THE 2004 ANNUAL REPORT OF THE MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) PROGRAM AT NAVAL AIR STATION BRUNSWICK AND REDINGTON TRAINING FACILITY

David F. DeSante, Peter Pyle, and Danielle Kaschube

THE INSTITUTE FOR BIRD POPULATIONS
P.O. Box 1346
Point Reyes Station, CA 94956-1346

(415) 663-1436

ddesante@birdpop.org

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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 (NAS) Brunswick and the Redington Training Facility in 2004, in the exact same locations in which they were operated in 2003. These included two stations at NAS Brunswick (Golf Course and Chimney Rock) and four stations at Redington (Potato Nubble, Redington Pond, Blueline Trail, and Highland). Two stations each were selected to sample primarily deciduous forest habitats (Chimney Rock and Redington Pond), primarily mixed deciduous/coniferous forest habitats (Golf Course and Potato Nubble), and primarily coniferous forest habitats (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.

A total of 369 individual birds of 41 species were newly banded at the six stations during the summer of 2004, various individuals of these species were recaptured a total of 138 times, and 9 birds were captured and released unbanded, for a total of 516 captures of 45 species. Capture indices (adults captured/600 net-hrs) suggest that the total adult population size in 2004 was greatest at Redington Pond, followed Blueline Trail, Highland, Potato Nubble, Golf Course, and Chimney Rock. The reproductive index, as determined by the number of young per adult, was highest at Potato Nubble followed by Redington Pond, Blueline Trail, Highland, Golf Course, and Chimney Rock, where no young birds were captured for the second year in a row.

Constant-effort comparisons between 2003 and 2004 were undertaken at all six Brunswick and Redington stations. Adult population size for all species pooled and at all six stations combined decreased slightly whereas reproductive index showed a moderately substantial but non-significant

absolute increase of +0.035 between 2003 and 2004. These changes did not appear to be region wide or species wide. An increase in breeding populations at Potato Nubble, an increase in productivity at Redington Pond, and a decrease in productivity at Highland were all substantially larger than at the other stations.

A result of potential concern is that the two-year mean reproductive index from all six stations combined (0.27) was low compared with the mean value calculated for all species pooled in the Northeast MAPS Region as a whole (0.44 during the ten-year period 1992-2001), and that seven of nine target species showed substantially (> 50%) lower productivity at Brunswick/Redington than in the Northeast Region. It is possible that productivity was simply lower than normal along the Atlantic Seaboard during these two years, and that more years of data will reveal higher levels of productivity at Brunswick and Redington than were observed in 2003 and 2004. We have seen large fluctuation in productivity at other MAPS stations, which is often related to density-dependent effects at the station, local weather events, or even global climatological cycles. Alternatively, low productivity at Brunswick and Redington could be counterbalanced by high survival rates among the birds breeding there. We will be able to obtain preliminary estimates of survival for target species after three years of data have been collected.

Both adult population size (mean 46.9 birds/600 net-hours) and productivity (mean 0.03 young birds per adult) of landbirds were especially low at the two stations on NAS Brunswick, even in comparison with other stations on the immediate Atlantic coast. For example, at Cape Cod National Seashore during 1999-2003 the mean adults per 600 net-hours was 55.2 and the mean productivity was 0.20 young per adult. The low values (especially for productivity) at Brunswick are cause for concern.

Multivariate ANOVAs and logistic regression analyses were used to assess variation in numbers of adults captured and productivity by habitat, year, and station, for 13 target species and for all species pooled. The multivariate analyses indicated little variation between 2003 and 2004 in either adult population sizes or productivity, after controlling for habitat type. Higher breeding populations were found at the coniferous stations (Blueline Trail and Highland) than in the deciduous-forest (Chimney Rock and Redington Pond) and mixed-forest (Golf Course and Potato Nubble) stations. This pattern was not observed for productivity, however, where there was very little variation by habitat when all species were pooled. Several species (including Swainson's Thrush, Nashville Warbler, Magnolia Warbler, and White-throated Sparrow) showed higher breeding populations but lower productivity in coniferous forests than in the other habitat types, while the reverse seemed to hold for American Robin, Black-throated Green Warbler, and Ovenbird. It will be interesting to see if these patterns strengthen after more years of data are collected.

Once additional years of data have been gathered, the power of these multivariate analyses will increase. We will also be able to combine these results with those of long-term trends in populations and productivity, and mark-recapture analyses estimating survival, capture probability, and proportion of residents. Once causal factors for population declines have been identified, 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.

The long-term goal for the Brunswick/Redington MAPS program is to 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 (1) determining spatial patterns in productivity indices and survival rate estimates as a function of spatial patterns in populations trends for target species; (2) determining the proximate demographic factors causing observed population trends in the target species; (3) link MAPS data with landscape-level habitat data and spatially explicit weather data in a geographical information system (GIS); (4) identify relationships between landscape-level habitat and/or weather characteristics and the primary demographic responses (productivity and survival rates) of the target species; (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.

In addition, MAPS data from NAS Brunswick and Redington Training Facility will provide an important contribution to the determination of accurate indices of adult population size and productivity and precise estimates of adult survival rates on still larger region-wide (e.g., all of northeastern North American) and continental scales for a substantial number of landbird species (see http://www.birdpop.org/nbii/NBIIHome.asp). We conclude that the MAPS protocol is well-suited to provide an integral component of Brunswick and Redington's integrated natural resource management, and we recommend the continued operation of the NAS Brunswick and Redington Training Facility MAPS stations well into the future.

INTRODUCTION

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

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

Landbirds

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

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

agencies in PIF, the DoD has established long-term avian monitoring efforts at military installations using protocols developed by the Monitoring Working Group of PIF. Clearly, the long-term monitoring goals of the DoD and the monitoring and research goals of PIF share many common elements.

Primary Demographic Parameters

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

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

MAPS

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

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

Now in its 16th year (13th year of standardized protocol and extensive distribution of stations), the MAPS program has expanded greatly from 178 stations in 1992 to nearly 500 stations in 2004. The substantial growth of the Program since 1992 was caused by its endorsement by PIF and the subsequent involvement of various federal agencies in PIF, including the Department of Defense, Department of the Navy, Department of the Army, Texas Army National Guard, National Park Service, USDA Forest Service, and US Fish and Wildlife Service. Within the past ten years, for example, IBP has been contracted to operate as many as 157 MAPS stations per year on federal properties, including 76 stations on military installations administered by the DoD and the Texas Army National Guard.

Goals and Objectives of MAPS

MAPS is organized to fulfill three 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.

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

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

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

Recent Important Results from MAPS

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

SPECIFICS OF THE NAVAL AIR STATION BRUNSWICK AND REDINGTON TRAINING FACILITY MAPS PROGRAM IN 2004

Six MAPS stations were re-established and operated on Naval Air Station (NAS) Brunswick (two stations), near the coast at Brunswick, Maine, and Redington Training Facility (four stations), in a montane region near Rangeley, Maine, in 2004, in the exact same locations in which they were originally established in 2003. In 2003, these stations were 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.
At NAS 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 Training Facility, 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 and additional details on the habitat species composition, presence of running or standing water, and history of habitat disturbance to the stations are presented in Table 2.

The six stations were re-established for operation by IBP Biologist Richard Gibbons, with the help of IBP field biologist interns, Adam Perry and Erin Cashion, during May 30 to June 5, 2004. The two field biologist interns had received intensive training during a comprehensive course in mist netting and bird-banding techniques given by Richard Gibbons and IBP biologist Ken Burton, which took place May 1-15 at the Jug Bay Wetlands Sanctuary in Maryland, and they received additional in-the-field training setting up and operating stations at NSGA Sugar Grove during May 18-24. The interns began operation of the Brunswick and Redington stations May 31-June 7. 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 4 (beginning May 31), and Period 10 (beginning July 29). The operation of all stations occurred on schedule during each of the seven 10-day periods, in coordination with personnel at Reddington to avoid conflict with SERE exercises. The interns were supervised by Richard Gibbons for the duration of the field season.

METHODS

The operation of each of the six stations during 2004 followed MAPS protocol, as established for use by the MAPS Program throughout North America and spelled out in the MAPS Manual (DeSante et al. 2004a). An overview of both the field and analytical techniques is presented here.

Data Collection

With few exceptions, all birds captured during the course of the study were identified to species, age, and sex and, if unbanded, were banded with USGS/BRD numbered aluminum bands. Birds were released immediately upon capture and before being banded or processed if situations arose where bird safety would be comprised. The following data were taken on all birds captured, including recaptures, according to MAPS guidelines using standardized codes and forms (DeSante et al. 2004a):

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

For each of the six stations operated, simple habitat maps were prepared on which up to four major habitat types, as well as the locations of all structures, roads, trails, and streams, were identified and delineated. The pattern and extent of cover of each major habitat type identified at

each station, as well as the pattern and extent of cover of each of four major vertical layers of vegetation (upperstory, midstory, understory, and ground cover) in each major habitat type, were classified into one of twelve pattern types and eleven cover categories according to guidelines spelled out in the MAPS Habitat Structure Assessment (HSA) Protocol, developed by IBP Landscape Ecologist, Philip Nott, and the IBP staff (Nott et al. 2003b). These data are summarized in Table 2.

Computer Data Entry and Verification

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

(1) Clean-up programs to check the validity of all codes entered and the ranges of all numerical data;
(2) Cross-check programs to compare station, date, and net fields from the banding data with those from the 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 2004 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 2004) 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 2003 and 2004 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 two years, 2003 and 2004, and for both stations combined, we calculated two-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 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. Multivariate analyses of adult population size and productivity. We conducted multivariate ANOVAs on indices of adult population size, and logistic regression analyses on reproductive indices as a function of habitat, year, and station. Because habitat and station are incorporated into these analyses as non-continuous variables, the analysis format requires the designation of a reference habitat and station against which values for the other habitats and stations are compared. For both multivariate ANOVAs and logistic regressions we chose the group with the highest abundance of adults captured as the reference group. Thus we chose coniferous forest as the reference habitat and Blueline Trail as the reference station. We also chose the current year, 2004, as the reference year. We set the relative number of adults to be zero and the relative productivity (actually odds ratio) to be one for the reference habitat, year, and station. In certain cases not enough individuals were captured in the reference category and another reference habitat, station, or year was selected. All ANOVA analyses also included a net-hour term to adjust for the variable amount of effort that occurred at each station.

Data preparation for the ANOVA analyses was completed using data-management programs in dBASE5.7. The multivariate ANOVAs themselves were completed using the statistical-analysis package STATA (Stata Corporation 1995), and statistical significance was determined based on the F-statistic. We conducted these multivariate ANOVAs for all species pooled and for each target species for which we recorded an average of 5 or more individuals per year were recorded at the six stations combined, and at which the species was a regular (B) or usual (U) breeder.

Logistic regression, when used in productivity analyses, estimates the probability of an individual bird captured at random being a young bird. The "odds ratio", the term used for the probability value produced by logistic regression, is the odds of a captured individual being a young bird after both other variables (year and station) have been accounted for. As with multivariate ANOVAs, the logistic-regression analysis format requires the designation of a reference year (2004) and reference station (Blueline Trail); however, when adults captured or productivity was zero at the designated reference station a surrogate reference station was used. Data preparation for the logistic regression analyses was completed using data-management programs in dBASE5.7, and the logistic regression analyses themselves were completed on all species pooled and each target species using the statistical-analysis package STATA (Stata Corporation 1995). Statistical significance in logistic regression was determined based on the z-statistic (or Wald Statistic) which equates to the maximum likelihood estimate based on the odds ratio divided by the standard error (Stata Corporation 1995).

RESULTS

A total of 2421.8 net-hours was accumulated at the six MAPS stations operated at NAS Bruswick and Redington Training Facility in 2004 (Table 1). Of these, 2124.8 net-hours could be compared with 2003 data in a constant-effort manner. A summary of the habitat characteristics at each of the six stations (Tables 1 and 2) indicates that two of the stations (Chimney Rock at Brunswick and Redington Pond at Redington) are comprised primarily of deciduous forest, two stations (Golf Course at Brunswick and Potato Nubble at Redington) are comprised primarily of mixed forest, and two stations (Blueline Trail and Highland, both at Redington) are comprised primarily of coniferous forest.

Indices of Adult Population Size and Post-fledging Productivity

The 2004 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 3 and for all stations combined in Table 5. A total of 516 captures of 45 species were recorded at the six stations combined (Table 5). Newly banded birds represented 71.5% of the total captures. The greatest number of captures occurred at Redington Pond (144), followed by Blueline Trail (108), Potato Nubble (87), Highland (80), Golf Course (63), and Chimney Rock (34). Species richness of adults was greatest at Blueline Trail (28 species), followed by Redington Pond (24), Potato Nubble (17), Golf Course (15), Highland (14), and Chimney Rock (11). In general, capture rates were higher but species richness was lower than in 2003, on a station-by-station basis. Overall, the most abundantly captured species at the six stations, in descending order (Table 5), were White-throated Sparrow (60), followed by Swainson's Thrush (47), Magnolia Warbler (46), Ovenbird (36), Hermit Thrush (35), Black-throated Blue Warbler (34), Common Yellowthroat (29), Black-throated Green Warbler (26), and Nashville Warbler (23).

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 4 and for all stations combined in Table 5. These capture indices suggest that the total adult population size in 2004 was greatest at Redington Pond (118.3 adults/600 net-hours), followed Blueline Trail (100.7), Highland (87.7), Potato Nubble (60.5), Golf Course (53.9), and Chimney Rock (39.9).

Overall, the most abundant breeding species at the six Brunswick and Redington MAPS stations in 2004, as determined by adults captured per 600 net-hrs, were Swainson's Thrush and White-throated Sparrow, followed by Magnolia Warbler, Ovenbird, Hermit Thrush, Black-throated Blue Warbler, Black-throated Green Warbler, and Nashville Warbler (Table 5). 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 2004 (see Table 4):

Golf Course
Hermit Thrush
Black-throated Green Warbler
Common Yellowthroat
Nashville Warbler
Ovenbird

Blueline Trail
White-throated Sparrow
Blackburnian Warbler
Black-capped Chickadee
Swainson's Thrush
Nashville Warbler
Yellow-rumped Warbler
Common Yellowthroat
Yellow-bellied Flycatcher
Hermit Thrush

Chimney Rock
Black-thr. Green Warbler
Ovenbird
Common Yellowthroat
Hermit Thrush

Redington Pond
Swainson's Thrush
Magnolia Warbler
Black-thr. Blue Warbler
American Redstart
"Traill's" Flycatcher
Ovenbird
White-throated Sparrow
Common Yellowthroat
Winter Wren
Purple Finch

Potato Nubble
Black-throated Blue Warbler
Hermit Thrush
Magnolia Warbler
Ovenbird
White-throated Sparrow
Swainson's Thrush

Highland
Magnolia Warbler
Swainson's Thrush
Blackpoll Warbler
Boreal Chickadee
White-throated Sparrow
Black-capped Chickadee

Captures of young of all species pooled (Table 4) were highest at Redington Pond (55.4 young birds/600 net hours) followed by Blueline Trail (37.0), Potato Nubble (33.1), Highland (7.6), Golf Course (2.9), and Chimney Rock (0.0). The reproductive index, as determined by the number of young per adult, was highest at Potato Nubble (0.55) followed by Redington Pond (0.47), Blueline Trail (0.37), Highland (0.09), Golf Course (0.05), and Chimney Rock (0.00), where no young birds were captured for the second year in a row.

Comparisons between 2003 and 2004
Constant-effort comparisons between 2003 and 2004 were undertaken at all six Brunswick and Redington stations, for numbers of adult birds captured (index of adult population size; Table 6), numbers of young birds captured (Table 7), and number of young per adult (reproductive index; Table 8).

Adult population size, for all species pooled and at all six stations combined, decreased slightly and non-significantly, by -1.1% between 2003 and 2004 (Table 6). Decreases between 2003 and 2004 were recorded for 26 of 51 species, a proportion not significantly greater than 0.50. The number of adults captured of all species pooled decreased at four stations, by amounts ranging from -5.3% at Highland to -22.2% at Golf Course, and they increased at Redington Pond (by +7.4%) and Potato Nubble (+42.9%). The proportion of increasing or decreasing species was not significantly greater than 0.50 at any station. Four species (Red-eyed Vireo, American Robin, Northern Waterthrush, and Canada Warbler) showed significant or near-significant between-year declines across stations whereas no species showed such increases.

The number of young birds captured, of all species pooled and for all six stations combined, increased by +13.0%, a non-significant change (Table 7). Increases between 2003 and 2004 were recorded for 10 of 29 species, a proportion not significantly greater than 0.50. Young captured

for all species pooled increased at two stations (Potato Nubble by +28.6% and Redington Pond by 112.5%), it remained unchanged at two stations (Golf Course and Chimney Rock), and it decreased at two stations (Blueline Trail by -17.4% and Highland by -64.3%). The proportion of decreasing species was near-significantly greater than 0.50 at Highland. Only one species showed a significant change in young captured across stations, Black-throated Blue Warbler, which increased.

