THE 2007 ANNUAL REPORT OF THE MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) PROGRAM AT NAVAL AIR STATION BRUNSWICK AND REDINGTON TRAINING FACILITY

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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. 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 to fulfill its military mission in an optimal manner.

We re-established and operated six MAPS stations on Naval Air Station Brunswick (hereafter "Brunswick") and the Redington Training Facility (hereafter "Redington") in 2007, in the exact same locations in which they were established in 2003 and operated in 2004-2006. These included two stations at Brunswick (Golf Course and Chimney Rock) and four stations at Redington (Potato Nubble, Redington Pond, Blueline Trail, and Highland). Ten mist nets at each station were operated for six morning hours per day, on one day per 10-day period, and for seven consecutive 10-day periods between May 31 and August 8.

Because the MAPS program has only been operated for five years at Brunswick and Redington, we are not yet ready to formulate management strategies specific to these bases. However, with the addition of a fifth year of data we are now able to provide more precise survival estimates for up to 13 species breeding at Brunswick and Redington. These survival estimates help confirm preliminary assessments from last year's report (Nott et al. 2007). In the previous year's report (Pyle et al. 2006) we also used multivariate analyses to compare results between habitats, stations, and years. This year we will begin to assess how population dynamics of landbirds at Brunswick and Redington are affected by reproductive success, survival, or both.

A total of 339 individual birds of 46 species were newly banded at the six stations during the summer of 2007, various individuals of these species were recaptured a total of 71 times, and 17 birds were captured and released unbanded, for a total of 427 captures of 51 species. Capture indices (adults captured/600 net-hrs) suggest that the total adult population size in 2003-2007 was

greatest at Redington Pond and Blueline Trail, and that the lowest breeding populations have been recorded at Golf Course and Chimney Rock. Productivity values have been high at Potato Nubble and Blueline Trail, and much lower at Golf Course and Chimney Rock. Highland showed population size and reproductive index values that were close to average.

Constant-effort comparisons between 2006 and 2007 were undertaken at all six Brunswick and Redington stations. Adult breeding populations, of all species pooled and for all six stations combined, decreased slightly and non-significantly (by -4.6%), the number of young birds captured decreased by a non-significant -22.0%, and reproductive index (the number of young per adult) showed an absolute increase of -0.115, a non-significant change. In general these changes were not region wide, with Golf Course and Blueline Trail tending to show changes in the opposite directions as most other stations; nor were they species wide, many species showing changes opposite to that when all species were pooled. This compares to more dramatic changes between 2005 and 2006, when breeding populations increased fairly substantially, young increased substantially and significantly, and reproductive success also increased substantially but only near-significantly at Brunswick and Redington.

Over the five-year period, the reproductive index of 0.35 is fairly low compared with the mean value of 0.44 calculated for all species pooled in the Northeast MAPS Region, during the 12-year period 1992-2003. Of nine target species for which productivity values could be compared, three were substantially (> 50%) lower, three were slightly (< 50%) lower; two were slightly (< 50%) higher; and one showed substantially (> 50%) higher productivity at Brunswick/Redington than in the Northeast Region. This indicates that productivity may be slightly lower than it should be for many species at Brunswick and Redington, at least during the five-year period 2003-2007. However, productivity has improved substantially since 2005, when six species showed substantially lower values and only one species showed a slightly higher value than was found in the Northeast Region. It should also be noted that productivity is much lower at the two NAS Brunswick stations than at the four Reddington stations. The mean productivity index from the four Reddington stations is comparable to that of the Northeast Region as a whole, indicating that productivity may be good at Reddington.

The population trend for all species pooled was substantially and near-significantly positive during the five-year period 2003-2007, showing an annual increase of 4.6%. Substantial five-year increases were recorded for nine of the 21 species, whereas substantial declines were recorded for only four species. The five-year trend in productivity for all species pooled increased substantially but non-significantly between 2003 and 2007, showing an annual increase of 3.0%. Four species showed substantial increases and four showed substantial decreases.

We were able to obtain estimates of adult survival and recapture probabilities using temporally variable, time-constant ($\varphi p \tau$) models, for 13 species breeding at Brunswick and Redington. Estimates of annual adult survival rate ranged from a low of 0.317 for White-throated Sparrow to a high of 0.764 for American Redstart, with a mean of 0.512. The mean precision of these 13 survival estimates (based on C.V.) was 37.5%. Nine species showed improved precision following the extra year of data. The precision of our estimates will invariably improve as more years of data

are collected at Brunswick and Redington.

We compared survival values at Brunswick and Redington to values estimated from MAPS stations operated in 1992-2003 within Bird Conservation Region (BCR) 14, the Atlantic Northern Forest Region, in which Brunswick and Redington are located. Survival of eight species was higher at Brunswick during 2003-2007 than in the Region during 1992-2003, by amounts ranging from +11% to +85%. By contrast only four species showed lower survival at Brunswick, by amounts ranging from -2% to -21%. This indicates relatively good survival of target species at Brunswick and Redington. Of possible concern, however, is that the one resident or near-resident species, Black-capped Chickadee, showed the lowest value compared to the region, indicating possible negative over-winter effects at Brunswick.

Both productivity and survival of birds vary with body mass so we compared mean productivity indices and survival estimates recorded at Brunswick and Redington as a function of mean body mass (log transformed) for 11 target species for which both productivity and survival estimates were obtained. For productivity, the regression line based on data from the 11 species at Brunswick and Redington was below one based on data from North America as a whole, helping confirm that productivity is low at Brunswick. For survival, the regression line based on data Brunswick was above that based on data from North America as a whole, also helping to confirm that survival is healthy at Brunswick.

Of five of species showing declines at Brunswick two (Common Yellowthroat and Blackpoll Warbler) showed lower-than expected productivity but roughly expected survival, indicating that low productivity at Brunswick and Redington may be the cause of the declines. Another two of these five species (Magnolia Warbler and Black-capped Chickadee), showed slightly higher-than expected productivity and slightly-lower than expected survival, indicating that poor survival might be causing the declines at Brunswick. The fifth species (American Redstart), showed higher-than--expected values for both productivity and adult survival-rate, indicating that another factor, such as low first-year survival or recruitment may be causing the population decline at Brunswick.

Of six species showing population increases, one (Swainson's Thrush), showed close-to-expected productivity but higher-than-expected survival, indicating that good survival may be contributing to the increases; two (White-throated Sparrow and Hermit Thrush), showed close-to-expected or slightly high productivity but slightly low or lower-than-expected survival, indicating that adequate productivity or some other factor (e.g., high juvenal survival or recruitment) may be contributing to the increases; and three (Black-throated Green Warbler, Ovenbird, and Red-eyed Vireo) showed adequate adult survival but lower-than-expected productivity, also indicating that other factors may be contributing to the increases at Brunswick.
In summary, low productivity is implicated as causes for declines in two of the four declining species and may also be preventing greater increases for three increasing species, whereas slightly low survival may be the reason for declines in two declining species and be affecting the increases of one or two species. These results reinforce others presented above, indicating that productivity is lower (especially at NAS Bruswick) and survival higher at Brunswick and Redington than is

indicated for the region and the continent.

Thus, it appears that high survival is counterbalancing low productivity, at least at NAS Brinswick, resulting in stable or increasing five-year population trends for most species. While on the surface this may appear to be a favorable situation, it is opposite to results from other MAPS stations across the continent, generally indicating that low survival, particularly for Neotropical migrants, is the primary factor driving population declines. Thus, should survival of the populations at Brunswick decline, we would expect more severe population declines at the installation. Low productivity combined with increasing populations may also indicate that Brunswick is harboring a "sink population", that is being supported primarily by higher productivity from surrounding regions. One of the goals of MAPS is to identify such populations such that management actions can be taken to increase productivity.

As more years of data accumulate we will be able to make better assessments of population trends as well as inferences about the effects of weather on productivity and the effect of changes in productivity on population size. MAPS data from Brunswick and Redington can be pooled with other MAPS data to provide large-scale regional (or even continental) indices and estimates of (and longer-term trends in) these key demographic parameters, as we have provided in this report regarding productivity in the Northeastern MAPS region and adult survival in Bird Conservation Region 14. Once causal factors for population declines or low productivity have been confirmed (after six or more years of data have been collected), we will be prepared to make management recommendations to increase productivity and/or survival of landbirds at Brunswick and Redington and to assess the results of management actions.

We will also continue to monitor the primary demographic parameters of landbirds on these installations, 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. 2002, Nott et al 2003a, Nott and Michel 2005); (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 installations and elsewhere (Nott 2000, Nott et al. 2003a).

Very recently we undertook an analysis of the entire MAPS program in the Northeastern Region for the Northeast Coordinated Bird Monitoring Partnership (DeSante et al. 2008). In this report it was recommended that the MAPS program be increased by about 50% throughout the Northeastern United States. We also analyzed capture results from all 183 stations that have operated in the Northeast Region and made recommendations to either continue or to relocate active MAPS stations, depending on their contributions to understanding population dynamics of species of concern in the region. Five of the six Brunswick stations were contributing adequately

toward this effort; however, captures of regional species of concern at the Chimney Rock station were slightly fewer than our recommended cut-off station continuation. We will consider these results in planning for the future of the MAPS program at Brunswick and Redington and for the ability of the program to effectively guide potential management actions for improving productivity of landbirds at these installations.

We conclude that the MAPS protocol is very well-suited to achieving these long-term ecological goals and recommend continuing the MAPS program at Brunswick and Redington well into the future.

INTRODUCTION

Since 1989, The Institute for Bird Populations (IBP) 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 over 500 constant-effort mist-netting and banding stations. MAPS was designed to provide information on the vital rates (productivity or birth rate, and survivorship or death rate) of landbirds that is critically needed for efforts to identify demographic causes of the severe and sometimes accelerating population declines documented (Robbins et al. 1989, Terborgh 1989, Peterjohn et al.1995) for many species of North American landbirds (DeSante 1992, DeSante et al. 1995, 1999, 2001). Such data on vital rates are also critically needed in efforts to identify management strategies to reverse such population declines (DeSante 1995, DeSante and Rosenberg 1998).

Recent important results from MAPS reported in the peer-reviewed literature include the following:

- 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).

- Measures of productivity and survival derived from MAPS data were consistent with observed population changes at multiple spatial scales (DeSante et al. 1999).

- 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).

- 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).

- 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. 2002).

- Analyses describing relationships between four demographic parameters (adult population size, population trend, number of young, and productivity) and landscape-level habitat characteristics for bird species of conservation concern have been completed for 13 military installations in south-central and southeastern United States, allowing conservation management strategies to be formulated and tested (Nott et al. 2003a).

- A number of large military installations in North Carolina, Indiana, Kentucky, Missouri, and Texas have been monitored since 1994 by IBP under an agreement with the DoD Legacy Resources Management Office. Performance measures of population demographics and landscape showed that, in general, the installations managed large tracts of forest which represented a high percentage of the land compared to the landscape within a 20km radius of the installations' boundaries. These forested areas also featured large tracts of "core area" known to be beneficial to forest species. Consequently, the survival rate estimates and productivity indices of forest bird populations were higher than those of the surrounding MAPS or North American Bird Conservation Initiative's (NABCI) Bird Conservation Regions (Nott and Morris 2007).

MAPS is organized to fulfill three sets of goals and objectives: monitoring, research, and management. The specific **monitoring** goals of MAPS are to provide, for over 100 target species, including 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, and recruitment into the adult population from modified Cormack- Jolly-Seber analyses of mark-recapture data on adult birds.

The specific **research** goals of MAPS are to identify and describe: (a) 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 (b) 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.

All of these monitoring, research, and management goals are in agreement with the Department of Defense (DoD) Partners-in-Flight (PIF) strategy. Moreover, because birds are excellent indicators of the health of ecological systems, they can serve as a sensitive barometer of the overall effectiveness of efforts to maintain the biodiversity and ecological integrity of military installations. Accordingly, the MAPS program was initiated on select military installations beginning in 1992 and soon became one of the focus projects of the DoD PIF program. It was expected that information from the MAPS program would be capable of aiding research and management efforts on these military installations to protect and enhance the installations' avifauna and ecological integrity, while allowing them to fulfill their military mission.

Accordingly, the MAPS program was established on Naval Air Station Brunswick (hereafter "Brunswick") and Redington Training Facility (hereafter "Redington") in 2003. It is expected that information from the MAPS program will be capable of aiding research and management efforts at Brunswick and Redington to protect and enhance the installation's avifauna and ecological integrity, while helping it fulfill its military mission in an optimal manner.

The initial objective of the MAPS Program on DoD installations has been to identify generalized management guidelines and formulate specific management actions that could be implemented on military installations and elsewhere to reverse the population declines of target landbird species and to maintain the populations of stable or increasing species. The identification and formulation of these management guidelines and actions has been achieved for many installations by modeling the vital rates (productivity and survivorship) of the various landbird species as a function of landscape-level habitat characteristics and spatially explicit weather variables. The goal was to identify relationships between adult population size, numbers of young produced, productivity (ratio of young to adults), and trends in those parameters and these habitat and weather variables. Resultant management strategies were designed to involve efforts to modify the habitat from characteristics associated with low population size, population trend, or productivity to characteristics associated with high population size, population trend, or productivity (especially for species for which low productivity was found to be driving the population decline).

The Legacy Resource Management Program allowed us to undertake these analyses and formulate management strategies. These analyses were completed in 2003 and management guidelines were formulated for ten bird species of conservation concern that breed in the southeastern United States (Nott et al. 2003a). With additional funding from the Legacy Resource Management Program, we are currently implementing these guidelines through management actions on eight military installations in conjunction with efforts to increase military Readiness and Range Sustainment (Nott and Michel 2005). The strategy for implementing these guidelines includes the establishment of new MAPS stations to monitor the effectiveness of such proposed or on-going management, the discontinuance of an equal number of old stations, and the continued operation of others of the old stations to serve as controls for the new management stations. In this way, the total number of stations operated will remain the same.

