THE 2001 ANNUAL REPORT OF THE MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) PROGRAM IN REGION SIX OF THE USDA FOREST SERVICE

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TABLE OF CONTENTS

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 o some 500 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 annual estimates of adult survivorship, recruitment into the adult population, and population growth rate at multiple spatial scales for many 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 syste of national forests provides a group of ideal locations for this large-scale, long-term monitoring, because they provide large areas of breeding habitat for year-round resident and Neotropica 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 national forests, national parks, and military installations. In this vein, it is expected that population and demographic data on the landbirds found in any given national forest will aid research and management efforts on the forest to protect and enhance the forest's avifauna and ecological integrity while allowing it to serve its multi-use purposes.

In this report of the tenth year (2001) of the MAPS program in Forest Service Region 6, we: (1) assess populations of landbirds on six national forests in the Region (Mt. Baker/Snoqualmie, Wenatchee, Umatilla, Willamette, Siuslaw, and Fremont) and for all six forests combined, (2) identify declining landbird species and forests with large numbers of declining species in the Region, (3) identify likely proximate demographic causes (productivity or survival) for those population declines, and (4) suggest additional analyses to be performed during 2003 to identify relationships between the vital rate(s) causing the declines and station-specific and landscape-leve habitat characteristics. Based on those analyses, we plan to identify general managemen guidelines and formulate specific management actions that can begin to be implemented in 2004 to reverse landbird population declines on the national forests in Region 6.

We operated 36 MAPS stations in 2001 (six on each of the six forests in Region 6 mentioned above) at the exact same locations at which they were operated from 1992 to 2000 (33 stations) or 1993 to 2000 (three stations). With very few exceptions, the ten net sites per station were operated for six morning hours per day, on one day per 10-day period, and for seven (or eight on Siuslaw and Willamette national forests) consecutive 10-day periods between May 31 (or May 21 on Siuslaw and Willamette) and August 8 in all ten years, 1992-2001.

Data from 2001 revealed that population sizes rebounded dramatically in 2001, after showing a highly significant decline between 1992 and 2000. This rebound appears to be the result of an equally dramatic increase in productivity noted in 2000. This increase in productivity was

associated with the warm phase of the North Atlantic Oscillation which causes warm dry late winter and early spring conditions in the Pacific Northwest and promotes large outbreaks of defoliating insects, particularly western spruce budworm and Douglas fir tussock moth. MAPS data has shown that productivity of Pacific Northwest landbirds, particularly temperate-wintering species, is strongly and positively correlated with the warm phase of the North Atlantic Oscillation, which was unusually strong in 2000 (Nott et al. 2002).

Despite the encouraging nature of the 2000 increase in productivity and 2001 increase in population sizes, both breeding population sizes and productivity have shown ten-year (1992-2001) declines on Region-Six national forests. Overall, 13 species showed substantial and, in most cases, significant declines in breeding populations, while only seven species showed substantial increases in population size. Similarly, eight species showed substantial declines in productivity, while only two species showed substantial increases in productivity. Population sizes for all species pooled over all forests combined showed a substantial ten-year decline o -1.5% per year (r = -0.524, P = 0.120), indicating that populations of landbirds have declined b over 1%% during the past decade. Productivity for all species pooled over all six forests showed a non-substantial ten-year decline of -0.007 per year (r = -0.318, P = 0.371).

Among the six individual national forests, breeding populations of all species pooled showed ten-year declines at three forests (Umatilla, Willamette, and Siuslaw), stable populations at one fores (Wenatchee), and increases at two forests (Mt. Baker and Fremont). The declines were mos significant at Umatilla where the Annual Percent Change (APC) in populations of all species pooled was = -5.6% (P = 0.002). Productivity of all species pooled showed declines at five o the six forests and was most significant at Willamette (P = 0.020). Only at Umatilla (P = 0.844) did productivity show a slight ten-year increase, which is good news in light of the large population declines noted there. Indeed, increased productivity at Umatilla in 2000 caused a large population increase at Umatilla in 2001 (which caused the ten-year 1992-2001 population trend there to be substantially less negative (APC = - 5.6%, P = 0.002) than the nine-year 1992-2000 trend there (APC = - 7.6%, P = 0.000).