Reproductive index (the number of young per adult) showed an absolute increase of +0.035, from 0.243 in 2003 to 0.278 in 2004 for all species pooled and both stations combined, a non-significant change (Table 6). Increases in productivity were recorded for only 8 of 34 species, however, a proportion not significantly greater than 0.50. Reproductive index increased at two stations (Golf Course by +0.013 and Redington Pond by +0.231), it remained unchanged at Chimney Rock, and it decreased at three stations by amounts ranging from -0.038 at Blueline Trail to -0.153 at Highland. The proportion of increasing or decreasing species was not significantly greater than 0.50 at any station, and only one species (Ovenbird) showed a near-significant increase across stations.

Thus, in general, breeding populations declined slightly whereas productivity increased slightly at NAS Brunswick and Redington Training Facility between 2003 and 2004. However, these changes did not appear to be region wide or species wide. The increase in breeding populations at Potato Nubble, the increase in productivity at Redington Pond and the decrease in productivity at Highland were all substantially larger than at the other stations. Furthermore, only six species showed significant or near-significant changes in breeding population or productivity across stations, a small number for such comparisons at MAPS stations.

Two-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 two-year period 2003-2004, are presented in Table 9, 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 in deciduous forest and Blueline Trail in coniferous forest, and that the lowest breeding populations have been recorded at Potato Nubble in mixed coniferous/deciduous forest and at Golf Course in deciduous Forest. Productivity values were high at Potato Nubble, Redington Pond, and Blueline Trail, and much lower at Highland, Golf Course, and Chimney Rock.

The overall reproductive index of 0.27 is low compared with the mean value calculated for all species pooled in the Northeast MAPS Region as a whole, during the ten-year period 1992-2001 (0.44; see http://www.birdpop.org/nbii/NBIIHome.asp). Of nine target species for which productivity values could be compared, seven (Red-eyed Vireo, Black-capped Chickadee, American Robin, Magnolia Warbler, American Redstart, Ovenbird, and Common Yellowthroat) were substantially (> 50%) lower, one (Hermit Thrush) was slightly (< 50%) lower and one (White-throated Sparrow) was slightly higher at Brunswick/Redington than in the Northeast Region. This indicates that productivity may be lower than it should be at Brunswick and

Redington, at least during the two-year period 2003-2004.

Multivariate Analyses of Adult Population Size and Productivity

Multivariate ANOVAs assessing variation in numbers of adults captured by habitat, year, and station for 17 target species are shown in Figures 1-17 and for all species pooled in Figure 18. Variation by year was analyzed while adjusting for forest type.

For all species pooled, the difference in breeding population sizes (as estimated by adults captured) between 2003 and 2004, adjusting for forest type and effort, was not significant (Fig. 18**A**), confirming the results of Table 6. Similarly, there were no significant differences between 2003 and 2004 for any of the 17 target species according to multivariate ANOVA (Figs. 1-17**A**). Adjusting for year and effort, near-significantly higher breeding populations were found in coniferous forest than in mixed coniferous/deciduous forest for all species pooled (Fig. 18**B**), with populations in deciduous forest also being lower than those in coniferous forest, but not significantly so. Among the target species, similar patterns were observed for Yellow-bellied Flycatcher (Fig. 1**B**), Nashville Warbler (Fig. 8**B**), Yellow-rumped Warbler (Fig. 11**B**), and White-throated Sparrow (Fig 17**B**), in most cases with populations in deciduous forest also being significantly lower than those in coniferous forests. For Hermit Thrush (Fig. 6**B**) and Ovenbird (Fig. 15**B**) populations in mixed forests were significantly or near-significantly higher than in coniferous forest, and for Red-eyed Vireo (Fig. 3**B**) and Ovenbird (Fig. 15**B**) populations in deciduous forests were significantly or near-significantly higher than in coniferous forest. Adjusting for year, breeding populations of all species pooled were significantly higher at Blueline Trail than at Golf Course, Chimney Rock, and Potato Nubble, with those at Redington Pond and Highland being comparable to that at Blueline Trail (Fig. 18**C**), reflecting the results also noted in Tables 3-4. Populations at Blueline Trail were also significantly or near-significantly higher than they were at one or more other stations for Yellow-bellied Flycatcher (Fig. 1**C**), "Traill's" Flycatcher (Fig. 2**C**), Swainson's Thrush (Fig. 5**C**), Yellow-rumped Warbler (Fig. 11**C**), and White-throated Sparrow (Fig. 17**C**), whereas they were significantly or near-significantly lower at Blueline Trail than at one or more stations for Red-eyed Vireo (Fig. 3**C**), Swainson's Thrush (Fig. 5**C**), Hermit Thrush (Fig. 6**C**), American Robin (Fig. 7**C**), Magnolia Warbler (Fig. 9**C**), Black-throated Blue Warbler (Fig. 10**C**), Black-throated Green Warbler (Fig. 12**C**), Blackpoll Warbler (Fig. 13**C**), American Redstart (Fig. 14**C**), and Ovenbird (Fig. 15**C**).

The odds ratios for productivity indices for 13 of the 17 target species and all species pooled are presented in Figures 1-18**D-F**. For four species (Yellow-bellied Flycatcher, "Traill's" Flycatcher, Red-eyed Vireo, and Blackpoll Warbler), there were not enough young or adults captured in two of the three habitats and the analysis thus could not be performed. For four additional species (American Robin, American Redstart, Ovenbird, and Common Yellowthroat) not enough young were captured in one of the two years so the year analysis could not be performed and the habitat and station analyses are thus univariate rather than multivariate.

As with breeding populations, there were no significant or near-significant differences in productivity between 2003 and 2004, adjusting for habitat type, for all species pooled (Fig. 18**D**)

or for eight of the nine species with enough data to perform this comparison (Figs. 2-17**D**), generally confirming the results in Table 8. The one exception was Yellow-rumped Warbler (Fig. 11**D**) for which no young were captured in 2003. Likewise there were no significant or near-significant differences in productivity by forest type, adjusting for year, for all species pooled (Fig. 18**E**); however, significant or near-significant differences in productivity were found for Black-capped Chickadee (Fig. 4**E**; higher in coniferous than mixed forest), Swainson's Thrush (Fig. 5**E**; lower in coniferous than in mixed forest), American Robin (Fig. 7**E**; higher in coniferous than in both mixed and deciduous forests), Black-throated Green Warbler (Fig. 12**E**; higher in coniferous than in both mixed and deciduous forests), Nashville Warbler (Fig. 8**E**; lower in coniferous than in deciduous forests), American Redstart (Fig. 14**E**; higher in coniferous than in deciduous forests), and White-throated Sparrow (Fig. 17**E**; lower in coniferous than in deciduous forests). Adjusting for year, productivity was higher at Blueline Trail than at Golf Course, Chimney Rock, and Highland, for all species pooled (Fig. 18**F**). Productivity at Blueline Trail was also significantly or near-significantly higher than it was at one or more other stations for 12 of the 13 target species (Figs. 2-17**F**), whereas they were lower at Blueline Trail than at one or more stations for just three species, Hermit Thrush (Fig. 6**F**), Nashville Warbler (Fig. 8**F**), and White-throated Sparrow (Fig. 17**F**).

Thus, in general, there was little variation between 2003 and 2004 in either adult population sizes or productivity, after controlling for habitat type. Higher breeding populations were found at the coniferous stations (Blueline Trail and Highland) than in the other habitat types, after adjusting for the effects of year, but this pattern was not observed for productivity, where there was very little variation by habitat when all species were pooled. Interestingly, there were several species that showed higher breeding populations but lower productivity in coniferous forests than in the other habitat types. These include Swainson's Thrush, Nashville Warbler, Magnolia Warbler, and White-throated Sparrow, with Nashville Warbler and White-throated Sparrow showing significant or near-significant differences in the opposite direction. The reverse situation seemed to hold for American Robin, Black-throated Green Warbler, and Ovenbird. It will be interesting to see if these patterns strengthen after more years of data are collected.

DISCUSSION

Despite the fact that the NAS Brunswick and Redington Training Facility MAPS stations have been run for only two years, important and interesting data have been gathered on breeding populations and productivity for many summer resident landbird species on the installations. Data from all six MAPS stations at Brunswick and Redington have been pooled to provide indices of breeding population size and productivity, and comparisons between the two years and between three habitat types have been performed. As more years of data accumulate we will be able to make inferences about the effects of weather on productivity and the effect of changes in productivity on population size. After four or more years of data have been collected we will also be able examine trends in breeding population size and productivity and examine annual survival-rate estimates, capture probabilities, and proportion of residents. 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, as well as comparisons between these landholdings 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.

A result of potential concern from the first two years (2003-2004) of MAPS at Brunswick and Redington is that the overall reproductive index (0.27) was low compared with the mean value calculated for all species pooled in the Northeast MAPS Region as a whole (0.44 during the ten-year period 1992-2001), and that seven of nine target species showed substantially (> 50%) lower productivity at Brunswick/Redington than in the Northeast Region. It is possible that productivity was simply lower than normal along the Atlantic Seaboard during these two years, and that more years of data will reveal higher levels of productivity at Brunswick and Redington than were observed in 2003 and 2004. We have seen large fluctuation in productivity at other MAPS stations, which is often related to density-dependent effects at the station, local weather events, or even global climatological cycles. Alternatively, low productivity at Brunswick and Redington could be counterbalanced by high survival rates among the birds breeding there. We will be able to obtain preliminary estimates of survival (with a non-transient model) for many of these target species after three years of data have been collected.

Both adult population size (mean 46.9 birds/600 net-hours) and productivity (mean 0.03 young birds per adult) of landbirds were especially low at the two stations on NAS Brunswick, even in comparison with other stations on the immediate Atlantic coast. For example, at Cape Cod National Seashore during 1999-2003 the mean adults per 600 net-hours was 55.2 and the mean productivity was 0.20 young per adult (DeSante et al. 2004b). The low values (especially for productivity) at Brunswick is cause for some concern.

Mean numbers of adults captured, an index of breeding population sizes, appeared to be higher among the coniferous-forest stations (Blueline Trail and Highland), than in the deciduous-forest

(Chimney Rock and Redington Pond) and mixed-forest (Golf Course and Potato Nubble) stations. This pattern was not observed for productivity, however, where there was very little variation by habitat when all species were pooled. Several species (including Swainson's Thrush, Nashville Warbler, Magnolia Warbler, and White-throated Sparrow) showed higher breeding populations but lower productivity in coniferous forests than in the other habitat types, and it will be interesting to see if this pattern strengthens after more years of data are collected.

Once additional years of data have been gathered, we will be able to further explore these hypotheses and many others concerning landbird dynamics at these two installations. With more years of data not only will we be able to strengthen the power of ANOVA analyses of adult population sizes and logistic regression analyses of productivity (including multivariate examinations of the 17 or more individual target species), we will be able 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 have been identified, 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.

The long-term goal for the Brunswick/Redington MAPS program is to 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); (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). We conclude that the MAPS protocol is very well-suited to achieving these long-term ecological goals and recommend continuing the MAPS program at NAS Brunswick and Redington Training Facility well into the future.

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LITERATURE CITED

Bart, J., Kepler, C., Sykes, P., & Bocetti, C. 1999. Evaluation of mist-net sampling as an index to productivity in Kirtland's Warblers. *Auk* 116:1147-1151.

DeSante, D.F. 1990. The role of recruitment in the dynamics of a Sierran subalpine bird community. *American Naturalist* 136:429-455.

DeSante, D.F. 1992. Monitoring Avian Productivity and Survivorship (MAPS): a sharp, rather than blunt, tool for monitoring and assessing landbird populations. Pp. 511-521 *in*: D.R. McCullough and R.H. Barrett (eds.), *Wildlife 2001: Populations*. Elsevier Applied Science, London, U.K.

DeSante, D.F. 1995. Suggestions for future directions for studies of marked migratory landbirds from the perspective of a practitioner in population management and conservation. *Journal Applied Statistics* 22:949-965.

DeSante, D.F. 2000. Patterns of productivity and survivorship from the MAPS Program. *In* Bonney, R., D.N. Pashley, R. Cooper, and L. Niles (eds.), *Strategies for Bird Conservation: the Partners in Flight Planning Process*. Proceedings RMRS-P-16. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.

DeSante, D.F., K.M. Burton, J.F. Saracco, and B.L. Walker. 1995. Productivity indices and survival rate estimates from MAPS, a continent-wide programme of constant-effort mist netting in North America. *Journal Applied Statistics* 22:935-947.

DeSante, D.F., K.M. Burton, P. Velez, and D. Froehlich. 2004a. *MAPS Manual*. The Institute for Bird Populations, Point Reyes Station, CA. 49 pp.

DeSante, D.F., and T.L. George. 1994. Population trends in the landbirds of western North America. Pp. 173-190 *in*: J.R. Jehl, Jr. and N.K. Johnson (eds.), A Century of Avifaunal Change in Western North America, *Studies in Avian Biology*, No. 15, (Cooper Ornithological Society).

DeSante, D.F., M.P. Nott, and D.R. O'Grady, D.R. 2001. Identifying the proximate demographic cause(s) of population change by modeling spatial variation in productivity, survivorship, and population trends. *Ardea* 89(special issue):185-207.

DeSante, D.F., D.R. O'Grady, and P. Pyle. 1999. Measures of productivity and survival derived from standardized mist-netting are consistent with observed population changes. *Bird Study* 46(suppl.):S178-188.

DeSante, D.F., P. Pyle, and D. Kaschube. 2004b. The 2003 annua; and final report of the Monitoring Avian Productivity and Survivorship (MAPS) Program on Cape Cod National Seashore. The Institute for Bird Populations, Point Reyes Station, California.48 pp.

DeSante, D.F., and D.K. Rosenberg. 1998. What do we need to monitor in order to manage landbirds? Pp. 93-106 *in*: J. Marzluff and R. Sallabanks (eds.), *Avian Conservation: Research Needs and Effective Implementation*. Island Press, Washington, DC.

Finch, D.M., and P.W. Stangel. 1993. *Status and Management of Neotropical Migratory Birds*. USDA Forest Service, General Technical Report RM-229. 422 pp.

George, T.L., A.C. Fowler, R.L. Knight, and L.C. McEwen. 1992. Impacts of a severe drought on grassland birds in western North America. *Ecological Applications* 2:275-284.

Nott, M.P. 2000. *Identifying Management Actions on DoD Installations to Reverse Declines in Neotropical Birds*. Unpubl. report to the U.S. Department of Defense Legacy Resource Management Program. The Institute for Bird Populations, Point Reyes Station, CA 18 pp.

Nott, M.P. 2002. *Climate, Weather, and Landscape Effects on Landbird Survival and Reproductive Success in Texas*. Unpublished report to the U.S. Department of Defense Legacy Resource Management Program, Adjutant General's Department of Texas, and USGS/BRD Patuxent Wildlife Research Center. The Institute for Bird Populations, Point Reyes Station, CA. 29 pp.

Nott, M.P., D.F. DeSante, and N. Michel. 2003b. *Monitoring Avian Productivity and Survivorship (MAPS) Habitat Structure Assessment (HSA) Protocol*. The Institute for Bird Populations, Point Reyes Station, CA. 43 pp.

Nott, M.P., D.F. DeSante, and N. Michel. 2003a. *Management strategies for reversing declines in landbirds of conservation concern on military installations: A landscape-scale analysis of MAPS data*. The Institute for Bird Populations, Pt. Reyes Station, CA. 357 pp.

Nott, M.P., D.F. DeSante, R.B. Siegel, and P. Pyle. 2002. Influences of the El Niño/Southern Oscillation and the North Atlantic Oscillation on avian productivity in forests of the Pacific Northwest of North America. *Global Ecology and Biogeography* 11:333-342.

Peach, W.J., S.T. Buckland, and S.R. Baillie. 1996. The use of constant effort mist-netting to measure between-year changes in the abundance and productivity of common passerines. *Bird Study* 43:142-156.

Peterjohn, B.G., J.R. Sauer, and C.S. Robbins. 1995. Population trends from the North American Breeding Bird Survey. Pp. 3-39 *in*: T.E. Martin and D.M. Finch (eds.), *Ecology and Management of Neotropical Migratory Birds*. Oxford University Press, New York.

Robbins, C.S., J.R. Sauer, R.S. Greenberg, and S. Droege. 1989. Population declines in North

American birds that migrate to the Neotropics. *Proceedings of the National Academy of Sciences (USA)* 86:7658-7662.

Stata Corporation 1995. *Reference Manual*, Release 4. Stata Press, College Station, TX. 1601.

Temple, S.A., and J.A. Wiens. 1989. Bird populations and environmental changes: can birds be bio-indicators? *American Birds* 43:260-270.

Terborgh, J. 1989. *Where Have All the Birds Gone?, Essays on the Biology and Conservation of Birds that Migrate to the American Tropics*. Princeton Univ Press, Princeton, NJ. 207 pp.

Table 1. Summary of the 2004 MAPS program on Naval Air Station Brunswick and Redington Training Facility.

