo	6	6	5	17
Blue-headed Vireo	0	0	1	1
Warbling Vireo	1	0	0	1
Red-eyed Vireo	10	18	11	39
Blue-winged Warbler	2	1	0	3
Golden-winged Warbler	0	1	1(1)	4
Brewster's Warbler	0	0	1	1
Lawrence's Warbler	0	0	1	1
Tennessee Warbler*	1	0	0	0
Northern Parula	1	0	2	3
Yellow Warbler	14(1)	11	10(1)	37
Chestnut-sided Warbler	1	0(1)	0	2
Magnolia Warbler*	0	4	3	7
Blackpoll Warbler*	0	3	0	3
Black-and-White Warbler	1	2	1	4
American Redstart	49(5)	39	36(4)	133
Louisiana Waterthrush	2	1(1)	6	10
Worm-eating Warbler	4	0	0	4
Ovenbird	4	8	4	16
Mourning Warbler*	0	2	0	2
Canada Warbler*	0	1	0	1

Table 2 continued

Common Yellowthroat	3	12	3	18
Kentucky Warbler	1	1	0	2
Hooded Warbler	0	2	2	4
Wilson's Warbler*	0	1	0	1
Yellow-breasted Chat	9	7(1)	6(1)	24
Scarlet Tanager	1	2	1	4
Northern Cardinal	21	3(1)	3(1)	29
Rose-breasted Grosbeak	1	0	0	1
Indigo Bunting	9(2)	13(1)	0	25
Eastern Towhee	0(1)	1(1)	1(1)	5
Chipping Sparrow	6	0(1)	0	7
Field Sparrow	0	3	0	3
Song Sparrow	10 (4)	11 (3)	14 (3)	45
Brown-headed Cowbird	1	0	0	1
Common Crackle	2	2(1)	8(1)	14
Red-winged Blackbird	0	0	3	3
Baltimore Oriole	3	0(1)	6	10
Orchard Oriole	3(1)	4(1)	3	12
House Finch	5	0	0	5
American Goldfinch	10(1)	25(1)	22(2)	61

* = migrant

Table 3. Recapture data.

Band No.	Species	SEX	Date Banded	Date Recaptured
1591-09710	Song Sparrow	U*	10-05-1996 ¹	05-21-1997
0951-57386	Gray Catbird	♂	06-30-1996	05-21-1997
0951-57334	Gray Catbird	♂	05-31-1996	05-21-1997 07-30-1998
0951-57330	Northern Cardinal	♀	05-31-1996	05-21-1997
2060-89875	American Redstart	♂	05-31-1996	05-21-1997
1760-55220	Yellow-breasted Chat	♂	05-31-1996	05-21-1997 06-30-1998
1571-39154	Carolina Wren	♂	05-21-1996	05-21-1997
1760-55244	Yellow Warbler	♂	06-21-1996	05-21-1997
1571-43486	Orchard Oriole	♂	06-21-1996	05-21-1997
2060-89881	Yellow Warbler	♀	05-31-1996	05-31-1997
3111-79804	Red-eyed Vireo	♀	07-10-1996	05-31-1997
1571-39162	Yellow-breasted Chat	♀	05-31-1996	06-10-1997
2060-89883	Yellow Warbler	♀	05-31-1996	06-10-1997
0951-57370	Wood Thrush	♂	06-10-1996	06-10-1997
0951-57314	Gray Catbird	♂	05-21-1996	06-10-1997
2060-89867	American Redstart	♀	05-21-1996	06-10-1997
1760-55305	White-eyed Vireo	U*	08-20-1996 ¹	06-10-1997 05-21-1998
0951-57374	Northern Cardinal	♂	06-10-1996	06-20-1997
2080-92571	American Redstart	♀	06-30-1996	06-20-1997
8101-89924	Gray Catbird	♂	08-09-1996	07-20-1997 07-30-1998
0951-57382	Northern Cardinal	♀	06-30-1996	07-20-1997
2060-89865	American Redstart	♂	05-21-1996	07-30-1997
1551-04910	Red-eyed Vireo	♂	06-10-1997	05-21-1998
1760-55238	White-eyed Vireo	U*	06-10-1996	05-21-1998
1591-10258	Carolina Wren	♀	07-20-1997	05-21-1998
1760-55239	Chipping Sparrow	♂	06-10-1996	05-21-1998
0951-57385	Gray Catbird	♀	06-30-1996	05-31-1998
2090-95405	American Redstart	♀	05-21-1997	05-31-1998
2090-95415	American Redstart	♂	05-31-1997	05-31-1998
2090-95411	American Redstart	♀	05-21-1997	06-10-1998
3111-79832	Red-eyed Vireo	♀	08-19-1996	06-10-1998
2090-95158	Golden-winged Warbler	♀	08-31-1997 ¹	06-10-1998
1581-67812	Gray Catbird	♂	06-10-1997	06-30-1998
0951-57377	Gray Catbird	♀	06-21-1996	06-30-1998
8101-89924	Gray Catbird	♂	08-09-1996	06-30-1998
1551-04923	Red-eyed Vireo	♀	06-30-1997	07-20-1998
1591-10012	Carolina Wren	♀	09-20-1997 ¹	07-20-1998
1581-67403	Northern Cardinal	♀	09-19-1997 ¹	07-20-1998
1551-04954	Ovenbird	U*	09-05-1997 ¹	07-20-1998
0902-64626	Northern Cardinal	♂	07-30-1996	07-30-1998

