THE 2003 ANNUAL REPORT OF THE MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) PROGRAM AT NAVAL SECURITY GROUP ACTIVITY (NSGA) SUGAR GROVE

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EXECUTIVE SUMMARY

Since 1989, The Institute for Bird Populations has been coordinating the Monitoring Avian Productivity and Survivorship (MAPS) Program, a cooperative effort among public and private agencies and individual bird banders in North America, to operate a continent-wide network of constant-effort mist-netting and banding stations. The purpose of the MAPS program is to provide annual indices of adult population size and post-fledging productivity, as well as estimates of adult survivorship and recruitment into the adult population, for various landbird species. Broad-scale data on productivity and survivorship are not obtained from any other avian monitoring program in North America and are needed to provide crucial information upon which to initiate research and management actions to reverse the recently-documented declines in North American landbird populations. The system of military installations in the United States may provide one group of ideal locations for this large-scale, long-term biomonitoring because they provide large areas of breeding habitat for Neotropical migratory landbirds that are subject to varying management practices.

A second objective of the MAPS program is to provide standardized population and demographic data for the landbirds found on federally managed public lands, such as military installations, national forests, national parks, and wildlife refuges. In this vein, it is expected that population and demographic data on the landbirds found on any given military installation will aid research and management efforts on the installation to protect and enhance its avifauna and ecological integrity while simultaneously helping it fulfill its military mission in an optimal manner.

We re-established and operated two MAPS stations at Navy Security Group Activity (NSGA) Sugar Grove in 2003: the South Fork Potomac River station in bottomland riparian/mixed forest habitat, and the Beaver Creek station in ridgetop/open forest habitat. Ten mist nets at each station, set up in the exact same locations at which they were established in 2001 and 2002, were operated for six morning hours per day, on one day per 10-day period, and for seven or eight consecutive 10-day periods between May 17 and August 6.

A total of 164 individual birds of 29 species were newly banded at the two stations during the summer of 2002, various individuals of these species were recaptured a total of 44 times, and 12 birds (mostly hummingbirds which we do not band) were captured and released unbanded. Thus, a total of 220 captures of 31 species was recorded. The greatest number of captures by far was recorded at the South Fork Potomac River station (200 captures of 28 species), while the Beaver Creek station had only 20 captures of 9 species.

The index of adult population size for all species pooled in 2001 at the South Fork Potomac River station was 102.6 birds per 600 net hours, nearly 12 times as high as that at the Beaver Creek station (8.7 birds per 600 net hours). These results have been similar during all three years of the study and suggest that the habitat at the South Fork Potomac River station can support a larger and more varied adult breeding population than the habitat at the Beaver Creek Station. This may

be a result of higher habitat diversity and a denser more diverse understory at the South Fork Potomac River station, as compared to the Beaver Creek station. In contrast, however, productivity has tended to be slightly higher at Beaver Creek than at South Fork Potomac River during the three years of operation.

Comparisons between the three years of operation at NSGA Sugar Grove using multivariate ANOVAs and logistic regression revealed that adult population sizes were higher in 2002 than in 2001 and 2003, whereas productivity was significantly lower in 2002 than in 2001 and 2003. This was especially true of the installation's most abundant species, Worm-eating Warbler, but was also reflected in the dynamics of the other species, as well. We found a similar drop in adult populations and increase in productivity between 2002 and 2003 at the six stations at roughly similar elevations in Shenandoah National Park, indicating that these patterns are region-wide.

This type of alternating two-year cycle has often been observed at other MAPS locations and reflects density-dependent effects. Should this pattern continue we should expect to see higher breeding populations with lower productivity in 2004, although unusual climatic events, weather conditions, or other events (such as the gypsy-moth infestation that affected Shenandoah National Park in the early 1990's) can disrupt this alternating pattern.

Substantial population trends were detected at NSGA Sugar Grove for all four target species, with two being positive and two being negative; the trend for all species pooled was substantially negative but not significant. Productivity trends for two species were substantially positive but not significant, and for two species and all species pooled they were stable. Significant trends are difficult to achieve with only three data points; should these tendencies continue we will expect to see more significant trends after five or more years of data have been collected.

Using three years of data from the two stations, estimates of apparent annual adult survival rate and recapture probability could be obtained from a non-transient model for only one of the four target species breeding at NSGA Sugar Grove, Song Sparrow. This survival rate estimate 0.669 suggests that adult survival may be excellent at NSGA Sugar Grove, although we caution that the estimate has poor precision. However, after five or more years of data have been collected, we should be able to obtain more precise estimates for more species using a transient model.

As more years of data accumulate we will be able to examine additional between-year changes in these indices in order to make inferences about the effects of weather on productivity and the effect of changes in productivity on population size. We will also be able to examine longer-term trends in breeding population size and productivity to make inferences about the prospects of the various species, and will be able to more completely examine annual survival-rate estimates, recapture probabilities, and proportion of residents in order to make inferences regarding the effect of survivorship on population dynamics. Pooling data at this level will also allow comparison between NSGA Sugar Grove and other protected areas at which MAPS stations are operated in the region, as well as comparisons between NSGA Sugar Grove and other unprotected areas in the region.

The long-term goal for the NSGA Sugar Grove MAPS program is to continue to monitor the primary demographic parameters of landbirds in order to provide critical information to clarify the ecological processes leading from environmental stressors to population responses. We will accomplish this by including NSGA Sugar Grove data in analyses of data from other central Appalachian MAPS stations to: (a) determine spatial patterns in productivity indices and survival rate estimates as a function of spatial patterns in population trends for target species; (b) determine the proximate demographic factor(s) (i.e., productivity or survivorship or both) causing observed population trends; (c) link MAPS data with landscape-level habitat data and spatially explicit weather data in a geographical information system (GIS); (d) identify relationships between landscape-level habitat and/or weather characteristics and the primary demographic responses (productivity and survival rates) of target species; (e) generate hypotheses regarding the ultimate environmental causes of the population trends; and (f) make comprehensive recommendations for habitat and use-related management goals both at local scale of the installation and the larger scale of the central Appalachians.

In addition, MAPS data from NSGA Sugar Grove will provide an important contribution to the determination of accurate indices of adult population size and productivity and precise estimates of adult survival rates on the still larger region-wide scale (e.g., northeastern North American) for a substantial number of landbird species. We conclude that the MAPS protocol is well-suited to provide an integral component of NSGA Sugar Grove's long-term ecological monitoring effort. Based on the above information, we recommend the continued operation of the NSGA Sugar Grove MAPS stations well into the future.

INTRODUCTION

The United States Department of Defense (DoD), including the Department of the Navy, has assumed responsibility for managing natural resources on lands under their jurisdiction in a manner that, as much as possible considering their military mission, maintains the ecological integrity and species diversity of the ecosystems present on those lands. In order to carry out this responsibility, integrated long-term programs are needed to monitor the natural resources on military installations and to monitor the effects of varying management practices on those resources.

The development and implementation of an effective long-term monitoring program on military installations can be of even wider importance than aiding the Department of Defense in its management of those resources. Because military lands often provide large areas of multiple and often relatively pristine ecosystems subject to varying management practices, studies conducted on these lands can provide invaluable information for understanding natural ecological processes and for evaluating the effects of large-scale, even global, environmental changes. Thus, long-term monitoring data from military installations can provide information that is crucial for efforts to preserve natural resources and biodiversity on a continental or even global scale.

Landbirds

Landbirds, because of their high body temperature, rapid metabolism, and high ecological position on most food webs, are excellent indicators of the effects of local, regional, and global environmental change in terrestrial ecosystems. Furthermore, their abundance and diversity in virtually all terrestrial habitats, diurnal nature, discrete reproductive seasonality, and intermediate longevity facilitate the monitoring of their population and demographic parameters. It is not surprising, therefore, that landbirds have been selected by the DoD to receive high priority for monitoring. Nor is it surprising that several large-scale monitoring programs that provide annual population estimates and long-term population trends for landbirds are already in place on this continent. They include the North American Breeding Bird Survey (BBS), the Breeding Bird Census, the Winter Bird Population Study, and the Christmas Bird Count.

Recent analyses of data from several of these programs, particularly the BBS, suggest that populations of many landbirds, including forest-, scrubland-, and grassland-inhabiting species, appear to be in serious decline (Peterjohn et al. 1995). Indeed, populations of most landbird species appear to be declining on a global basis. Nearctic-Neotropical migratory landbirds (species that breed in North America and winter in Central and South America and the West Indies; hereafter, Neotropical migratory birds) constitute one group for which pronounced population declines have been documented (Robbins et al. 1989, Terborgh 1989). In response to these declines, the Neotropical Migratory Bird Conservation Program, "Partners in Flight - Aves de las Americas," was initiated in 1991 (Finch and Stangel 1993). The major goal of Partners in Flight (PIF) is to reverse the declines in Neotropical migratory birds through a coordinated program of monitoring, research, management, education, and international cooperation. As one of the major cooperating agencies in PIF, the DoD has established long-term avian monitoring efforts at military installations using protocols developed by the Monitoring Working Group of PIF. Clearly, the long-term monitoring goals of the DoD and the monitoring and research goals of PIF share many common elements.

Primary Demographic Parameters

Existing population-trend data on Neotropical migrants, while suggesting severe and sometimes accelerating declines, provide no information on primary demographic parameters (productivity and survivorship) of these birds. Thus, population-trend data alone provide no means for determining at what point(s) in the life cycles problems are occurring, or to what extent the observed population trends are being driven by causal factors that affect birth rates, death rates, or both (DeSante 1995). In particular, large-scale North American avian monitoring programs that provide only population-trend data have been unable to determine to what extent forest fragmentation and deforestation on the temperate breeding grounds, versus that on the tropical wintering grounds, are causes for declining populations of Neotropical migrants. Without critical data on productivity and survivorship, it will be extremely difficult to identify effective management and conservation actions to reverse current population declines (DeSante 1992).

The ability to monitor primary demographic parameters of target species must also be an important component of any successful long-term inventory and monitoring program that aims to monitor the ecological processes leading from environmental stressors to population responses (DeSante and Rosenberg 1998). This is because environmental factors and management actions affect primary demographic parameters directly and these effects can be observed over a short time period (Temple and Wiens 1989). Because of the buffering effects of floater individuals and density-dependent responses of populations, there may be substantial timelags between changes in primary parameters and resulting changes in population size or density as measured by census or survey methods (DeSante and George 1994). Thus, a population could be in trouble long before this becomes evident from survey data. Moreover, because of the vagility of many animal species, especially birds, local variations in secondary parameters (e.g., population size or density) may be masked by recruitment from a wider region (George et al. 1992) or accentuated by lack of recruitment from a wider area (DeSante 1990). A successful monitoring program should be able to account for these factors.

MAPS

In 1989, The Institute for Bird Populations (IBP) established the Monitoring Avian Productivity and Survivorship (MAPS) program, a cooperative effort among public agencies, private organizations, and individual bird banders in North America to operate a continent-wide network of constant-effort mist-netting and banding stations to provide long-term demographic data on landbirds (DeSante et al. 1995). The design of the MAPS program was patterned after the very successful British Constant Effort Sites (CES) Scheme that has been operated by the British Trust for Ornithology since 1981 (Peach et al. 1996). The MAPS program was endorsed in 1991 by both the Monitoring Working Group of PIF and the USDI Bird Banding Laboratory, and a four-year pilot project (1992-1995) was approved by the USDI Fish and Wildlife Service and National Biological Service (now the Biological Resources Division [BRD] of the U.S.