Station			Major Habitat Type	Latitude-longitude	Avg Elev. (m)	2004 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˚52'15"N,-69˚56'30"W	13	411.7 (350.2)	7	5/31 - 8/02
Chimney Rock	CHRO	15655	Northern red oak and maple forest, shrubs and small firs along seasonal streams	43˚52'30"N,-69˚55'05"W	18	390.7 (370.7)	7	6/01 - 7/30
Redington Training Facility								
Potato Nubble	PONU	15657	Mixed forest of maple/birch deciduous and fir/spruce coniferous components	44˚59'30"N,-70˚30'30"W	488	416.8 (342.2)	7	6/06 - 8/03
Redington Pond	REPO	15656	Primarily birch/maple forest with scattered balsam fir, pond, alder thicket	44˚58'58"N,-70˚24'59"W	507	400.7 (347.0)	7	6/07 - 8/04
Blueline Trail	BLUE	15658	Boggy balsam fir and Eastern hemlock forest, alder thicket	44˚59'25"N,-70˚26'20"W	515	405.3 (340.7)	7	6/05 - 8/05
Highland	HGHL	15659	Stunted red spruce and balsam fir forest, beaver ponds, very boggy areas	45˚00'35"N,-70˚27'15"W	724	396.7 (374.2)	7	6/04 - 8/06
ALL STATIONS COMBINED						2421.8(2124.8)	7	5/31 - 8/06

[1] Total net-hours in 2004. Net-hours in 2004 that could be compared in a constant-effort manner to 2003 are shown in parentheses.

Table 2. Habitat summary of the six MAPS stations located on Naval Air Station Brunswick and Redington Training Facility.

Station	Habitat Type[1]	% of Sta.[2]	Canopy Height (m)[3]	Dominant Species[4]		Water present	Disturbance history of station
				Upperstory and midstory	Understory and ground level		
Naval Air Station Brunswick							
Golf Course	MF	100	22	Acer rubrum, Acer saccharum, Pinus strobus, Quercus rubra, Populus tremuloides, Ulmus Americana, Picea rubens, Abies balsamea	Acer saccharum, Abies balsamea, Tsuga canadensis, Maianthemum canadense, Trientalis borealis	None	Pipeline and roads bisect the station
Chimney Rock	DW	100	18	Quercus rubra, Acer saccharum, Pinus strobus, Abies balsamea, Picea rubens	Abies balsamea, Pinus strobus, Acer rubrum	Seasonal bog (>50 m^2) ~2% of station	Homestead (~1800), selective logging (~1940-50)
Redington Training Facility							
Potato Nubble	MF	100	15	Picea mariana, Abies balsamea, Betula papyrifera, Betula lutea, Acer saccharum	Alnus serrulata, Picea glauca, Abies balsamea, Corylus cornuta, grass spp., Fragaria virginiana, Trifolium spp., Oxalis montana	None	Selective logging (up to ~1960), bisected by road
Redington Pond	DF	100	12	Betula lutea, Picea mariana, Abies balsamea, Acer rubrum, Acer saccharum, Betula papyrifera	Alnus rugosa, Abies balsamea, Picea mariana, Acer pennsylvanicum, Acer saccharum, Acer rubrum, Betula spp., Cornus Canadensis, Fragaria virginiana	Large stream (2-5 m wide, ~3% of station): permanent lake (>50 m^2, ~9% of station)	Selective logging (up to ~1960), railway track

Table 2. (cont.) Habitat summary of the six MAPS stations located on Naval Air Station Brunswick and Redington Training Facility.

Station	Habitat Type[1]	% of Sta.[2]	Canopy Height (m)[3]	Dominant Species[4]		Water present	Disturbance history of station
				Upperstory and midstory	Understory and ground level		
Blueline Trail	CB	60	15	Abies balsamea, Betula papyrifera, Alnus serrulata	Acer serrulata, Abies balsamea, moss spp., grass spp., fern spp.	Running water (~3% of station); permanent bog (>50 m^2, ~1% of station)	Selective logging (up to ~1960), railway track
	CF	40	15	Abies balsamea, Picea rubens, Betula papyrifera	Acer balsamea, Cornus canadensis, Oxalis montana, fern spp., moss spp.	None	Selective logging (up to ~1960), railway track
Highland	CF	100	12	Picea rubens, Betula papyrifera, Abies balsamea	Ledum groenlandicum, Cornus canadensis, Oxalis montana, fern spp., moss spp.	Small stream (0.5-2m wide, ~1.5% of station); permanent pond (>50m^2, ~6% of station)	Selective logging (up to ~1960), fire (~1980)

[1] General habitat type of the station. DW - deciduous woodland; DF - deciduous forest; MF - mixed forest; CB - coniferous bog; CF - coniferous forest.

[2] Percentage of station area comprised of the indicated habitat type.

[3] Average height of tree canopy.

[4] The dominant and most common species in each vegetative layer. Upperstory and midstory = vegetation found over 5m above ground. Understory and ground cover = vegetation found under 5m above ground.

Table 3. Capture summary for the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility in 2004. 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
Ruby-throated Hummingbird								1										
Yellow-bellied Sapsucker							1						1					
Hairy Woodpecker	2												1					
Pileated Woodpecker		1																
Yellow-bellied Flycatcher													3			2		
"Traill's" Flycatcher	1		1							4		5	2		1			
Least Flycatcher										2			2		1			
Blue-headed Vireo							1											
Philadelphia Vireo										4	1							
Red-eyed Vireo	1			1						2								
Blue Jay	1		2															
Black-capped Chickadee				1			1						5		1	3		1
Boreal Chickadee																5		3
Red-breasted Nuthatch	1			1		1							1					
Brown Creeper		1																
Winter Wren										3								
Golden-crowned Kinglet							1						1			2		
Veery				2		3							1					
Swainson's Thrush							6		1	14		9	4		1	9		3
Hermit Thrush	5		7	3		1	12		4				3					
American Robin							1		1	1			1					
Gray Catbird										1								
Cedar Waxwing	1									1			1					
Nashville Warbler	5		1				1		1	6			5		2	2		
Magnolia Warbler							6		1	12		8	3			12		4
Black-throated Blue Warbler							10		2	13		3	4			2		

Table 3. (cont.) Capture summary for the six individual MAPS stations operated on Naval Air Station Brunswick and Redington Training Facility in 2004. 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
Yellow-rumped Warbler										4			5			1		1
Black-throated Green Warb.	6		5	6		1	2			1			4			1		
Blackburnian Warbler							1			2			10		1			
Blackpoll Warbler													1			7		8
Black-and-white Warbler	2																	
American Redstart										3		9	3					
Ovenbird	5	1	2	5		1	9		3	6		1	1			1	1	
Northern Waterthrush				1						1			2					
Mourning Warbler										2								
Common Yellowthroat	4		7	2	1	2				6			6		1			
Canada Warbler							1			2			2					
Chipping Sparrow	1																	
Song Sparrow															1			
Swamp Sparrow													4		1			
White-throated Sparrow							8		7	12		1	9		13	7		3
Dark-eyed Junco							2	1	2	2						1	1	
Northern Cardinal				1														
Common Grackle				1														
Purple Finch										3								
ALL SPECIES POOLED	35	3	25	24	1	9	63	2	22	107	1	36	85	0	23	55	2	23
Total Number of Captures		63			34			87			144			108			80	
Number of Species	13	3	7	11	1	6	16	2	9	24	1	7	27	0	10	14	2	7
Total Number of Species		15			11			17			24			28			14	

Table 4. 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 2004.

	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							1.4	0.0	0.00				1.5	0.0	0.00			
Hairy Woodpecker	2.9	0.0	0.00										1.5	0.0	0.00			
Yellow-bellied Flycatcher													4.4	0.0	0.00	3.0	0.0	0.00
"Traill's" Flycatcher										7.5	0.0	0.00	3.0	0.0	0.00			
Least Flycatcher										1.5	1.5	1.00	3.0	0.0	0.00			
Blue-headed Vireo							1.4	0.0	0.00									
Philadelphia Vireo										3.0	3.0	1.00						
Red-eyed Vireo	1.5	0.0	0.00	1.5	0.0	0.00				3.0	0.0	0.00						
Blue Jay	2.9	0.0	0.00															
Black-capped Chickadee				1.5	0.0	0.00	1.4	0.0	0.00				7.4	1.5	0.20	6.1	0.0	0.00
Boreal Chickadee																9.1	0.0	0.00
Red-breasted Nuthatch	1.5	0.0	0.00	1.5	0.0	0.00							1.5	0.0	0.00			
Winter Wren										4.5	0.0	0.00						
Golden-crowned Kinglet							1.4	0.0	0.00				1.5	0.0	0.00	0.0	3.0	undf.[1]
Veery				3.1	0.0	0.00							1.5	0.0	0.00			
Swainson's Thrush							5.8	4.3	0.75	15.0	7.5	0.50	5.9	1.5	0.25	15.1	1.5	0.10
Hermit Thrush	11.7	0.0	0.00	4.6	0.0	0.00	7.2	10.1	1.40				4.4	0.0	0.00			
American Robin							2.9	0.0	0.00	1.5	0.0	0.00	1.5	0.0	0.00			
Gray Catbird										1.5	0.0	0.00						
Cedar Waxwing	1.5	0.0	0.00							1.5	0.0	0.00	1.5	0.0	0.00			
Nashville Warbler	5.8	1.5	0.25				1.4	0.0	0.00	3.0	6.0	2.00	5.9	1.5	0.25	3.0	0.0	0.00
Magnolia Warbler							7.2	1.4	0.20	13.5	6.0	0.44	1.5	3.0	2.00	18.2	0.0	0.00
Black-throated Blue Warbler							8.6	5.8	0.67	13.5	7.5	0.56	1.5	4.4	3.00	3.0	0.0	0.00
Yellow-rumped Warbler										3.0	3.0	1.00	5.9	1.5	0.25	3.0	0.0	0.00

Table 4. (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 2004.

	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
Black-throated Green Warbler	8.7	0.0	0.00	9.2	0.0	0.00	2.9	0.0	0.00	1.5	0.0	0.00	1.5	4.4	3.00	1.5	0.0	0.00
Blackburnian Warbler							1.4	0.0	0.00	0.0	3.0	undf.[1]	8.9	5.9	0.67			
Blackpoll Warbler													0.0	1.5	undf.[1]	15.1	0.0	0.00
Black-and-white Warbler	2.9	0.0	0.00															
American Redstart										10.5	0.0	0.00	3.0	1.5	0.50			
Ovenbird	5.8	0.0	0.00	7.7	0.0	0.00	7.2	5.8	0.80	7.5	3.0	0.40	0.0	1.5	undf.	1.5	0.0	0.00
Northern Waterthrush				1.5	0.0	0.00				1.5	0.0	0.00	3.0	0.0	0.00			
Mourning Warbler										1.5	1.5	1.00						
Common Yellowthroat	7.3	1.5	0.20	6.1	0.0	0.00				6.0	3.0	0.50	5.9	3.0	0.50			
Canada Warbler							1.4	0.0	0.00	3.0	0.0	0.00	1.5	1.5	1.00			
Chipping Sparrow	1.5	0.0	0.00															
Song Sparrow													1.5	0.0	0.00			
Swamp Sparrow													3.0	3.0	1.00			
White-throated Sparrow							7.2	4.3	0.60	7.5	10.5	1.40	19.2	1.5	0.08	7.6	3.0	0.40
Dark-eyed Junco							1.4	1.4	1.00	3.0	0.0	0.00				1.5	0.0	0.00
Northern Cardinal				1.5	0.0	0.00												
Common Grackle				1.5	0.0	0.00												
Purple Finch										4.5	0.0	0.00						
ALL SPECIES POOLED	53.9	2.9	0.05	39.9	0.0	0.00	60.5	33.1	0.55	118.3	55.4	0.47	100.7	37.0	0.37	87.7	7.6	0.09
Number of Species	12	2		11	0		16	7		23	12		26	15		13	3	
Total Number of Species		12			11			16			24			28			14	

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

Table 5. Summary of results for all six Naval Air Station Brunswick and Redington Training Facility MAPS stations combined in 2004.

Species	Birds captured			Birds/600 nethours		Reprod. Index
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Ruby-throated Hummingbird		1				
Yellow-bellied Sapsucker	2			0.5	0.0	0.00
Hairy Woodpecker	3			0.7	0.0	0.00
Pileated Woodpecker		1				
Yellow-bellied Flycatcher	5			1.2	0.0	0.00
"Traill's" Flycatcher	7		7	1.7	0.0	0.00
Least Flycatcher	4		1	0.7	0.2	0.33
Blue-headed Vireo	1			0.2	0.0	0.00
Philadelphia Vireo	4	1		0.5	0.5	1.00
Red-eyed Vireo	4			1.0	0.0	0.00
Blue Jay	1		2	0.5	0.0	0.00
Black-capped Chickadee	10		2	2.7	0.2	0.09
Boreal Chickadee	5		3	1.5	0.0	0.00
Red-breasted Nuthatch	3		1	0.7	0.0	0.00
Brown Creeper		1				
Winter Wren	3			0.7	0.0	0.00
Golden-crowned Kinglet	4			0.5	0.5	1.00
Veery	3		3	0.7	0.0	0.00
Swainson's Thrush	33		14	6.9	2.5	0.36
Hermit Thrush	23		12	4.7	1.7	0.37
American Robin	3		1	1.0	0.0	0.00
Gray Catbird	1			0.2	0.0	0.00
Cedar Waxwing	3			0.7	0.0	0.00
Nashville Warbler	19		4	3.2	1.5	0.46
Magnolia Warbler	33		13	6.7	1.7	0.26
Black-throated Blue Warbler	29		5	4.5	3.0	0.67
Yellow-rumped Warbler	10		1	2.0	0.7	0.38
Black-throated Green Warbler	20		6	4.2	0.7	0.18
Blackburnian Warbler	13		1	1.7	1.5	0.86
Blackpoll Warbler	8		8	2.5	0.2	0.10
Black-and-white Warbler	2			0.5	0.0	0.00
American Redstart	6		9	2.2	0.2	0.11
Ovenbird	27	2	7	5.0	1.7	0.35

Table 5. (cont.) Summary of results for all six Naval Air Station Brunswick and Redington Training Facility MAPS stations combined in 2004.

Species	Birds captured			Birds/600 nethours		Reprod. Index
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Northern Waterthrush	4			1.0	0.0	0.00
Mourning Warbler	2			0.2	0.2	1.00
Common Yellowthroat	18	1	10	4.2	1.2	0.29
Canada Warbler	5			1.0	0.2	0.25
Chipping Sparrow	1			0.2	0.0	0.00
Song Sparrow			1	0.2	0.0	0.00
Swamp Sparrow	4		1	0.5	0.5	1.00
White-throated Sparrow	36		24	6.9	3.2	0.46
Dark-eyed Junco	5	2	2	1.0	0.2	0.25
Northern Cardinal	1			0.2	0.0	0.00
Common Grackle	1			0.2	0.0	0.00
Purple Finch	3			0.7	0.0	0.00
ALL SPECIES POOLED	369	9	138	76.8	22.8	0.30
Total Number of Captures		516				
Number of Species	41	7	24	42	21	
Total Number of Species		45			42	

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

Table 6. Percentage changes between 2003 and 2004 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 2003	All six stations combined: Number of adults 2004	All six stations combined: Percent change	All six stations combined: SE[2]	
Yellow-bellied Sapsucker					++++[3]		1	0	1	++++[3]		
Downy Woodpecker				-100.0	-100.0		2	4	0	-100.0	88.9	
Hairy Woodpecker	100.0				++++		2	1	3	200.0	200.0	
Eastern Wood-Pewee		-100.0					1	1	0	-100.0		
Yellow-bellied Flycatcher					-57.1	0.0	2	8	4	-50.0	12.5	
"Traill's" Flycatcher				33.3	0.0	-100.0	5	5	7	40.0	45.6	
Least Flycatcher				0.0		-100.0	2	2	1	-50.0	50.0	
Eastern Phoebe					-100.0		1	1	0	-100.0		
Blue-headed Vireo	-100.0		++++[3]	-100.0	-100.0		4	4	1	-75.0	33.9	
Philadelphia Vireo				-75.0			1	4	1	-75.0		
Red-eyed Vireo		0.0	-100.0	-60.0	-100.0		4	9	3	-66.7	13.5	**
Blue Jay	100.0	-100.0	-100.0				3	4	2	-50.0	57.3	
Black-capped Chickadee	-100.0	-50.0	++++	-100.0	33.3	300.0	6	15	10	-33.3	46.1	
Boreal Chickadee						200.0	1	2	6	200.0		
Red-breasted Nuthatch	++++[3]	++++[3]			0.0		3	1	3	200.0	300.0	
Brown Creeper	-100.0			-100.0			2	3	0	-100.0	88.9	
Winter Wren				++++[3]			1	0	3	++++		
Golden-crowned Kinglet			++++		0.0		2	1	2	100.0	200.0	
Ruby-crowned Kinglet					-100.0		1	2	0	-100.0		
Veery	-100.0	0.0		-100.0	0.0		4	6	3	-50.0	30.4	
Swainson's Thrush		-100.0	-50.0	25.0	0.0	-10.0	5	31	27	-12.9	15.8	
Hermit Thrush	-20.0	0.0	++++		100.0		4	14	18	28.6	58.2	
American Robin	-100.0	-100.0	-33.3	-100.0			4	8	2	-75.0	21.0	**
Gray Catbird				++++			1	0	1	++++		