Because the MAPS program has only been operated for five years at Brunswick and Redington, we are not yet ready to formulate management strategies specific to these bases. However, with

the addition of a fifth year of data we are now able to estimate survival for up to 13 species breeding at Brunswick and Redington. These survival estimates will form the focus of this report. In a previous report (Pyle et al. 2006) we also used multivariate analyses to compare results between habitats, stations, and years. This year we will continue to assess how population dynamics of landbirds at Brunswick and Redington are affected by reproductive success, survival, or both.

METHODS

Specifics of the Brunswick and Redington Stations

Six MAPS stations were re-established and operated on Brunswick (two stations), near the coast at Brunswick, Maine, and Redington (four stations), in a montane region near Rangeley, Maine, in 2007, in the exact same locations in which they were originally established in 2003 and operated in 2004-2006. These stations were originally selected in three different habitat types, deciduous, mixed, and coniferous forests, and along an elevational gradient such that species diversity on each installation could be inventoried and differences in species composition and productivity between habitat types and elevation could be examined (Pyle et al. 2006).

At Brunswick the two stations are: 1) Golf Course (GOCO) in mixed (primarily balsam fir/eastern hemlock canopy with deciduous understory) habitat at 13 m elevation at the southwestern end on the installation near the golf course, and 2) Chimney Rock (CHRO) in deciduous (primarily northern red oak) habitat at 18 m elevation on the southeastern edge of the installation. At Redington, stations were selected, in careful consideration of Survival, Evasion, Resistance, and Escape (SERE) training exercises, at: 3) Potato Nubble (PONU) in mixed (primarily maple and birch with fir/spruce subdominant) habitat at 488 m elevation near the entrance road at the west end of the installation, 4) Redington Pond (REPO) in deciduous (primarily birch and maple) habitat at 507 m elevation on the east end of Redington Pond, 5) Blueline Trail (BLUE) in lowland coniferous (primarily balsam fir and Eastern hemlock) habitat at 515 m elevation in the central region of the installation near the head of Blueline Trail, and 6) Highland (HGHL) in upland coniferous (primarily balsam fir and red spruce) habitat at 724 m elevation in the north-central region of the installation just south of the High Road. A summary of the major habitats represented at each of the six stations is presented in Table 1. Additional details on the habitat composition (Nott et al. 2003b), degree of drainage, and history of habitat disturbance to the stations are presented in Table 2 of Pyle et al. (2006).

The six stations were re-established for operation by IBP biologist Leslie Latt and biologist-interns Kimberly Farr and Dustin Partridge during June 14 to July 4, 2007. The season began 10-20 days later than normal due to funding uncertainties and conflicts with SERE exercises at Reddington. The two biologist-interns had received intensive training during a comprehensive course in mist netting and bird-banding techniques given by IBP biologists Danielle Kaschube, which took place June 4-11 at the Jug Bay Wetlands Sanctuary in Maryland. Each station was operated for six morning hours per day (beginning at local sunrise) on one day in each of seven consecutive 10-day periods between Period 5 (beginning June 10; the two Brunswick stations),

Period 6 (beginning June 20; three Reddington stations), or Period 7 (beginning July 1; one Reddington station), and Period 10 (beginning July 29). The operation of all stations occurred on schedule during each of the four, five, or six 10-day periods, in coordination with personnel at Reddington and to avoid conflict with SERE exercises.

Collection of MAPS Data

All MAPS stations were operated in accordance with the highly standardized banding protocols established by IBP for use by the MAPS Program throughout North America and spelled out in detail in the MAPS Manual (DeSante et al. 2007). On each day of operation each year, one 12-m long, 30-mm mesh, 4-tier nylon mist net was erected at each of ten fixed mist-net sites within the interior eight ha of each 20-ha station. 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 or processed if situations arose where bird safety would be compromised. The following data were taken on all birds captured, including recaptures, according to MAPS guidelines using standardized codes and forms (DeSante et al. 2007):

(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., extent of 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) presence of molt limits and plumage characteristics;
(12) wing chord;
(13) fat class and body mass;
(14) date and time of capture (net-run time);
(15) station and net site where captured; and
(16) any pertinent notes.

Effort data (i.e., the number and timing of net-hours on each day 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.

The computer entry, proofing, and verification of all banding, effort, and breeding status data were completed by IBP biologists using specially designed data entry, verification, and editing

programs. 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. 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 effort and breeding status 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), extent of juvenal plumage, extent of body and flight-feather molt, extent of primary-feather wear, and presence of molt limits and plumage characteristics;
(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, body mass, fat content, date and station of capture, 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 3.

A. Population-Size and Productivity Analyses — The proofed, verified, and corrected banding data from 2007 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 2007) of

individual adult and young birds; and
(3) the reproductive index.

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. As our index of post-fledging productivity we are now using "reproductive index" (number of young divided by number of adults) as opposed to "proportion of young in the catch" previously used. Reproductive index is a more intuitive value for productivity, and it is also more comparable to other calculated MAPS parameters such as recruitment indices.

For each station, we calculated percent changes between 2006 and 2007 in the numbers of adult and young birds captured, and actual changes in the reproductive index. 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 in the indices of adult population size and post-fledging productivity according to methods developed by the BTO in their CES scheme (Peach et al. 1996), by using confidence intervals derived from the standard errors of the mean percentage changes of all six stations. 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 six stations operated for the five years, 2003-2007, and for all stations combined, we calculated five-year means for the numbers of adult and young birds captured per 600 net hours and the reproductive index 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 reproductive index among years or between stations. In order to make such inferences, we previously (Pyle et al. 2006) conducted multivariate analyses of variance (of numbers of adults captured) and logistic regression analyses (of productivity index, or the probability that a captured bird is young).

B. Analyses of trends in adult population size and productivity — We examined five-year (2003-2007) trends in indices of adult population size and productivity, for each target species for which we recorded an average of at least 2.5 individual adults per year at the six stations combined, at stations 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 five years based on an arbitrary starting index of 1.0 in 2003. 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 five 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 five-year period, to provide an estimate of the population trend for the species; *APC* was calculated as:

(actual 2004 value of *PSI* / predicted 2003 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. 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 $SE \leq 0.140$ (for five-year trends) are considered to have a stable trend; and those for which $-0.5 \leq r \leq 0.5$ and $SE > 0.140$ 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 reproductive index values in 2003 and calculating each successive year's value based on the 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 we do not categorize productivity trends by degree of fluctuation.

C. Estimates of Survivorship. Survival of target species was estimated using Modified Cormack-Jolly-Seber (CJS) mark-recapture analyses (Pollock et al.1990, Lebreton et al.1992) on five years (2003-2007) of capture histories of adult birds from the six stations combined. Target species were those for which, on average, at least 2.5 individual adults per year and at least two between-year returns were recorded from the six stations pooled, at which the species was a breeder during more than half of the years the station was operated. Using the computer program TMSURVIV (White 1983, Hines et al. 2003), we calculated, for each target species, maximum-likelihood estimates and standard errors (*SE*s) for adult survival probability, adult recapture probability, and the proportion of residents among newly captured adults using time-constant models (Pradel et al. 1997, Nott and DeSante 2002, Hines et al. 2003). The use of the transient model accounts for the existence of transient adults (dispersing and floater individuals which are only captured once) in the sample of newly captured birds, and provides survival estimates that are unbiased with respect to these transient individuals (Pradel et al. 1997). 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 1543.5 net-hours was accumulated at the six MAPS stations operated at Bruswick and Redington in 2007 (Table 1). This represents only 61.3% of the maximum possible hours for six stations in seven periods (2520 hrs), due the late start and conflicts with SERE exercises. Of these 1543.2 hrs, 1460.8 net-hours (94.6%) could be compared with 2006 data in a constant-effort manner.

Indices of Adult Population Size and Post-fledging Productivity

The 2007 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 six stations in Table 2 and for all stations combined in Table 4. A total of 427 captures of 51 species were recorded at the six stations combined (Table 4). Newly banded birds represented 79.4% of the total captures. The greatest number of captures occurred at Blueline Trail (131),followed by, Redington Pond (92), Potato Nubble (80), Highland (57), Chimney Rock (34), and Golf Course (33). Species richness was greatest at Blueline Trail (33 species), followed by Potato Nubble and Redington Pond (23 each), Highland (18), Golf Course (13), and Chimney Rock (10). Overall, the most abundantly captured species at the six stations, in descending order (Table 4), were White-throated Sparrow, Black-throated Blue Warbler, Swainson's Thrush, Hermit Thrush, Magnolia Warbler, Ovenbird, Black-throated Green Warbler, and Common Yellowthroat.

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 reproductive index (young captured per adult), for each species and for all species pooled at each station in Table 3 and for all stations combined in Table 4. These capture indices suggest that the total adult population size in 2007 was greatest at Redington Pond (209.5 adults/600 net-hours), followed Blueline Trail (180.6), Potato Nubble (114.3), Highland (69.8), Chimney Rock (45.0), and Golf Course (42.8).

Overall, the most abundant breeding species at the six Brunswick and Redington MAPS stations in 2007, as determined by adults captured per 600 net-hrs, was Swainson's Thrush, followed in descending order by White-throated Sparrow, Ovenbird, Hermit Thrush, Black-throated Blue Warbler, Black-throated Green Warbler, American Robin, Magnolia Warbler, Common Yellowthroat, Red-eyed Vireo, and Bicknell's Thrush (Table 4). The following is a list of the common breeding species (captured at a rate of at least 4.0 adults per 600 net-hours), in decreasing order, at each station in 2007 (see Table 3):

Golf Course
Hermit Thrush
Black-thr.Green Warbler
Common Yellowthroat

Chimney Rock
Ovenbird
Black-thr. Green Warbler
Hermit Thrush

Potato Nubble
Black-thr. Blue Warbler
Ovenbird
Hermit Thrush
White-throated Sparrow
Philadelphia Vireo
Veery
Magnolia Warbler
Black-thr. Green Warbler

Redington Pond
Swainson's Thrush
Red-eyed Vireo
Bicknell's Thrush
American Redstart
Black-thr. Blue Warbler
Least Flycatcher
Ovenbird
White-throated Sparrow
Common Yellowthroat
Magnolia Warbler
Yellow-rumped Warbler

Blueline Trail
White-throated Sparrow
Magnolia Warbler
Common Yellowthroat
Traill's Flycatcher
Ruby-crowned Kinglet
Hermit Thrush
American Robin
Northern Waterthrush
Acadian Flycatcher
Red-eyed Vireo
Black-thr. Green Warbler
Black-and-white Warbler

Highland
Swainson's Thrush
White-throated Sparrow
Blackpoll Warbler
Dark-eyed Junco
Veery
Magnolia Warbler

Captures of young of all species pooled (Table 3) varied substantially, being highest at Blueline Trail (183.9 young birds/600 net hours), followed by Redington Pond (85.9), Potato Nubble (46.2), Highland (45.0), Golf Course (5.3), and Chimney Rock (3.6). The reproductive index, as determined by the number of young per adult, also varied, being highest at Blueline Trail (1.02), followed by Highland (0.65), Redington Pond (0.41), Potato Nubble (0.40), Golf Course (0.13), and Chimney Rock (0.08).

Comparisons between 2006 and 2007
Constant-effort comparisons between 2006 and 2007 were undertaken at all six Brunswick and Redington stations, for numbers of adult birds captured (index of adult population size; Table 5), numbers of young birds captured (Table 6), and number of young per adult (reproductive index; Table 7).

Adult population size, for all species pooled and at all six stations combined, decreased slightly and non-significantly, by -4.6% between 2006 and 2007 (Table 5). Decreases were recorded for 23 of 49 species (0.49), a proportion not significantly greater than the proportion expected by chance (0.50). The number of adults captured of all species pooled decreased at four stations, by amounts ranging from -2.3% at Potato Nubble to -40.5% at Golf Course, whereas it increased at Redington Pond (by +16.3%) and Blueline Trail (by +58.8%). The proportion of increasing species was significantly greater than 0.50 at Blueline Trail. Yellow-bellied Flycactcher and Nashville Warbler showed significant between-year decreases across stations whereas American

Robin showed a near-significant increase across stations.

The number of young birds captured, of all species pooled and for all six stations combined, decreased by -22.0%, a non-significant change (Table 6). Increases between 2006 and 2007 were recorded for 17 of 40 species (0.43), a proportion not significantly greater than 0.50. Young captured for all species pooled decreased at four of the six stations, by amounts ranging from -41.2% at Highland to -71.4% at Chimney Rock, whereas it increased at Blueline Trail (by +36.6%) and Golf Course (+50.0%). The proportion of decreasing species was not significantly greater than 0.50 at any station. Swainson's Thrush, American Redstart, and Ovenbird showed significant declines in young captured across stations, whereas Dark-eyed Junco showed a near-significant increase.

Reproductive index (the number of young per adult) showed an absolute decrease of -0.115, from 0.630 in 2006 to 0.515 in 2007 for all species pooled and both stations combined, a non-significant change (Table 7). Decreases and increases in productivity were each recorded for 13 of 33 species (0.39), a proportion not significantly greater than 0.50. Reproductive index decreased at five stations by amounts ranging from -0.095 at Chimney Rock to -0.441 at Redington Pond, whereas it increased at Golf Course by +0.082. The proportion of increasing or decreasing species was not significantly greater than 0.50 at any station, and only one species (Swainson's Thrush) showed a significant decrease across stations.

Thus, in general, all three parameters showed decreases between 2006 and 2007, with those of breeding populations not as severe as those of young captured or reproductive success. All changes were non-significant. These changes were not region wide, with Golf Course and Blueline Trail tending to show changes in the opposite directions as most other stations; nor were they species wide, many species showing changes opposite to that when all species were pooled. This compares to more dramatic changes between 2005 and 2006, when breeding populations increased fairly substantially, young increased substantially and significantly, and reproductive success also increased substantially but only near-significantly at Brunswick and Redington. We often observer alternating changes in opposite directions at MAPS stations, perhaps reflecting density dependent effects, and this may be occurring at Brunswick and Redington.