Geological Survey [USGS]) to evaluate its utility and effectiveness for monitoring demographic parameters of landbirds.

Now in its 14th year (11th year of standardized protocol and extensive distribution of stations), the MAPS program has expanded greatly from 178 stations in 1992 to over 500 stations in 2002. The substantial growth of the Program since 1992 was caused by its endorsement by PIF and the subsequent involvement of various federal agencies in PIF, including the Department of Defense, Department of the Navy, Department of the Army, Texas Army National Guard, National Park Service, USDA Forest Service, and US Fish and Wildlife Service. Within the past ten years, for example, IBP has been contracted to operate as many as 157 MAPS stations per year on federal properties, including 76 stations on military installations administered by the DoD and the Texas Army National Guard.

Goals and Objectives of MAPS

MAPS is organized to fulfill three tiers of goals and objectives: monitoring, research, and management.

- The specific monitoring goals of MAPS are to provide, for over 100 target species, including many Neotropical-wintering migrants, temperate-wintering migrants, and permanent residents:

  (A) annual indices of adult population size and post-fledging productivity from data on the numbers and proportions of young and adult birds captured; and

  (B) annual estimates of adult population size, adult survival rates, proportions of residents, recruitment into the adult population, and population growth rates from modified Cormack- Jolly-Seber (CJS) analyses of mark-recapture data on adult birds.

- The specific research goals of MAPS are to identify and describe:

  (1) temporal and spatial patterns in these demographic indices and estimates at a variety of spatial scales ranging from the local landscape to the entire continent; and

  (2) relationships between these patterns and ecological characteristics of the target species, population trends of the target species, station-specific and landscape-level habitat characteristics, and spatially-explicit weather variables.

- The specific management goals of MAPS are to use these patterns and relationships, at the appropriate spatial scales, to:

  (a) identify thresholds and trigger points to notify appropriate agencies and organizations of the need for further research and/or management actions;

  (b) determine the proximate demographic cause(s) of population change;

(c) suggest management actions and conservation strategies to reverse population declines and maintain stable or increasing populations; and

(d) evaluate the effectiveness of the management actions and conservation strategies actually implemented through an adaptive management framework.

The overall objectives of MAPS are to achieve the above-outlined goals by means of long-term monitoring at two major spatial scales. The first is a very large scale — effectively the entire North American continent divided into eight geographical regions. It is envisioned that DoD military installations, along with national parks, national forests, and other publicly owned lands, will provide a major subset of sites for this large-scale objective.

The second, smaller-scale but still long-term objective is to fulfill the above-outlined goals for specific geographical areas (perhaps based on physiographic strata or Bird Conservation Regions) or specific locations (such as individual military installations, national forests, or national parks) to aid research and management efforts within the installations, forests, or parks to protect and enhance their avifauna and ecological integrity. The sampling strategy utilized at these smaller scales should be hypothesis-driven and should be integrated with other research and monitoring efforts. DeSante et al. (1999) showed that measures of productivity and survival derived from MAPS data were consistent with observed populations changes at these smaller spatial scales. This provides considerable assurance that the goals and objectives outlined above can be achieved.

Both long-term objectives are in agreement with the Department of Defense's avian monitoring program. Accordingly, the MAPS program was established on Naval Security Group Activity (NSGA) Sugar Grove in 2001. It is expected that information from the MAPS program will be capable of aiding research and management efforts on NSGA Sugar Grove to protect and enhance the installation's avifauna and ecological integrity, while helping it fulfill its military mission in an optimal manner.

Recent Important Results from MAPS

Recent important results from MAPS reported in the peer-reviewed literature include the following. (1) Age ratios obtained during late summer, population-wide mist netting provided a good index to actual productivity in the Kirtland's Warbler (Bart et al. 1999). (2) Measures of productivity and survival derived from MAPS data were consistent with observed population changes at multiple spatial scales (DeSante et al. 1999). (3) Patterns of productivity from MAPS at two large spatial scales (eastern North America and the Sierra Nevada) not only agreed with those found by direct nest monitoring and those predicted from theoretical considerations, but were in general agreement with current life-history theory and were robust with respect to both time and space (DeSante 2000). (4) Modeling spatial variation in MAPS productivity indices and survival-rate estimates as a function of spatial variation in population trends provides a successful means for identifying the proximate demographic cause(s) of population change at multiple spatial scales (DeSante et al. 2001). (5) Productivity of landbirds breeding in Pacific Northwest national forests is affected by global climate cycles including the El Niño Southern Oscillation and the

North Atlantic Oscillation, in such a manner that productivity of Neotropical migratory species is determined more by late winter and early spring weather conditions on their wintering grounds than by late spring and summer weather conditions on their breeding grounds (Nott et al. 2002b). These results indicate that MAPS is capable of achieving, and in some cases is already achieving, its objectives and goals.

SPECIFICS OF THE NSGA SUGAR GROVE MAPS PROGRAM

Two MAPS stations were re-established and operated on NSGA Sugar Grove in 2003, at the same locations at which they were originally established in 2001 by IBP field biologists, Amy McAndrews and Amy Finfera, with help from Jack Markham (Horticulturist/Urban Forester, Atlantic Division, Naval Facilities Engineering Command) and Steve Niethamer (Environmental Programs Manager at NSGA Sugar Grove). The stations were re-established in 2003 by Amy McAndrews, with the help of IBP field biologist interns, Leah Gibbons, Lauren Hoffstetter, and Derek Robertson, during the third week of May, 2003. The two stations are located as follows: (1) the South Fork Potomac River station on the main base in a riparian corridor of mixed forest bordering the southern branch of the Potomac River southern fork; and (2) the Beaver Creek station bordering the George Washington National Forest in open mixed forest. A summary of the major habitats represented at each of the two stations is presented in Table 1 along with a summary of the 2003 operation of each station.

The three field biologist interns, who were also responsible for operating the six MAPS stations in Shenandoah National Park, received intensive training during a comprehensive course in mist netting and bird-banding techniques given by IBP biologist Amy McAndrews, which took place May 1-14 at the Jug Bay Wetlands Sanctuary in southern Maryland. The interns began operation of the NSGA Sugar Grove stations on May 17 at the Potomac River station, but were rained out the following day and were not able to start the Beaver Creek station until June 4. The interns were supervised by Amy McAndrews for the duration of the field season.

All ten net sites at each station were established without difficulty at the exact same locations where they were operated in 2001 and 2002. Each station was operated for six morning hours per day (beginning at local sunrise) on one day in each of eight (Potomac River) or seven (Beaver Creek) consecutive 10-day periods between Period 3 (Potomac River) or Period 4 (Beaver Creek), and Period 10 (August 5-6 for the two stations). The operation of all stations occurred on schedule during each of the seven or eight 10-day periods.

METHODS

The operation of each of the two stations during 2003 followed MAPS protocol, as established for use by the MAPS Program throughout North America and spelled out in the MAPS Manual (DeSante et al. 2003). An overview of both the field and analytical techniques is presented here.

Data Collection

With few exceptions, all birds captured during the course of the study were identified to species, age, and sex and, if unbanded, were banded with USGS/BRD numbered aluminum bands. Birds were released immediately upon capture and before being banded if situations arose where bird safety would be comprised. Such situations could involve exceptionally large numbers of birds being captured at once, or the sudden onset of adverse weather conditions such as high winds or heavy rainfall. The following data were taken on all birds captured, including recaptures, according to MAPS guidelines using standardized codes and forms (DeSante et al. 2003):

(1) capture code (newly banded, recaptured, band changed, unbanded);
(2) band number;
(3) species;
(4) age and how aged;
(5) sex (if possible) and how sexed (if applicable);
(6) extent of skull pneumaticization;
(7) breeding condition of adults (i.e., presence or absence of a cloacal protuberance or brood patch);
(8) extent of juvenal plumage in young birds;
(9) extent of body and flight-feather molt;
(10) extent of primary-feather wear;
(11) fat class;
(12) wing chord and weight;
(13) date and time of capture (net-run time); and
(14) station and net site where captured.

Effort data, i.e., the number and timing of net-hours on each day (period) of operation, were also collected in a standardized manner. In order to allow constant-effort comparisons of data to be made, the times of opening and closing the array of mist nets and of beginning each net check were recorded to the nearest ten minutes. The breeding (summer residency) status (confirmed breeder, likely breeder, non-breeder) of each species seen, heard, or captured at each MAPS station on each day of operation was recorded using techniques similar to those employed for breeding bird atlas projects.

For each of the two stations operated, simple habitat maps were prepared on which up to four major habitat types, as well as the locations of all structures, roads, trails, and streams, were identified and delineated. The pattern and extent of cover of each major habitat type identified at each station, as well as the pattern and extent of cover of each of four major vertical layers of vegetation (upperstory, midstory, understory, and ground cover) in each major habitat type, were classified into one of twelve pattern types and eleven cover categories according to guidelines spelled out in the MAPS Habitat Structure Assessment (HSA) Protocol, developed by IBP Landscape Ecologist, Philip Nott, and the IBP staff (Nott et al. 2003a).

Computer Data Entry and Verification

The computer entry of all banding data was completed by John W. Shipman of Zoological Data Processing, Socorro, NM. The critical data for each banding record (capture code, band number, species, age, sex, date, capture time, station, and net number) were proofed by hand against the raw data and any computer-entry errors were corrected. Computer entry of effort, breeding status, and vegetation data was completed by IBP biologists using specially designed data entry programs. All banding data were then run through a series of verification programs as follows:

(1) Clean-up programs to check the validity of all codes entered and the ranges of all numerical data;
(2) Cross-check programs to compare station, date, and net fields from the banding data with those from the summary of mist netting effort data;
(3) Cross-check programs to compare species, age, and sex determinations against degree of skull pneumaticization, breeding condition (extent of cloacal protuberance and brood patch), and extent of body and flight-feather molt, primary-feather wear, and juvenal plumage for each record;
(4) Screening programs which allow identification of unusual or duplicate band numbers or unusual band sizes for each species; and
(5) Verification programs to screen banding and recapture data from all years of operation for inconsistent species, age, or sex determinations for each band number.

Any discrepancies or suspicious data identified by any of these programs were examined manually and corrected if necessary. Wing chord, weight, station of capture, date, and any pertinent notes were used as supplementary information for the correct determination of species, age, and sex in all of these verification processes.

Data Analysis

To facilitate analyses, we first classified the landbird species captured in mist nets into five groups based upon their breeding or summer residency status. Each species was classified as one of the following: a regular breeder (B) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during all years* that the station was operated; a usual breeder (U) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during more than half but not all of the years* that the station was operated; an occasional breeder (O) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during half or fewer of the years* that the station was operated; a transient (T) if the species was *never* a breeder or summer resident at the station, but the station was within the overall breeding range of the species; and a migrant (M) if the station was not located within the overall breeding range of the species. Data from a station for a species classified as a migrant ‘M’ at the station were not included in any analyses, except those used to produce Table 2.