Thus, it appears that the negative population declines observed in the Pacific Northwest were driven primarily by declines in the Oregon coast range, western slope of the Oregon Cascades, and northern Rocky Mountain region of Oregon, whereas declines in productivity appear to have been virtually region wide. The fact that constant-effort changes in productivity during a given between-year comparison ("productivity-population correlation") correlated positively with constant-effort changes in breeding population the following year for 28 of 42 species, that eigh of nine significant or nearly significant productivity-population correlations were positive, and tha this correlation for all species pooled was significantly positive (P = 0.030), indicates that changes in productivity one year often bring about corresponding changes in population size the next year. Thus, we infer that the region wide declines in productivity may be one primary cause for the general declines in breeding populations seen throughout the Pacific Northwest.

In last year's report, we demonstrated that global weather patterns as measured by the El Niño/ Southern Oscillation Index (SOI), can account for some of the declines in productivity observed

within Region-Six national forests. Indeed, Nott et a .*(*2002) showed that productivity of Pacifi Northwest landbirds, particularly Neotropical-wintering species, is positively correlated with the warm phase of the El Niño/Southern Oscillation. Because the strongest El Niño (warm phase) years were early in the past decade and the strongest La Niña years were late in the past decade, we would expect productivity for these species to have decreased over the past decade.

Nevertheless, because a substantial number of species with pronounced negative population trends had positive productivity trends, global climate cycles are not the only, and likely not the major, cause of the avian population declines in the region. For most declining species, however, low overall productivity (regardless of the productivity trend) or low average survival rates (or both), that are unrelated to climate, appear to provide the major cause(s) of the populati declines. We suspect that the ultimate environmental cause for these deficient vital rates, especially low productivity, relates to habitat loss and/or degradation. In order to identify the demographic causes of population decline, it is necessary to determine the magnitudes and patterns of survival rates, as well as productivity indices, and to enquire whether productivity or survival is lower than expected.

We were obtained survivorship estimates for 38 target species in Region-Six national forests, when all locations were combined. $\Delta QAIC_c$ values for survivorship models were relatively high (≥ 6.0) in 28 of these 38 species, indicating that relatively little annual variation in surviva occurred for many species. In order to assess whether or not productivity and survival in a given species were as expected, we regressed both productivity indices and survival estimates agains body mass for 33 target species for which survival was estimated with $CV(\varphi) \leq 30$. For both productivity and survival, the regression lines based on data from the 33 species in Region-Si national forests were very similar to those based on data from 210 species throughout North America as a whole, in both slope and magnitude, indicating similar patterns among the species in Region Six as compared with that of the continent overall. The actual value of the productivity index or survival rate estimate for a given species on a given forest (or over the region as a whole) as compared to its expected value from the regression line, provided an indication as to whether or not productivity or survival for that species might be deficient on that forest (or over the region as a whole). We used this information along with information on the species' productivity trend, productivity-population correlation, and $\Delta QAIC_c$ values (an indication of the amount of annua variation in survival) to identify the probable demographic cause of population change for each species on each forest and over the region as a whole.

Based on all of these demographic data obtained to date on Region-Six national forests, we made assessments as to whether population declines were due to deficient productivity on the breeding grounds, deficient adult survival probably during migration and/or on the winter grounds, both, or neither. We conclude that, for seven of 13 species exhibiting substantial region-wide population declines (Dusky and "Western" flycatchers, Warbling Vireo, Black-throated Gra Warbler, Common Yellowthroat, Chipping Sparrow, and Pine Siskin), deficient (low or decreasing) productivity appeared to be driving or contributing to the negative population trends. We conclude that deficient (low or time-dependent) survival appeared to be driving or contributing to negative population trends for at least four of the 13 species (Red-naped

Sapsucker, House Wren, Ruby-crowned Kinglet, and possibly Lincoln's Sparrow). For the remaining two species with substantial region-wide population declines (Orange-crowned and Townsend's warblers), neither deficient productivity nor deficient adult survival seemed to be driving or contribution to the population declines. This indicates that some other factor (such as low juvenile survival or inadequate immigration rate) may be accounting for the decreases. In future analyses, we hope to address the possibility that the declines in these latter species might be caused by low juvenile survival and/or low recruitment by examining ratios of estimates o recruitment of young to indices of annual productivity to create indices of juvenal survival.