Five-year mean population size and productivity values in relation to the Northeast Region
Mean numbers of individual adults (an index of adult population size) and young captured per 600 net-hours, and reproductive index (a measure of productivity), averaged over the five-year period 2003-2007, are presented in Table 8, for each station and for all six stations combined. Examination of values for all species pooled indicates that the highest breeding populations have been recorded at Redington Pond and Blueline Trail, and that the lowest breeding populations have been recorded at Golf Course and Chimney Rock. Productivity values have been high at Potato Nubble and Blueline Trail, and much lower at Golf Course and Chimney Rock. Highland showed population size and reproductive index values that were close to average.

The overall reproductive index of 0.35 is fairly low compared with the mean value of 0.43 calculated for all species pooled in the Northeast MAPS Region, during the 12-year period 1992-

2003. Of nine target species for which productivity values could be compared, three (Red-eyed Vireo, American Robin, and Common Yellowthroat) were substantially (> 50%) lower, three (Hermit Thrush, American Redstart, and Ovenbird) were slightly (< 50%) lower; two (Magnolia Warbler and White-throated Sparrow) were slightly (< 50%) higher; and one (Black-capped Chickadee) showed substantially (> 50%) higher productivity at Brunswick/Redington than in the Northeast Region. This indicates that productivity may be slightly lower than it should be for many species at Brunswick and Redington, at least during the five-year period 2003-2007. However, productivity has improved substantially since 2005, when six species showed substantially lower values and only one species showed a slightly higher value than was found in the Northeast Region. It should also be noted that productivity is much lower at the two NAS Brunswick stations (Golf Course and Chimney Rock; mean productivity index 0.07) than at the four Reddington stations. The mean productivity index from the four Reddington stations (0.44 from Table 8) is comparable to that of the Northeast Region as a whole, indicating that productivity may be good at Reddington.

Five-year trends in adult population size and productivity

"Chain" indices of adult population size and productivity, at the six Bruswick and Redington stations combined, for 21 target species and for all species pooled, are presented in Figures 1 and 2, respectively. 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 1.

The population trend for all species pooled was substantially ($r > 0.5$) and near-significantly ($P = 0.097$) positive during the five-year period 2003-2007 (Fig. 1), showing an annual increase of 4.6%. Substantial five-year increases were recorded for nine of the 21 species, the positive trends being significant for Traill's Flycatcher, Swainson's Thrush, and Dark-eyed Junco, and being non-significant for Blue-headed Vireo, Red-eyed Vireo, Black-throated Blue Warbler, Black-throated Green Warbler, Ovenbird, and White-throated Sparrow. By contrast, substantial declines were recorded for only four species, the negative trends being significant for Yellow-bellied Flycatcher and non-significant for Nashville Warbler, American Redstart, and Common Yellowthroat. The remaining eight species showed non-substantial population trends (absolute $r < 0.5$), with those of Black-capped Chickadee, Hermit Thrush, Magnolia Warbler being non-fluctuating (SE of the slope < 0.140 for a five-year population trend) and those of American Robin, Cedar Waxwing, and Yellow-rumped, Blackpoll, and Canada warblers showing wide inter-annual fluctuation (SE of slope > 0.140).

The five-year trend in productivity for all species pooled increased substantially but non-significantly between 2003 and 2007 (Fig. 2), showing an annual increase of 3.0%. Two of the target species (Traill's Flycatcher and Cedar Waxwing) had no young captured during the five-year period, preventing the calculation of meaningful trends. Of the remaining 19 species, four showed substantial increases, with those of Magnolia Warbler, Yellow-rumped Warbler, and American Redstart being significant and that of Black-capped Chickadee being non-significant, and four showed substantial decreases, with the negative trend of White-throated Sparrow being

significant and those of Blue-headed Vireo, Swainson's Thrush, and Black-throated Green Warbler being non-significant. The remaining 11 species (Fig. 2) showed non-substantial trends.

Estimates of Adult Survivorship

Using five years of data (2003-2007) from all six stations, we were able to obtain estimates of adult survival and recapture probabilities using temporally variable, time-constant ($\varphi p \tau$) models, for 13 species breeding at Brunswick and Redington (Table 9).

Estimates of annual adult survival rate ranged from a low of 0.317 for White-throated Sparrow to a high of 0.764 for American Redstart, with a mean of 0.512. Recapture probability varied from a low of 0.153 for Black-throated Green Warbler to a high of 0.850 for American Redstart, with a mean of 0.533. Proportion of residents varied from a low of 0.098 for American Redstart to a high of 1.000 for Veery and Black-throated Green Warbler, and averaged 0.490. The precision of these survival estimates, as estimated by mean C.V., was 37.5%, which is as expected for survivorship analyses on five years of data. A comparison of C.V.s with those of estimates from four years (2003-2006) of data, for 12 species (all but Black-thoated Green Warbler) revealed only a slight improvement, of 36.0% after five years of data had been collected vs. 36.1% after four years of data had been collected. However, nine species showed improved precision following the extra year of data, and only three species (Red-eyed Vireo, American Redstart, and White-throated Sparrow) showed decreased precision. Data collected during the MAPS program as a whole reveals that precision of our estimates will invariably improve as more years of data are collected at Brunswick and Redington, up to 12 years of data or more.

To see how the survival values compare to those of surrounding areas, we have presented the values estimated from MAPS stations operated in 1992-2003 within Bird Conservation Region (BCR) 14, the Atlantic Northern Forest Region, in which Brunswick and Redington are located (Table 9). Survival of eight species was higher at Brunswick during 2003-2007 than in the Region during 1992-2003, by amounts ranging from +11% (Veery) to +85% (American Redstart). By contrast only four species showed lower survival at Brunswick, by amounts ranging from -2% (Ovenbird) to -21% (Black-capped Chickadee). Although some of these differences may relate to the different time frames for data analysis, these results indicate excellent survival for target species breeding at Brunswick and Redington. Of possible concern, however, is that the one resident or near-resident species, Black-capped Chickadee, showed the lowest value compared to the region, indicating possible negative over-winter effects at Brunswick.

Productivity and Survival as a Function of Body Mass

It has previously been shown that both productivity and survival of birds vary with body mass: on average, the larger the bird the lower the productivity and the higher the survival. Thus, in order to assess whether or not productivity or survival in a given species is higher or lower than expected, body mass needs to be accounted for. Figure 3 shows mean productivity indices and time-constant annual adult survival rate estimates recorded at Brunswick and Redington as a function of mean body mass (log transformed) for 11 target species for which both productivity indices (Table 8) and survival estimates (Table 9) could be obtained. The purpose of this analysis was to determine which species at Brunswick and Redington showed higher or lower productivity

or survival than might be expected given their body mass. Two regression lines are presented on each graph, one (solid) based on the 11 target species using data from Brunswick and Redington, and one (dashed) using data from 210 (productivity) and 89 (survival) species for which these parameters could be estimated from MAPS data collected from stations distributed across the entire North American continent.

For productivity (Fig. 3**A**), the regression line based on data from the 11 species at Brunswick and Redington shows the same (parallel) relationship between productivity and mass, but is below that based on data from North America as a whole, confirming our earlier supposition that productivity is low at Brunswick. For survival (Fig. 3**B**), the regression line based on data Brunswick is above that based on data from North America as a whole (for the most part), also confirming our earlier supposition that survival is healthy at Brunswick.

Five of the species shown in Figure 3 (species alpha codes in bold uppercase letters) showed population declines (Fig. 1; $r < -3.0$). Two of these species, Common Yellowthroat (**COYE**) and Blackpoll Warbler (**BLPW**) showed lower-than expected productivity but roughly expected survival, indicating that low productivity at Brunswick and Redington may be the cause of the declines. Two species, Magnolia Warbler (**MAWA**) and Black-capped Chickadee (**BCCH**), showed slightly higher-than expected productivity and slightly-lower than expected survival, indicating that poor survival might be causing the declines at Brunswick, as noted above for the chickadee. The fifth species, American Redstart (**AMRE**), showed higher-than--expected values for both productivity and adult survival-rate, indicating that another factor, such as low first-year survival or recruitment may be causing the population decline at Brunswick.

The remaining six species shown in Figure 3 (in regular-font uppercase letters) showed population increases (Fig. 1; $r > 0.3$). One of these species, Swainson's Thrush (SWTH), showed close-to-expected or slightly high productivity and higher-than-expected survival, indicating that good survival may be contributing to the increase at Brunswick. Two of these species, White-throated Sparrow (WTSP) and Hermit Thrush (HETH), also showed close-to-expected or slightly high productivity but slightly low or lower-than-expected survival, indicating that adequate productivity or some other factor (see below) may be contributing to the increases at Brunswick. The remaining three species, Black-throated Green Warbler (BTNW), Ovenbird (OVEN), and Red-eyed Vireo (REVI), showed adequate adult survival but lower-than-expected productivity, indicating that other factors (e.g., high juvenal survival or recruitment) may be contributing to the increases at Brunswick.

Thus, in summary, low productivity is implicated as causes for declines in two of the four declining species and may also be preventing greater increases for three increasing species, whereas slightly low survival may be the reason for declines in two declining species and be affecting the increases of one or two species. These results reinforce others presented above, indicating that productivity is lower (especially at NAS Bruswick) and survival higher at Brunswick and Redington than is indicated for the region and the continent.

DISCUSSION

Despite the fact that the Brunswick and Redington MAPS stations have been run for only five years, important and interesting data have been gathered on breeding populations and productivity for many summer resident landbird species on the installations. Notably, the species composition at these stations shows a strong boreal-forest component that is not sampled adequately by MAPS locations elsewhere. Among MAPS stations operated by the Institute for Bird Populations, for example, six target species at Brunswick and Redington (Yellow-bellied Flycatcher, Magnolia, Black-throated Blue, Black-throated Green, and Canada warblers, and White-throated Sparrow) have not been captured in sufficient numbers to be monitored effectively at any other location. This underscores the importance of the Brunswick and Redington stations to understanding the population dynamics of this important group of landbirds.

Data from all six MAPS stations at Brunswick and Redington have been pooled to provide indices of breeding population size and productivity, and we have been able to examine five-year trends in breeding population sizes and productivity for 21 target species and all species pooled.
We have also been able to generate more precise estimates of adult survival than were possible after only four years of data had been collected. In previous reports (e.g., Pyle et al. 2006), we were also able to compare population size and productivity estimates between two habitat types, and between three soil-saturation categories at Brunswick and Redington.

As more years of data accumulate we will be able to make better assessments of population trends as well as inferences about the effects of weather on productivity and the effect of changes in productivity on population size. The precision of our survival estimates will improve substantially as more data is collected, up to and even beyond 12 years of data collection (Rosenberg 1996). Pooling data at this level will further allow comparison between Brunswick/Redington and other military installations, parks, other protected areas along the Atlantic seaboard that participate in the MAPS program, and unprotected areas along the Atlantic coast. Finally, MAPS data from Brunswick and Redington can be pooled with other MAPS data to provide large-scale regional (or even continental) indices and estimates of (and longer-term trends in) these key demographic parameters, as we have provided in this report regarding productivity in the Northeastern MAPS region and adult survival in Bird Conservation Region 14.

An immediate concern from the first five years (2003-2007) of MAPS at Brunswick and Redington is that productivity at NAS Brusnwick appears to be very low in comparison to the Northeastern Region and to North America as a whole. Productivity at Redington, by contrast, appears to be adequate in comparison to the Northeast Region. Overall, it appears that high survival may be counterbalancing the low productivity, resulting in stable or increasing five-year population trends for many species. While on the surface this may appear to be a favorable situation, it is opposite to results from other MAPS stations across the continent, generally indicating that low survival, particularly for Neotropical migrants, is the primary factor driving population declines. Thus, should survival of the populations at NAS Brunswick decline, we will likely be facing some severe population declines at this installation. Low productivity combined with increasing populations may also indicate that NAS Brunswick may be harboring a “sink

population", that is being supported primarily by higher productivity from surrounding regions. One of the goals of the MAPS program is to identify such populations, such that management actions can be taken to increase productivity. With six or more years of data we may be able to detect inter-annual patterns in adult survival, which may indicate whether or not survival is stable at Brunswick and Redington.

Once additional years of data have been gathered, we will also be able to explore the underlying causes of these patterns and many others concerning landbird dynamics at these two installations, to combine these results with those of constant-effort, year-to-year comparisons, long-term trends in populations and productivity, and mark-recapture analyses of survival, capture probability, and proportion of residents as well. Once causal factors for population declines or low productivity have been confirmed with an adequate time-series of data (six or more years), we will be prepared to make management recommendations to increase productivity and/or survival of landbirds at Brunswick and Redington and to assess the results of management actions.

We will also continue to monitor the primary demographic parameters of landbirds on these installations, 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 the Brunswick/Redington MAPS program in analyses of data from other Atlantic slope 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. 2002, Nott et al 2003a, Nott and Michel 2005); (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 installations and elsewhere (Nott 2000, Nott et al. 2003a).

Very recently we undertook an analysis of the entire MAPS program in the Northeastern Region for the Northeast Coordinated Bird Monitoring Partnership (DeSante et al. 2008). In this report it was recommended that the MAPS program be increased by about 50% throughout the Northeastern United States. We also analyzed capture results from all 183 stations that have operated in the Northeast Region and made recommendations to either continue or to relocate active MAPS stations, depending on their contributions to understanding population dynamics of species of concern in the region. Five of the six Brunswick stations were contributing adequately toward this effort; however, captures of regional species of concern at the Chimney Rock station were slightly fewer than our recommended cut-off station continuation. We will consider these results in planning for the future of the MAPS program at Brunswick and Redington and for the ability of the program to effectively guide potential management actions for improving productivity of landbirds at these installations.