A. Population-Size and Productivity Analyses — The proofed, verified, and corrected banding data from 2003 were run through a series of analysis programs that calculated for each species and for all species combined at each station and for all stations pooled:

(1) the numbers of newly banded birds, recaptured birds, and birds released unbanded;
(2) the numbers and capture rates (per 600 net-hours) of first captures (in 2003) of individual adult and young birds; and
(3) the proportion of young in the catch.

Following the procedures pioneered by the British Trust for Ornithology (BTO) in their CES Scheme (Peach et al. 1996), the number of adult birds captured was used as an index of adult population size, while the proportion of young in the catch was used as an index of post-fledging productivity.

For each station, we calculated percent changes between 2002 and 2003 in the numbers of adult and young birds captured, and actual changes in the proportion of young in the catch. These between-year comparisons were made in a "constant-effort" manner by means of a specially designed analysis program that used actual net-run (capture) times and net-opening and -closing times on a net-by-net and period-by-period basis to exclude captures that occurred in a given net in a given period in one year during the time when that net was not operated in that period in the other year. We determined the statistical significance of between-year changes according to methods developed by the BTO in their CES scheme (Peach et al. 1996). Thus, for species captured at both stations at NSGA Sugar Grove, we statistically inferred the significance of installation-wide annual changes in the indices of adult population size and post-fledging productivity by using confidence intervals derived from the standard errors of the mean percentage changes. Because of the sample size of only two stations, between-year changes for any given species at NSGA Sugar Grove are unlikely to reach statistical significance unless the changes at the two stations are substantial and very nearly the same. The statistical significance of the overall change at a given station was inferred from a one-sided binomial test on the proportion of species at that station that increased (or decreased). Throughout this report, we use an alpha level of 0.05 for statistical significance, and we use the term “near-significant” or “nearly significant” for differences for which $0.05 \leq P < 0.10$.

For each of the two stations operated for the three years, 2001-2003, and for both stations combined, we calculated three-year means for the numbers of adult and young birds captured per 600 net hours and the proportion of young in the catch for each individual species and for all species pooled. While these mean numbers provide an indication of the relative adult population size and productivity of the various species at each station and at all stations pooled, they don’t provide sufficient information by themselves for statistical inference of the differences in adult population size or productivity among years or between stations. In order to make such inferences, we conducted multivariate analyses of variance (of numbers of adults captured) and logistic regression analyses (of productivity).

B. Multivariate analyses on adult population size — We conducted multivariate ANOVAs on indices of adult population size (mean number of adult birds captured) as a function of year and station. Because year and station are incorporated into the ANOVAs as non-continuous variables, the analysis format requires the designation of a reference station or reference group against which the relative mean number of adults for the other stations or groups are compared. For both Multivariate ANOVAs and logistic regressions (see below), we chose 2003 as the reference year and South Fork Potomac River as the reference station. We set the relative number of adults to be zero for the reference year and station. The multivariate ANOVAs estimated differences among years and between stations after controlling for the other variable. Multivariate ANOVAs also included a net-hour term to adjust for the variable amount of effort that occurred at each station, and the ANOVA for all species combined included the addition of a species term to control for relative species abundance.

Data preparation for the ANOVA analyses was completed using data-management programs in dBASE4. The multivariate ANOVAs themselves were completed using the statistical-analysis package STATA (Stata Corporation 1995), and statistical significance was determined based on the F-statistic. We conducted these multivariate ANOVAs for all species pooled and for each of four target species for which we recorded an average of seven or more individual adult captures per year at the two stations combined, and at which the species was a regular (B) or usual (U) breeder. The analysis for all species pooled also included species that were transients (T).

C. Logistic regression analyses of productivity — In a similar manner to multivariate ANOVA, the use of logistic regression provides an analytical framework for examining productivity as a function of year and station while controlling for the other variable. Logistic regression, when used in productivity analyses, estimates the probability of an individual bird captured at random being a young bird. The "odds ratio", the term used for the probability value produced by logistic regression, is the odds of a captured individual being a young bird after both other variables (year and station) have been accounted for. As with multivariate ANOVAs, the logistic-regression analysis format requires the designation of a reference year (2003) and reference station (South Fork Potomac River). Data preparation for the logistic regression analyses was completed using data-management programs in dBASE4, and the logistic regression analyses themselves were completed on all species pooled and the four target species using the statistical-analysis package STATA (Stata Corporation 1995). Statistical significance in logistic regression was determined based on the z-statistic (or Wald Statistic) which equates to the maximum likelihood estimate based on the odds ratio divided by the standard error (Stata Corporation 1995).

D. Analyses of trends in adult population size and productivity — We examined three-year (2001-2003) trends in indices of adult population size and productivity for the four target species for which we recorded an average of seven or more individual adult captures per year at the two stations combined, and at which the species was a regular (B) or usual (U) breeder. For trends in adult population size, we first calculated adult population indices for each species in each of the three years based on an arbitrary starting index of 1.0 in 2001. Constant-effort changes (as defined above) were used to calculate these "chain" indices in each subsequent year by multiplying the proportional change between the two years times the index of the previous year and adding that figure to the index of the previous year, or simply:

$$PSI_{i+1} = PSI_i + PSI_i * (d_i/100)$$

where PSI_i is the population size index for year I and d_i is the percentage change in constant-effort numbers from year I to year i+1. A regression analysis was then run to determine the slope of these indices over the three years (*PT*). Because the indices for adult population size were based on percentage changes, we further calculated the annual percent change (*APC*), defined as the average change per year over the three-year period, to provide an estimate of the population trend for the species; *APC* was calculated as:

(actual 2001 value of *PSI* / predicted 2001 value of *PSI* based on the regression) * *PT*.

We present *APC*, the standard error of the slope (*SE),* the correlation coefficient *(r*), and the significance of the correlation (*P*) to describe each trend. Again, we use an alpha level of 0.05 for statistical significance and we use the terms "nearly significant" or "near-significant" for trends for which $0.05 \leq P < 0.10$. Species for which $r > 0.5$ are considered to have a substantially increasing trend; those for which $r < -0.5$ are considered to have a substantially decreasing trend; those for which $-0.5 \leq r \leq 0.5$ and $SE \leq 0.389$ (for three-year trends) are considered to have a stable trend; and those for which $-0.5 \leq r \leq 0.5$ and $SE > 0.389$ (for three-year trends) are considered to have widely fluctuating values but no substantial trend.

Trends in Productivity, *PrT*, were calculated in an analogous manner by starting with actual productivity values in 2001 and calculating each successive year's value based on the actual constant-effort changes in productivity between each pair of consecutive years. For trends in productivity, the slope (*PrT*) and its standard error (*SE*) are presented, along with the correlation coefficient *(r*)*,* and the significance of the correlation (*P*). Productivity trends are characterized in a manner analogous to that for population trends, except that productivity trends are considered to be highly fluctuating if the *SE* of the slope > 0.222 (for three-year productivity trends).

E. Survivorship analyses — Modified Cormack-Jolly-Seber (CJS) mark-recapture analyses (Pollock et al.1990, Lebreton et al.1992) were conducted on the four target species using three years (2001-2003) of capture histories of adult birds. Using the computer program SURVIV (White 1983), we calculated, for each target species, maximum- likelihood estimates and standard errors (*SE*s) for the apparent adult survival probability (ϕ) and adult recapture probability (*p*) using a non-transient model. Recapture probability is defined as the conditional probability of recapturing a bird in a subsequent year that was banded in a previous year, given that it survived and returned to the place it was originally banded.

RESULTS

A total of 811.8 net-hours was accumulated at the two MAPS stations operated at NSGA Sugar Grove in 2003 (Table 1). Data from 636.0 of these net-hours could be compared directly to 2002 data in a constant-effort manner.

Indices of Adult Population Size and Post-fledging Productivity

A. 2003 values. The 2003 capture summary of the numbers of newly-banded, unbanded, and recaptured birds is presented for each species and all species pooled at each of the two stations in Table 2. A total of 200 captures of 28 species was recorded at the South Fork Potomac River station, while Beaver Creek produced only 20 captures of 9 species. Overall, the most abundantly captured species at the two stations were Worm-eating Warbler, followed by Indigo Bunting, Ovenbird, Song Sparrow, Gray Catbird, and Carolina Wren (Table 2).

In order to standardize the number of captures with respect to variation in mist-netting effort (due to unsuitable weather conditions and accidental net damage; see Table 1), we present capture rates (per 600 net-hours) of individual adult and young birds, as well as the percentage of young in the catch, for each species and for all species pooled at each station in Table 3. These capture indices suggest that the total adult population size in 2003 was almost 12 times as high at South Fork Potomac River (102.6 birds per 600 net hours) as it was at Beaver Creek (8.7 birds per 600 net hours). Species richness of adults at the South Fork Potomac River station (25 species) was over three times as high as the Beaver Creek station (7 species). Captures of young of all species pooled at South Fork Potomac River in 2003 (102.6) was over five times as high as at Beaver Creek, whereas the index of productivity, as determined by the percentage of young in the catch, was slightly higher at Beaver Creek (0.52) than at South Fork Potomac River (0.50). Overall, the highest breeding populations at the two stations, based on adults captured per 600 net-hours, were Worm-eating Warbler, Indigo Bunting, Gray Catbird, Song Sparrow, Ovenbird, White-eyed Vireo, and Tufted Titmouse (Table 3).

B. Comparisons between 2002 and 2003. Constant-effort comparisons between 2002 and 2003 were undertaken at both NSGA Sugar Grove stations for numbers of adult birds captured (index of adult population size; Table 4), numbers of young birds captured (Table 5), and proportion of young in the catch (productivity index; Table 6).

Adult population size for all species pooled at both stations combined decreased substantially but non-significantly by -27.2% between 2002 and 2003 (Table 4). Decreases were recorded for 19 of 29 species, a proportion near-significantly greater than 0.50 ($P = 0.068$). The number of adults captured of all species pooled decreased at both stations, by -25.0% at South Fork Potomac River and -44.4% at Beaver Creek. The proportion of increasing or decreasing species was not significantly greater than 0.50 at either station. There were no species that showed consistent decreases or increases of adults at both stations.

The number of young birds captured of all species pooled for both stations combined increased by +66.0%, a substantial but non-significant change (Table 5). Increases between 2002 and 2003 were recorded for 16 of 21 species, a proportion significantly greater than 0.50 ($P = 0.013$). Change in young captured for all species pooled increased at both stations, by +70.0% at South Fork Potomac River and by +42.9% at Beaver Creek. The proportion of increasing species at South Fork Potomac River was greater than 0.50 by a highly significant margin. Among individual species, only one, Black-capped Chickadee, showed a consistent change, an increase in the number of young, at both stations.