U* = unknown sex. ¹ = Banding during fall migration, which is a different project.

DISCUSSION

The total number of birds captured per 100 net h is exceedingly high when compared to 236 stations in North America (see DeSante et al. 1996). For example, only 24 of the 236 stations had a higher capture ratio. This is biased by yearly variation and habitats, but at least signifies that the riparian habitat of Sandstone Falls is an important area for breeding birds in West Virginia. The individuals of 59 species captured during the study is considerably high diversity compared to other stations in the Northeast. The station will be able to assess recruitment and survivorship in its fifth year of operation because of substantial recaptures of some target species. Target species include neotropical migrants such as Gray Catbird, Red-eyed Vireo, and American Redstart, as well as resident species such as the Carolina Wren (Stover et al. in press).

A few species (e.g., Carolina Wren, American Redstart) were captured in about equal numbers during the three years, but others declined in capture ratio, e.g., Northern Cardinal and Indigo Bunting. Declines in number of captures in these latter two species, for example, are probably due to different factors. For example, we believe we caught less Northern Cardinals in 1998 than 1996 because a snowfall decreased the amount of brushy cover used for foraging and hiding, and this species probably learns the positioning of net lanes. It must be pointed out that net lanes cannot be changed according the standard MAPS protocol. In addition, the Northern Cardinal is probably relatively long lived compared to some neotropical migrants and smaller species and may experience slower recruitment rates. We did, however, recapture five Northern Cardinals that were marked in 1996 or 1997, but this species probably experiences high winter mortality due to starvation and predation by *Accipiter* spp. Decline in the capture of Indigo Buntings (see Table 2) can probably be explained by the fact that they occurred in low numbers in 1998 in the area and throughout the Northeast. For example, my colleagues and I found the same trend at our Northeast Ohio MAPS station.

It will interesting to compare recapture data and recruitment on resident species such as the Northern Cardinal and Carolina Wren with long-distance neotropical migrants such as the Gray Catbird (8 recaptures, see Table 3), Red-eyed Vireo (4 recaptures), and the American Redstart (7 recaptures). Species-specific trends must be interpreted in future analyses. For example, the Common Yellowthroat had a good year in 1997 (12 captures) but were in low numbers in 1996 and 1998 (see Table 2).

SIGNIFICANCE

The Sandstone Falls MAPS project has generated much interest in the state and has sparked the initiation of three additional stations by other investigators. Likewise, the Sandstone Falls project has been endorsed by the WV PIF Working Group as a monitoring program that will aid in developing conservation plans for species of special concern or threatened. The tedious and time consuming work involved in running a MAPS station has prevented more stations from operating, but the project provides more information than current point counts being conducted in West Virginia. This has

posed problems with development of conservation plans through PIF, while neighboring states with many stations (e.g., Ohio and Virginia) have the necessary demographic data needed for management practices.

In summary, I recommend continuation of the MAPS program at Sandstone Falls for at least two more years so that estimates of recruitment may be obtained as well as better estimates of population trends. This station will eventually produce data necessary for estimating recruitment and survivorship of the American Redstart and Yellow-breasted Chat, among other species, which cannot be done by a large majority of the other MAPS stations. My goal is to keep the station operational for long-term (i.e., 20 years) to provide important demographic data on target species for the (1) NPS, (2) WV and Northeast PIF Working Groups, and (3) IBP. If we lose the station, IBP will lose an important station needed for assessment of demographics in the Northeast, and, more importantly, many bird species will continue to decline without our help. We surely cannot halt avian population declines without the necessary data for determining causal factors of decline.

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