We conclude that the MAPS protocol is very well-suited to achieving these long-term ecological goals and recommend continuing the MAPS program at Brunswick and Redington well into the future.

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Table 1. Summary of the 2007 MAPS program on Naval Air Station Brunswick and Redington Training Facility.

Station			Major Habitat Type	Latitude-longitude	Avg Elev. (m)	2007 operation		
Name	Code	No.				Total number of net-hours[1]	No. of periods	Inclusive dates
Naval Air Station Brunswick								
Golf Course	GOCO	15654	Mixed balsam fir and maple forest with boggy areas, golf course	43°52'08"N,-69°56'20"W	13	336.7 (318.8)	6	6/14 - 7/31
Chimney Rock	CHRO	15655	Northern red oak and maple forest, shrubs and small firs along seasonal streams	43°52'24"N,-69°55'05"W	18	333.0 (332.5)	6	6/15 - 8/05
Redington Training Facility								
Potato Nubble	PONU	15657	Mixed forest of maple/birch deciduous and fir/spruce coniferous components	44°59'30"N,-70°30'33"W	488	246.7 (212.0)	5	6/21 - 8/02
Redington Pond	REPO	15656	Primarily birch/maple forest with scattered balsam fir, pond, alder thicket	44°58'57"N,-70°24'53"W	507	174.7 (159.3)	5	6/23 - 8/01
Blueline Trail	BLUE	15658	Boggy balsam fir and Eastern hemlock forest, alder thicket	44°59'20"N,-70°26'12"W	515	186.0 (176.0)	4	7/04 - 8/03
Highland	HGHL	15659	Stunted red spruce and balsam fir forest, beaver ponds, very boggy areas	45°00'31"N,-70°27'10"W	724	266.5 (262.2)	5	6/20 - 8/04
ALL STATIONS COMBINED						1543.5(1460.8)	6	6/14 - 8/05

[1] Total net-hours in 2007. Net-hours in 2007 that could be compared in a constant-effort manner to 2006 are shown in parentheses.

Table 2. Capture summary for the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility in 2007. N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Golf Course			Chimney Rock			Potato Nubble			Redington Pond			Blueline Trail			Highland		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Cooper's Hawk								1										
Ruffed Grouse		1																
Ruby-throated Hummingbird								1						1				
Yellow-bellied Sapsucker							1											
Downy Woodpecker													7					
Hairy Woodpecker																1		
Black-backed Woodpecker																1		
Yellow-bellied Flycatcher																		1
Acadian Flycatcher										1			4					
Traill's Flycatcher										1			3					
Least Flycatcher										4			6					
Blue-headed Vireo										1						1		
Philadelphia Vireo							2		1									
Red-eyed Vireo							1			11			2					
Gray Jay																1		
Blue Jay	1																	
Black-capped Chickadee	3			2			1						5			1		
Boreal Chickadee																1		
Brown Creeper							2			1				1		1		
Winter Wren													2					
Golden-crowned Kinglet																5		
Ruby-crowned Kinglet	1												3					
Veery	1						2			1			1			2		
Gray-cheeked Thrush							1									1		
Swainson's Thrush	1									12		9	1			5		8
Hermit Thrush	5		2	4		2	10		1	1			2		2			
American Robin				2		1	1			7		2	3	1				
Cedar Waxwing	1									1			1					

Table 2. (cont.) Capture summary for the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility in 2007. N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Golf Course			Chimney Rock			Potato Nubble			Redington Pond			Blueline Trail			Highland		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Nashville Warbler	1												1			1		
Northern Parula								1										
Chestnut-sided Warbler							1			3			3					
Magnolia Warbler							3			4			18		1	2		
Black-throated Blue Warbler							16	2	4	9		1	5		2			
Yellow-rumped Warbler				1			1		1	2			4					
Black-throated Green Warb.	5		1	4		4	2						6					
Pine Warbler													1		1			
Blackpoll Warbler													2					5
Black-and-white Warbler	2									1			3	2				
American Redstart							1			3								
Ovenbird			1	5		4	8		1	3		1	1					
Northern Waterthrush													3		2			
Common Yellowthroat	4		3				3			3			4		1			
Canada Warbler										2			1					
Song Sparrow				1									3					
Lincoln's Sparrow							1											
White-throated Sparrow				1		1	5	1	2	5		1	10	2	5	6	2	
Dark-eyed Junco							2			1			1			10	1	
Northern Cardinal				1														
Rose-breasted Grosbeak													3					
Common Grackle				1									1					
Purple Finch										1						1		
ALL SPECIES POOLED	25	1	7	22	0	12	64	6	10	78	0	14	110	7	14	40	3	14
Total Number of Captures		33			34			80			92			131			57	
Number of Species	11	1	4	10	0	5	20	5	6	23	0	5	31	5	7	16	2	3
Total Number of Species		13			10			23			23			33			18	

Table 3. Numbers of adult and young individual birds captured per 600 net-hours and reproductive index (young/adult) at the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility in 2007.

	Golf Course			Chimney Rock			Potato Nubble			Redington Pond			Blueline Trail			Highland		
Species	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index
Yellow-bellied Sapsucker							2.4	0.0	0.00									
Downy Woodpecker													3.2	19.4	6.00			
Hairy Woodpecker																2.3	0.0	0.00
Black-backed Woodpecker																0.0	2.3	und.[1]
Yellow-bellied Flycatcher																2.3	0.0	0.00
Acadian Flycatcher										0.0	3.4	und.[1]	6.5	3.2	0.50			
Traill's Flycatcher										3.4	0.0	0.00	9.7	0.0	0.00			
Least Flycatcher										13.7	0.0	0.00	3.2	9.7	3.00			
Blue-headed Vireo										3.4	0.0	0.00				2.3	0.0	0.00
Philadelphia Vireo							4.9	0.0	0.00									
Red-eyed Vireo							2.4	0.0	0.00	24.0	13.7	0.57	6.5	0.0	0.00			
Gray Jay																0.0	2.3	und.
Blue Jay	1.8	0.0	0.00															
Black-capped Chickadee	3.6	1.8	0.50	3.6	0.0	0.00	2.4	0.0	0.00				3.2	12.9	4.00	0.0	2.3	und.
Boreal Chickadee																0.0	2.3	und.
Brown Creeper							0.0	4.9	und.[1]	0.0	3.4	und.				0.0	2.3	und.
Winter Wren													0.0	6.5	und.[1]			
Golden-crowned Kinglet																0.0	11.3	und.
Ruby-crowned Kinglet	1.8	0.0	0.00										9.7	0.0	0.00			
Veery	1.8	0.0	0.00				4.9	0.0	0.00	3.4	0.0	0.00	0.0	3.2	und.	4.5	0.0	0.00
Gray-cheeked Thrush							2.4	0.0	0.00							2.3	0.0	0.00

Table 3. (cont.) Numbers of adult and young individual birds captured per 600 net-hours and reproductive index (young/adult) at the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility in 2007.

	Golf Course			Chimney Rock			Potato Nubble			Redington Pond			Blueline Trail			Highland		
Species	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index
Swainson's Thrush	1.8	0.0	0.00							55.0	6.9	0.13	3.2	0.0	0.00	22.5	0.0	0.00
Hermit Thrush	10.7	0.0	0.00	7.2	1.8	0.25	14.6	9.7	0.67	0.0	3.4	und.	9.7	0.0	0.00			
American Robin				3.6	0.0	0.00	2.4	0.0	0.00	20.6	6.9	0.33	9.7	0.0	0.00			
Cedar Waxwing	1.8	0.0	0.00							3.4	0.0	0.00	3.2	0.0	0.00			
Nashville Warbler	1.8	0.0	0.00										0.0	3.2	und.	2.3	0.0	0.00
Chestnut-sided Warbler							0.0	2.4	und.	3.4	6.9	2.00	0.0	6.5	und.			
Magnolia Warbler							4.9	2.4	0.50	6.9	6.9	1.00	19.4	38.7	2.00	4.5	0.0	0.00
Black-throated Blue Warbler							31.6	9.7	0.31	17.2	17.2	1.00	3.2	12.9	4.00			
Yellow-rumped Warbler				1.8	0.0	0.00	2.4	2.4	1.00	6.9	0.0	0.00	3.2	9.7	3.00			
Black-throated Green Warbler	8.9	0.0	0.00	10.8	0.0	0.00	4.9	0.0	0.00				6.5	12.9	2.00			
Pine Warbler													3.2	0.0	0.00			
Blackpoll Warbler													0.0	6.5	und.	6.8	0.0	0.00
Black-and-white Warbler	3.6	0.0	0.00							0.0	3.4	und.	6.5	3.2	0.50			
American Redstart							0.0	2.4	und.	3.4	6.9	2.00						
Ovenbird	1.8	0.0	0.00	12.6	0.0	0.00	17.0	4.9	0.29	13.7	0.0	0.00	3.2	0.0	0.00			
Northern Waterthrush													9.7	3.2	0.33			
Common Yellowthroat	5.3	3.6	0.67				2.4	2.4	1.00	10.3	0.0	0.00	16.1	0.0	0.00			
Canada Warbler										3.4	3.4	1.00	0.0	3.2	und.			
Song Sparrow				0.0	1.8	und.[1]							3.2	6.5	2.00			
Lincoln's Sparrow							2.4	0.0	0.00									
White-throated Sparrow				1.8	0.0	0.00	9.7	2.4	0.25	13.7	3.4	0.25	35.5	9.7	0.27	11.3	4.5	0.40

Table 3. (cont.) Numbers of adult and young individual birds captured per 600 net-hours and reproductive index (young/adult) at the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility in 2007.

	Golf Course			Chimney Rock			Potato Nubble			Redington Pond			Blueline Trail			Highland		
Species	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index
Dark-eyed Junco							2.4	2.4	1.00	3.4	0.0	0.00	0.0	3.2	und.	6.8	18.0	2.67
Northern Cardinal				1.8	0.0	0.00												
Rose-breasted Grosbeak													0.0	9.7	und.			
Common Grackle				1.8	0.0	0.00							3.2	0.0	0.00			
Purple Finch										3.4	0.0	0.00				2.3	0.0	0.00
ALL SPECIES POOLED	44.6	5.3	0.12	45.0	3.6	0.08	114.3	46.2	0.40	213.0	85.9	0.40	180.6	183.9	1.02	69.8	45.0	0.65
Number of Species	12	2		9	2		17	11		19	13		23	20		12	8	
Total Number of Species		12			10			20			23			31			18	

[1] Reproductive index (young/adult) is undefined because no adults of this species were captured at this station in this year.

Table 4. Summary of results for all six Naval Air Station Brunswick and Redington Training Facility MAPS stations combined in 2007.

Species	Birds captured			Birds/600 nethours		Reprod. Index
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Cooper's Hawk		1				
Ruffed Grouse		1				
Ruby-throated Hummingbird		2				
Yellow-bellied Sapsucker	1			0.4	0.0	0.00
Downy Woodpecker	7			0.4	2.3	6.00
Hairy Woodpecker	1			0.4	0.0	0.00
Black-backed Woodpecker	1			0.0	0.4	und.[1]
Yellow-bellied Flycatcher			1	0.4	0.0	0.00
Acadian Flycatcher	5			0.8	0.8	1.00
Traill's Flycatcher	4			1.6	0.0	0.00
Least Flycatcher	10			1.9	1.2	0.60
Blue-headed Vireo	2			0.8	0.0	0.00
Philadelphia Vireo	2		1	0.8	0.0	0.00
Red-eyed Vireo	14			3.9	1.6	0.40
Gray Jay	1			0.0	0.4	und.
Blue Jay	1			0.4	0.0	0.00
Black-capped Chickadee	12			2.3	2.3	1.00
Boreal Chickadee	1			0.0	0.4	und.
Brown Creeper	4	1		0.0	1.6	und.
Winter Wren	2			0.0	0.8	und.
Golden-crowned Kinglet	5			0.0	1.9	und.
Ruby-crowned Kinglet	4			1.6	0.0	0.00
Veery	7			2.3	0.4	0.17
Gray-cheeked Thrush	2			0.8	0.0	0.00
Swainson's Thrush	19		17	10.9	0.8	0.07
Hermit Thrush	22		7	7.4	2.3	0.32
American Robin	13	1	3	4.7	0.8	0.17
Cedar Waxwing	3			1.2	0.0	0.00
Nashville Warbler	3			0.8	0.4	0.50
Northern Parula		1				
Chestnut-sided Warbler	7			0.4	1.9	5.00
Magnolia Warbler	27		1	4.7	5.8	1.25

Table 4. (cont.) Summary of results for all six Naval Air Station Brunswick and Redington Training Facility MAPS stations combined in 2007.

Species	Birds captured			Birds/600 nethours		Reprod. Index
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Black-throated Blue Warbler	30	2	7	7.4	5.1	0.68
Yellow-rumped Warbler	8		1	1.9	1.6	0.80
Black-throated Green Warbler	17		5	5.8	1.6	0.27
Pine Warbler	1		1	0.4	0.0	0.00
Blackpoll Warbler	2		5	1.2	0.8	0.67
Black-and-white Warbler	6	2		1.6	0.8	0.50
American Redstart	4			0.4	1.2	3.00
Ovenbird	17		7	7.8	0.8	0.10
Northern Waterthrush	3		2	1.2	0.4	0.33
Common Yellowthroat	14		4	4.7	1.2	0.25
Canada Warbler	3			0.4	0.8	2.00
Song Sparrow	4			0.4	1.2	3.00
Lincoln's Sparrow	1			0.4	0.0	0.00
White-throated Sparrow	27	5	9	9.7	2.7	0.28
Dark-eyed Junco	14	1		1.9	3.9	2.00
Northern Cardinal	1			0.4	0.0	0.00
Rose-breasted Grosbeak	3			0.0	1.2	und.
Common Grackle	2			0.8	0.0	0.00
Purple Finch	2			0.8	0.0	0.00
ALL SPECIES POOLED	339	17	71	95.6	49.0	0.51
Total Number of Captures		427				
Number of Species	46	10	15	40	32	
Total Number of Species		51			47	

[1] Reproductive index (young/adult) is undefined because no adults of this species were captured at this location in this year.