With adult populations decreasing and number of young increasing, productivity (the proportion of young in the catch) showed a substantial absolute increase of +0.202, from 0.367 in 2002 to 0.569 in 2003 for all species pooled and all stations combined (Table 6). Increases in productivity were recorded for 13 of 16 species, a proportion significantly greater than 0.50 ($P = 0.011$). As with young captured, increases in productivity were noted at both stations, by absolute values of +0.200 at South Fork Potomac River and +0.229 at Beaver Creek. The proportion of increasing species at South Fork Potomac River (12 of 14) was greater than 0.50 by a highly significant margin. There were no species that showed consistent decreases or increases in productivity at both stations.

Thus, in general, breeding populations decreased substantially at both stations while productivity increased substantially at both stations, indicating an installation-wide pattern. The near-significant and significant proportions of species showing these respective patterns indicate that these changes were species-wide, as well as installation-wide.

C. Three-year mean population size and productivity values. Mean numbers of individual adults (an index of adult population size) and young captured per 600 net-hours, and proportion of young in the catch (an index of productivity), averaged over the three-year period 2001-2003, are presented in Table 7, for each station and both stations combined. Examination of values for all species pooled confirms that the large disparity in capture rates of adults and young between South Fork Potomac River (110.2 and 97.7 per 600 net-hours, respectively) and Beaver Creek (19.9 and 20.6 per 600 net-hours) has been consistent over the three-year period. Productivity (proportion of young in the catch), however, has tended to be higher at Beaver Creek (0.53) than at South Fork Potomac River (0.46). Examination of individual species indicates that the species composition between the two stations also differs substantially, with seven of the 19 species recorded at Beaver Creek being unrecorded at South Fork Potomac River, and two other species (Black-capped Chickadee and Tufted Titmouse) showing higher values of young or both young and adults at Beaver Creek than at South Fork Potomac River, despite the much lower capture rates overall at Beaver Creek. For both stations and all three years combined, the highest breeding populations were recorded for Worm-eating Warbler, followed by Indigo Bunting, Gray Catbird, Song Sparrow, Ovenbird, Carolina Wren, Northern Cardinal, White-eyed Vireo, and Tufted Titmouse (Table 7), an ordering of species very similar to that in 2003 (Table 3).

D. Multivariate analyses of variance of adult population size. Multivariate analyses assessing variation in numbers of adults captured by year and station, for all species combined and for four target species, are shown in Figure 1**A**-**B**. For all species combined, there was very little variation in numbers of adults captured by year (controlling for station, species, and net-hours); numbers tended to be very slightly and non-significantly higher in both 2001 and 2002 than they were in 2003 (Fig. 1**A**). There was similarly very little variation in adults captured by year for Gray Catbird, Song Sparrow, and Indigo Bunting. For Worm-eating Warbler, however, the adult capture rate was significantly lower in 2001 and highly significantly greater in 2002 than it was in 2003 (Fig. 1**A**).

For all species combined, a significantly higher number of adults was captured at the South Fork Potomac River station than at the Beaver Creek station, even after controlling for interannual variation, species, and net-hours (Fig. 1**B**). This pattern was similar for Worm-eating Warbler, where the much lower numbers of adults captured at Beaver Creek was highly significant. Although all three of the other target species (Gray Catbird, Song Sparrow, and Indigo Bunting) also had a lower capture rate of adults at Beaver Creek, in none of them was this difference significant (Fig. 1**B**), even though no adults were captured at Beaver Creek for the first two of these three species (Table 7).

E. Logistic regression analyses of productivity. The odds ratios for productivity indices for all species combined and for the four target species are presented in Figure 1**C**-**D**. For all species combined, when controlling for station, productivity was highly significantly lower in 2002 than it was in 2003, whereas the 2001 productivity value was virtually identical to that in 2003 (Fig. 1**C**). Productivity was lower in 2002 than in 2003 for three of the four target species, being highly significantly lower in 2002 than in 2003 for Gray Catbird and virtually identical in 2002 and 2003 (when controlling for station) for Indigo Bunting. Productivity in 2001 was near-significantly higher than that in 2003 for Worm-eating Warbler but near-significantly lower than that in 2003 for Song Sparrow (Fig. 1**C**).

For all species combined, productivity at the South Fork Potomac River was slightly and non-significantly lower than that of the Beaver Creek station, when controlling for interannual variation (Fig. 1**D**). This pattern was similar for Indigo Bunting. For Worm-eating Warbler, however, productivity was significantly higher at the Potomac River station than at Beaver Creek (Fig. 1**D**). This comparison could not be performed for Gray Catbird and Song Sparrow, for which no young or adult birds were captured at beaver Creek (Table 7) and productivity could not be calculated.

F. Three-year trends in adult population size and productivity. "Chain" indices of adult population size are presented in Figure 2 for the 4 target species (with an average of at least seven individual adults captured per year) and for all species pooled at the two stations combined. See Methods for an explanation of the calculations used to obtain these indices. We used the slope of the regression line for each species to calculate the Annual Percentage Change (*APC*) for the population. *APC* along with the standard error of the slope (SE), the correlation coefficient *(r)*, and the significance of the correlation (*P*) for each target species and for all species pooled are included in Figure 2.

Population trends for all four species were substantial (absolute $r > 0.5$), with two being positive (Worm-eating Warbler and Indigo Bunting) and two being negative (Gray Catbird and Song Sparrow). Three of these trends showed r-values > 0.9, indicating consistent trends, but only for the positive trend in Indigo Buntings was the correlation significant ($r = 1.00$, $P = 0.018$). The trend for all species pooled was also substantially negative ($r = -0.886$) but not significant. Significant trends are difficult to achieve with only three data points; should these tendencies continue we will likely see more significant trends after five or more years of data have been collected.

Trends in productivity for the four target species and all species pooled are shown in Figure 3. Productivity trends for Song Sparrow and Indigo Bunting were substantially positive ($r > 0.50$) while the productivity trend for Worm-eating Warbler was substantially negative ($r < -0.50$), but none of the three trends were significant. The productivity trend for Gray Catbird was essentially stable (absolute $r < 0.5$ and $SE < 0.222$), although the tendency was negative. The productivity trend for all species pooled was also stable, although with a positive tendency. Again, we expect to see more significant trends after more years of data have been collected.

Estimates of Adult Survivorship

Using three years of data from the two stations, estimates of adult survival and recapture probabilities could be obtained for only one (Song Sparrow) of the four target species breeding at NSGA Sugar Grove. Using a non-transient model, the apparent annual adult survival rate (ϕ) for Song Sparrow was estimated at 0.669 (*S.E.* = 0.522; CV(ϕ) = 78.0%), while its recapture probability (p) was estimated at 0.280 (*S.E.* = 0.308). Survival could not be estimated for the other three species due to low recapture rates and only three years of data (the absolute minimum number of years for using a non-transient model). After five or more years of data have been collected we should be able to obtain more precise survival estimates for more species using a transient model.

DISCUSSION

Three years (2001-2003) of MAPS data from two stations on NSGA Sugar Grove confirm that both species richness and the abundance of adult birds at the South Fork Potomac River station, located in bottomland riparian/mixed forest habitat, was substantially higher than that at the Beaver Creek station, located in ridgetop/open forest habitat. We believe that the bottomland riparian/mixed forest habitat can support larger breeding populations due to its denser more diverse canopy and much richer understory than the more open ridgetop habitat that largely lacks an understory. In addition, the windier, more exposed conditions at the ridgetop station could also negatively influence the numbers of breeding birds by lowering the quantity of food resources available to them.

Between-year and -station comparisons of the three years of operation at the two stations on NSGA Sugar Grove using multivariate ANOVAs for adult population size and logistic regression analyses for productivity not only confirmed the between-station differences adult population sizes, but also revealed that adult population sizes tended to be slightly higher in 2002 than in 2001 and 2003, whereas productivity was significantly lower in 2002 than in 2001 and 2003. This was especially true of the installation's most abundant species, Worm-eating Warbler, but was also reflected in the dynamics of the other species, as well. We found a similar drop in adult populations and increase in productivity between 2002 and 2003 at the six stations at roughly similar elevations in Shenandoah National Park, suggesting that these patterns were consistent over the entire central Appalachian region.

This type of alternating two-year cycle has often been observed at other MAPS locations and likely reflects density-dependent effects. Increased productivity one year causes increased recruitment and thus increased population sizes the next year, which in turn results in decreased productivity due to more competition and a higher proportion of first-time breeders. This decreased productivity then results in lower breeding populations the following year that show higher productivity, and so on. If this pattern continue, we should expect to see higher breeding populations with lower productivity in 2004, although unusual climatic events, weather conditions, or other environmental events (such as the gypsy-moth infestation that affected Shenandoah National Park in the early 1990's) can disrupt this alternating pattern.

Population trends for all four target species at NSGA Sugar Grove were substantial, with two being positive and two being negative. Three of these showed r-values > 0.9, indicating consistent trends, but only for the positive trend in Indigo Buntings was the correlation significant. The trend for all species pooled was substantially negative (r = -0.886) but not significant. Productivity trends were substantially positive but not significant for two species, substantially negative positive but not significant for one species, essentially stable but with a positive tendency for the fourth species, and essentially stable but with a negative tendency for all species pooled. Significant trends are difficult to achieve with only three data points; should these tendencies continue we will likely see more significant trends after five or more years of data have been collected.

Using three years of data from the two stations, estimates of adult survival and recapture probabilities could be obtained for only one of the four target species breeding at NSGA Sugar Grove, Song Sparrow. The survival rate estimate for this species, 0.669, suggest that survival on NSGA Sugar Grove is good, although the precision of this estimate, as given by CV(ϕ) = 78.0%, was poor. Survival could not be estimated for the other three species due to low recapture rates and only three years of data (the absolute minimum to estimate survival with a non-transient model). We should be able to obtain more precise estimates of survival for more species using a transient model after five or more years of data have been collected.

Despite the fact that the NSGA Sugar Grove MAPS stations have been operated for only three years, interesting data have been gathered on adult populations and productivity for a number of breeding landbirds at the installation. In addition to confirming differences in indices of adult population size and productivity both among years and between the two stations, we have been able to obtain preliminary results on population trends, productivity trends, and survival for all species pooled and for a few target species. As more years of data accumulate we will be able to examine additional between-year changes in these indices in order to make inferences about the effects of weather on productivity and the effect of changes in productivity on population size. We will also be able to make inferences regarding longer-term trends for the various species and causes of those trends. Finally, we will be able to better examine annual survival-rate estimates, recapture probabilities, and proportions of residents among newly captured adults in order to make inferences regarding the effect of survivorship on population dynamics. Pooling data at this level will also allow comparison between NSGA Sugar Grove and other protected areas at which MAPS stations are operated in the region, as well as comparisons between NSGA Sugar Grove and other unprotected areas in the region. Finally, MAPS data from NSGA Sugar Grove will be pooled with MAPS data from outside the installation to provide regional (or even continental) indices and estimates of (and longer-term trends in) these key demographic parameters.