Table 6. (cont.) Percentage changes between 2003 and 2004 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 2003	All six stations combined: Number of adults 2004	All six stations combined: Percent change	All six stations combined: SE[2]	
Cedar Waxwing	++++			-80.0	0.0		3	6	3	-50.0	38.2	
Tennessee Warbler				-100.0			1	1	0	-100.0		
Nashville Warbler	100.0		++++	++++	-33.3	-81.8	5	19	13	-31.6	38.4	
Northern Parula					-100.0		1	2	0	-100.0		
Chestnut-sided Warbler	-100.0			-100.0			2	2	0	-100.0	88.9	
Magnolia Warbler			300.0	80.0	-100.0	22.2	4	17	24	41.2	31.4	
Black-throated Blue Warb.			50.0	200.0	++++	++++[3]	4	7	18	157.1	82.5	
Yellow-rumped Warbler				-50.0	100.0	100.0	3	5	7	40.0	55.0	
Black-throated Green Warb.	++++	100.0	100.0	++++	++++	0.0	6	5	17	240.0	174.4	
Blackburnian Warbler			++++		200.0		2	1	4	300.0	200.0	
Bay-breasted Warbler					-100.0	-100.0	2	3	0	-100.0	88.9	
Blackpoll Warbler						100.0	1	5	10	100.0		
Black-and-white Warbler	100.0						1	1	2	100.0		
American Redstart				-12.5	++++		2	8	8	0.0	25.0	
Ovenbird	33.3	25.0	66.7	150.0	-100.0	++++	6	14	20	42.9	30.2	
Northern Waterthrush	-100.0	++++	-100.0	++++	-100.0	-100.0	6	7	2	-71.4	28.1	*
Mourning Warbler				++++			1	0	1	++++		
Common Yellowthroat	0.0	0.0	-100.0	++++	0.0	-100.0	6	17	14	-17.6	24.4	
Canada Warbler	-100.0	-100.0	0.0	-50.0	++++	-100.0	6	9	4	-55.6	19.4	**
Scarlet Tanager		-100.0					1	2	0	-100.0		
Song Sparrow	-100.0				++++		2	1	1	0.0	200.0	
Lincoln's Sparrow	-100.0						1	1	0	-100.0		
Swamp Sparrow					++++		1	0	2	++++		
White-throated Sparrow	-100.0		++++	0.0	50.0	-20.0	5	20	25	25.0	39.2	

Table 6. (cont.) Percentage changes between 2003 and 2004 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 2003	Number of adults 2004	Percent change	SE[2]
Dark-eyed Junco			++++	100.0		-50.0	3	3	4	33.3	83.9
Northern Cardinal		++++					1	0	1	++++	
Purple Finch				50.0			1	2	3	50.0	
ALL SPECIES POOLED	-22.2	-7.4	42.9	7.4	-8.5	-5.3	6	284	281	-1.1	6.7
No. species that increased[4]	8(3)	5(3)	12(8)	14(7)	13(8)	7(2)				23(6)	
No. species that decreased[5]	12(11)	7(6)	6(4)	14(8)	12(10)	10(6)				26(11)	
No. species remained same	1	4	1	2	7	2				2	
Total Number of Species	21	16	19	30	32	19				51	
Proportion of increasing (decreasing) species	(0.571)	(0.438)	0.632	0.467	(0.375)	(0.526)				(0.510)	
Sig. of increase (decrease)[6]	(0.332)	(0.773)	0.180	0.708	(0.945)	(0.500)				(0.500)	

[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 2003.
[4] No. of species for which adults were captured in 2004 but not in 2003 are in parentheses.
[5] No. of species for which adults were captured in 2003 but not in 2004 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. Percentage changes between 2003 and 2004 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	All six stations combined			
							n[1]	Number of young 2003	Number of young 2004	Percent change	SE[2]
Yellow-bellied Sapsucker							0	0	0		
Downy Woodpecker			-100.0		-100.0		2	2	0	-100.0	88.9
Hairy Woodpecker	-100.0		-100.0				2	2	0	-100.0	88.9
Eastern Wood-Pewee							0	0	0		
Yellow-bellied Flycatcher							0	0	0		
"Traill's" Flycatcher							0	0	0		
Least Flycatcher				-100.0	-100.0		2	2	0	-100.0	88.9
Eastern Phoebe							0	0	0		
Blue-headed Vireo					-100.0		1	1	0	-100.0	
Philadelphia Vireo				++++[3]			1	0	2	++++[3]	
Red-eyed Vireo							0	0	0		
Blue Jay							0	0	0		
Black-capped Chickadee				-100.0		-100.0	2	2	0	-100.0	88.9
Boreal Chickadee							0	0	0		
Red-breasted Nuthatch				-100.0			1	1	0	-100.0	
Brown Creeper							0	0	0		
Winter Wren							0	0	0		
Golden-crowned Kinglet			-100.0		-100.0	++++[3]	3	2	2	0.0	150.0
Ruby-crowned Kinglet							0	0	0		
Veery							0	0	0		
Swainson's Thrush			-50.0	25.0	++++[3]	-66.7	4	11	9	-18.2	29.2
Hermit Thrush			150.0	-100.0	-100.0		3	5	5	0.0	91.7
American Robin					-100.0		1	2	0	-100.0	
Gray Catbird	-100.0						1	1	0	-100.0	

Table 7. (cont.) Percentage changes between 2003 and 2004 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 2003	All six stations combined: Number of young 2004	All six stations combined: Percent change	All six stations combined: SE[2]	
Cedar Waxwing							0	0	0			
Tennessee Warbler							0	0	0			
Nashville Warbler	++++[3]			200.0	-66.7	-100.0	4	5	5	0.0	73.0	
Northern Parula					-100.0		1	1	0	-100.0		
Chestnut-sided Warbler							0	0	0			
Magnolia Warbler			++++[3]	++++	100.0		3	1	6	500.0	624.5	
Black-throated Blue Warb.			100.0	150.0	100.0		3	5	11	120.0	18.3	**
Yellow-rumped Warbler				++++	++++		2	0	3	++++		
Black-throated Green Warb.					-50.0		1	2	1	-50.0		
Blackburnian Warbler				++++	33.3		2	3	6	100.0	133.3	
Bay-breasted Warbler							0	0	0			
Blackpoll Warbler							0	0	0			
Black-and-white Warbler							0	0	0			
American Redstart					++++		1	0	1	++++		
Ovenbird			++++	++++	++++		3	0	6	++++		
Northern Waterthrush			-100.0		-100.0		2	2	0	-100.0	88.9	
Mourning Warbler				++++			1	0	1	++++		
Common Yellowthroat	++++			++++	++++		3	0	5	++++		
Canada Warbler					0.0	-100.0	2	2	1	-50.0	50.0	
Scarlet Tanager							0	0	0			
Song Sparrow							0	0	0			
Lincoln's Sparrow							0	0	0			
Swamp Sparrow				-100.0	++++		2	1	2	100.0	400.0	
White-throated Sparrow			++++	250.0	-100.0	-71.4	4	12	11	-8.3	73.1	

Table 7. (cont.) Percentage changes between 2003 and 2004 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 2003	All six stations combined: Number of young 2004	All six stations combined: Percent change	All six stations combined: SE[2]
Dark-eyed Junco			-50.0			-100.0	2	3	1	-66.7	22.2
Northern Cardinal							0	0	0		
Purple Finch				-100.0			1	1	0	-100.0	
ALL SPECIES POOLED	0.0	0.0	28.6	112.5	-17.4	-64.3	5	69	78	13.0	33.4
No. species that increased[4]	2(2)	0(0)	5(3)	11(7)	9(6)	1(1)				10(6)	
No. species that decreased[5]	2(2)	0(0)	6(4)	6(6)	11(9)	6(4)				16(11)	
No. species remained same	0	0	0	0	1	0				3	
Total Number of Species	4	0	11	17	21	7				29	
Proportion of increasing (decreasing) species	0.500	n/a	0.455	0.647	(0.524)	(0.857)				0.345	
Sig. of increase (decrease)[6]	0.688	n/a	0.726	0.166	(0.500)	(0.063) *				0.969	

[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 2003.
[4] No. of species for which young birds were captured in 2004 but not in 2003 are in parentheses.
[5] No. of species for which young birds were captured in 2003 but not in 2004 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 8. Absolute changes between 2003 and 2004 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 2003	All six stations combined: Reproductive Index 2004	All six stations combined: Change	All six stations combined: SE[2]
Yellow-bellied Sapsucker					+-+-+[3]		1	undf.[4]	0.000	+-+-+[3]	
Downy Woodpecker			+-+-+[3]	+-+-+[3]	+-+-+		3	0.500	undf.[4]	+-+-+	
Hairy Woodpecker	-1.000		+-+-+		+-+-+		3	2.000	0.000	-2.000	1.732
Eastern Wood-Pewee		+-+-+[3]					1	0.000	undf.	+-+-+	
Yellow-bellied Flycatcher					0.000	0.000	2	0.000	0.000	0.000	0.000
"Traill's" Flycatcher				0.000	0.000	+-+-+[3]	5	0.000	0.000	0.000	0.000
Least Flycatcher				-1.000	+-+-+	+-+-+	3	1.000	0.000	-1.000	0.866
Eastern Phoebe					+-+-+		1	0.000	undf.	+-+-+	
Blue-headed Vireo	+-+-+[3]		+-+-+	+-+-+	+-+-+		4	0.250	0.000	-0.250	0.270
Philadelphia Vireo				2.000			1	0.000	2.000	2.000	
Red-eyed Vireo		0.000	+-+-+	0.000	+-+-+		4	0.000	0.000	0.000	0.000
Blue Jay	0.000	+-+-+	+-+-+				3	0.000	0.000	0.000	0.000
Black-capped Chickadee	+-+-+	0.000	+-+-+	+-+-+	0.000	-1.000	6	0.133	0.000	-0.133	0.113
Boreal Chickadee						0.000	1	0.000	0.000	0.000	
Red-breasted Nuthatch	+-+-+	+-+-+		+-+-+	0.000		4	1.000	0.000	-1.000	1.633
Brown Creeper	+-+-+			+-+-+			2	0.000	undf.	+-+-+	
Winter Wren				+-+-+			1	undf.	0.000	+-+-+	
Golden-crowned Kinglet			+-+-+		-1.000	+-+-+	3	2.000	1.000	-1.000	2.291
Ruby-crowned Kinglet					+-+-+		1	0.000	undf.	+-+-+	
Veery	+-+-+	0.000		+-+-+	0.000		4	0.000	0.000	0.000	0.000
Swainson's Thrush		+-+-+	0.000	0.000	0.250	-0.189	5	0.355	0.333	-0.022	0.139
Hermit Thrush	0.000	0.000	+-+-+	+-+-+	-1.000		5	0.357	0.278	-0.079	0.464
American Robin	+-+-+	+-+-+	0.000	+-+-+	+-+-+		5	0.250	0.000	-0.250	0.316
Gray Catbird	+-+-+			+-+-+			2	undf.	0.000	+-+-+	

Table 8. (cont.) Absolute changes between 2003 and 2004 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 2003	Reproductive Index 2004	Change	SE[2]	
Cedar Waxwing	+-+-+			0.000	0.000		3	0.000	0.000	0.000	0.000	
Tennessee Warbler				+-+-+			1	0.000	undf.	+-+-+		
Nashville Warbler	0.250		+-+-+	+-+-+	-0.250	-0.091	5	0.263	0.385	0.122	0.265	
Northern Parula					+-+-+		1	0.500	undf.	+-+-+		
Chestnut-sided Warbler	+-+-+			+-+-+			2	0.000	undf.	+-+-+		
Magnolia Warbler			0.250	0.333	+-+-+	0.000	4	0.059	0.250	0.191	0.183	
Black-throated Blue Warb.			0.167	-0.111	+-+-+	+-+-+	4	0.714	0.611	-0.103	0.252	
Yellow-rumped Warbler				2.000	0.250	0.000	3	0.000	0.429	0.429	0.337	
Black-throated Green Warb.	+-+-+	0.000	0.000	+-+-+	+-+-+	0.000	6	0.400	0.059	-0.341	0.530	
Blackburnian Warbler			+-+-+	+-+-+	-1.667		3	3.000	1.500	-1.500	0.781	
Bay-breasted Warbler					+-+-+	+-+-+	2	0.000	undf.	+-+-+		
Blackpoll Warbler						0.000	1	0.000	0.000	0.000		
Black-and-white Warbler	0.000						1	0.000	0.000	0.000		
American Redstart				0.000	+-+-+		2	0.000	0.125	0.125	0.219	
Ovenbird	0.000	0.000	0.600	0.400	+-+-+	+-+-+	6	0.000	0.300	0.300	0.148	*
Northern Waterthrush	+-+-+	+-+-+	+-+-+	+-+-+	+-+-+	+-+-+	6	0.286	0.000	-0.286	0.152	
Mourning Warbler				+-+-+			1	undf.	1.000	+-+-+		
Common Yellowthroat	0.200	0.000	+-+-+	+-+-+	0.667	+-+-+	6	0.000	0.357	0.357	0.178	
Canada Warbler	+-+-+	+-+-+	0.000	0.000	+-+-+	+-+-+	6	0.222	0.250	0.028	0.325	
Scarlet Tanager		+-+-+					1	0.000	undf.	+-+-+		
Song Sparrow	+-+-+				+-+-+		2	0.000	0.000	0.000	0.000	
Lincoln's Sparrow	+-+-+						1	0.000	undf.	+-+-+		
Swamp Sparrow				+-+-+	+-+-+		2	undf.	1.000	+-+-+		
White-throated Sparrow	+-+-+		+-+-+	1.250	-0.375	-0.900	5	0.600	0.440	-0.160	0.426	

Table 8. (cont.) Absolute changes between 2003 and 2004 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	All six stations combined: n[1]	Reproductive Index: 2003	2004	Change	SE[2]
Dark-eyed Junco			+-+-+	0.000		-0.500	3	1.000	0.250	-0.750	1.040
Northern Cardinal		+-+-+					1	undf.	0.000	+-+-+	
Purple Finch				-0.500			1	0.500	0.000	-0.500	
ALL SPECIES POOLED	0.013	0.000	-0.050	0.231	-0.038	-0.153	6	0.243	0.278	0.035	0.103
No. species that increased	2	0	3	5	3	0				8	
No. species that decreased	1	0	0	3	5	5				16	
No. species remained same	4	7	4	7	6	6				10	
Total Number of Species[5]	7	7	7	15	14	11				34	
Proportion of increasing (decreasing) species	0.286	0.000	(0.000)	0.714	(0.357)	(0.455)				0.235	
Sig. of increase (decrease)[6]	0.938	1.000	(1.000)	0.227	(0.910)	(0.726)				1.000	

[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 undefined at this station because no adult individual of the species was captured in one of the two years.
[4] Reproductive index not given 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 9. 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 two years, 2003 and 2004. 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							0.7	0.0	0.00				1.6	0.0	0.00				0.4	0.0	0.00
Downy Woodpecker							0.0	0.9	und.[2]	0.8	0.0	0.00	2.5	0.8	0.33				0.5	0.3	0.50
Hairy Woodpecker	2.3	0.9	0.50				0.0	0.9	und.				1.6	0.0	0.00				0.6	0.3	0.50
Eastern Wood-Pewee				0.8	0.0	0.00													0.1	0.0	0.00
Yellow-bellied Flycatcher													8.1	0.0	0.00	3.0	0.0	0.00	1.8	0.0	0.00
"Traill's" Flycatcher										6.2	0.0	0.00	4.0	0.0	0.00	0.8	0.0	0.00	1.8	0.0	0.00
Least Flycatcher										1.6	1.6	1.00	1.5	0.8	0.00	0.8	0.0	0.00	0.6	0.4	0.67
Eastern Phoebe													0.8	0.0	0.00				0.1	0.0	0.00
Blue-headed Vireo	1.7	0.0	0.00				0.7	0.0	0.00	0.8	0.0	0.00	0.8	0.8	1.00				0.7	0.1	0.13
Philadelphia Vireo										4.8	1.5	0.50							0.8	0.2	0.50
Red-eyed Vireo	0.7	0.0	0.00	1.5	0.0	0.00	0.9	0.0	0.00	5.6	0.0	0.00	1.7	0.0	0.00				1.7	0.0	0.00
Blue Jay	2.3	0.0	0.00	0.8	0.0	0.00	1.7	0.0	0.00										0.8	0.0	0.00
Black-capped Chickadee	6.0	0.0	0.00	2.3	0.0	0.00	0.7	0.0	0.00	1.6	0.8	0.50	8.7	0.7	0.10	3.8	0.8	0.50	3.8	0.4	0.10
Boreal Chickadee																6.0	0.0	0.00	1.0	0.0	0.00
Red-breasted Nuthatch	0.7	0.0	0.00	0.8	0.0	0.00				0.0	0.8	und.[2]	1.6	0.0	0.00				0.5	0.1	0.50
Brown Creeper	0.9	0.0	0.00							1.6	0.0	0.00							0.4	0.0	0.00
Winter Wren										2.2	0.0	0.00							0.4	0.0	0.00
Golden-crowned Kinglet							0.7	0.9	0.00				1.6	0.8	0.50	0.0	1.5	und.[2]	0.4	0.5	1.50
Ruby-crowned Kinglet													1.7	0.0	0.00				0.3	0.0	0.00
Veery	1.7	0.0	0.00	3.0	0.0	0.00				0.8	0.0	0.00	1.6	0.0	0.00				1.2	0.0	0.00
Swainson's Thrush				0.8	0.0	0.00	9.8	5.6	0.63	14.0	7.0	0.50	6.3	0.7	0.13	15.1	3.0	0.20	7.7	2.7	0.36
Hermit Thrush	14.4	0.0	0.00	4.6	0.0	0.00	3.6	6.8	1.40	0.0	1.6	und.	3.1	0.8	0.50				4.2	1.5	0.36
American Robin	1.7	0.0	0.00	0.8	0.0	0.00	4.0	0.0	0.00	2.4	0.0	0.00	1.6	1.7	1.00				1.7	0.3	0.11
Gray Catbird	0.0	0.9	und.[2]							0.7	0.0	0.00							0.1	0.1	0.00
Cedar Waxwing	0.7	0.0	0.00							4.8	0.0	0.00	1.6	0.0	0.00				1.2	0.0	0.00
Tennessee Warbler										0.8	0.0	0.00							0.1	0.0	0.00