We also examined demographic parameters for the seven species that demonstrated substantia region-wide population increases. We conclude that high productivity alone was driving or contributing to the population increases in three of seven species (Brown Creeper, Varied Thrush, and White-crowned Sparrow), that high adult survival was driving or contributing to the population increases in American Robin, that both high productivity and high adult survival was driving the increases in Mountain Chickadee, and that neither high productivity nor high adult survival was driving the increases in Hammond's Flycatcher and Black-headed Grosbeak (although Hammond's Flycatcher did show a positive productivity-population correlation). Again, we suspect that high juvenile survival and/or immigration may be contributing to the increases in these latter two species.

Among the individual forests, it also appeared that productivity was the driving force behind more population changes than was adult survival. Deficient productivity was implicated in the declines of 13 of the 34 substantially declining species on individual forests, while deficient survival was implicated in only 8 of the 34 forest-species combinations. Similarly, high productivity appeared to be driving population increases in 7 of 15 forest-species combinations, while high survival was driving population increases in only 2 of 15 combinations.

The population declines in landbirds that we have documented on Region Six national forests, especially those that can be shown to be caused by low productivity on the breeding grounds, are potentially within the ability of the U.S. Forest Service to correct. We believe that the mos parsimonious ultimate environmental cause for these avian population declines is loss and/or degradation of appropriate breeding habitat on and adjacent to the forest. We suggest tha additional new analyses of the MAPS data already collected through 2001 can lead to the development of management strategies, based on active habitat manipulation (or lack thereof), that will be effective in reversing these declines. In this regard, we have found that patterns o landscape structure detected within a two- to four-kilometer radius area of each MAPS station are good predictors, not only of the numbers of birds of each species captured, but also and more importantly, of their productivity levels as well (Nott 2000a). This study, based on MAPS data from military installations in eastern United States, revealed the existence of critical threshold values of woodland/forest patch size above which productivity levels could be maximized for four forest-interior species (Acadian Flycatcher, Wood Thrush, Kentucky Warbler, and Hood Warbler). It thus provided an extremely powerful tool to identify and formulate managemen actions aimed at increasing populations of these locally or globally declining species. B coupling station-specific and landscape-level information on habitat characteristics with spatially

explicit weather data and estimates and indices of population trends and vital rates of targe species in a GIS-based framework, we will be able to control for large-scale weather and climate effects and identify the landscape-level habitat characteristics associated with both low and high productivity and low and high survival rates for each target species. Then, using these results, we will be able to identify generalized management guidelines, and formulate specific managemen actions, to reverse the population declines of the target landbird species. By this approach, we aim to develop optimal, multi-use management strategies for reversing population declines and maintaining stable or increasing populations.

We have secured a challenge grant from the National Fish and Wildlife Foundation (federal share provided by the USDA Forest Service) to undertake these analyses using data from Region 6 national forests and other appropriate locations in the Northwestern Region of North America, and to identify generalized management guidelines and formulate specific management actions for altering habitat characteristics from those associated with low productivity (or low survivorship) for the target species to those associated with high productivity (or high survivorship). Our goa is to complete these analyses and the formulation of management guidelines and actions by April 2004.

The final objective for this proposed work will be to implement the generalized managemen guidelines and specific management actions on select districts on select Region 6 national forest beginning in 2004. In order to accomplish this objective, we will work closely with distric foresters and natural resource managers on the Region 6 national forests during the latter part of 2003 and early in 2004 to identify opportunities where the management guidelines and actions we propose can be integrated into existing or new actions designed to manage or harvest fores products or enhance the forest's wildlife or other natural resources. Continued monitoring of the demographic parameters and trends in the populations targeted for management will enable us t track the effectiveness of the guidelines and actions implemented, and to modify them as appropriate. We recommend, therefore, that the operation of the 36 MAPS stations currently active on the Mount Baker/ Snoqualmie, Wenatchee, Umatilla, Willamette, Siuslaw, and Fremont national forests be sustained through 2003, while we complete the analyses to identify and formulate management strategies to reverse the declines. We further suggest that a number o new MAPS stations be established and operated beginning in 2004 in appropriate locations to evaluate the effectiveness of the management strategies actually implemented, that the operation of an equal number of existing stations be discontinued, and that a subset of the current MAPS stations continue to be operated to serve as critical controls for the new treatment stations.