The long-term goal for the NSGA Sugar Grove MAPS program is to continue to monitor the primary demographic parameters of the installation's landbirds in order to provide critical information that can be used to aid our understanding of the ecological processes leading from environmental stressors to population responses. This is to be accomplished by including data from NSGA Sugar Grove in analyses of data from other central Appalachian MAPS stations to: (1) determine spatial patterns in productivity indices and survival rate estimates as a function of spatial patterns in populations trends for target species (DeSante 2000, DeSante et al. 1999, 2001); (2) determine the proximate demographic factor(s) (i.e., productivity or survivorship) causing observed population trends in the target species (DeSante et al. 2001); (3) link MAPS data with landscape-level habitat data and spatially explicit weather data in a geographical information system (GIS) (Nott 2002); (4) identify relationships between landscape-level habitat and/or weather characteristics and the primary demographic responses (productivity and survival rates) of the target species (Nott 2002, Nott et al. 2002b, Nott et al 2003b); (5) generate hypotheses regarding the ultimate environmental causes of the population trends; and (6) make comprehensive recommendations for habitat and use-related management strategies both on the installation and elsewhere (Nott 2000, Nott et al. 2003b).

In addition, MAPS data from NSGA Sugar Grove will provide an important contribution to the determination of accurate indices of adult population size and productivity and precise estimates of adult survival rates on the still larger region-wide scale (e.g., northeastern North American) for a substantial number of landbird species. We conclude that the MAPS protocol is well-suited to provide an integral component of NSGA Sugar Grove's long-term ecological monitoring effort. Based on the above information, we recommend the continued operation of the NSGA Sugar Grove MAPS stations well into the future.

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Table 1. Summary of the 2003 MAPS program on Naval Security Group Activity Sugar Grove.

Station						2003 operation		
Name	Code	No.	Major Habitat Type	Latitude-longitude	Avg Elev. (m)	Total number of net-hours	No. of periods	Inclusive dates
South Fork Potomac River	SFPR	15627	Gentle slope, riparian corridor, mixed forest, hayfield edge	38˚34'44"N, -79˚16'13"W	536	468.0 (350.7)	8	5/17 - 8/05
Beaver Creek	BECR	15628	Steep slope, open mixed forest, grassland edge; no understory	38˚30'40"N, -79˚16'26"W	658	343.8 (285.3)	7	6/04 - 8/06
ALL STATIONS COMBINED						811.8 (636.0)	8	5/17 - 8/06

[1] Total net-hours in 2003. Net-hours in 2003 that could be compared in a constant-effort manner to 2002 are shown in parentheses.

Table 2. Capture summary for the two individual MAPS stations, and both stations pooled, operated on Naval Security Group Activity Sugar Grove in 2003. N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	South Fork Potomac River			Beaver Creek			Both stations pooled		
Species	N	U	R	N	U	R	N	U	R
Ruby-throated Hummingbird		3			2			5	
Downy Woodpecker	2						2		
White-eyed Vireo	4		5				4		5
Red-eyed Vireo	2		1				2		1
Blue Jay	2						2		
American Crow					1			1	
Black-capped Chickadee	2			3	1		5	1	
Tufted Titmouse	5		1	2		1	7		2
Carolina Wren	7	1	5	1			8	1	5
American Robin	2						2		
Gray Catbird	13		3				13		3
Brown Thrasher	3						3		
Cedar Waxwing	2						2		
Magnolia Warbler	2		1				2		1
Black-and-white Warbler	3						3		
American Redstart	3		1				3		1
Worm-eating Warbler	43	2	7				43	2	7
Ovenbird	15		2	2			17		2
Northern Waterthrush	3						3		
Louisiana Waterthrush	2						2		
Common Yellowthroat	2		1				2		1
Wilson's Warbler	1						1		
Canada Warbler	1						1		
Scarlet Tanager	1						1		
Eastern Towhee	2		1				2		1
Chipping Sparrow				5			5		
Song Sparrow	11	2	5				11	2	5
Northern Cardinal	4						4		
Indigo Bunting	11		8	1			12		8
Baltimore Oriole	1		2				1		2
American Goldfinch				1			1		
ALL SPECIES POOLED	149	8	43	15	4	1	164	12	44
Total Number of Captures		200			20			220	
Number of Species	27	4	14	7	3	1	29	6	14
Total Number of Species		28			9			31	

Table 3. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the two individual MAPS stations, and both stations pooled, operated on Naval Security Group Activity Sugar Grove in 2003.

	South Fork Potomac River			Beaver Creek			Both stations pooled		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Downy Woodpecker	1.3	1.3	0.50				0.7	0.7	0.50
White-eyed Vireo	5.1	2.6	0.33				3.0	1.5	0.33
Red-eyed Vireo	3.8	0.0	0.00				2.2	0.0	0.00
Blue Jay	2.6	0.0	0.00				1.5	0.0	0.00
Black-capped Chickadee	1.3	1.3	0.50	0.0	5.2	1.00	0.7	3.0	0.80
Tufted Titmouse	2.6	5.1	0.67	3.5	1.7	0.33	3.0	3.7	0.56
Carolina Wren	3.8	7.7	0.67	0.0	1.7	1.00	2.2	5.2	0.70
American Robin	1.3	1.3	0.50				0.7	0.7	0.50
Gray Catbird	12.8	3.8	0.23				7.4	2.2	0.23
Brown Thrasher	0.0	3.8	1.00				0.0	2.2	1.00
Cedar Waxwing	2.6	0.0	0.00				1.5	0.0	0.00
Black-and-white Warbler	1.3	2.6	0.67				0.7	1.5	0.67
American Redstart	3.8	0.0	0.00				2.2	0.0	0.00
Worm-eating Warbler	17.9	39.7	0.69				10.3	22.9	0.69
Ovenbird	6.4	12.8	0.67	1.7	1.7	0.50	4.4	8.1	0.65
Northern Waterthrush	3.8	0.0	0.00				2.2	0.0	0.00
Louisiana Waterthrush	1.3	1.3	0.50				0.7	0.7	0.50
Common Yellowthroat	2.6	0.0	0.00				1.5	0.0	0.00
Canada Warbler	0.0	1.3	1.00				0.0	0.7	1.00
Scarlet Tanager	0.0	1.3	1.00				0.0	0.7	1.00
Eastern Towhee	1.3	1.3	0.50				0.7	0.7	0.50
Chipping Sparrow				0.0	8.7	1.00	0.0	3.7	1.00
Song Sparrow	9.0	9.0	0.50				5.2	5.2	0.50
Northern Cardinal	2.6	2.6	0.50				1.5	1.5	0.50
Indigo Bunting	12.8	3.8	0.23	1.7	0.0	0.00	8.1	2.2	0.21
Baltimore Oriole	2.6	0.0	0.00				1.5	0.0	0.00
American Goldfinch				1.7	0.0	0.00	0.7	0.0	0.00
ALL SPECIES POOLED	102.6	102.6	0.50	8.7	19.2	0.69	62.8	67.3	0.52
Number of Species	22	18		4	5		23	19	
Total Number of Species		25			7			27	

Table 4. Percentage changes between 2002 and 2003 in the numbers of individual ADULT birds captured at two constant-effort MAPS stations on Naval Security Group Activity Sugar Grove.

Species	S. Fork Potomac	Beaver Creek	n[1]	Both stations combined: Number of adults 2002	Number of adults 2003	Percent change	SE[2]
Downy Woodpecker	++++[3]		1	0	1	++++[3]	
Eastern Phoebe	-100.0		1	1	0	-100.0	
Great Crested Flycatcher	-100.0		1	1	0	-100.0	
White-eyed Vireo	100.0		1	2	4	100.0	
Red-eyed Vireo	-100.0		1	1	0	-100.0	
Blue Jay	0.0		1	1	1	0.0	
Carolina Chickadee			0	0	0		
Black-capped Chickadee		-100.0	1	1	0	-100.0	
Tufted Titmouse	-100.0	100.0	2	2	2	0.0	100.0
Carolina Wren	-88.9		1	9	1	-88.9	
Blue-gray Gnatcatcher		-100.0	1	1	0	-100.0	
American Robin	0.0		1	1	1	0.0	
Gray Catbird	-12.5		1	8	7	-12.5	
Brown Thrasher	-100.0		1	2	0	-100.0	
Cedar Waxwing	++++		1	0	2	++++	
Northern Parula		-100.0	1	1	0	-100.0	
Yellow Warbler	-100.0		1	1	0	-100.0	
Black-and-white Warbler	-50.0		1	2	1	-50.0	
American Redstart	++++		1	0	1	++++	
Worm-eating Warbler	22.2	-100.0	2	12	11	-8.3	45.8
Ovenbird	-50.0	0.0	2	11	6	-45.5	8.3
Louisiana Waterthrush	-50.0		1	2	1	-50.0	
Canada Warbler			0	0	0		
Scarlet Tanager			0	0	0		
Eastern Towhee	++++		1	0	1	++++	
Chipping Sparrow		-100.0	1	1	0	-100.0	
Song Sparrow	-16.7		1	6	5	-16.7	
Northern Cardinal	-33.3		1	3	2	-33.3	
Indigo Bunting	0.0	++++[3]	2	10	11	10.0	20.0
Common Grackle	-100.0		1	1	0	-100.0	
Baltimore Oriole	-100.0		1	1	0	-100.0	
American Goldfinch		++++	1	0	1	++++	
ALL SPECIES POOLED	-25.0	-44.4	2	81	59	-27.2	3.8
No. species that increased[4]	6(4)	3(2)				7(5)	
No. species that decreased[5]	15(8)	5(5)				19(11)	
No. species remained same	3	1				3	
Total Number of Species	24	9				29	
Proportion of increasing (decreasing) species	(0.625)	(0.556)				(0.655)	
Sig. of increase (decrease)[6]	(0.154)	(0.500)				(0.068) *	

Table 4. (cont.) Percentage changes between 2002 and 2003 in the numbers of individual ADULT birds captured at two constant-effort MAPS stations on Naval Security Group Activity Sugar Grove.

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[1] Number of stations at which at least one adult bird was captured in either year.
[2] Standard error of the % change in the number of adult birds captured.
[3] Increase indeterminate (infinite) because no adult was captured during 2002.
[4] No. of species for which adults were captured in 2003 but not in 2002 are in parentheses.
[5] No. of species for which adults were captured in 2002 but not in 2003 are in parentheses.
[6] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 5. Percentage changes between 2002 and 2003 in the numbers of individual YOUNG birds captured at two constant-effort MAPS stations on Naval Security Group Activity Sugar Grove.