Table 9. (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 two years, 2003 and 2004. 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]
Nashville Warbler	4.6	0.7	0.13				0.7	0.0	0.00	1.5	3.8	2.00	8.0	3.2	0.38	9.8	0.8	0.05	4.2	1.4	0.36
Northern Parula													1.7	0.8	0.50				0.3	0.1	0.50
Chestnut-sided Warbler	0.9	0.0	0.00							0.8	0.0	0.00							0.3	0.0	0.00
Magnolia Warbler							4.5	0.7	0.10	10.8	3.0	0.22	2.4	2.3	1.25	15.9	0.0	0.00	5.6	1.0	0.16
Black-throated Blue Warb.							7.8	4.6	0.58	9.2	5.4	0.61	0.7	3.1	3.00	1.5	0.0	0.00	3.2	2.2	0.69
Yellow-rumped Warbler										3.1	1.5	0.50	4.6	0.7	0.13	2.3	0.0	0.00	1.7	0.4	0.19
Black-throated Grn. Warb.	4.4	0.0	0.00	6.9	0.0	0.00	2.3	0.0	0.00	0.7	0.0	0.00	0.7	3.9	3.00	1.5	0.0	0.00	2.8	0.6	0.29
Blackburnian Warbler							0.7	0.0	0.00	0.0	1.5	und..	5.3	5.5	1.83				1.0	1.1	1.93
Bay-breasted Warbler													0.8	0.0	0.00	1.5	0.0	0.00	0.4	0.0	0.00
Blackpoll Warbler													0.0	0.7	und..	11.3	0.0	0.00	1.9	0.1	0.05
Black-and-white Warbler	2.3	0.0	0.00																0.4	0.0	0.00
American Redstart										11.8	0.0	0.00	1.5	0.7	0.50				2.2	0.1	0.06
Ovenbird	5.5	0.0	0.00	6.8	0.0	0.00	6.2	2.9	0.40	5.4	1.5	0.20	1.7	0.7	0.00	0.8	0.0	0.00	4.4	0.9	0.18
Northern Waterthrush	0.9	0.0	0.00	0.8	0.0	0.00	0.9	0.9	1.00	0.7	0.0	0.00	4.0	0.8	0.17	1.5	0.0	0.00	1.4	0.3	0.14
Mourning Warbler										0.7	0.7	1.00							0.1	0.1	1.00
Common Yellowthroat	7.9	0.7	0.10	6.1	0.0	0.00	2.6	0.0	0.00	3.0	1.5	0.50	5.5	1.5	0.25	1.5	0.0	0.00	4.4	0.6	0.15
Canada Warbler	0.9	0.0	0.00	1.5	0.0	0.00	1.6	0.0	0.00	4.8	0.0	0.00	0.7	1.6	1.00	0.8	0.8	1.00	1.7	0.4	0.24
Scarlet Tanager				1.5	0.0	0.00													0.3	0.0	0.00
Chipping Sparrow	0.7	0.0	0.00																0.1	0.0	0.00
Song Sparrow	0.9	0.0	0.00										0.7	0.0	0.00				0.3	0.0	0.00
Lincoln's Sparrow	0.9	0.0	0.00																0.1	0.0	0.00
Swamp Sparrow										0.0	0.8	und..	1.5	1.5	1.00				0.2	0.4	1.00
White-throated Sparrow	2.6	0.0	0.00				3.6	2.2	0.60	7.0	6.9	0.95	16.3	3.2	0.23	8.3	6.8	0.78	6.3	3.2	0.52
Dark-eyed Junco							0.7	2.5	1.00	2.3	0.0	0.00				2.3	0.8	0.25	0.9	0.5	0.63
Northern Cardinal				0.8	0.0	0.00													0.1	0.0	0.00
Common Grackle				0.8	0.0	0.00													0.1	0.0	0.00

Table 9. (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 two years, 2003 and 2004. 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]
Purple Finch										3.9	0.8	0.25							0.6	0.1	0.25
ALL SPECIES POOLED	65.5	3.2	0.05	40.2	0.0	0.00	54.6	28.7	0.52	114.7	40.8	0.35	106.3	37.7	0.36	88.3	14.3	0.16	78.1	20.7	0.27
Number of Species	23	4		17	0		20	11		30	17		34	23		19	7		53	30	
Total Number of Species		24			17			22			34			35			20			53	

[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] The reproductive index is undefined for both 2003 and 2004.

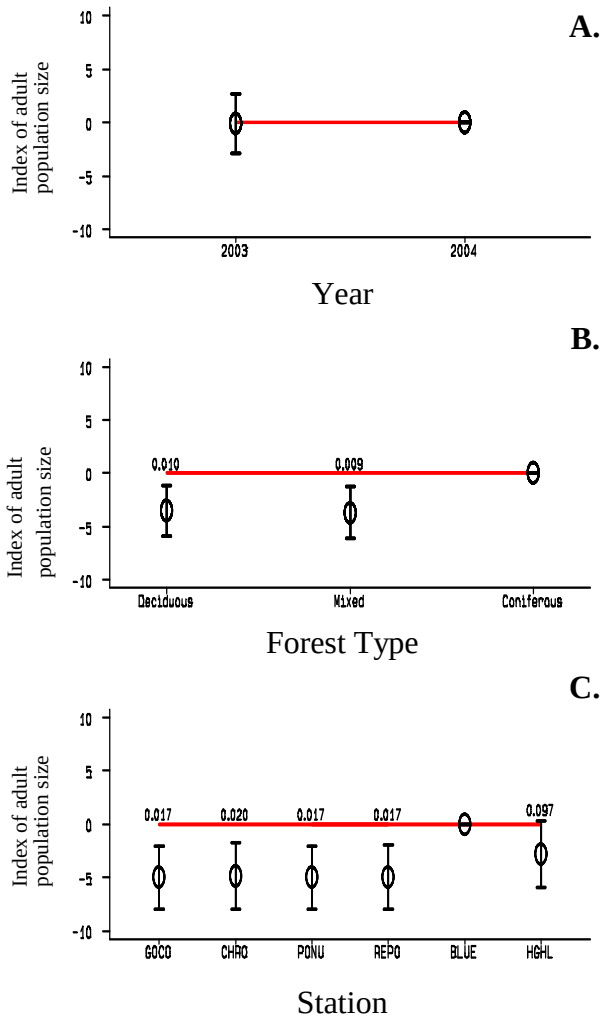

Figure 1. Relative mean numbers of adults with 95% confidence intervals, for **Yellow-bellied Flycatcher**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours), thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A and B or year and station for figure C (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

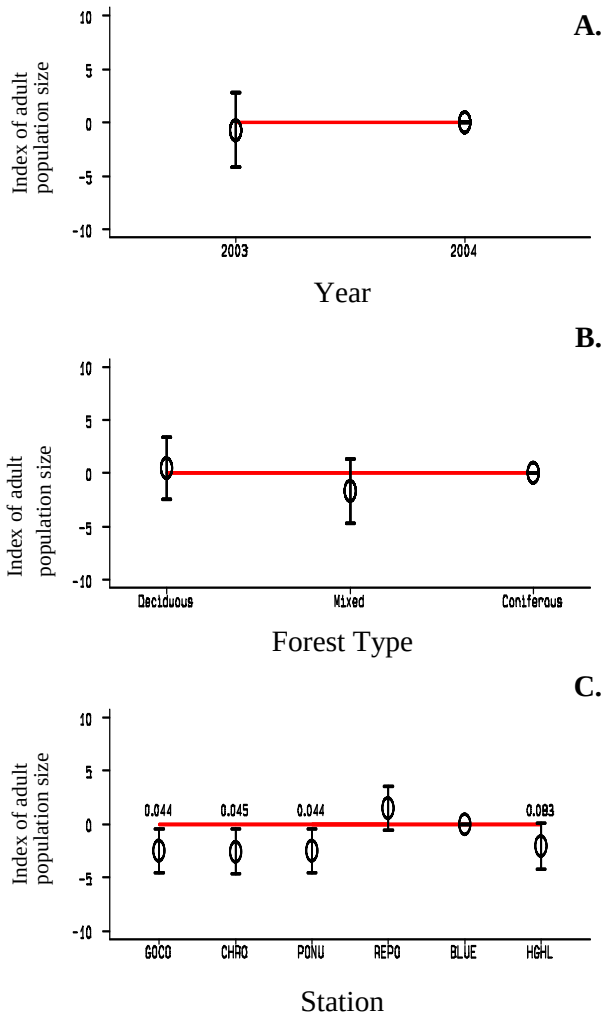

Figure 2. Relative mean numbers of adults with 95% confidence intervals, for **"Traill's" Flycatcher**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours), thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A and B or year and station for figure C (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

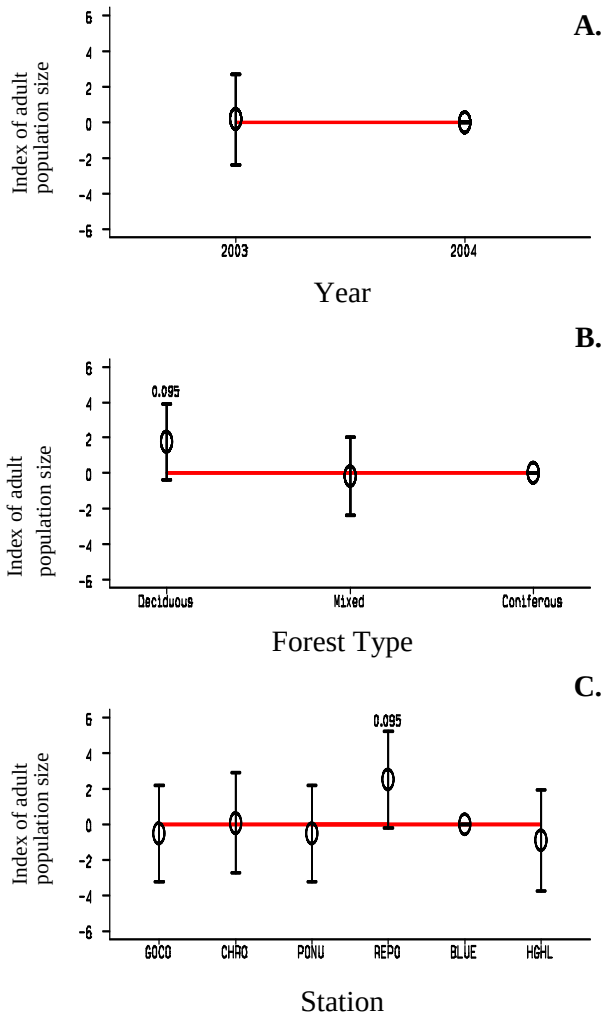

Figure 3. Relative mean numbers of adults with 95% confidence intervals, for **Red-eyed Vireo**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours), thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A and B or year and station for figure C (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

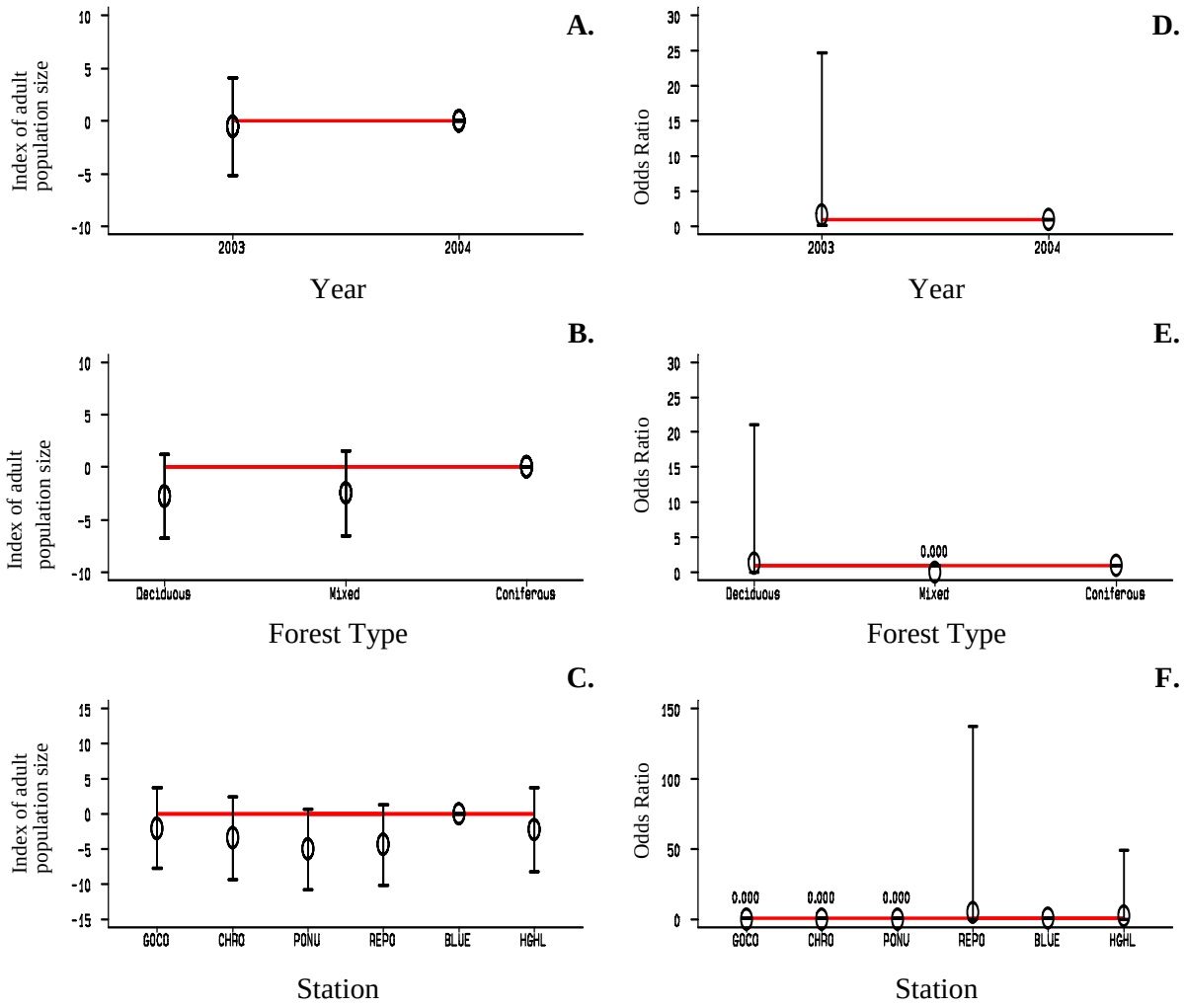

Figure 4. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **Black-capped Chickadee**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

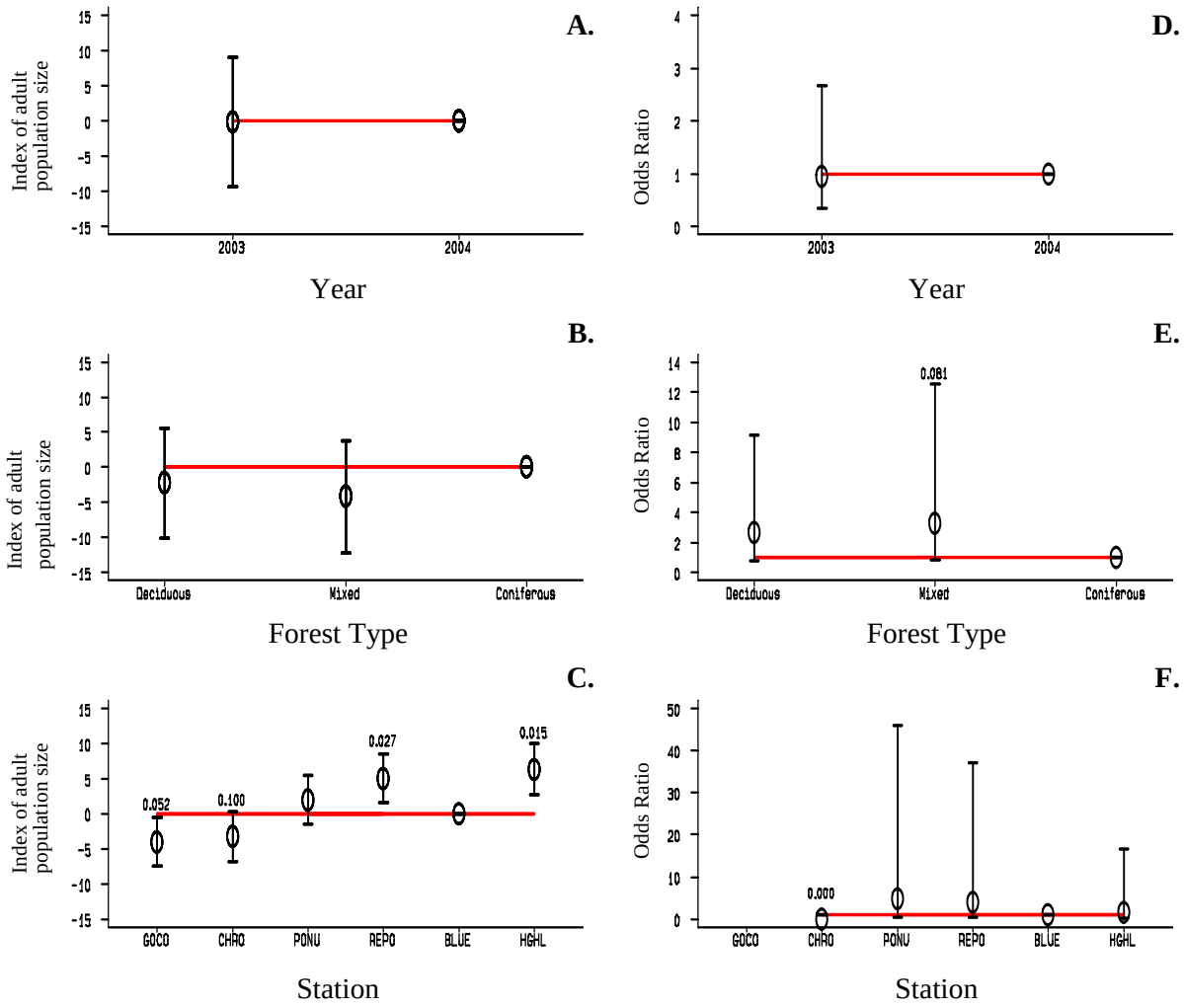

Figure 5. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **Swainson's Thrush**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