INTRODUCTION

The USDA Forest Service has been charged with responsibility for managing the natural resources on their lands in such a manner that, as much as possible considering the multi-use purposes of these lands, conserves them unimpaired for future generations. The Forest Service has been further charged with responsibility for maintaining the ecological integrity and species diversity of the ecosystems present on those lands. In order to carry out these charges, integrated long-term programs are needed to monitor the natural resources on national forests and the effects of varying management practices on those resources.

The development and implementation of effective long-term biomonitoring programs on the national forests can be of even wider importance than aiding the Forest Service in its managemen of natural resources. Because national forest lands provide large areas of multiple ecosystems subject to varying management practices, studies conducted on those lands can provide invaluable information for understanding natural ecological processes and for evaluating the effects of both local and large-scale, even global, environmental changes. Thus, long-term monitoring data from national forests 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 trophic position on most food webs, may be excellent indicators of the effects of local, regional, and globa 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 Forest Service to receive high priority for monitoring. Nor is it surprising that several large-scale monitoring programs tha provide annual population estimates and long-term population trends for landbirds are already i 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 tha populations of many landbirds, including forest-, scrubland-, and grassland-inhabiting species, appear to be in serious decline (Peterjohn et al. 1995). Indeed, populations of most landbird species appear to be declining on a global basis. Nearctic-Neotropical migratory landbirds (species that breed in North America and winter in Central and South America and the Wes Indies; hereafter, Neotropical migratory birds) constitute one group for which pronounced population declines have been documented (Robbins et al. 1989, Terborgh 1989). In response t 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 USDA Forest Service has defined its role in the program to include the establishment of long-term avian monitoring programs on national forest

lands using protocols developed by the Monitoring Working Group of PIF. Clearly, the long-term avian monitoring goals of the Forest Service 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 critica 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 shor 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 i 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 o recruitment from a wider area (DeSante 1990). A successful monitoring program should be able to account for these factors.

The MAPS Program

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 ver 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 b 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. A peer review of the Program and evaluation of the pilot project were completed by a panel assembled by USGS/BRD, which concluded that: (1) MAPS is technically sound and is based on the best available biological and statistical methods; (2) it complement other landbird monitoring programs such as the BBS by providing useful information on landbird demographics that is not available elsewhere; and (3) it is the most important project in the nongame bird monitoring arena since the creation of the BBS (Geissler 1996).

Now in its thirteenth year (tenth year of standardized protocol and extensive distribution o stations), the MAPS program has expanded greatly from 178 stations in 1992 to about stations in 2001. 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 USDA Forest Service, National Park Service, Department of Defense, Department of the Navy, Texas Army National Guard, and US Fish and Wildlife Service. Within the past ten years, for example, IBP has been contracted to operate over 150 MAPS stations on federal lands, including six stations on each of six national forests in Forest Service Region 6 and one forest in Region 1.

Goals and Objectives of MAPS

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

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

  (A) annual indices of adult population size and post-fledging productivity from data on the numbers and proportions of young and adult birds captured; and
  (B) annual estimates of adult population size, adult survival rates, proportions of residents, recruitment into the adult population, and population growth rates from modified Cormack-Jolly-Seber (CJS) analyses of mark-recapture data on adult birds.

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

  (1) temporal and spatial patterns in these demographic indices and estimates at a variety o spatial scales ranging from the local landscape to the entire continent; and
  (2) relationships between these patterns and ecological characteristics of the target species, population trends of the target species, station-specific and landscape-level habita 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-ter 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 national forest lands, along with national parks, DoD military installations, 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 national forests, national parks, or military installations) to aid research and management efforts within the forests, parks, or installations 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.

The USDA Forest Service Region 6 MAPS Program

Both of the long-term objectives of MAPS, as described above, were found to be in agreement with objectives of the Forest Service's PIF program and with the Forest Service's own avian monitoring efforts. Accordingly, the MAPS Program was established in Region 6 in 1992, with six stations being established in each of six national forests (Mt. Baker/Snoqualmie, Wenatchee, Umatilla, Willamette, Siuslaw, and Fremont). Within each forest, an effort was made to establish two or three stations in more heavily managed landscapes in a major forest type that is of high management importance on the forest, two or three stations in less heavily managed landscapes o the same forest type, and perhaps one or two additional stations in other forest types of less management importance but of high or unique importance to landbird populations. In some cases, stations were established (at least in part) along a habitat gradient in the forest. The overall goal of the initial establishment of the MAPS program in Region 6 was to provide high quality information on the demographics of landbirds on the forests that could be used to aid research and management efforts on national forests in the Region to protect and enhance the forests' avifauna and ecological integrity, while allowing them to fulfill their multi-use purposes.