Table 5. Percentage changes between 2006 and 2007 in the numbers of individual ADULT birds captured at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Number of adults 2006	Number of adults 2007	Percent change	SE[2]	
Yellow-bellied Sapsucker			++++[3]				1	0	1	++++[3]		
Downy Woodpecker	-100.0				0.0		2	2	1	-50.0	50.0	
Hairy Woodpecker		-100.0	-100.0			++++[3]	3	2	1	-50.0	75.0	
Black-backed Woodpecker							0	0	0			
Yellow-bellied Flycatcher				-100.0	-100.0	-66.7	3	6	1	-83.3	12.7	**
Acadian Flycatcher					++++[3]		1	0	2	++++		
Traill's Flycatcher				-50.0	50.0		2	4	4	0.0	50.0	
Least Flycatcher				-33.3	++++		2	3	3	0.0	66.7	
Blue-headed Vireo	-100.0	-100.0		++++[3]		++++	4	2	2	0.0	115.5	
Philadelphia Vireo			++++	-100.0			2	1	2	100.0	400.0	
Red-eyed Vireo		-100.0	-66.7	150.0	100.0		4	8	8	0.0	61.2	
Gray Jay							0	0	0			
Blue Jay	++++[3]	-100.0					2	1	1	0.0	200.0	
Black-capped Chickadee	-33.3	0.0	++++		++++		4	5	6	20.0	50.2	
Boreal Chickadee						-100.0	1	2	0	-100.0		
Red-breasted Nuthatch					-100.0		1	1	0	-100.0		
Brown Creeper	-100.0		-100.0				2	4	0	-100.0	88.9	
Winter Wren							0	0	0			
Golden-crowned Kinglet							0	0	0			
Ruby-crowned Kinglet	++++				++++		2	0	4	++++		
Veery	-100.0	-100.0	++++	++++		++++	5	5	5	0.0	104.9	
Gray-cheeked Thrush			++++			++++	2	0	2	++++		
Swainson's Thrush	++++		-100.0	160.0	-66.7	0.0	5	22	25	13.6	46.3	
Hermit Thrush	50.0	-20.0	300.0		200.0		4	11	17	54.5	49.3	
American Robin		100.0	++++	400.0	200.0		4	3	11	266.7	94.3	*

Table 5. (cont.) Percentage changes between 2006 and 2007 in the numbers of individual ADULT birds captured at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Number of adults 2006	Number of adults 2007	Percent change	SE[2]	
Cedar Waxwing	++++			0.0	-75.0		3	5	3	-40.0	43.3	
Tennessee Warbler					-100.0		1	4	0	-100.0		
Nashville Warbler	0.0		-100.0		-100.0	-80.0	4	10	2	-80.0	11.3	***
Northern Parula							0	0	0			
Chestnut-sided Warbler				-50.0			1	2	1	-50.0		
Magnolia Warbler			-71.4	0.0	200.0	0.0	4	12	11	-8.3	58.5	
Black-throated Blue Warb.			140.0	-16.7	0.0		3	12	18	50.0	61.7	
Yellow-rumped Warbler		0.0	-75.0	100.0	++++	-100.0	5	10	5	-50.0	32.6	
Black-throated Green Warb.	150.0	0.0	++++	-100.0	++++		5	10	15	50.0	61.2	
Blackburnian Warbler	-100.0						1	1	0	-100.0		
Pine Warbler					++++		1	0	1	++++		
Bay-breasted Warbler						-100.0	1	2	0	-100.0		
Blackpoll Warbler						-50.0	1	6	3	-50.0		
Black-and-white Warbler	-50.0	-100.0					2	4	1	-75.0	25.0	
American Redstart			-100.0	-85.7			2	10	1	-90.0	6.0	
Ovenbird	-83.3	-30.0	0.0	++++	++++		5	23	20	-13.0	30.2	
Northern Waterthrush					200.0		1	1	3	200.0		
Common Yellowthroat	-57.1	-100.0	++++	50.0	66.7		5	14	12	-14.3	36.1	
Canada Warbler			-100.0	0.0			2	3	1	-66.7	44.4	
Scarlet Tanager		-100.0					1	1	0	-100.0		
Song Sparrow				-100.0	++++		2	1	1	0.0	200.0	
Lincoln's Sparrow			++++				1	0	1	++++		
Swamp Sparrow							0	0	0			
White-throated Sparrow	-100.0	0.0	0.0	200.0	120.0	25.0	6	15	23	53.3	32.4	
Dark-eyed Junco			0.0	0.0		50.0	3	4	5	25.0	18.8	

Table 5. (cont.) Percentage changes between 2006 and 2007 in the numbers of individual ADULT birds captured at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Number of adults 2006	Number of adults 2007	Percent change	SE[2]
Northern Cardinal	-100.0	++++[3]					2	1	1	0.0	200.0
Rose-breasted Grosbeak							0	0	0		
Common Grackle		++++			++++		2	0	2	++++	
Purple Finch				-100.0		++++	2	2	1	-50.0	100.0
American Goldfinch	-100.0	-100.0					2	3	0	-100.0	88.9
ALL SPECIES POOLED	-37.8	-37.5	-2.3	18.6	58.8	-22.5	6	238	227	-4.6	14.1
No. species that increased[4]	6(4)	3 (2)	11(9)	9(3)	18(10)	7(5)				17(7)	
No. species that decreased[5]	12(8)	11(9)	9(6)	10 (5)	6(4)	6(3)				23(8)	
No. species remained same	1	4	3	4	2	2				8	
Total Number of Species	19	18	23	23	26	15				48	
Proportion of increasing (decreasing) species	(0.632)	(0.611)	(0.391)	0.391	0.692	(0.400)				(0.479)	
Sig. of increase (decrease)[6]	(0.180)	(0.240)	(0.895)	0.895	0.038 **	(0.849)				(0.667)	

[1] Number of stations lying within the breeding range of the species at which at least one individual adult bird of the species was captured in either year.
[2] Standard error of the percent change in the number of individual adults captured.
[3] Increase indeterminate (infinite) because no adult was captured during 2006.
[4] No. of species for which adults were captured in 2007 but not in 2006 are in parentheses.
[5] No. of species for which adults were captured in 2006 but not in 2007 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 2006 and 2007 in the numbers of individual YOUNG birds captured at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Number of young 2006	Number of young 2007	Percent change	SE[2]	
Yellow-bellied Sapsucker							0	0	0			
Downy Woodpecker					++++[3]		1	0	6	++++[3]		
Hairy Woodpecker							0	0	0			
Black-backed Woodpecker						++++[3]	1	0	1	++++		
Yellow-bellied Flycatcher					-100.0		1	1	0	-100.0		
Acadian Flycatcher				++++[3]	++++		2	0	2	++++		
Traill's Flycatcher							0	0	0			
Least Flycatcher				-100.0	-50.0		2	8	3	-62.5	18.8	
Blue-headed Vireo					-100.0		1	1	0	-100.0		
Philadelphia Vireo							0	0	0			
Red-eyed Vireo				0.0			1	1	1	0.0		
Gray Jay						++++	1	0	1	++++		
Blue Jay							0	0	0			
Black-capped Chickadee	-50.0				33.3	-50.0	3	7	6	-14.3	30.6	
Boreal Chickadee						++++	1	0	1	++++		
Red-breasted Nuthatch							0	0	0			
Brown Creeper		-100.0	0.0	++++		++++	4	4	4	0.0	70.7	
Winter Wren					++++		1	0	2	++++		
Golden-crowned Kinglet					-100.0	25.0	2	5	5	0.0	40.0	
Ruby-crowned Kinglet							0	0	0			
Veery					++++		1	0	1	++++		
Gray-cheeked Thrush							0	0	0			
Swainson's Thrush			-100.0	-50.0	-100.0	-100.0	4	20	2	-90.0	11.7	***
Hermit Thrush		0.0	300.0	0.0	-100.0		4	5	6	20.0	85.4	
American Robin		-100.0		100.0			2	2	2	0.0	100.0	

Table 6. (cont.) Percentage changes between 2006 and 2007 in the numbers of individual YOUNG birds captured at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Number of young 2006	All six stations combined: Number of young 2007	All six stations combined: Percent change	All six stations combined: SE[2]	
Cedar Waxwing							0	0	0			
Tennessee Warbler							0	0	0			
Nashville Warbler				-100.0	0.0	-100.0	3	4	1	-75.0	28.6	
Northern Parula					-100.0		1	1	0	-100.0		
Chestnut-sided Warbler				++++	-50.0		2	4	4	0.0	100.0	
Magnolia Warbler			-66.7	++++	500.0	-100.0	4	11	15	36.4	135.4	
Black-throated Blue Warb.			-72.7	-28.6	100.0	-100.0	4	21	12	-42.9	24.8	
Yellow-rumped Warbler			-50.0	-100.0	50.0	-100.0	4	6	4	-33.3	37.4	
Black-throated Green Warb.				-100.0	0.0		2	5	4	-20.0	32.0	
Blackburnian Warbler				-100.0	-100.0		2	3	0	-100.0	88.9	
Pine Warbler							0	0	0			
Bay-breasted Warbler						-100.0	1	1	0	-100.0		
Blackpoll Warbler					100.0	-100.0	2	2	2	0.0	100.0	
Black-and-white Warbler				++++	0.0		2	1	2	100.0	200.0	
American Redstart			++++[3]	-81.8	-100.0		3	13	3	-76.9	11.6	**
Ovenbird		-100.0	-80.0	-100.0			3	9	1	-88.9	7.4	***
Northern Waterthrush		-100.0			0.0		2	2	1	-50.0	50.0	
Common Yellowthroat	++++[3]		0.0				2	1	3	200.0	400.0	
Canada Warbler				-100.0	++++		2	1	1	0.0	200.0	
Scarlet Tanager							0	0	0			
Song Sparrow		++++[3]			++++		2	0	3	++++		
Lincoln's Sparrow							0	0	0			
Swamp Sparrow				-100.0	-100.0		2	3	0	-100.0	88.9	
White-throated Sparrow			-100.0	0.0	0.0	100.0	4	5	5	0.0	32.7	
Dark-eyed Junco			++++		++++	700.0	3	1	10	900.0	300.0	*

Table 6. (cont.) Percentage changes between 2006 and 2007 in the numbers of individual YOUNG birds captured at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Number of young 2006	Number of young 2007	Percent change	SE[2]
Northern Cardinal							0	0	0		
Rose-breasted Grosbeak					++++	-100.0	2	1	3	200.0	600.0
Common Grackle							0	0	0		
Purple Finch						-100.0	1	1	0	-100.0	
American Goldfinch							0	0	0		
ALL SPECIES POOLED	50.0	-71.4	-48.3	-43.2	36.6	-41.2	6	150	117	-22.0	20.0
No. species that increased[4]	1(1)	1 (1)	3(2)	6(5)	13(8)	7(4)				14(8)	
No. species that decreased[5]	1(0)	4 (4)	6(2)	11 (8)	11(9)	10(9)				17(7)	
No. species remained same	0	1	2	3	5	0				8	
Total Number of Species	2	6	11	20	29	17				39	
Proportion of increasing (decreasing) species	0.500	(0.667)	(0.545)	(0.550)	0.448	(0.588)				(0.436)	
Sig. of increase (decrease)[6]	0.750	(0.344)	(0.500)	(0.412)	0.771	(0.315)				(0.832)	

[1] Number of stations lying within the breeding range of the species at which at least one individual young bird of the species was captured in either year.
[2] Standard error of the percent change in the number of individual young captured.
[3] Increase indeterminate (infinite) because no young bird was captured during 2006.
[4] No. of species for which young birds were captured in 2007 but not in 2006 are in parentheses.
[5] No. of species for which young birds were captured in 2006 but not in 2007 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 7. Changes between 2006 and 2007 in the REPRODUCTIVE INDEX (young/adult) at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Reproductive Index 2006	Reproductive Index 2007	Change	SE[2]	
Yellow-bellied Sapsucker			nc.[3]				1	und.[4]	0.000	nc.[3]		
Downy Woodpecker	nc.[3]				6.000		2	0.000	6.000	6.000	0.000	
Hairy Woodpecker		nc.[3]	nc.			nc.[3]	3	0.000	0.000	0.000	0.000	
Black-backed Woodpecker						nc.	1	und.	und.[4]	nc.		
Yellow-bellied Flycatcher				nc.[3]	nc.[3]	0.000	3	0.167	0.000	-0.167	0.173	
Acadian Flycatcher				nc.	nc.		2	und.	1.000	nc.		
Traill's Flycatcher				0.000	0.000		2	0.000	0.000	0.000	0.000	
Least Flycatcher				-0.667	nc.		2	2.667	1.000	-1.667	4.216	
Blue-headed Vireo	nc.	nc.		nc.	nc.	nc.	5	0.500	0.000	-0.500	0.685	
Philadelphia Vireo			nc.	nc.			2	0.000	0.000	0.000	0.000	
Red-eyed Vireo		nc.	0.000	-0.300	0.000		4	0.125	0.125	0.000	0.144	
Gray Jay						nc.	1	und.	und.	nc.		
Blue Jay	nc.	nc.					2	0.000	0.000	0.000	0.000	
Black-capped Chickadee	-0.167	0.000	nc.		nc.	nc.	5	1.400	1.000	-0.400	1.356	
Boreal Chickadee						nc.	1	0.000	und.	nc.		
Red-breasted Nuthatch					nc.		1	0.000	und.	nc.		
Brown Creeper	nc.	nc.	nc.	nc.		nc.	5	1.000	und.	nc.		
Winter Wren					nc.		1	und.	und.	nc.		
Golden-crowned Kinglet					nc.	nc.	2	und.	und.	nc.		
Ruby-crowned Kinglet	nc.				nc.		2	und.	0.000	nc.		
Veery	nc.	nc.	nc.	nc.	nc.	nc.	6	0.000	0.200	0.200	0.255	
Gray-cheeked Thrush			nc.			nc.	2	und.	0.000	nc.		
Swainson's Thrush	nc.		nc.	-0.646	-0.333	-1.200	5	0.909	0.080	-0.829	0.186	**
Hermit Thrush	0.000	0.050	0.000	nc.	-2.000		5	0.455	0.353	-0.102	0.384	
American Robin		-1.000	nc.	-0.600	0.000		4	0.667	0.182	-0.485	0.342	