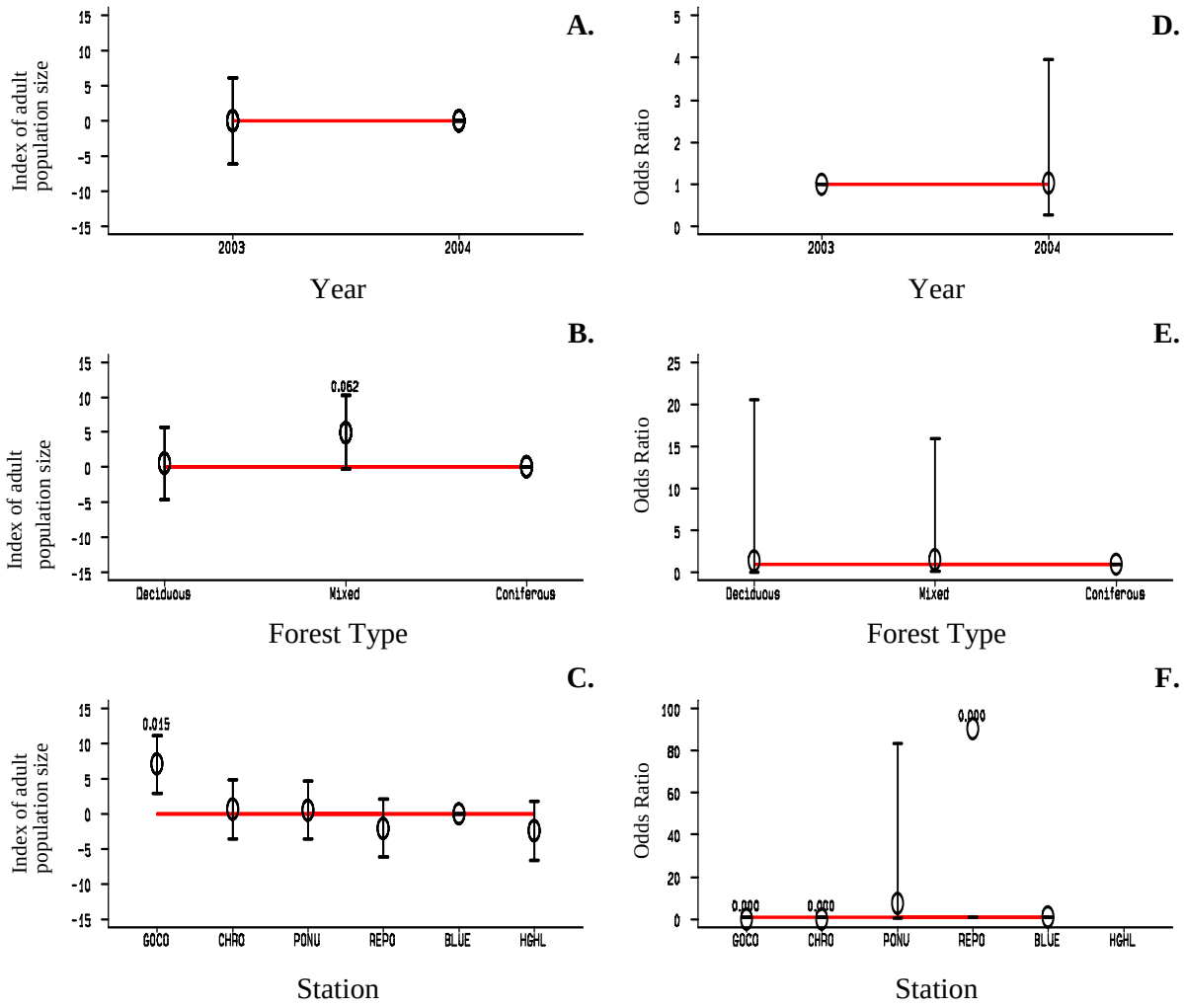

Figure 6. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **Hermit Thrush**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours). The odds ratios for year and habitat were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable, but odds ratios for station were calculated using univariate logistic regression. The variables included were year and habitat for figures A,B,D,E or year and station for figure C and just station for figure F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

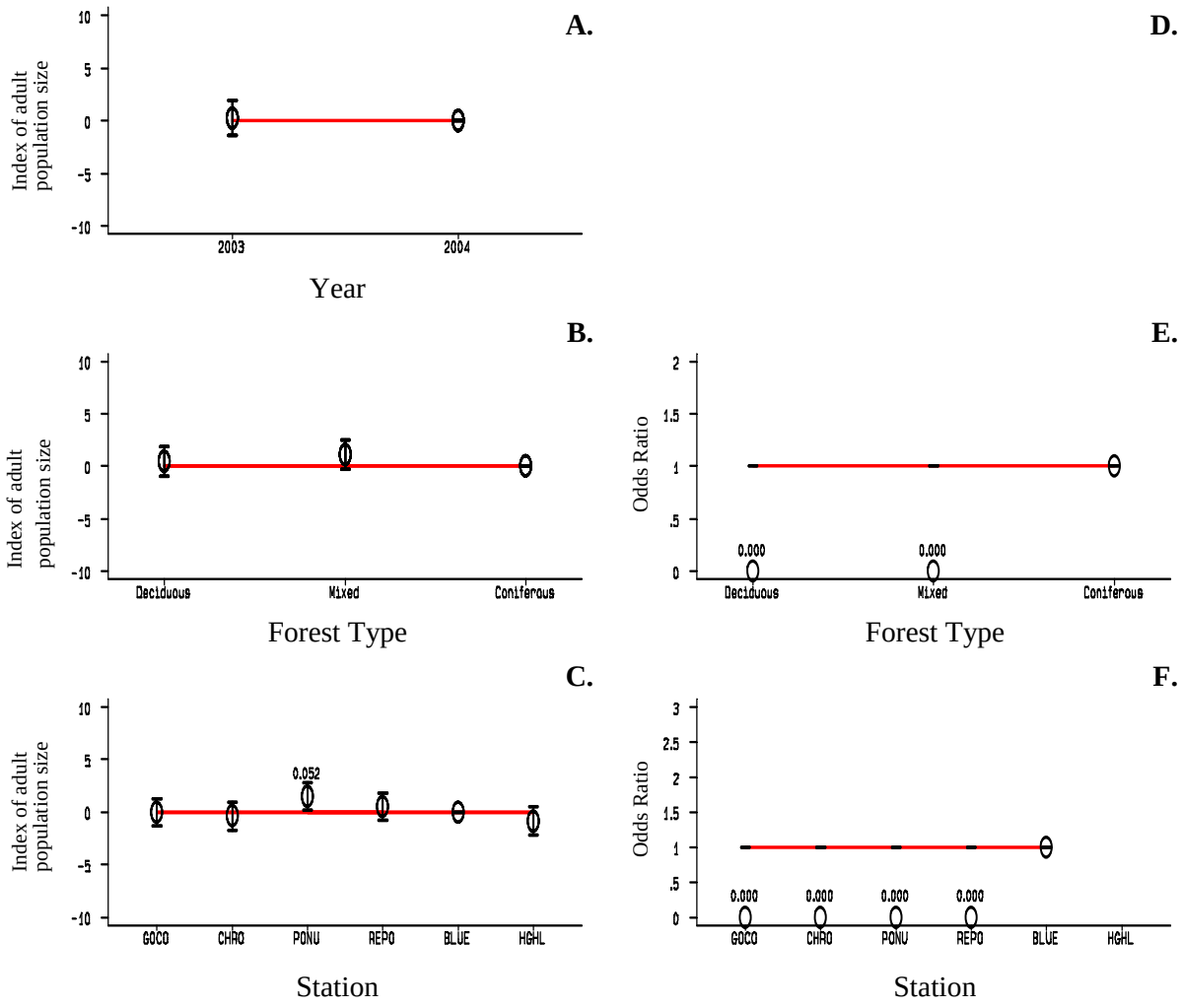

Figure 7. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (E,F), with 95% confidence intervals, for **American Robin**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours), thus controlling for the other variable while calculating the differences in the target variable. The odds ratios for each design variable were estimated using univariate logistic regression on a single design variable. The variables included were year and habitat for figures A and B (habitat only for figure E) or year and station for figure C (station only for figure F - see text) . For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

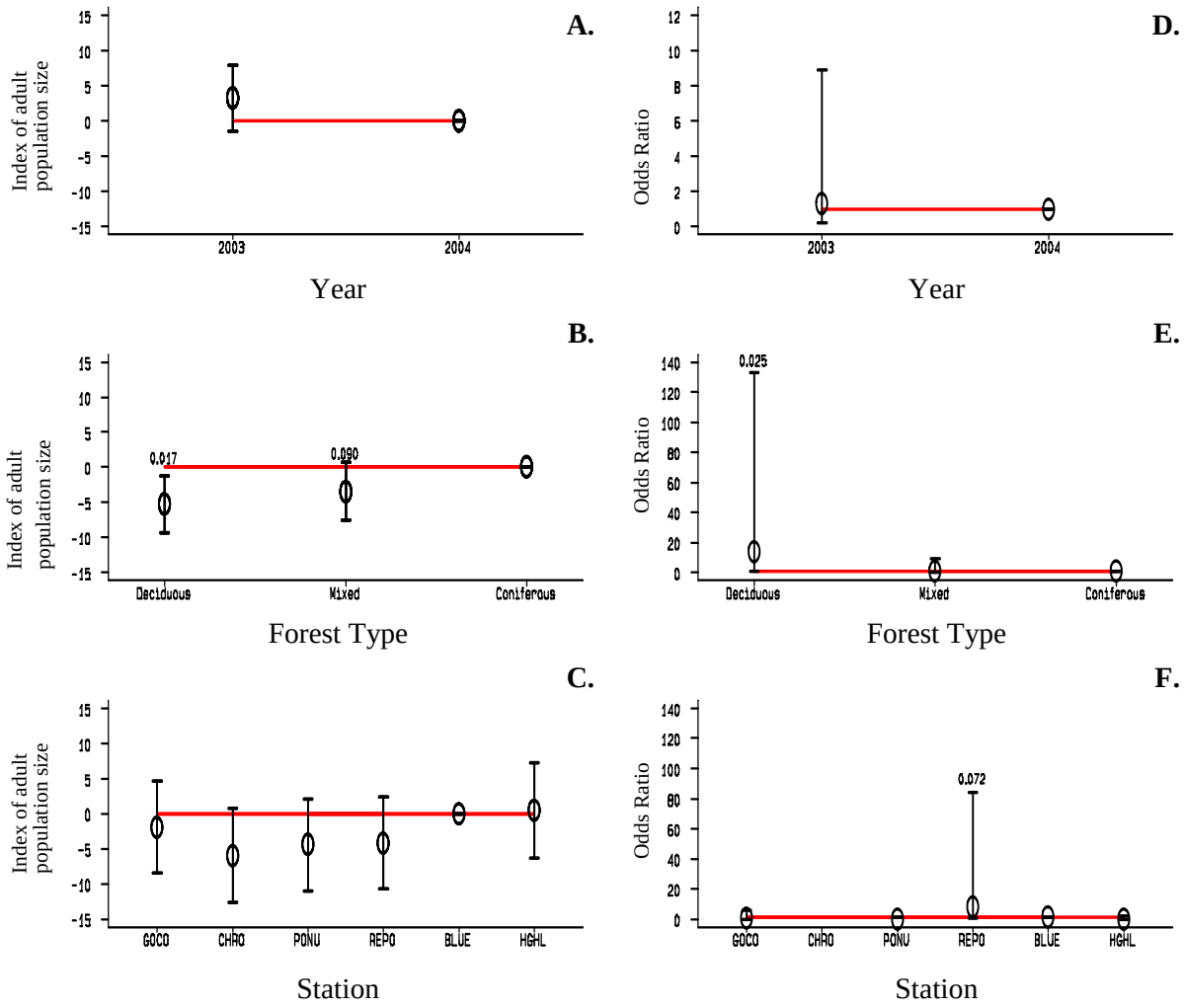

Figure 8. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **Nashville Warbler**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

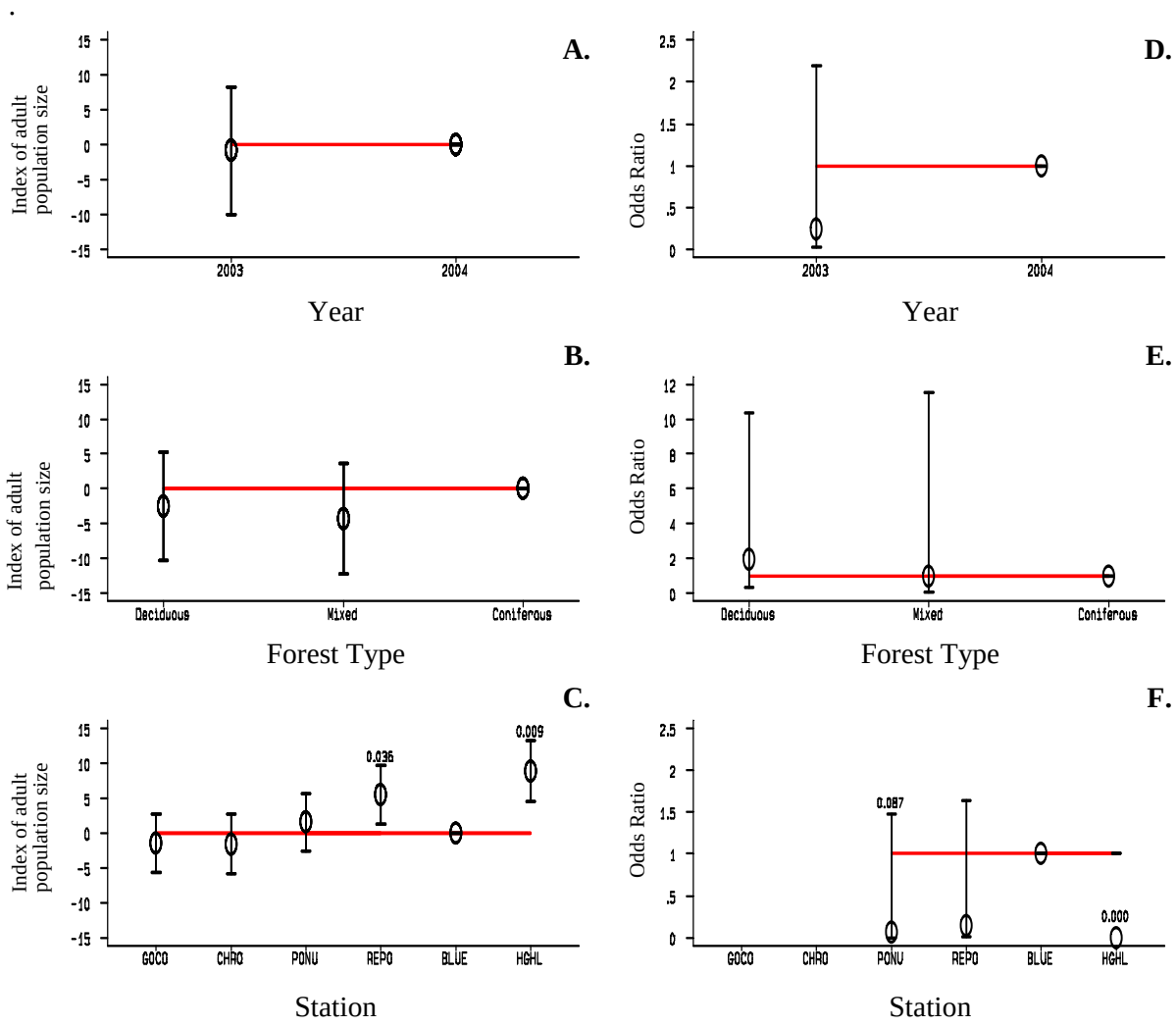

Figure 9. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **Magnolia Warbler**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