Three major objectives were articulated to achieve this goal. The first was to assure the continued operation of all 36 stations for at least 10 years, 1992-2001. With the completion of data collection during the summer of 2001 and the submission of this report, that first objective was accomplished. The second objective is to provide for a comprehensive analysis of the ten years of demographic data (plus data obtained during the summers of 2002 and 2003) as a function of station-specific and landscape-level habitat characteristics and spatially explicit weather data. Important analytical techniques have been developed and evaluated to accomplish these latter analyses, and funding has been secured through a challenge grant from the Nationa

Fish and Wildlife Foundation (federal share supplied by the USDA Forest Service) to achieve this second objective. Completing these analyses during 2003 and early 2004 is now an immediate objective. The third objective is to use the relationships between demographic parameters and landscape-level habitat characteristics developed through the second objective to identify genera management guidelines and formulate specific management actions to reverse population declines and maintain stable or increasing populations of landbirds. Our goal is to begin implementing these management strategies on Region 6 forests in 2004.

The 2001 Report

In this report we summarize results of the MAPS program at 36 stations on six national forests in Region 6 from 1992 through the summer of 2001. We present indices of adult population size and productivity and time-constant estimates of survivorship for target species on each individual forest, and identify multi-year trends in adult population sizes and productivity. We also presen these data for the region as a whole (based on all 36 stations pooled) and integrate these findings with data on body mass for select target species. The ultimate goal of this report is to identify declining landbird species (or habitats with large numbers of declining species) in Forest Service Region 6, to identify probable proximate, demographic causes (productivity or survival) for these population declines, and to suggest future analyses to confirm these causes. Finally, based on these data we present a plan that we believe will lead to the identification and formulation of management actions and conservation strategies to reverse landbird population declines in the Pacific Northwest.

METHODS

Thirty-six 20-ha MAPS stations were re-established in 2001 on Region 6 national forests (six on each of six national forests: Mt. Baker/Snoqualmie, Wenatchee, Umatilla, Willamette, Siuslaw, and Fremont) at the exact same locations at which they were originally established in 1992 (33 stations) or 1993 (3 stations). Through the efforts of twelve (two at each forest) intensively trained field biologist interns of The Institute for Bird Populations (mentioned by name in the Acknowledgments) who were supervised by Institute field biologists Pilar Velez and Neil Chartier, these banding stations were operated in accordance with the highly standardized banding protocols developed by The Institute for the MAPS Program throughout North America.

On each day of operation each year, one 12-m long, 30-mm mesh, 4-tier nylon mist net was erected at each of ten fixed mist-netting sites within the interior eight ha of each station. These ten nets at each station were operated for six morning hours per day (beginning at local sunrise), and for one day in each of eight (on Siuslaw and Willamette national forests) or seven (on the other four forests) consecutive 10-day periods between May 21 (Siuslaw and Willamette) or May 31 (other forests) and August 8. With very few exceptions, the operation of all stations occurred on schedule in each of the ten-day periods.

The operation of each of the 36 stations during 2001 and during each of the preceding eight years followed MAPS protocol, as established for use by the MAPS Program throughout North America and spelled out in the MAPS Manual (DeSante et al. 2001). 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. Such situations involved exceptionally large numbers o birds being captured at once, or the sudden onset of adverse weather conditions such as high winds or sudden rainfall. The following data were taken on all birds captured, including recaptures, according to MAPS guidelines using standardized codes and forms:

(1) capture code (newly banded, recaptured, band changed, unbanded);
(2) band number;
(3) species;
(4) age and how aged;
(5) sex (if possible) and how sexed (if applicable);
(6) extent of skull pneumaticization;
(7) breeding condition of adults (i.e., presence or absence of a cloacal protuberance or brood patch);
(8) extent of juvenal plumage in young birds;
(9) extent of body and flight-feather molt
(10) extent of primary-feather wear;

(11) wing chord;
(12) fat class and weight;
(13) date and time of capture (net-run time); and
(14) station and net site where captured.