Species	S. Fork Potomac	Beaver Creek	n[1]	Both stations combined: Number of young 2002	2003	Percent change	SE[2]
Downy Woodpecker	++++[3]		1	0	1	++++[3]	
Eastern Phoebe			0	0	0		
Great Crested Flycatcher			0	0	0		
White-eyed Vireo	++++		1	0	1	++++	
Red-eyed Vireo			0	0	0		
Blue Jay		-100.0	1	1	0	-100.0	
Carolina Chickadee		-100.0	1	2	0	-100.0	
Black-capped Chickadee	++++	++++[3]	2	0	4	++++	
Tufted Titmouse	200.0		1	1	3	200.0	
Carolina Wren	-14.3	0.0	2	8	7	-12.5	3.1
Blue-gray Gnatcatcher			0	0	0		
American Robin	++++		1	0	1	++++	
Gray Catbird	++++		1	0	2	++++	
Brown Thrasher	200.0		1	1	3	200.0	
Cedar Waxwing			0	0	0		
Northern Parula			0	0	0		
Yellow Warbler			0	0	0		
Black-and-white Warbler	++++		1	0	1	++++	
American Redstart			0	0	0		
Worm-eating Warbler	26.3		1	19	24	26.3	
Ovenbird	200.0	-50.0	2	5	10	100.0	120.0
Louisiana Waterthrush	0.0	-100.0	2	2	1	-50.0	50.0
Canada Warbler	++++		1	0	1	++++	
Scarlet Tanager	++++		1	0	1	++++	
Eastern Towhee	++++		1	0	1	++++	
Chipping Sparrow		++++	1	0	5	++++	
Song Sparrow	40.0		1	5	7	40.0	
Northern Cardinal	++++		1	0	2	++++	
Indigo Bunting	0.0		1	3	3	0.0	
Common Grackle			0	0	0		
Baltimore Oriole			0	0	0		
American Goldfinch			0	0	0		
ALL SPECIES POOLED	70.0	42.9	2	47	78	66.0	6.9
No. species that increased[4]	15(10)	2(2)				16(11)	
No. species that decreased[5]	1(0)	4(3)				4(2)	
No. species remained same	2	1				1	
Total Number of Species	18	7				21	
Proportion of increasing (decreasing) species	0.833	0.286				0.762	
Sig. of increase (decrease)[6]	0.004 ***	0.938				0.013 **	

Table 5. (cont.) Percentage changes between 2002 and 2003 in the numbers of individual YOUNG birds captured at two constant-effort MAPS stations on Naval Security Group Activity Sugar Grove.

[1] Number of stations at which at least one young bird was captured in either year.
[2] Standard error of the % change in the number of young birds captured.
[3] Increase indeterminate (infinite) because no young bird was captured during 2002.
[4] No. of species for which young birds were captured in 2003 but not in 2002 are in parentheses.
[5] No. of species for which young birds were captured in 2002 but not in 2003 are in parentheses.
[6] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 6. Percentage changes between 2002 and 2003 in the PROPORTION OF YOUNG in the catch at two constant-effort MAPS stations on Naval Security Group Activity Sugar Grove.

				Both stations combined			
				Proportion young			
Species	S. Fork Potomac	Beaver Creek	n[1]	2002	2003	Absol. change	SE[2]
Downy Woodpecker	+-+-+[3]		1	------[4]	0.500	+-+-+[3]	
Eastern Phoebe	+-+-+		1	0.000	------[4]	+-+-+	
Great Crested Flycatcher	+-+-+		1	0.000	------	+-+-+	
White-eyed Vireo	0.200		1	0.000	0.200	0.200	
Red-eyed Vireo	+-+-+		1	0.000	------	+-+-+	
Blue Jay	0.000	+-+-+[3]	2	0.500	0.000	-0.500	0.500
Carolina Chickadee		+-+-+	1	1.000	------	+-+-+	
Black-capped Chickadee	+-+-+	1.000	2	0.000	1.000	1.000	0.000
Tufted Titmouse	0.500	0.000	2	0.333	0.600	0.267	0.529
Carolina Wren	0.420	0.000	2	0.471	0.875	0.404	0.070
Blue-gray Gnatcatcher		+-+-+	1	0.000	------	+-+-+	
American Robin	0.500		1	0.000	0.500	0.500	
Gray Catbird	0.222		1	0.000	0.222	0.222	
Brown Thrasher	0.667		1	0.333	1.000	0.667	
Cedar Waxwing	+-+-+		1	------	0.000	+-+-+	
Northern Parula		+-+-+	1	0.000	------	+-+-+	
Yellow Warbler	+-+-+		1	0.000	------	+-+-+	
Black-and-white Warbler	0.500		1	0.000	0.500	0.500	
American Redstart	+-+-+		1	------	0.000	+-+-+	
Worm-eating Warbler	0.007	+-+-+	2	0.613	0.686	0.073	0.119
Ovenbird	0.412	-0.167	2	0.313	0.625	0.313	0.136
Louisiana Waterthrush	0.167	+-+-+	2	0.500	0.500	0.000	0.250
Canada Warbler	+-+-+		1	------	1.000	+-+-+	
Scarlet Tanager	+-+-+		1	------	1.000	+-+-+	
Eastern Towhee	+-+-+		1	------	0.500	+-+-+	
Chipping Sparrow		1.000	1	0.000	1.000	1.000	
Song Sparrow	0.129		1	0.455	0.583	0.129	
Northern Cardinal	0.500		1	0.000	0.500	0.500	
Indigo Bunting	0.000	+-+-+	2	0.231	0.214	-0.017	0.031
Common Grackle	+-+-+		1	0.000	------	+-+-+	
Baltimore Oriole	+-+-+		1	0.000	------	+-+-+	
American Goldfinch		+-+-+	1	------	0.000	+-+-+	
ALL SPECIES POOLED	0.200	0.229	2	0.367	0.569	0.202	0.028
No. species that increased	12	2				13	
No. species that decreased	0	1				2	
No. species remained same	2	2				1	
Total Number of Species[5]	14	5				16	
Proportion of increasing (decreasing) species	0.857	0.400				0.813	
Sig. of increase (decrease)[6]	0.006 ***	0.813				0.011 **	

Table 6. (cont.) Percentage changes between 2002 and 2003 in the PROPORTION OF YOUNG in the catch at two constant-effort MAPS stations on Naval Security Group Activity Sugar Grove.

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[1] Number of stations at which at least one aged bird was captured in either year.
[2] Standard error of the change in the proportion of young.
[3] The change in the proportion of young is undefined at this station because no aged individual of the species was captured in one of the two years.
[4] Proportion of young not given because no aged individual of the species was captured in the year shown.
[5] Species for which the change in the proportion of young is undefined are not included.
[6] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 \leq P < 0.05$; * $0.05 \leq P < 0.10$

Table 7. Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the two individual MAPS stations operated on Naval Security Group Activity Sugar Grove averaged over the three years, 2001-2003. Data for each species are included only from stations that lie within the breeding range of the species.

	South Fork Potomac River			Beaver Creek			All stations pooled		
Species	Ad.	Yg.	Prop. Yg.[1]	Ad.	Yg.	Prop. Yg.[1]	Ad.	Yg.	Prop. Yg.[1]
Yellow-billed Cuckoo				0.5	0.0	0.00	0.2	0.0	0.00
Downy Woodpecker	0.4	1.4	0.75				0.2	0.7	0.75
Hairy Woodpecker	0.0	0.5	1.00	0.5	0.0	0.00	0.2	0.2	0.50
Eastern Phoebe	1.5	0.0	0.00				0.8	0.0	0.00
Great Crested Flycatcher	0.6	0.0	0.00				0.3	0.0	0.00
White-eyed Vireo	4.7	1.3	0.18				2.5	0.7	0.18
Red-eyed Vireo	2.3	0.0	0.00	0.0	0.5	1.00	1.3	0.2	0.17
Blue Jay	1.4	0.0	0.00	0.0	0.6	1.00	0.8	0.3	0.25
Carolina Chickadee				0.0	1.1	1.00	0.0	0.6	1.00
Black-capped Chickadee	1.9	0.4	0.17	1.5	2.7	0.50	1.8	1.5	0.38
Tufted Titmouse	1.9	3.7	0.64	2.7	5.9	0.39	2.3	4.9	0.57
White-breasted Nuthatch				0.0	0.5	1.00	0.0	0.2	1.00
Carolina Wren	9.6	9.8	0.53	0.0	1.1	1.00	4.9	5.6	0.56
House Wren	0.0	0.5	1.00				0.0	0.2	1.00
Blue-gray Gnatcatcher				0.6	0.0	0.00	0.3	0.0	0.00
American Robin	1.0	0.4	0.25	0.5	0.0	0.00	0.8	0.2	0.17
Gray Catbird	14.4	3.7	0.17				7.6	1.9	0.17
Brown Thrasher	1.1	2.8	0.78				0.6	1.5	0.78
Cedar Waxwing	0.9	0.0	0.00				0.5	0.0	0.00
Northern Parula				0.6	0.0	0.00	0.3	0.0	0.00
Yellow Warbler	0.6	0.0	0.00				0.3	0.0	0.00
Black-throated Green Warbler	0.0	0.5	1.00				0.0	0.2	1.00
Black-and-white Warbler	3.0	1.8	0.36				1.5	1.0	0.36
American Redstart	1.8	0.5	0.25				1.0	0.2	0.25
Worm-eating Warbler	14.8	44.7	0.74	4.8	0.5	0.10	10.2	23.8	0.68
Ovenbird	9.6	11.7	0.55	1.1	2.3	0.63	5.5	7.3	0.58
Northern Waterthrush	1.8	0.0	0.00				1.0	0.0	0.00
Louisiana Waterthrush	2.0	1.0	0.28	0.5	0.6	0.50	1.3	0.8	0.33
Common Yellowthroat	0.9	0.0	0.00				0.5	0.0	0.00
Canada Warbler	0.0	0.9	1.00				0.0	0.5	1.00
Scarlet Tanager	0.5	0.4	0.50	0.5	0.0	0.00	0.5	0.2	0.50
Eastern Towhee	2.3	0.4	0.25				1.2	0.2	0.25
Chipping Sparrow				1.1	3.4	0.50	0.5	1.5	0.50
Song Sparrow	11.1	6.7	0.37				5.8	3.6	0.37
Northern Cardinal	6.3	1.8	0.23				3.3	1.0	0.23
Indigo Bunting	11.7	2.9	0.15	4.5	1.5	0.10	8.4	2.3	0.21
Common Grackle	1.0	0.0	0.00				0.5	0.0	0.00
Baltimore Oriole	1.4	0.0	0.00				0.8	0.0	0.00
American Goldfinch				0.6	0.0	0.00	0.2	0.0	0.00

Table 7. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the two individual MAPS stations operated on Naval Security Group Activity Sugar Grove averaged over the three years, 2001-2003. Data for each species are included only from stations that lie within the breeding range of the species.

	South Fork Potomac River			Beaver Creek			All stations pooled		
Species	Ad.	Yg.	Prop. Yg.[1]	Ad.	Yg.	Prop. Yg.[1]	Ad.	Yg.	Prop. Yg.[1]
ALL SPECIES POOLED	110.2	97.7	0.46	19.9	20.6	0.53	67.8	61.6	0.47
Number of Species	28	22		14	12		34	27	
Total Number of Species		32			19			39	

[1] Years for which the proportion of young was undefined (no aged birds were captured in the year) are not included in the mean proportion of young.