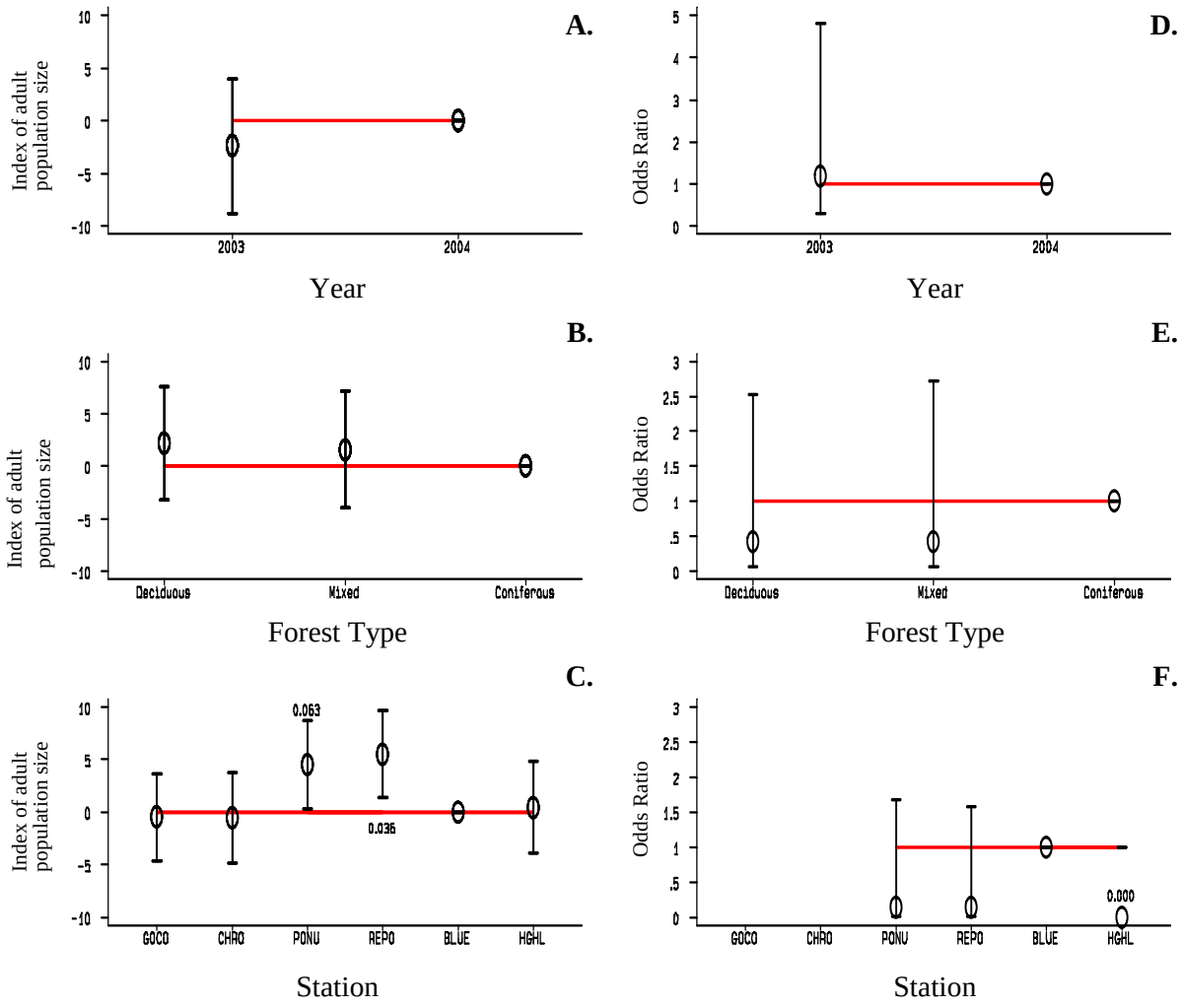

Figure 10. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **Black-throated Blue Warbler**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

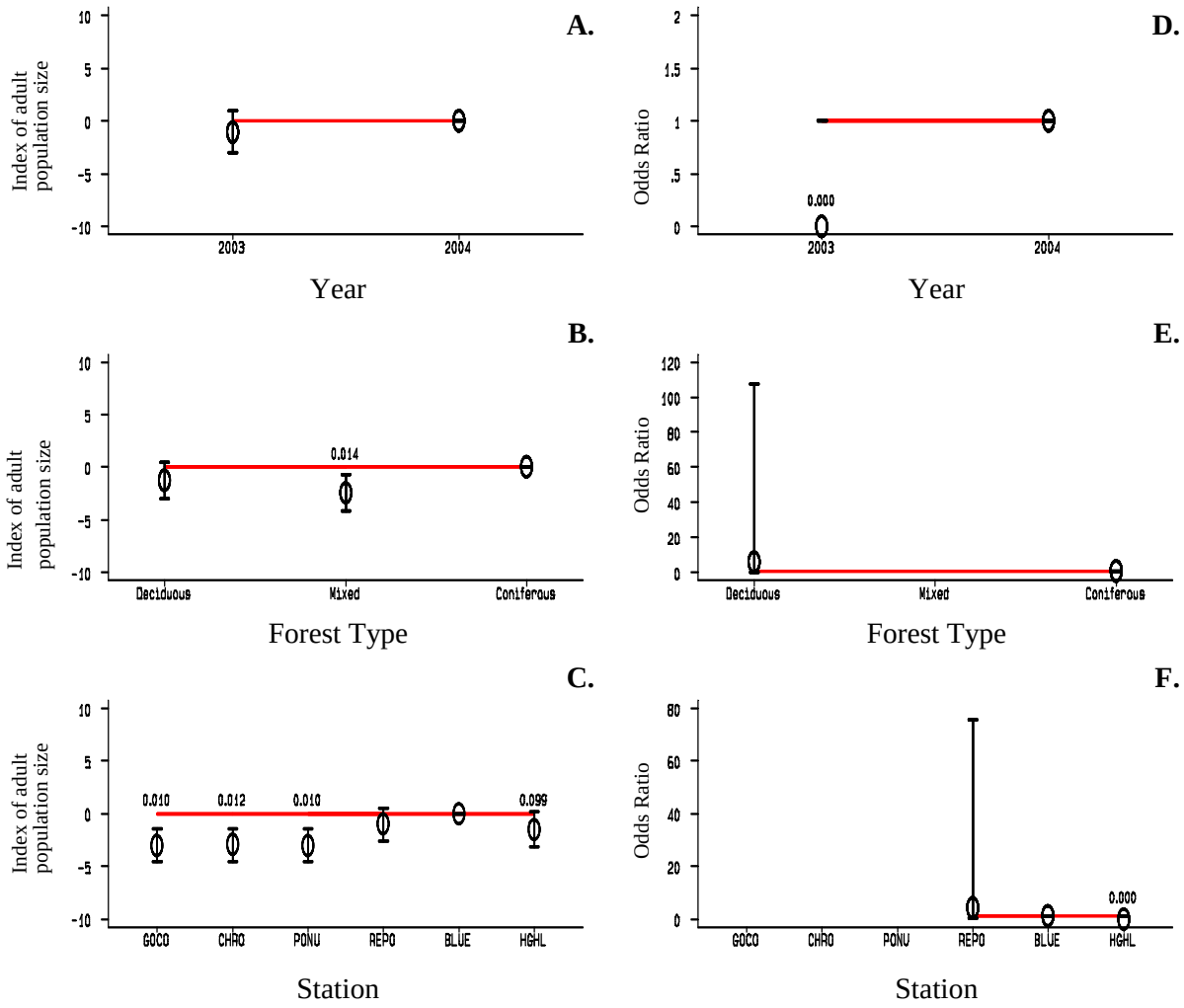

Figure 11. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **Yellow-rumped Warbler**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

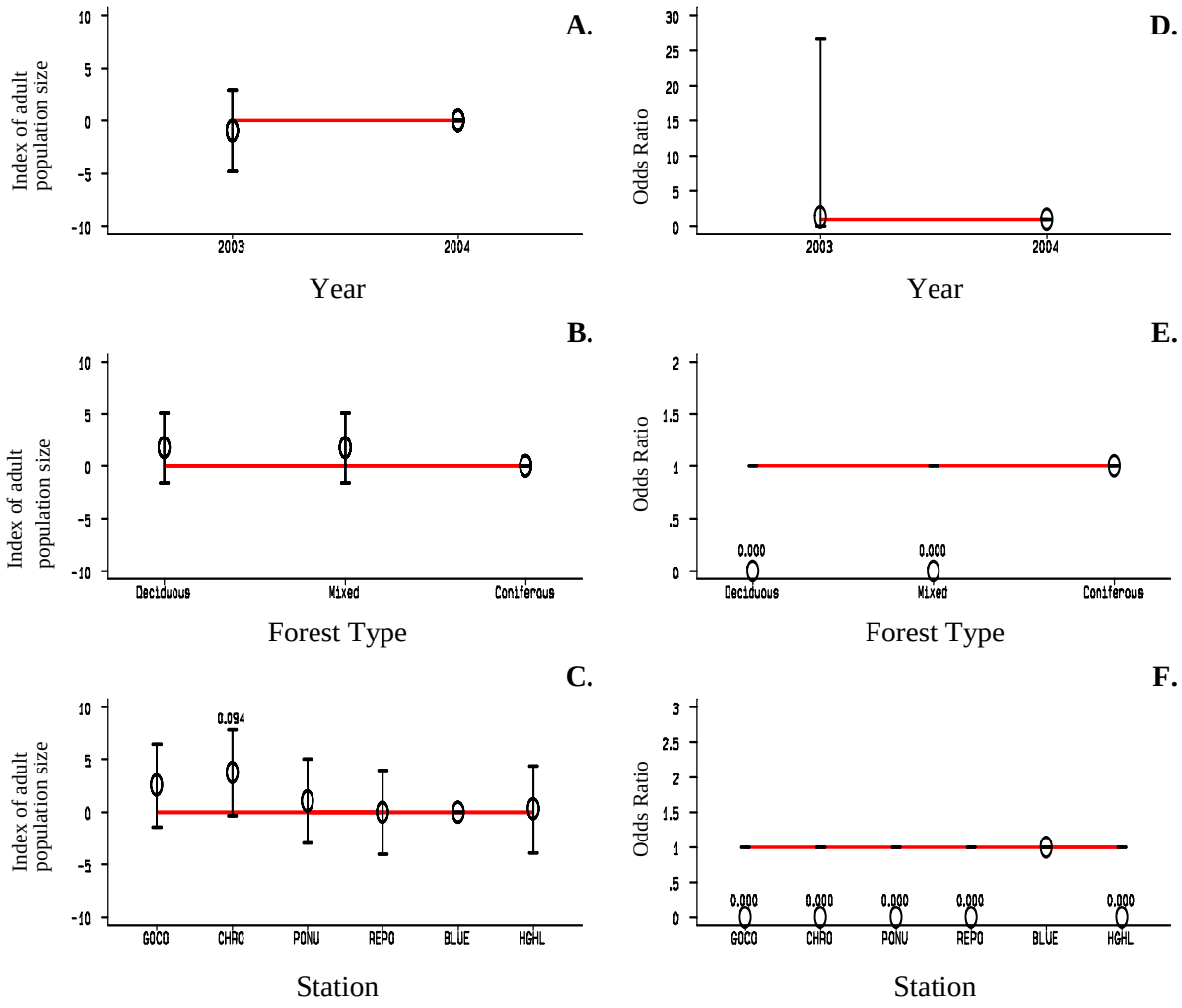

Figure 12. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **Black-throated Green Warbler**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

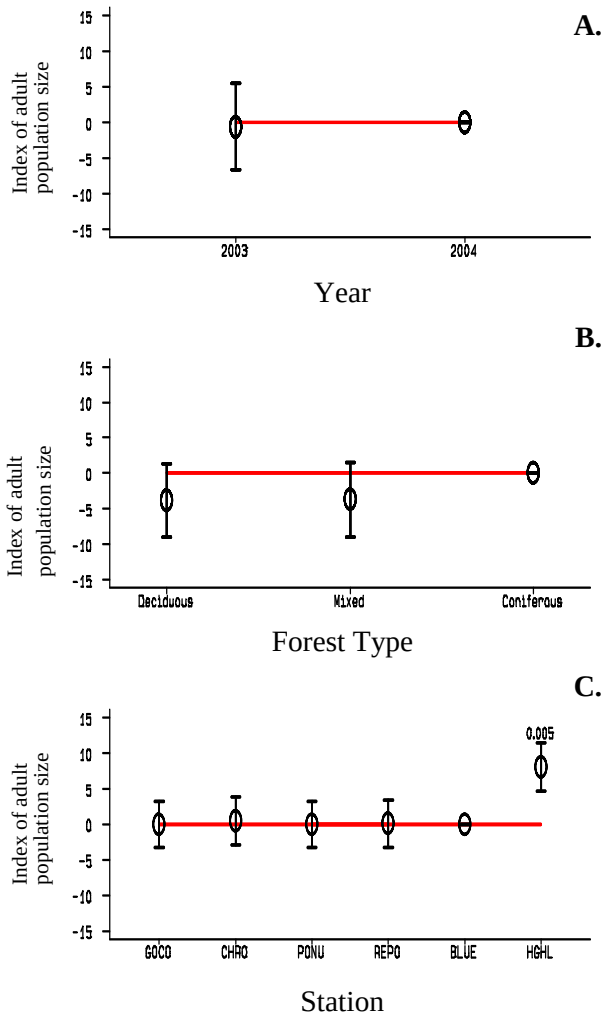

Figure 13. Relative mean numbers of adults with 95% confidence intervals, for **Blackpoll Warbler**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours), thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A and B or year and station for figure C (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

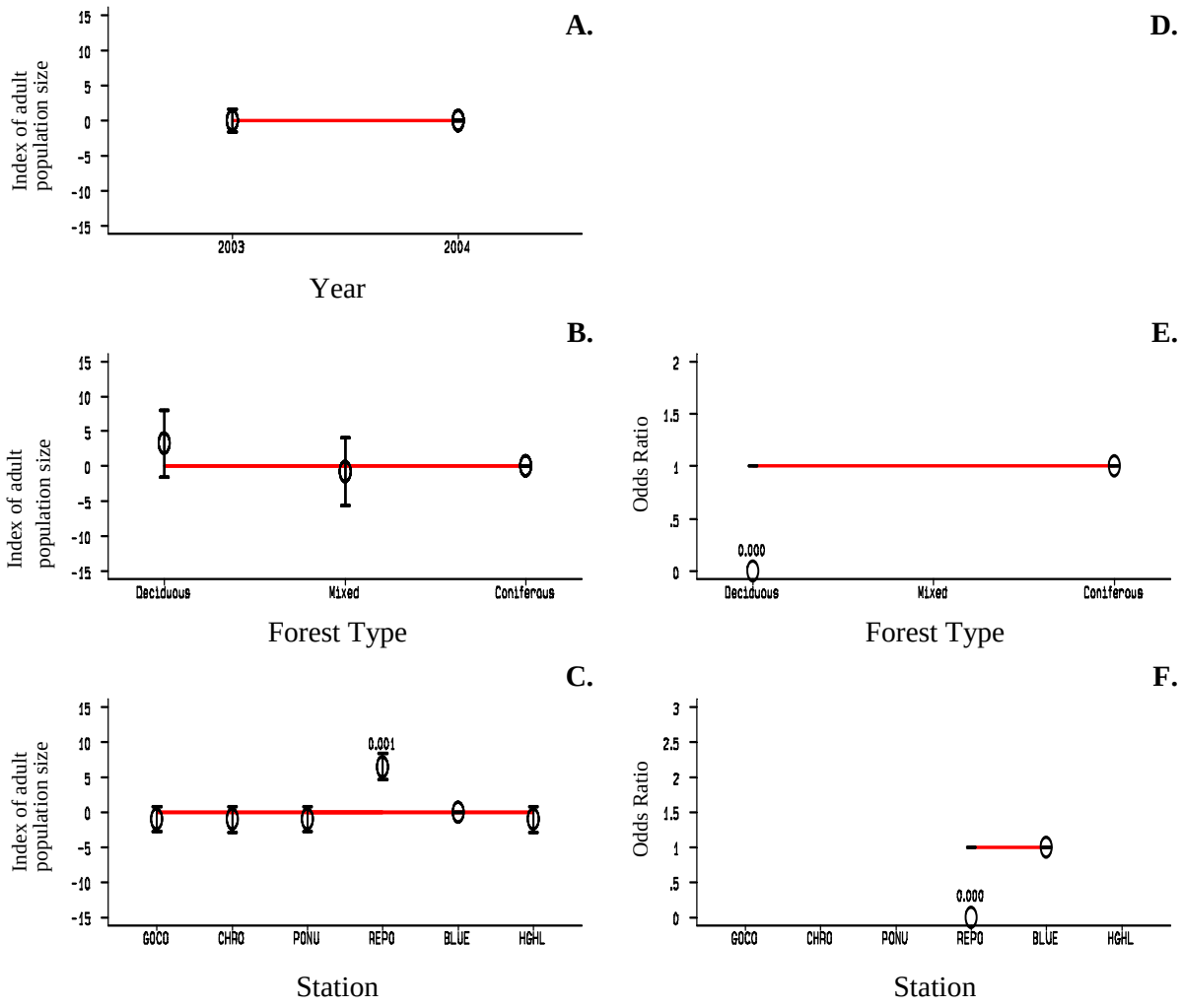

Figure 14. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (E,F), with 95% confidence intervals, for **American Redstart**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours), thus controlling for the other variable while calculating the differences in the target variable. The odds ratios for each design variable were estimated using univariate logistic regression on a single design variable. The variables included were year and habitat for figures A and B (habitat only for figure E) or year and station for figure C (station only for figure F -see text) . For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