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

For each of the 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; when suitable maps from previous years were available, these were used. The pattern and extent of cover of each major habitat type identified at each station, as we 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 o twelve pattern types and eleven cover categories according to guidelines spelled out in the MAPS Habitat Structure Assessment Protocol, developed by IBP Landscape Ecologist, M. Philip Nott, and the IBP staff (Nott 2001a).

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 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 a 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), and extent of body and flight-feather molt, primary-feather wear, and juvena plumage;
(4) Screening programs which allow identification of unusual or duplicate band numbers or unusual band sizes for each species; and
(5) Verification programs to screen banding and recapture data from all years of operation for inconsistent species, age, or sex determinations for each band number.

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

Data Analysis

To facilitate analyses, we first classified the landbird species captured in mist nets into five groups based upon their breeding (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 stati *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 stati *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 hal 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. All data for a given species from a given station were included in forest-specific year-2001 productivity analyses for the species (e.g., Tables 3 and 4 and analogous tables throughou the report) unless the species was classified as a migrant (M) at the station. For forest-specific productivity analyses involving temporal comparisons of data and for all survivorship analyses (Tables 5-8, 13-16, 21-24, 29-32, 37-40, and 45-48 and Figs. 1-18), as well as for all analyses that included data pooled over all forests (Table 49-52 and Figs. 19-22), data for a given species from a given station were included only if the species was classified as a regular (B) or usual (U) breeder at the station. Thus, data from a station for a species classified as a migrant (M) at the station were not included in any analyses.

A. Population-size and productivity analyses — The proofed, verified, and corrected banding data from 2001 were run through a series of analysis programs that calculated for each species and for all species pooled at each station and for all stations pooled on each forest:

(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 2001) for individual adult and young birds; and
(3) the proportion of young in the catch.

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

For each of the six stations on each forest and for all stations pooled, we calculated percen changes between 2000 and 2001 in the numbers of adult and young birds captured and absolute changes in post-fledging productivity (Peach et al. 1996). These year-to-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.

B. Analyses of trends in adult population size and productivity — For each of the six nationa forests and for all forests combined, we examined ten-year (1992-2001) trends in indices of adult population size and productivity for species for which we recorded an average of six or more adult captures per year at all stations pooled. For trends in adult population size, we firs calculated adult population indices for each species for each of the ten years based on an arbitrar starting index of 1.0 in 1992 Constant-effort changes (as defined above) were used to calculate these "chain" indices in each subsequent year by multiplying the proportional change (percen change divided by 100) between the two years times the index of the previous year and adding that figure to the index of the previous year, or simply:

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

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

(actual 1992 value o *PSI* / predicted 1992 value o *PSI* based on the regression) * *PT*.

We present the *APC*, the standard error of the slope (*SE*), the correlation coefficient (*r),* and the significance of the correlation (*P*) to describe each trend. Again, we use an alpha level of 0.05 for statistical significance. For purposes of discussion, however, we use the terms "nearly significant" or "near-significant" for trends for which $0.05 \leq P < 0.10$. Species for which $r > 0.5$ are considered to have a substantially increasing trend; those for which $r < -0.5$ are considered to have a substantially decreasing trend; those for which $-0.5 \leq r \leq 0.5$ and $SE \leq 0.035$ (for ten-year trends) are considered to have a stable trend; and those for which $-0.5 \leq r \leq 0.5$ and $SE > 0.035$ (for ten-year trends) are considered to have widely fluctuating values but no substantial trend.

Trends in productivity, *PrT*, were calculated in an analogous manner by starting with actua productivity values in 1992 and calculating each successive year's value based on the actua constant-effort changes in productivity between each pair of consecutive years. For trends in productivity, the slope (*PrT*) and its standard error (*SE*) are presented, along with the correlation coefficient (*r),* and the significance of the correlation (*P*). Productivity trends are characterized in a manner analogous to that for population trends, except that productivity trends are considered to be highly fluctuating if the SE of the slope > 0.020 (for ten-year productivity trends).