Table 7. (cont.) Changes between 2006 and 2007 in the REPRODUCTIVE INDEX (young/adult) at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Reproductive Index 2006	Reproductive Index 2007	Change	SE[2]
Cedar Waxwing	nc.			0.000	0.000		3	0.000	0.000	0.000	0.000
Tennessee Warbler					nc.		1	0.000	und.	nc.	
Nashville Warbler	0.000		nc.	nc.	nc.	-0.400	5	0.400	0.500	0.100	0.701
Northern Parula					nc.		1	und.	und.	nc.	
Chestnut-sided Warbler				2.000	nc.		2	2.000	4.000	2.000	5.657
Magnolia Warbler			0.071	2.000	1.000	-3.000	4	0.917	1.364	0.447	0.746
Black-throated Blue Warb.			-1.950	-0.167	2.000	nc.	4	1.750	0.667	-1.083	0.575
Yellow-rumped Warbler		0.000	0.500	-1.000	nc.	nc.	5	0.600	0.800	0.200	0.698
Black-throated Green Warb.	0.000	0.000	nc.	nc.	nc.		5	0.500	0.267	-0.233	0.646
Blackburnian Warbler	nc.			nc.	nc.		3	3.000	und.	nc.	
Pine Warbler					nc.		1	und.	0.000	nc.	
Bay-breasted Warbler						nc.	1	0.500	und.	nc.	
Blackpoll Warbler					nc.	-0.167	2	0.333	0.667	0.333	1.374
Black-and-white Warbler	0.000	nc.		nc.	nc.		4	0.250	2.000	1.750	2.850
American Redstart			nc.	0.429	nc.		3	1.300	3.000	1.700	1.828
Ovenbird	0.000	-0.200	-0.571	nc.	nc.		5	0.391	0.050	-0.341	0.212
Northern Waterthrush		nc.			-0.667		2	2.000	0.333	-1.667	
Common Yellowthroat	0.667	nc.	nc.	0.000	0.000		5	0.071	0.250	0.179	0.213
Canada Warbler			nc.	-1.000	nc.		3	0.333	1.000	0.667	1.774
Scarlet Tanager		nc.					1	0.000	und.	nc.	
Song Sparrow		nc.		nc.	nc.		3	0.000	3.000	3.000	1.732
Lincoln's Sparrow			nc.				1	und.	0.000	nc.	
Swamp Sparrow				nc.	nc.		2	und.	und.	nc.	
White-throated Sparrow	nc.	0.000	-0.333	-0.667	-0.218	0.150	6	0.333	0.217	-0.116	0.091
Dark-eyed Junco			1.000	0.000	nc.	2.167	4	0.250	2.000	1.750	0.751

Table 7. (cont.) Changes between 2006 and 2007 in the REPRODUCTIVE INDEX (young/adult) at six constant-effort MAPS stations on Naval Air Station Brunswick and Redington Training Facility.

Species	Golf Course	Chimney Rock	Potato Nubble	Redingt. Pond	Blueline Trail	Highland	n[1]	All six stations combined: Reproductive Index 2006	Reproductive Index 2007	Change	SE[2]
Northern Cardinal	nc.	nc.					2	0.000	0.000	0.000	0.000
Rose-breasted Grosbeak					nc.	nc.	2	und.	und.	nc.	
Common Grackle		nc.			nc.		2	und.	0.000	nc.	
Purple Finch				nc.		nc.	2	0.500	0.000	-0.500	1.000
American Goldfinch	nc.	nc.					2	0.000	und.	nc.	
ALL SPECIES POOLED	0.076	-0.095	-0.310	-0.449	-0.169	-0.205	6	0.630	0.515	-0.115	0.232
No. species that increased	1	1	3	3	3	2				13	
No. species that decreased	1	2	3	8	4	4				13	
No. species remained same	5	4	2	4	5	1				7	
Total Number of Species[5]	7	7	8	15	12	7				33	
Proportion of increasing (decreasing) species	0.143	(0.286)	(0.375)	(0.533)	(0.333)	(0.571)				(0.394)	
Sig. of increase (decrease)[6]	0.992	(0.938)	(0.855)	(0.500)	(0.927)	(0.500)				(0.919)	

[1] Number of stations lying within the breeding range of the species at which at least one individual aged bird of the species was captured in either year.
[2] Standard error of the change in the reproductive index.
[3] The change in reproductive index is non-calculable at this station because no adult individual of the species was captured in one of the two years.
[4] Reproductive index undefined because no adult individual of the species was captured in the year shown.
[5] Species for which the change in the reproductive index 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 8. Mean numbers of aged individual birds captured per 600 net-hours and reproductive index at the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility averaged over the five years, 2003-2007. Data for each species are included only from stations that lie within the breeding range of the species.

	Golf Course			Chimney Rock			Potato Nubble			Redington Pond			Blueline Trail			Highland			All stations pooled		
Species	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]
Yellow-bellied Sapsucker							0.8	0.0	0.00				1.2	0.0	0.00				0.3	0.0	0.00
Downy Woodpecker	0.3	0.0	0.00	0.3	0.0	0.00	0.3	0.6	0.00	0.9	0.0	0.00	1.9	4.5	2.11				0.6	0.7	1.88
Hairy Woodpecker	0.9	0.3	0.50	0.3	0.0	0.00	0.3	0.3	0.00				1.8	0.0	0.00	0.5	0.0	0.00	0.6	0.1	0.20
Black-backed Woodpecker																0.0	0.5	und.[3]	0.0	0.1	und.[3]
Eastern Wood-Pewee				0.3	0.0	0.00													0.1	0.0	0.00
Yellow-bellied Flycatcher										0.6	0.0	0.00	5.3	0.3	0.08	3.2	0.0	0.00	1.5	0.1	0.03
Acadian Flycatcher										0.0	0.7	und.[3]	1.3	0.6	0.50				0.2	0.2	1.00
Traill's Flycatcher										6.9	0.0	0.00	6.5	0.0	0.00	0.3	0.0	0.00	2.1	0.0	0.00
Least Flycatcher										4.6	2.5	0.81	1.5	4.1	1.00	0.3	0.0	0.00	0.9	1.0	1.14
Eastern Phoebe													0.6	0.0	0.00				0.1	0.0	0.00
Blue-headed Vireo	2.2	0.0	0.00	0.3	0.0	0.00	0.6	0.3	0.50	1.6	0.0	0.00	0.6	0.6	0.50	0.5	0.0	0.00	0.9	0.2	0.13
Philadelphia Vireo							1.0	0.0	0.00	3.5	0.9	0.33							0.7	0.1	0.27
Red-eyed Vireo	0.6	0.0	0.00	3.8	0.0	0.00	1.8	0.0	0.00	10.8	3.1	0.14	2.6	0.0	0.00				2.9	0.4	0.09
Gray Jay																0.3	0.8	1.00	0.1	0.1	1.00
Blue Jay	1.6	0.0	0.00	0.6	0.0	0.00	0.7	0.0	0.00	0.3	0.0	0.00	0.6	0.0	0.00				0.6	0.0	0.00
Black-capped Chickadee	4.4	1.0	0.29	3.1	0.0	0.00	2.6	0.0	0.00	3.1	0.6	0.28	5.7	4.7	1.20	1.8	1.3	0.33	3.4	1.2	0.43
Boreal Chickadee																3.6	0.5	0.00	0.6	0.1	0.00
Tufted Titmouse				0.6	0.0	0.00													0.1	0.0	0.00
Red-breasted Nuthatch	0.3	0.0	0.00	0.3	0.0	0.00	1.2	0.0	0.00	0.0	0.3	und.	1.2	0.0	0.00				0.5	0.1	0.25
Brown Creeper	1.3	0.0	0.00	0.3	1.1	2.00	0.3	1.6	2.00	1.3	1.0	0.33				0.0	0.5	und.	0.5	0.7	0.77
Winter Wren							0.0	0.3	und.[3]	1.2	0.0	0.00	0.0	1.3	und.[3]				0.2	0.2	0.50
Golden-crowned Kinglet							0.3	0.3	0.00	0.0	0.6	und.	1.2	0.9	0.50	0.0	4.0	und.	0.3	1.0	1.83
Ruby-crowned Kinglet	0.4	0.0	0.00										2.6	0.0	0.00				0.4	0.0	0.00
Veery	3.5	0.0	0.00	2.6	0.0	0.00	1.0	0.0	0.00	1.0	0.0	0.00	1.5	0.6	0.00	0.9	0.0	0.00	1.7	0.1	0.03
Gray-cheeked Thrush							0.5	0.0	0.00							0.5	0.0	0.00	0.2	0.0	0.00
Swainson's Thrush	0.7	0.0	0.00	0.3	0.0	0.00	7.4	5.0	0.73	25.6	6.7	0.33	6.8	0.6	0.07	19.9	6.3	0.31	9.5	3.0	0.32
Hermit Thrush	10.1	0.0	0.00	6.4	1.2	0.16	4.7	5.9	1.02	0.0	2.0	und.	4.4	0.9	0.33				4.3	1.6	0.41
American Robin	0.7	0.0	0.00	1.9	0.3	0.13	2.4	0.0	0.00	7.3	2.3	0.23	3.5	1.3	0.58				2.3	0.6	0.25

Table 8. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and reproductive index at the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility averaged over the five years, 2003-2007. Data for each species are included only from stations that lie within the breeding range of the species.

	Golf Course			Chimney Rock			Potato Nubble			Redington Pond			Blueline Trail			Highland			All stations pooled		
Species	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]
Gray Catbird	0.0	0.3	und.[3]							0.3	0.0	0.00	0.3	0.0	0.00				0.1	0.1	0.00
Cedar Waxwing	0.6	0.0	0.00							3.5	0.0	0.00	3.4	0.0	0.00				1.2	0.0	0.00
Tennessee Warbler										0.3	0.0	0.00	2.1	0.0	0.00				0.4	0.0	0.00
Nashville Warbler	3.4	0.3	0.05				1.5	0.3	0.17	0.6	1.8	2.00	4.4	2.2	0.27	7.3	0.9	0.07	2.9	0.9	0.32
Northern Parula													0.7	0.6	0.50				0.1	0.1	0.50
Chestnut-sided Warbler	0.3	0.0	0.00				0.0	0.8	und.	1.6	2.0	1.00	0.0	2.5	und.				0.3	0.7	2.67
Magnolia Warbler							7.8	2.9	0.33	9.4	3.2	0.36	7.9	11.1	1.20	10.3	1.8	0.60	5.6	2.7	0.51
Black-throated Blue Warbler							12.0	8.6	0.92	10.8	8.1	0.64	1.2	4.4	3.00	0.6	0.6	0.00	3.8	3.2	0.83
Yellow-rumped Warbler				0.9	0.0	0.00	2.7	1.4	0.63	4.5	0.9	0.40	3.1	3.1	0.94	3.3	0.6	0.13	2.3	0.9	0.39
Black-throated Gn. Warb.	5.7	0.0	0.00	7.5	0.0	0.00	2.5	0.0	0.00	1.8	0.3	0.08	2.2	5.3	2.25	0.6	0.0	0.00	3.5	0.8	0.23
Blackburnian Warbler	0.3	0.0	0.00				0.6	0.0	0.00	0.3	1.2	2.00	3.0	2.5	1.17				0.7	0.6	1.21
Pine Warbler													0.6	0.0	0.00				0.1	0.0	0.00
Bay-breasted Warbler													0.3	0.0	0.00	1.8	0.3	0.13	0.4	0.1	0.13
Blackpoll Warbler													0.0	1.9	und.	11.0	0.3	0.03	1.9	0.3	0.22
Black-and-white Warbler	3.2	0.0	0.00	0.6	0.0	0.00				0.0	0.7	und.	1.3	1.2	0.50				0.8	0.3	0.24
American Redstart							1.3	0.5	0.00	10.7	6.3	0.77	1.2	1.2	0.50	0.0	0.3	und.	2.1	1.3	0.96
Ovenbird	5.9	0.0	0.00	9.5	1.4	0.14	9.6	4.4	0.42	6.5	1.8	0.88	1.6	0.3	0.00	0.3	0.0	0.00	5.5	1.3	0.22
Northern Waterthrush	0.3	0.0	0.00	0.3	0.3	0.00	0.3	0.3	1.00	0.6	0.0	0.00	5.0	1.3	0.23	0.9	0.0	0.00	1.2	0.3	0.32
Mourning Warbler										0.3	0.3	1.00							0.0	0.0	1.00
Common Yellowthroat	9.1	1.0	0.17	3.9	0.0	0.00	1.8	0.8	0.33	5.1	0.9	0.21	8.4	0.6	0.10	0.9	0.0	0.00	4.7	0.6	0.13
Wilson's Warbler													0.3	0.0	0.00				0.1	0.0	0.00
Canada Warbler	0.9	0.0	0.00	0.6	0.0	0.00	1.3	0.0	0.00	6.6	1.3	0.29	0.6	1.3	0.50	0.3	0.3	1.00	1.7	0.4	0.55
Scarlet Tanager	0.3	0.0	0.00	0.9	0.0	0.00													0.2	0.0	0.00
Chipping Sparrow	0.3	0.0	0.00																*0.0*	*0.0*	*0.00*
Song Sparrow	0.3	0.0	0.00	0.0	0.4	und.[3]				1.2	0.0	0.00	0.9	1.3	1.00	0.0	0.3	und.	0.4	0.3	0.67
Lincoln's Sparrow	0.3	0.0	0.00				0.5	0.0	0.00										0.1	0.0	0.00
Swamp Sparrow										0.0	0.6	und.	1.5	1.2	1.00				0.2	0.3	1.33
White-throated Sparrow	1.9	0.0	0.00	0.6	0.0	0.00	5.9	2.6	0.63	9.3	4.4	0.53	19.6	4.1	0.19	7.7	3.9	0.44	7.0	2.4	0.35

Table 8. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and reproductive index at the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility averaged over the five years, 2003-2007. Data for each species are included only from stations that lie within the breeding range of the species.