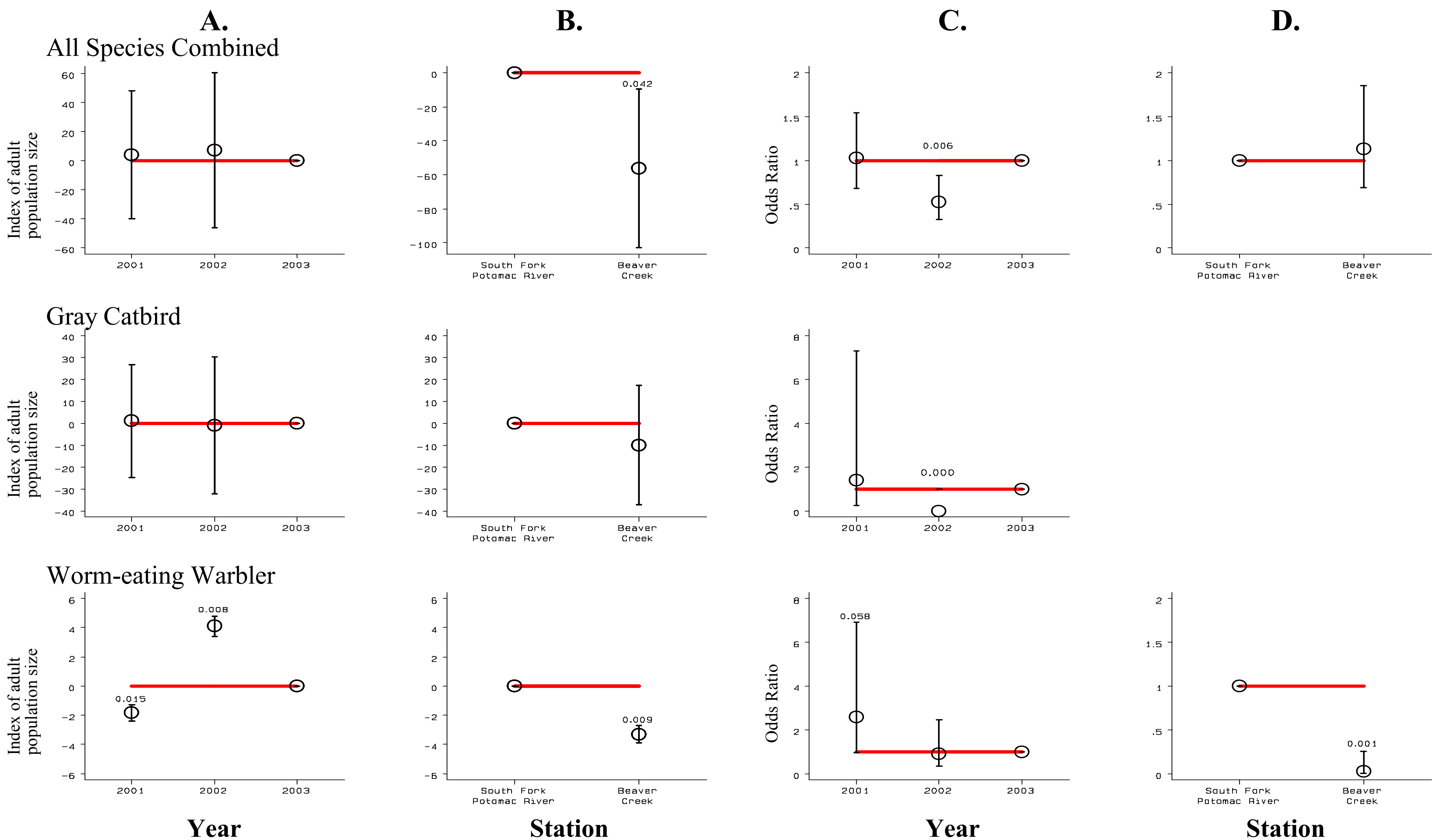

Figure 1. Relative mean numbers of adults (A,B) and odds ratios for productivity indices (C,D) with 95% confidence intervals for four target species and all species combined captured at two stations on Naval Security Group Activity Sugar Grove. Relative mean numbers of adults were estimated using multivariate ANOVA and the odds ratio for each design variable was estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The ANOVAs also controlled for effort (net-hours) and, for the all-species combined analysis, species abundance. The variables included were year (A,C) and station (B,D). For each variable, the estimates were compared to a reference point (lacking a 95% confidence interval and equivalent to the reference line), and the reference point and a reference line are plotted for ease of comparison. *P*-values are indicated for significant and near-significant comparisons.

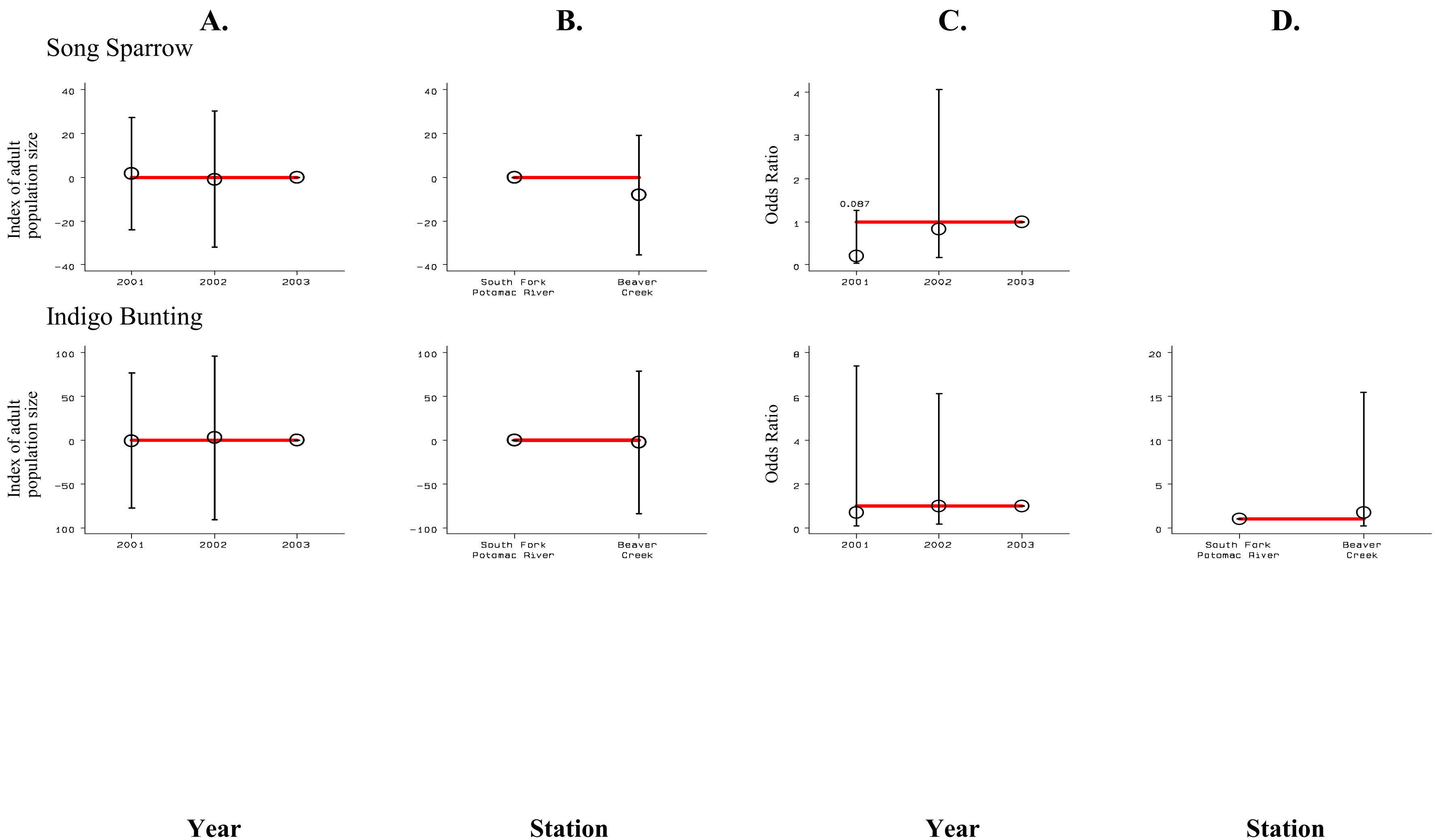

Figure 1. (cont.) Relative mean numbers of adults (A,B) and odds ratios for productivity indices (C,D) with 95% confidence intervals for four target species and all species combined captured at two stations on Naval Security Group Activity Sugar Grove. Relative mean numbers of adults were estimated using multivariate ANOVA and the odds ratio for each design variable was estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The ANOVAs also controlled for effort (net-hours) and, for the all-species combined analysis, species abundance. The variables included were year (A,C) and station (B,D). For each variable, the estimates were compared to a reference point (lacking a 95% confidence interval and equivalent to the reference line), and the reference point and a reference line are plotted for ease of comparison. *P*-values are indicated for significant and near-significant comparisons.

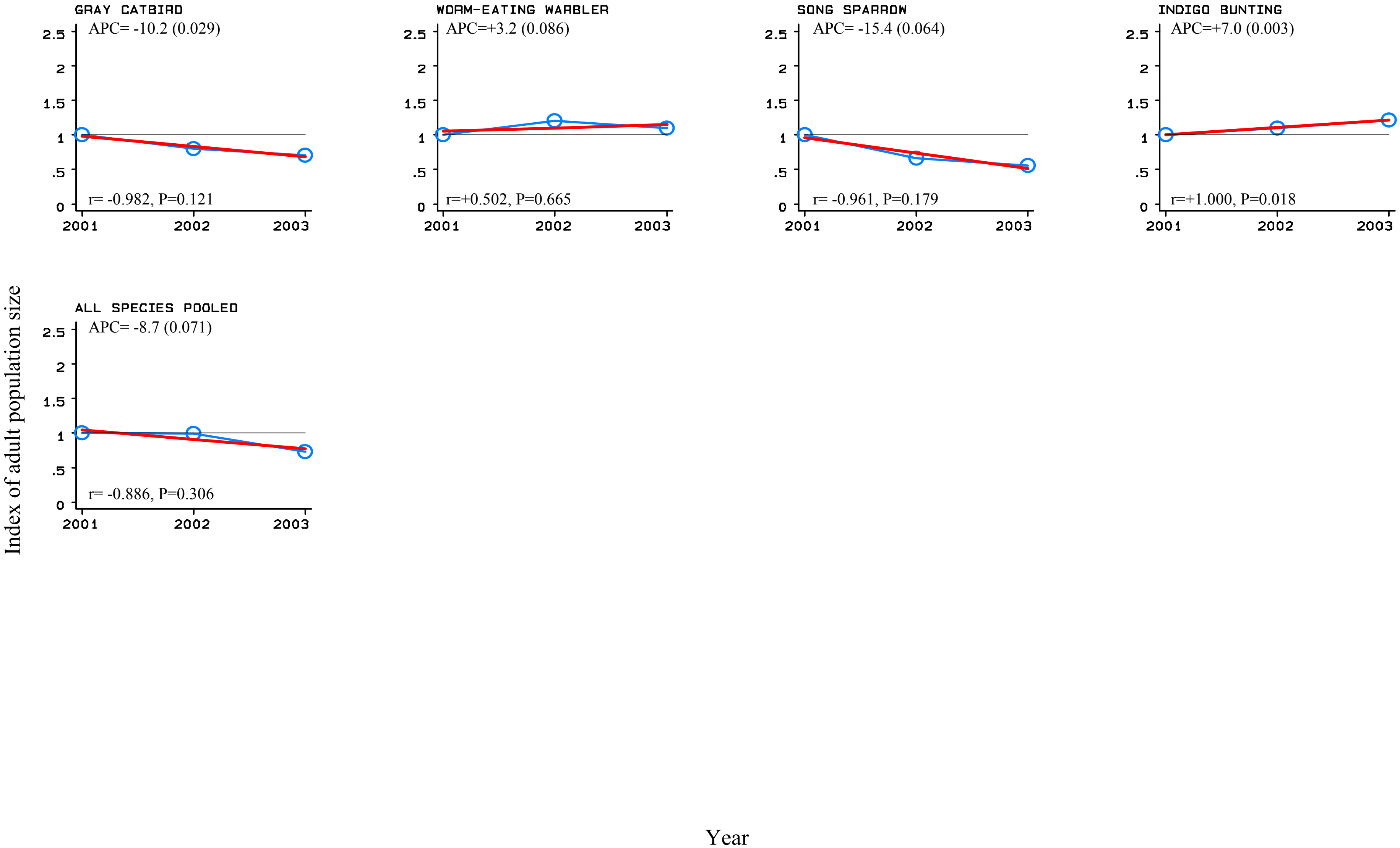

Figure 2. Population trends for four species and all species pooled on Naval Security Group Activity Sugar Grove over the three years 2001-2003. The index of population size was arbitrarily defined as 1.0 in 2001. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (APC), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (r) and significance of the correlation coefficient (P) are also shown on each graph.