C. Survivorship analyses — Modified Cormack-Jolly-Seber (CJS) mark-recapture analyses (Pollock et al.1990, Lebreton et al.1992) were conducted on select target species for each fores and for all forests combined using ten years (1992-2001) of capture histories of adult birds. Target species were those for which, on average, at least seven individual adults per year were recorded from all stations pooled at which the species was a regular (B) or ususal (U) breeder. Using the computer program SURVIV (White 1983), we calculated, for each target species, maximum-likelihood estimates and standard errors (*SE*s) for adult survival probability (φ), adult recapture probability (p), and the proportion of residents among newly captured adults (τ) using both a between-year and within-year transient model (Pradel et al. 1997, Nott and DeSante 2002). Because of the existence of floaters, failed breeders, and dispersing adults, transient models, which calculate the proportion of residents in the population, produce less biased estimates o adult survivorship than do non-transient models, provided there are sufficient data (four years or more) to estimate a proportion of residents. Thus, we only present the results of transient models. The use of the transient model ($\varphi p\tau$) provides an estimate of the proportion of transient adults (dispersing and floater individuals which are only captured once) in the sample of newly captured birds, and provides survival estimates that are unbiased with respect to these transient individuals (Pradel et al. 1997). Recapture probability is defined as the conditional probability of recapturing a bird in a subsequent year that was banded in a previous year, given that it survived and returned to the place it was originally banded.

We did not examine spatial variability in survival rates among individual stations, as data from single stations are generally insufficient to provide precise survival estimates. We limited our consideration to models that produced estimates for both survival and recapture probability that were neither 0 nor 1.

The ten years of data available for analysis allowed us to consider all possible combinations o both time-constant and time-dependent models (variability as a function of year) for each of the three parameters estimated, thus, for a total of eight models. The goodness of fit of the models was tested by using a Pearson's goodness-of-fit test. Of those models that fit the data, the one tha produced the lowest Akaike Information Criterion ($QAIC_C$, which corrects for overdispersion of data and is used with smaller sample sizes relative to the number of parameters examined) was chosen as the optimal model; models with QA_C's within 2.0 $QAIC_C$ units of each other were considered effectively equivalent. The $QAIC_C$ was calculated by multiplying the log-likelihood for the given model by -2, adding two times the number of estimable parameters in the model, and providing corrections for overdispersed data and small sample sizes.

To assess the degree of interannual variation in survival for each species we calculated $\Delta QAIC_C$ as the difference between the $QAIC_C$ value for the completely time-constant model ($\varphi p\tau$) and tha for the model with time-dependent survival but time-constant recapture probability and proportion of residents ($\varphi_t p\tau$). Thus, $\Delta QAIC_C$ was calculated as $QAIC_C(\varphi_t p\tau)$-$QAIC_C(\varphi p\tau)$, with lower (or more negative) $\Delta QAIC_C$ values indicating greater interannual variation in survival. Although we calculated time-dependent survival estimates for all target species on each forest, we only presen annual adult survival probabilities from the time-constant model ($\varphi p\tau$) and from all equivalent models as determined by $QAIC_C$.

D. Analysis of productivity indices and survival estimates as a function of body mass — In birds, both productivity and survival vary with body mass; on average, the larger the bird the lower the annual productivity and the higher the annual survival. Thus, in order to assess whether or no productivity or survival in a given species may be higher or lower than expected, body mass needs to be accounted for. We thus regressed mean productivity indices and time-constant annua survival rate estimates on body mass (log transformed to normalize the values) for all target species within the region, and compared the productivity and survival rates for individual species with the regression lines produced by these fits. We used the log of mean body mass values given by Dunning (1993). In this way we attempted to assess whether productivity and survival for each target species on each of the six Region 6 national forests was as expected, lower than expected, or higher than expected, based on its body mass.

Finally, based on all of the above demographic data, we made assessments as to whether the observed population declines and population increases on each of the six national forest appeared to be caused by poor productivity on the breeding grounds, poor survival probably during migration and/or on the winter grounds, both, or neither. For each national forest, we list both declining and increasing species along with assessments as to whether productivity and/or surviva has been deficient during the period of operation. Assessments for each species were based on a synthesis of actual productivity indices, productivity trends, actual survival values, $\Delta QAIC_C$ values, and values of productivity and survival in relation to body mass during the ten years of data collection.