	Golf Course			Chimney Rock			Potato Nubble			Redington Pond			Blueline Trail			Highland			All stations pooled		
Species	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]	Ad.	Yg.	Repr. Ind.[1]
Dark-eyed Junco							1.4	1.5	0.67	2.5	0.0	0.00	0.0	1.3	und.	4.1	4.8	0.83	1.3	1.2	0.84
Northern Cardinal	0.3	0.0	0.00	0.7	0.0	0.00													0.2	0.0	0.00
Rose-breasted Grosbeak													0.0	1.9	und.	0.0	0.3	und.	0.0	0.3	und.
Common Grackle				0.7	0.0	0.00							0.6	0.0	0.00				0.2	0.0	0.00
Baltimore Oriole	0.3	0.0	0.00																0.1	0.0	0.00
Purple Finch				0.3	0.0	0.00				3.5	0.9	0.30				0.5	0.3	0.00	0.7	0.2	0.33
American Goldfinch	0.9	0.0	0.00	0.6	0.0	0.00													0.3	0.0	0.00
ALL SPECIES POOLED	61.5	3.0	0.05	48.0	4.7	0.09	75.0	38.6	0.52	148.4	55.5	0.37	121.4	69.9	0.51	81.1	28.4	0.37	85.9	30.7	0.35
Number of Species	31	5		27	6		30	19		34	27		42	32		25	20		59	43	
Total Number of Species		32			28			32			40			47			31			61	

[1] Years for which the reproductive index was undefined (no adult birds were captured in the year) are not included in the mean reproductive index.
[2] For numbers presented in italics, the mean number of adults or young is greater than 0.1 at one or more stations, but over the entire location the mean number is less than 0.05. The species is counted in the number of species over all stations pooled.
[3] The reproductive index is undefined at this station because no young individual of the species was ever captured in the same year as an adult individual of the species.

Table 9. Estimates of adult annual survival and recapture probabilities and proportion of residents among newly captured adults using both temporally variable and time-constant models for 13 species breeding at MAPS stations on Naval Air Station Brunswick and Redington Training Facility obtained from five[1] years (2003-2007) of mark-recapture data.

Species	Num. sta2.[2]	Num. ind.[3]	Num. caps.[4]	Num. ret.[5]	Survival probability[6]	Surv. C.V.[7]	Recapture probability[8]	Proportion of residents[9]	Survival prob. Atlantic Northern Forest 1992-2003[10]
Traill's Flycatcher*	2	30	40	5	0.532 (0.222)	41.8	0.617 (0.306)	0.392 (0.297)	0.460 (0.070)
Red-eyed Vireo*	5	40	49	3	0.527 (0.335)	63.5	0.235 (0.275)	0.429 (0.482)	0.555 (0.076)
Black-capped Chickadee*	6	59	72	4	0.432 (0.240)	55.6	0.370 (0.310)	0.216 (0.202)	0.551 (0.052)
Veery*†	3	21	34	4	0.483 (0.311)	64.5	0.302 (0.276)	1.000 (0.972)	0.543 (0.045)
Swainson's Thrush	4	119	206	32	0.697 (0.093)	13.3	0.544 (0.108)	0.371 (0.107)	0.608 (0.062)
Hermit Thrush	4	62	93	10	0.425 (0.129)	30.4	0.716 (0.224)	0.278 (0.175)	0.463 (0.042)
Magnolia Warbler	4	82	144	14	0.442 (0.121)	27.5	0.593 (0.196)	0.347 (0.168)	0.400 (0.046)
Black-throated Green Warbler*†	6	55	73	5	0.535 (0.295)	55.2	0.153 (0.165)	1.000 (0.997)	0.403 (0.046)
Blackpoll Warbler	1	25	50	10	0.416 (0.140)	33.8	0.723 (0.231)	0.887 (0.466)	0.338 (0.128)
American Redstart	2	27	58	9	0.764 (0.124)	16.2	0.850 (0.136)	0.098 (0.096)	0.412 (0.045)
Ovenbird	4	77	123	12	0.493 (0.151)	30.7	0.534 (0.208)	0.365 (0.187)	0.501 (0.050)
Common Yellowthroat	6	63	101	14	0.593 (0.134)	22.7	0.557 (0.171)	0.367 (0.165)	0.446 (0.046)
White-throated Sparrow	4	88	152	14	0.317 (0.104)	32.8	0.738 (0.210)	0.623 (0.298)	0.282 (0.043)

[1] Analysis of all stations pooled include data from 2003-2007 from the Golf Course, Chimney Rock, Potato Nubble, and Highland stations and from 2003-2006 from the Redington Pond and Blueline Trail stations. These latter two stations did not operate enough periods in 2007 to be usable in survivorship analyses.

[2] Number of stations where the species was a regular or usual breeder and at which adults of the species were captured. Stations within one km of each other were combined into a single super-station to prevent individuals whose home ranges included portions of two or more stations from being counted as multiple individuals.

[3] Number of adult individuals captured at stations where the species was a regular or usual breeder (i.e., number of capture histories).

[4] Total number of captures of adult birds of the species at stations where the species was a regular or usual breeder.

[5] Total number of returns. A return is the first recapture in a given year of a bird originally banded at the same station in a previous year.

[6] Survival probability (φ) presented as the maximum likelihood estimate (standard error of the estimate).

Table 9. (cont.) Estimates of adult annual survival and recapture probabilities and proportion of residents among newly captured adults using both temporally variable and time-constant models for 13 species breeding at MAPS stations on Naval Air Station Brunswick and Redington Training Facility obtained from five[1] years (2003-2007) of mark-recapture data.

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[7] The coefficient of variation for survival probability, CV(φ).
[8] Recapture probability (p) presented as the maximum likelihood estimate (standard error of the estimate).
[9] The proportion of residents among newly captured adults (τ) presented as the maximum likelihood estimate (standard error of the estimate).
[10] Survival probability (φ) presented as the maximum likelihood estimate (standard error of the estimate) for the Bird Conservation Region the Atlantic Northern Forest over the 12 years 1992-2003.
* The estimate for survival probability should be viewed with caution because it is based on fewer than five between-year recaptures or the estimate is very imprecise (SE(φ)≥0.200 or CV(φ)≥50.0%)
† The estimate for survival probability, recapture probability, or both may be biased low because the estimate for τ was 1.00.

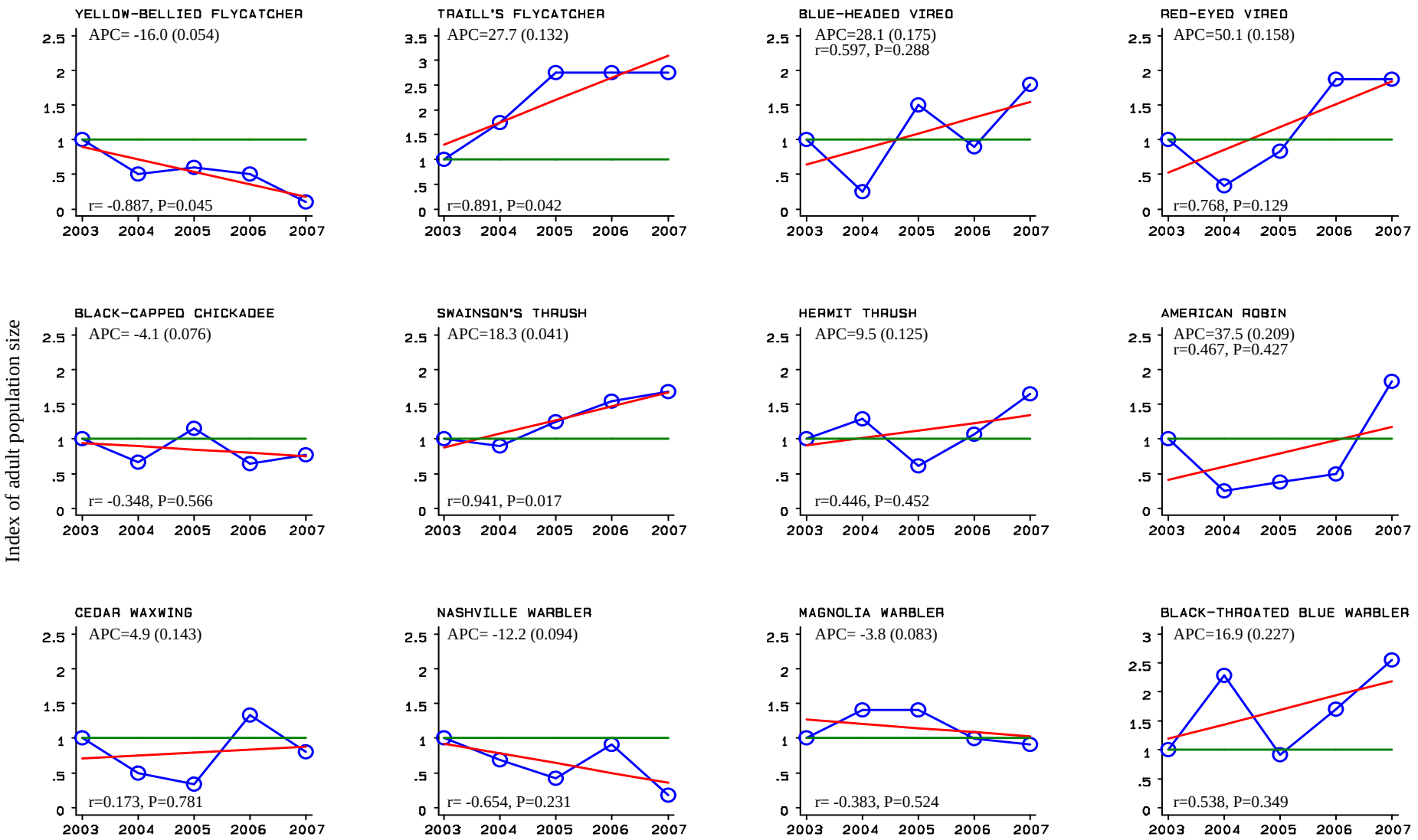

Figure 1. Population trends for 21 species and all species pooled on Naval Air Station Brunswick and Redington Training Facility over the five years 2003-2007. The index of population size was arbitrarily defined as 1.0 in 2003. Indices for subsequent years were determined from constant-effort between-year 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.

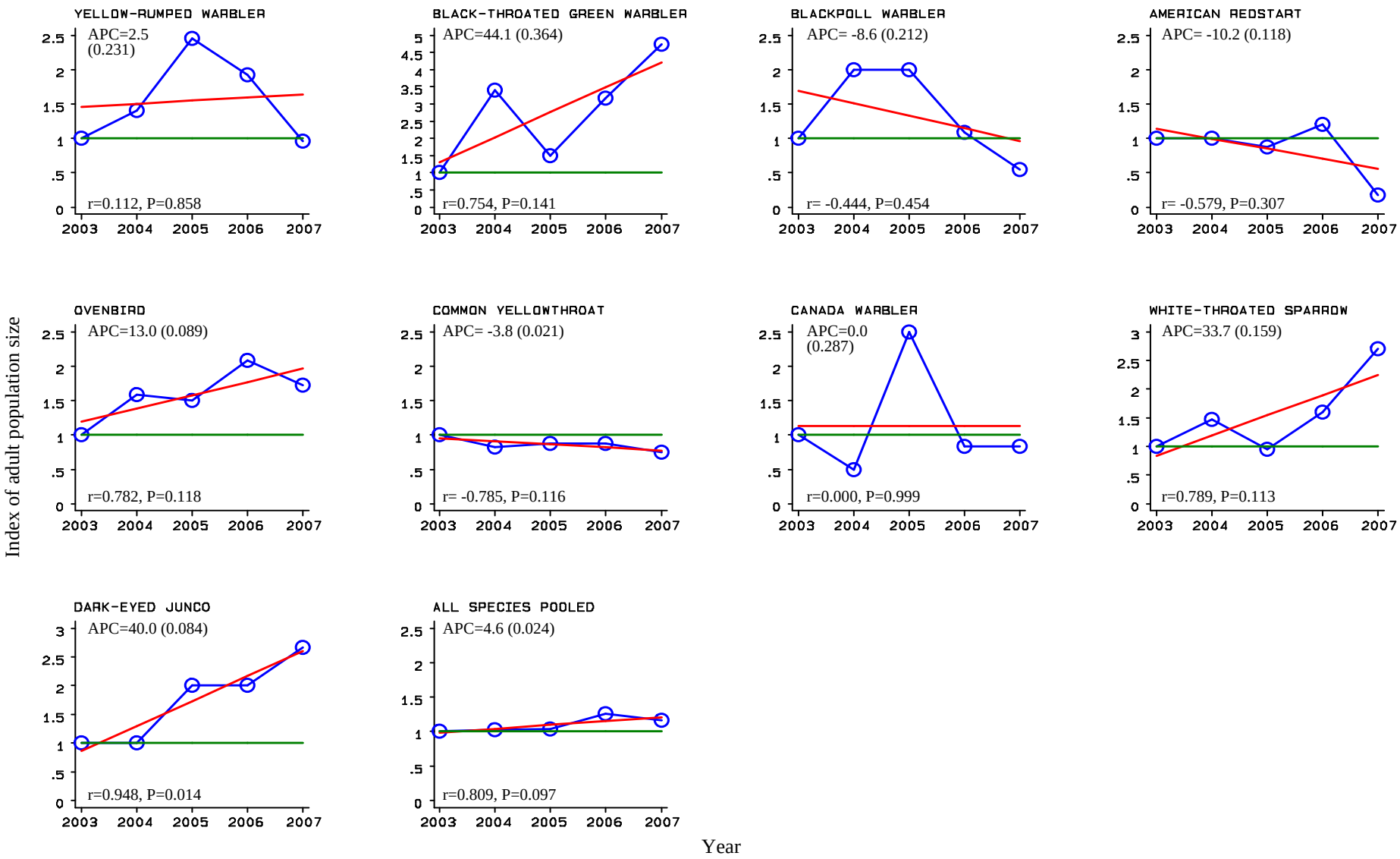

Figure 1. (cont.) Population trends for 21 species and all species pooled on Naval Air Station Brunswick and Redington Training Facility over the five years 2003-2007. The index of population size was arbitrarily defined as 1.0 in 2003. Indices for subsequent years were determined from constant-effort 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.