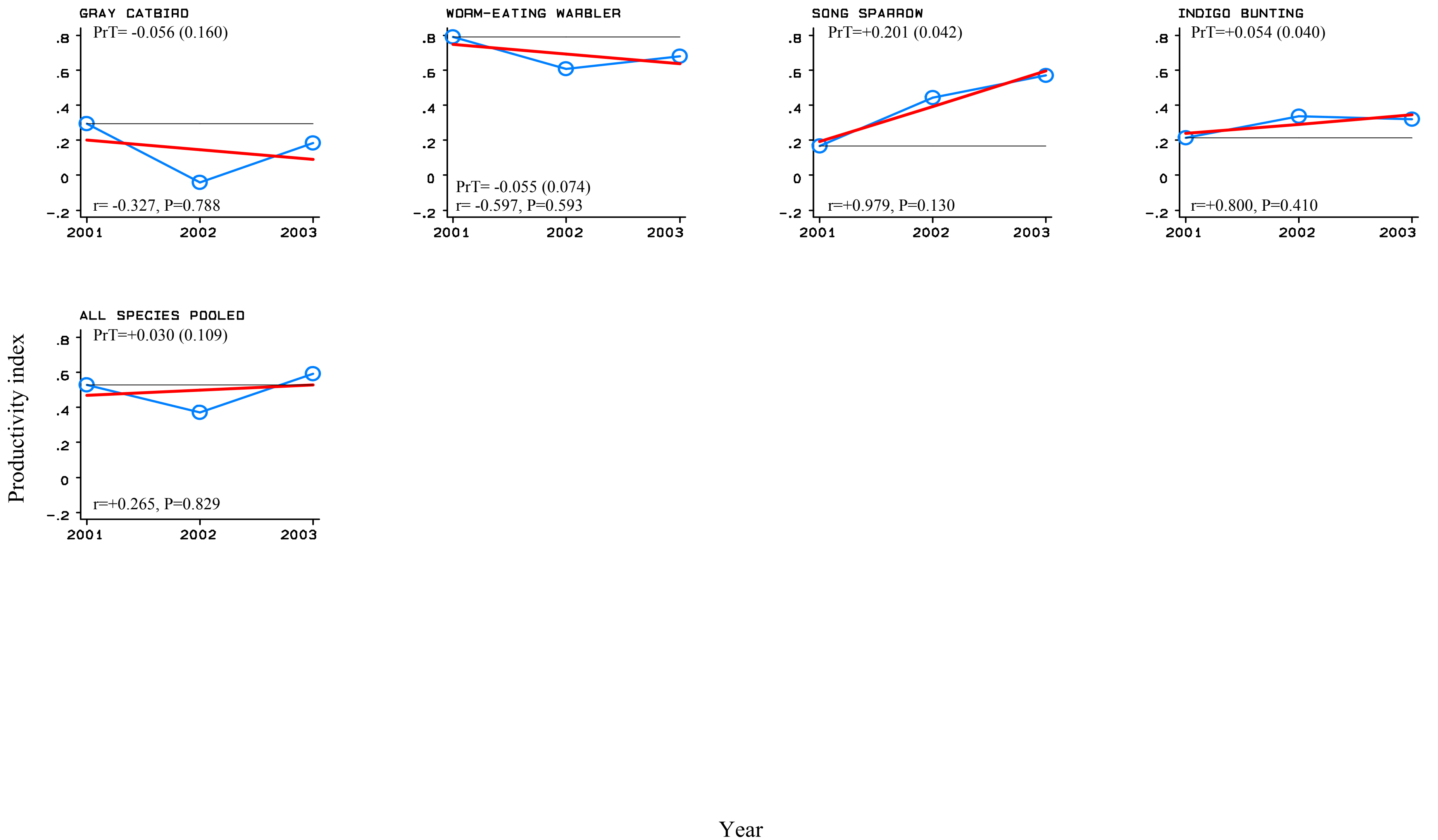

Figure 3. Trend in productivity for four species and all species pooled on Naval Security Group Activity Sugar Grove over the three years 2001-2003. The productivity index was defined as the actual productivity value in 2001. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (PrT), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (r) and significance of the correlation coefficient (P) are also shown on each graph.

Appendix I. Numerical listing (in AOU checklist order) of all the species sequence numbers, species alpha codes, and species names for all species banded or encountered during the three years, 2001-2003, of the MAPS Program on the two stations on Naval Security Group Activity Sugar Grove.

NUMB	SPEC	SPECIES NAME
00860	DCCO	Double-crested Cormorant
01010	GBHE	Great Blue Heron
01130	GRHE	Green Heron
01290	BLVU	Black Vulture
01300	TUVU	Turkey Vulture
01460	CAGO	Canada Goose
01570	WODU	Wood Duck
01630	MALL	Mallard
02020	OSPR	Osprey
02130	BAEA	Bald Eagle
02200	SSHA	Sharp-shinned Hawk
02210	COHA	Cooper's Hawk
02380	RSHA	Red-shouldered Hawk
02400	BWHA	Broad-winged Hawk
02460	RTHA	Red-tailed Hawk
02510	GOEA	Golden Eagle
02630	AMKE	American Kestrel
02940	RUGR	Ruffed Grouse
03040	WITU	Wild Turkey
03780	KILL	Killdeer
03970	SOSA	Solitary Sandpiper
04020	SPSA	Spotted Sandpiper
05570	MODO	Mourning Dove
06410	YBCU	Yellow-billed Cuckoo
06680	EASO	Eastern Screech-Owl
06800	GHOW	Great Horned Owl
07080	CONI	Common Nighthawk
07230	WPWI	Whip-poor-will
07400	CHSW	Chimney Swift
08630	RTHU	Ruby-throated Hummingbird
09110	BEKI	Belted Kingfisher
09550	RBWO	Red-bellied Woodpecker
09650	DOWO	Downy Woodpecker
09660	HAWO	Hairy Woodpecker
09800	YSFL	Yellow-shafted Flicker
09860	PIWO	Pileated Woodpecker
11390	EAWP	Eastern Wood-Pewee
11450	YBFL	Yellow-bellied Flycatcher
11460	ACFL	Acadian Flycatcher
11610	EAPH	Eastern Phoebe
11760	GCFL	Great Crested Flycatcher
12030	EAKI	Eastern Kingbird
12550	WEVI	White-eyed Vireo
12690	YTVI	Yellow-throated Vireo

Appendix I. (cont.) Numerical listing (in AOU checklist order) of all the species sequence numbers, species alpha codes, and species names for all species banded or encountered during the three years, 2001-2003, of the MAPS Program on the two stations on Naval Security Group Activity Sugar Grove.

NUMB	SPEC	SPECIES NAME
12720	BHVI	Blue-headed Vireo
12760	WAVI	Warbling Vireo
12790	REVI	Red-eyed Vireo
12930	BLJA	Blue Jay
13190	AMCR	American Crow
13270	FICR	Fish Crow
13300	CORA	Common Raven
13340	PUMA	Purple Martin
13410	TRES	Tree Swallow
13490	NRWS	Northern Rough-winged Swallow
13510	BANS	Bank Swallow
13520	CLSW	Cliff Swallow
13540	BARS	Barn Swallow
13560	CACH	Carolina Chickadee
13570	BCCH	Black-capped Chickadee
13660	TUTI	Tufted Titmouse
13690	RBNU	Red-breasted Nuthatch
13700	WBNU	White-breasted Nuthatch
13730	BRCR	Brown Creeper
14000	CARW	Carolina Wren
14070	HOWR	House Wren
14250	RCKI	Ruby-crowned Kinglet
14350	BGGN	Blue-gray Gnatcatcher
14560	EABL	Eastern Bluebird
14820	HETH	Hermit Thrush
14830	WOTH	Wood Thrush
15000	AMRO	American Robin
15130	GRCA	Gray Catbird
15150	NOMO	Northern Mockingbird
15200	BRTH	Brown Thrasher
15370	EUST	European Starling
15510	AMPI	American Pipit
15550	CEDW	Cedar Waxwing
15730	NOPA	Northern Parula
15750	YWAR	Yellow Warbler
15760	CSWA	Chestnut-sided Warbler
15770	MAWA	Magnolia Warbler
15790	BTBW	Black-throated Blue Warbler
15800	MYWA	Myrtle Warbler
15830	BTNW	Black-throated Green Warbler
15910	PIWA	Pine Warbler
15930	PRAW	Prairie Warbler
16030	BAWW	Black-and-white Warbler
16040	AMRE	American Redstart

Appendix I. (cont.) Numerical listing (in AOU checklist order) of all the species sequence numbers, species alpha codes, and species names for all species banded or encountered during the three years, 2001-2003, of the MAPS Program on the two stations on Naval Security Group Activity Sugar Grove.

NUMB	SPEC	SPECIES NAME
16060	WEWA	Worm-eating Warbler
16080	OVEN	Ovenbird
16090	NOWA	Northern Waterthrush
16100	LOWA	Louisiana Waterthrush
16150	COYE	Common Yellowthroat
16280	HOWA	Hooded Warbler
16290	WIWA	Wilson's Warbler
16300	CAWA	Canada Warbler
16830	SCTA	Scarlet Tanager
17820	EATO	Eastern Towhee
18020	CHSP	Chipping Sparrow
18140	GRSP	Grasshopper Sparrow
18230	SOSP	Song Sparrow
18270	WTSP	White-throated Sparrow
18560	NOCA	Northern Cardinal
18600	RBGR	Rose-breasted Grosbeak
18670	INBU	Indigo Bunting
18730	RWBL	Red-winged Blackbird
18800	EAME	Eastern Meadowlark
18870	COGR	Common Grackle
18960	BHCO	Brown-headed Cowbird
19160	BAOR	Baltimore Oriole
19370	HOFI	House Finch
19510	AMGO	American Goldfinch
19920	HOSP	House Sparrow
20085	UNBI	Unidentified Bird