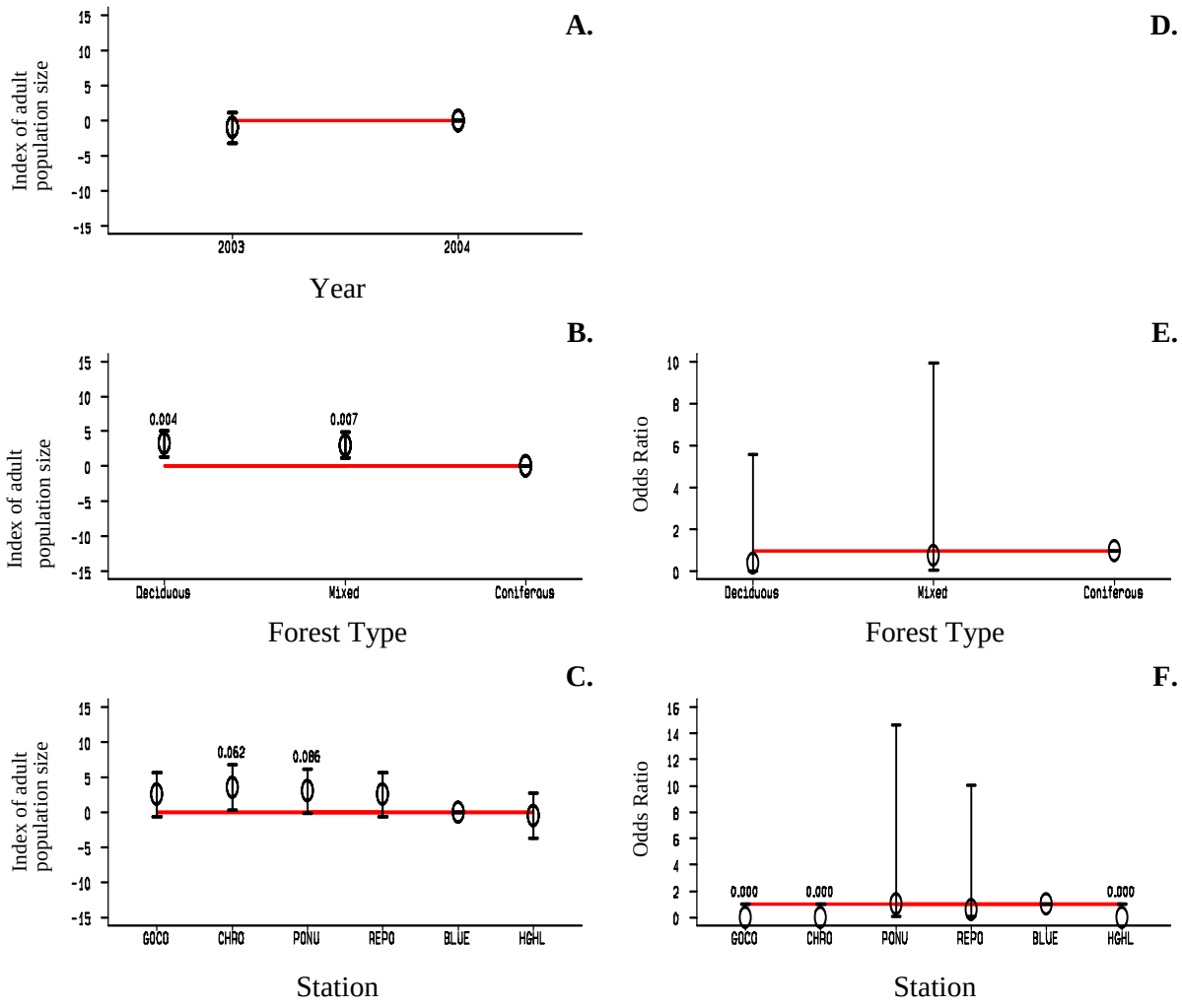

Figure 15. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (E,F), with 95% confidence intervals, for **Ovenbird**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours), thus controlling for the other variable while calculating the differences in the target variable. The odds ratios for each design variable were estimated using univariate logistic regression on a single design variable. The variables included were year and habitat for figures A and B (habitat only for figure E) or year and station for figure C (station only for figure F - see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

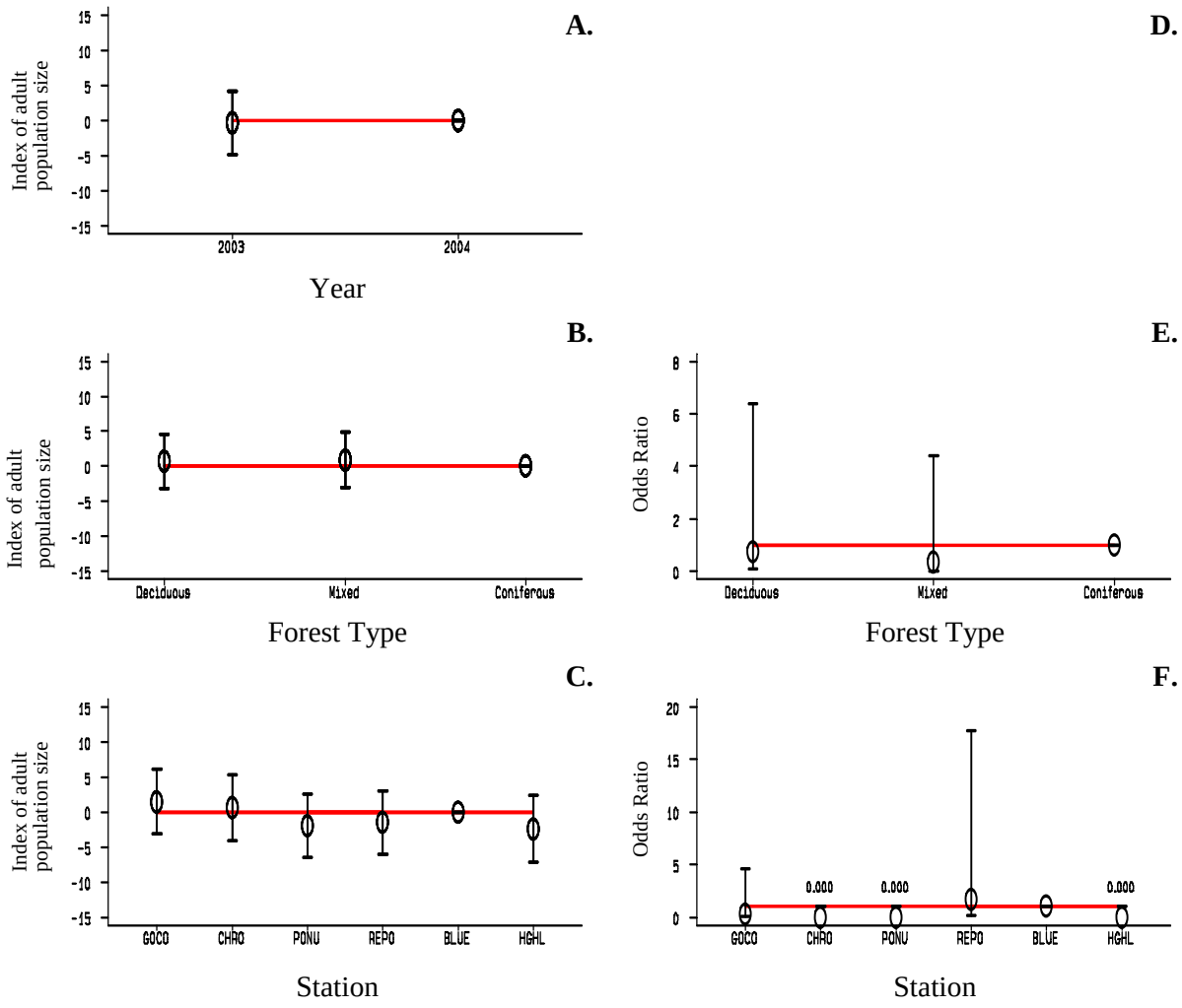

Figure 16. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (E,F), with 95% confidence intervals, for **Common Yellowthroat**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours), thus controlling for the other variable while calculating the differences in the target variable. The odds ratios for each design variable were estimated using univariate logistic regression on a single design variable. The variables included were year and habitat for figures A and B (habitat only for figure E) or year and station for figure C (station only for figure F -see text) . For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

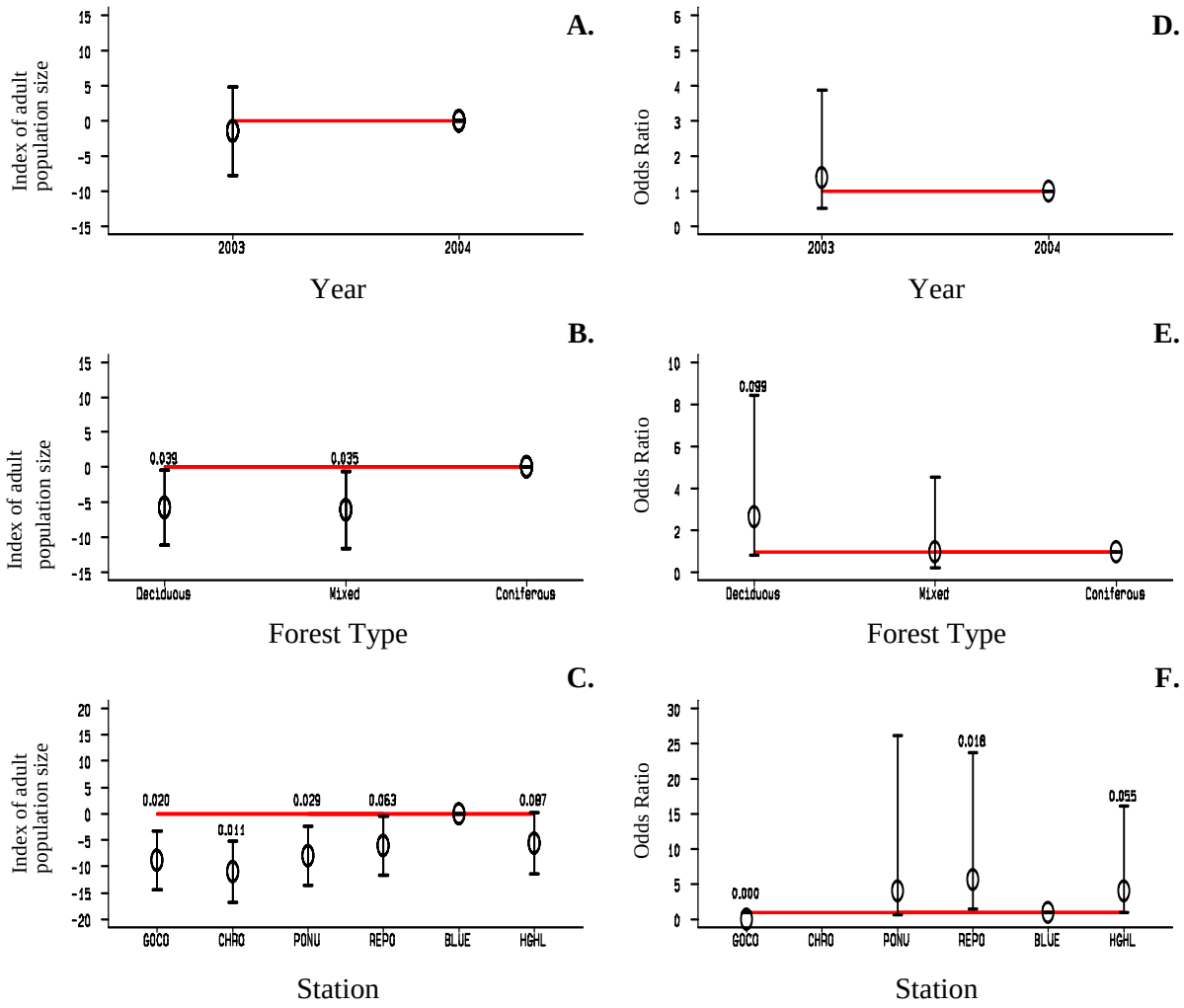

Figure 17. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **White-throated Sparrow**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.

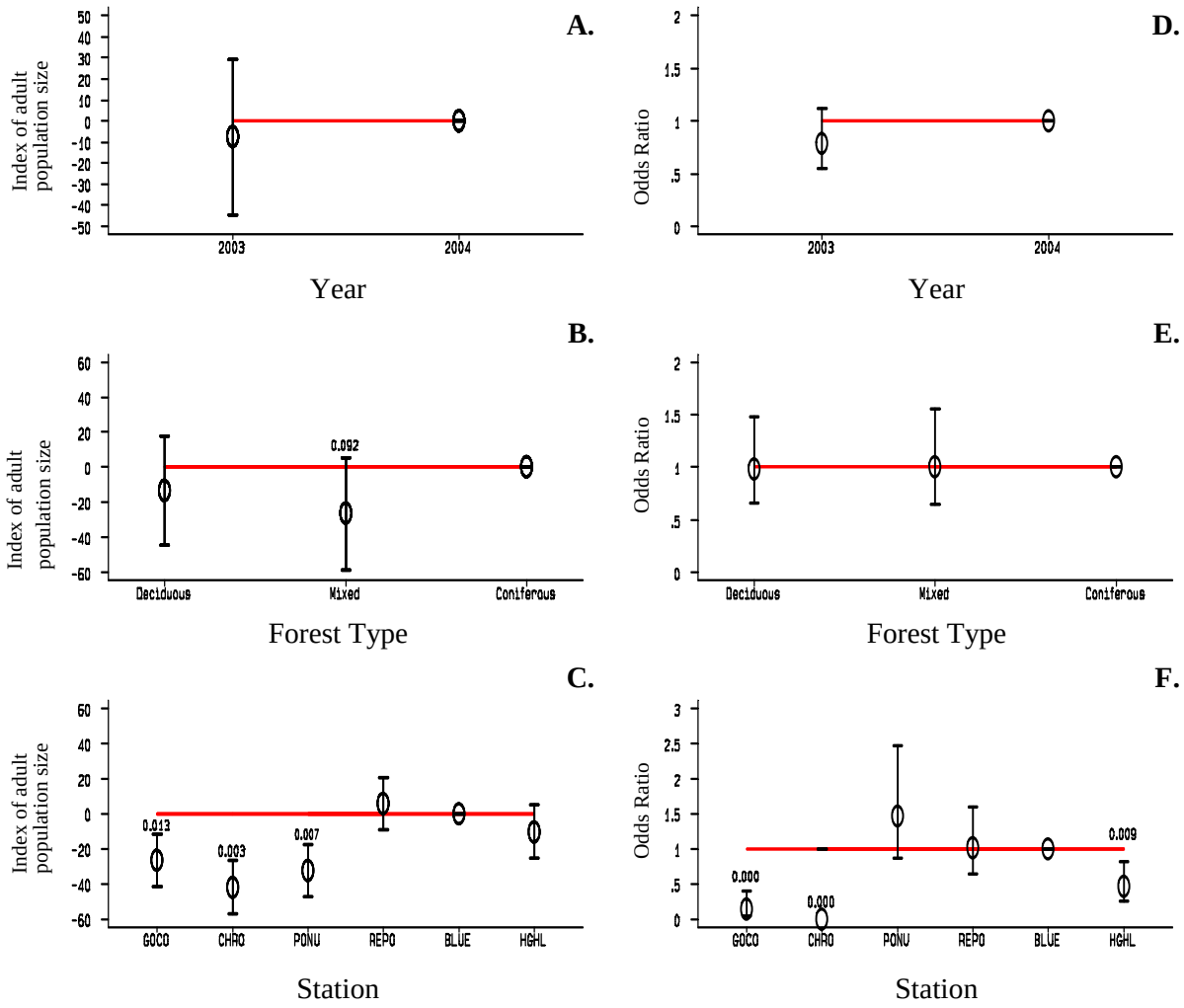

Figure 18. Relative mean numbers of adults (A-C) and odds ratios for productivity indices (D-F), with 95% confidence intervals, for **ALL SPECIES POOLED**, captured at six stations on Naval Air Station Brunswick and Redington Training Facility. Relative mean numbers were estimated using multivariate ANOVA (controlling for the number of net hours) and the odds ratios for each design variable were estimated using multivariate logistic regression, thus controlling for the other variable while calculating the differences in the target variable. The variables included were year and habitat for figures A,B,D,E or year and station for figures C and F (see text). For each variable, the estimates are compared to a reference point (lacking a 95% confidence interval), and the reference point and a reference line are plotted for ease of comparison. GOCO - Golf Course, CHRO - Chinmey Rock, PONU - Potato Nubble, REPO - Redington Pond, BLUE - Blueline Trail, and HGHL - Highland.