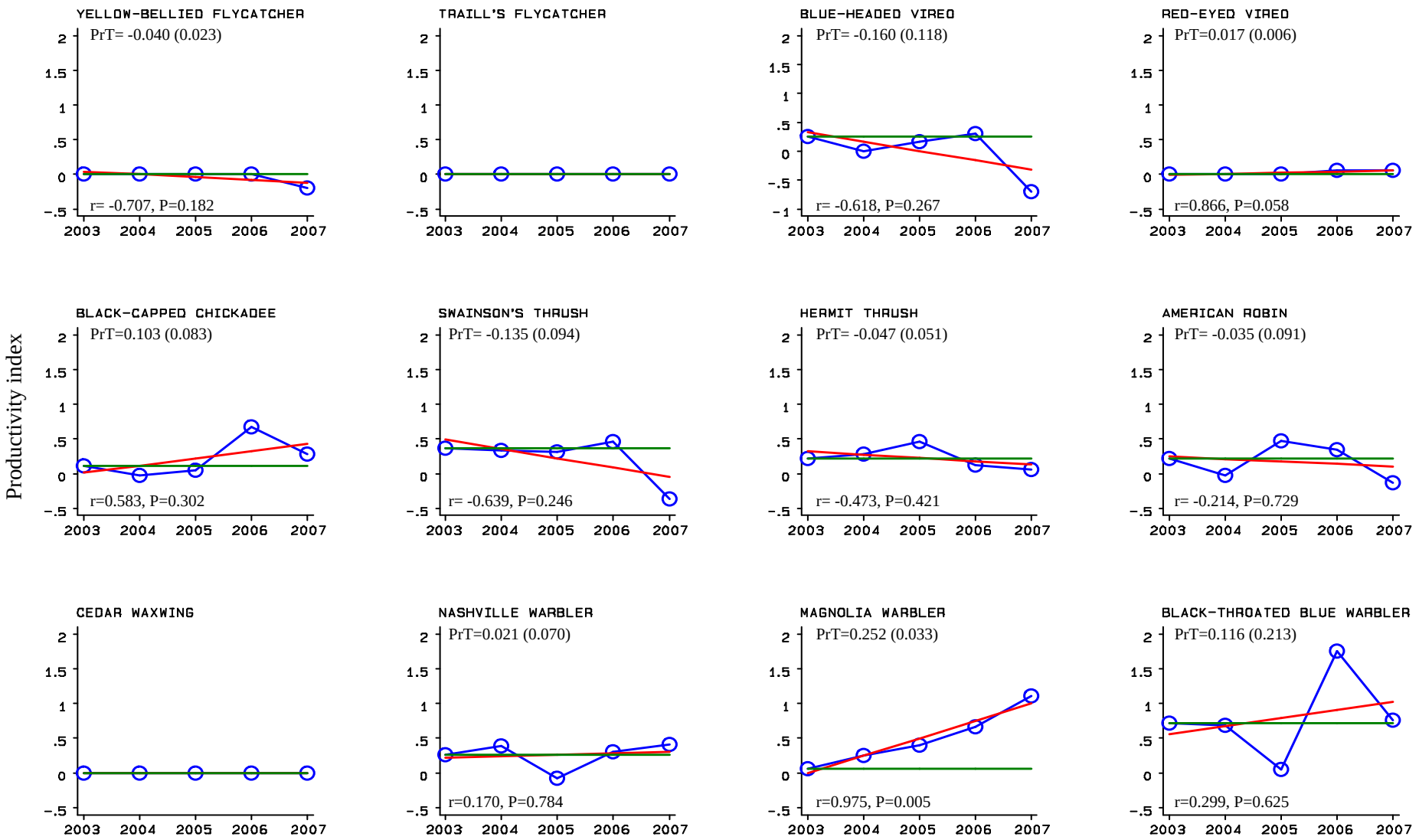

Figure 2. Trend in productivity for 21 species and all species pooled on Naval Air Station Brunswick and Redington Training Facility over the five years 2003-2007. The productivity index was defined as the actual productivity value in 2003. Indices for subsequent years were determined from constant-effort between-year changes in reproductive index 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.

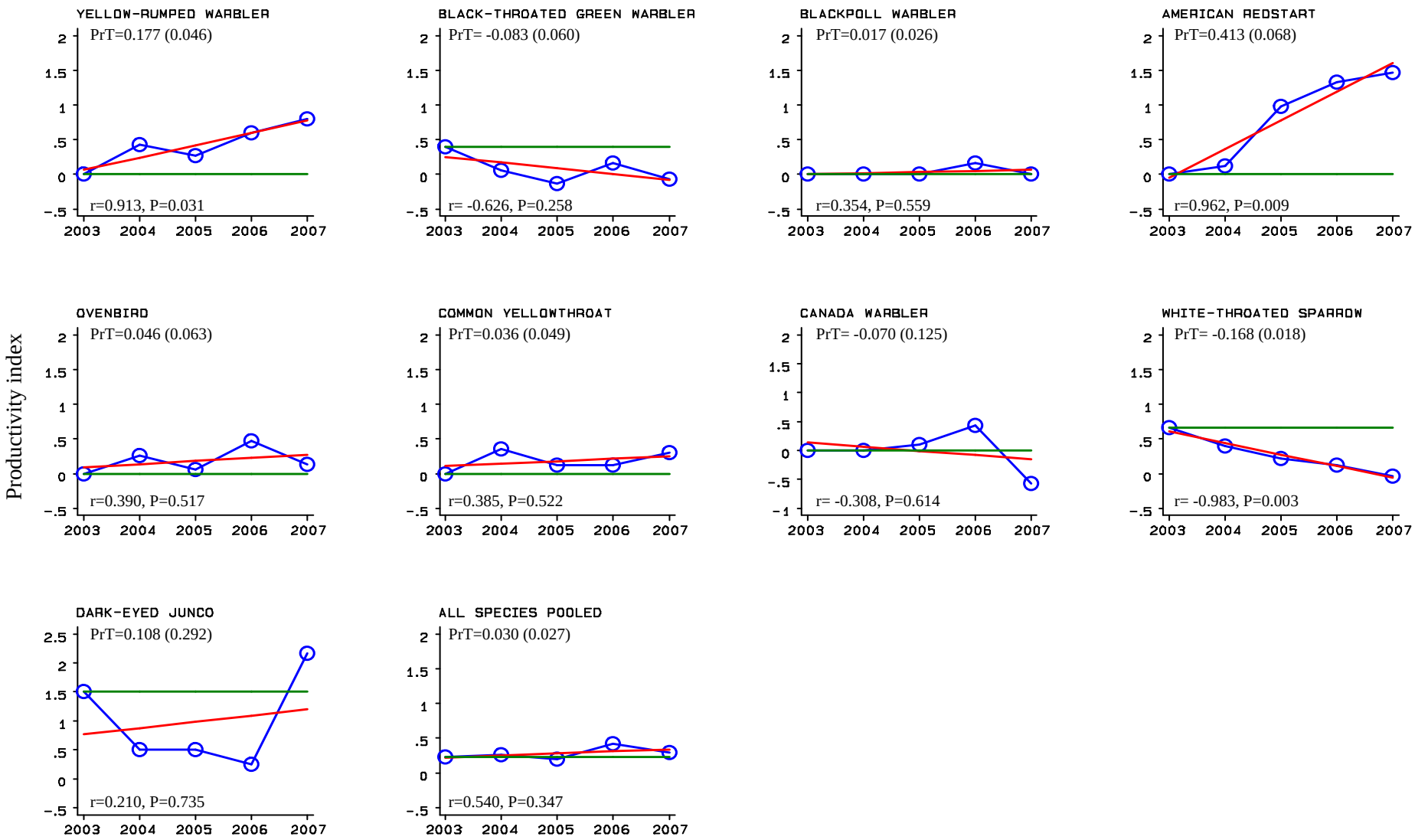

Figure 2. (cont.) Trend in productivity for 21 species and all species pooled on Naval Air Station Brunswick and Redington Training Facility over the five years 2003-2007. The productivity index was defined as the actual productivity value in 2003. Indices for subsequent years were determined from constant-effort between-year changes in reproductive index 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.

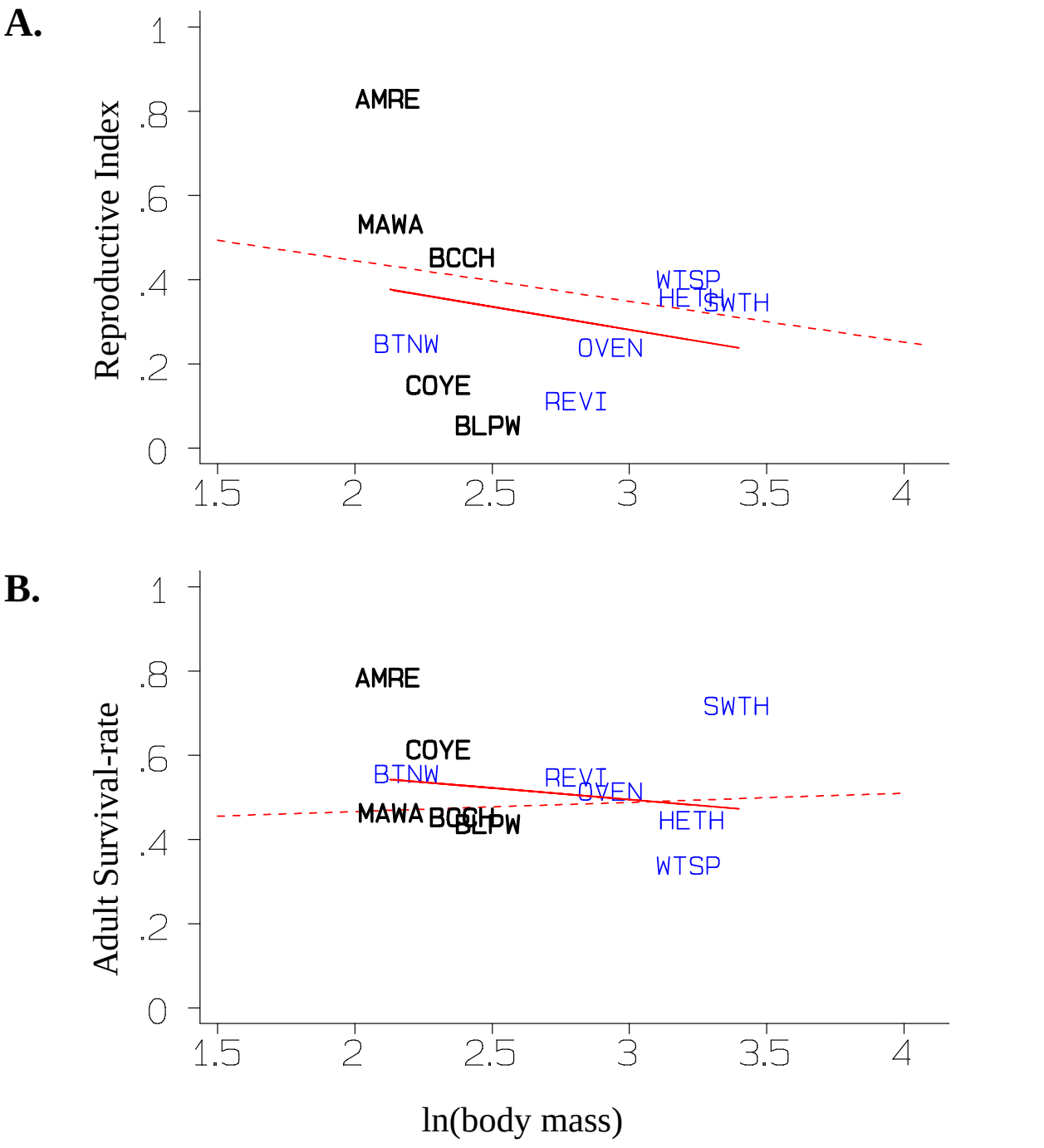

Figure 3. Regressions of mean reproductive index (**A**) and time-constant annual adult survival rate (**B**) at Naval Air Station Brunswick and Redington Training Facility on the natural log of body mass for the 11 target species for which survival estimates could be provided and for which the numbers of adults was not zero in any of the five years 2003-2007. Four-letter codes (see Appendix I) in bold upper-case letters represent species that had decreasing population trends; those in non-bold upper-case letters had substantially increasing trends; and those in lower-case letters had highly fluctuating data without any substantial linear trend. Regression lines are presented for the target species at Naval Air Station Brunswick and Redington Training Facility (solid line) and for all species throughout all of North America (dashed line; see text).