E. Additional regional-level analyses — We conducted population trend, productivity trend, and survival analyses for each forest individually. We conducted these same analyses at the regiona scale using data from all six forests combined. We also completed one additional analyses at the regional scale, using data pooled from all 36 stations, to evaluate the extent to which productivity in a given year has had a direct effect on breeding population size the following year. To do this, we regressed constant-effort changes in adult captures during one between-year comparison (Δadults(t_{i+2}-t_{i+1})) on changes in productivity during the preceding between-year comparison (Δproductivity(t_{i+1}-t_i)) for each target species and for all species pooled within the region. The *r*-values of these correlations, hereafter termed “productivity-population correlations” were used as indicators of the strength of this relationship.

RESULTS

MOUNT BAKER/SNOQUALMIE NATIONAL FOREST, WASHINGTON

Within Mt. Baker/Snoqualmie National Forest, the six stations are located (from highest to lowest elevation) as follows: (1) The Monte Cristo Lake station at 610 m; (2) the Perry Creek station at 512 m; (3) the Bench Thin station at 354 m; (4) the Frog Lake station at 317 m; (5) the Beaver Lake station at 299 m; and (6) the Murphy Creek station at 244 m. All stations have been in operation every year since 1992 except the Bench Thin station, which was established in 1993. All stations are on the Darrington Ranger District. Table 1 details the habitats and the 2001 operation of the Mt. Baker stations.

A total of 2230.8 net-hours was accumulated at the six MAPS stations operated on Mt. Baker National Forest in 2001 (Table 1). Of these, 2179.7 net-hours could be compared with data from 2000 in a constant-effort manner.

Indices of Adult Population Size and Post-fledging Productivity

The 2001 capture summary of the numbers of newly-banded, unbanded, and recaptured birds a Mt. Baker National Forest is presented for each species at each of the six stations individually in Table 2 and for all stations combined in Table 4. A total of 722 captures of 28 species was recorded during the summer of 2001. Newly banded birds comprised 55.8% of the total captures. As in past years, the greatest number of total captures (201) was recorded at the Monte Cristo Lake station and the smallest number of total captures (67) was recorded at the Perry Creek station. The highest species richness occurred at Beaver Lake (22 species) whereas the lowes species richness occurred at Perry Creek (11 species).

The capture rates (per 600 net-hours) of individual adult and young birds and the percentage o young in the catch are presented for each species and for all species pooled at each station (Table 3) and for all stations combined (Table 4). We present capture rates (captures per 600 net-hours) of adults and young in this table so that the data can be compared among stations which, because of the vagaries of weather and accidental net damage, can differ from one another in effor expended (see Table 1). These capture indices indicate that the total adult population size in 2001 was greatest at Monte Cristo Lake, followed in descending order by Beaver Lake, Murphy Creek, Frog Lake, Bench Thin, and Perry Creek. The capture rate of young (Table 3) of all species pooled at each station in 2001 followed a somewhat different sequence to that of adults: Monte Cristo Lake with the highest rate was followed in decreasing order by Bench Thin, Beaver Lake, Frog Lake, Murphy Creek, and Perry Creek. The index of productivity at the stations in 2001 (Table 3), i.e., the proportion of young in the catch, varied from 0.28 at Bench Thin, followed b Monte Cristo Lake, Frog Lake, and Perry Creek, to 0.13 at both Beaver Lake and Murphy Creek.

Among individual species, Swainson's Thrush was by far the most frequently captured species, followed in descending order by American Robin, Rufous Hummingbird, Song Sparrow, Winter Wren, Chestnut-backed Chickadee, Varied Thrush, “Western” Flycatcher, Cedar Waxwing, and

MacGillivray's Warbler (Table 4). Overall, the most abundant breeding species at the six Mt. Baker MAPS stations in 2001 (captured at a rate of at least 4.0 adults per 600 net-hours), in decreasing order, were Swainson's Thrush, American Robin, Song Sparrow, Varied Thrush, Chestnut-backed Chickadee, Cedar Waxwing, Winter Wren, and "Western" Flycatcher (Table 4; the number of individual adult Rufous Hummingbirds captured could not be determined since the birds were not banded). The following is a list of the common breeding species (captured at a rate of at least 6.0 adults per 600 net-hours), in decreasing order, at each station in 2001:

Monte Cristo Lake
Swainson's Thrush
American Robin
Song Sparrow
Cedar Waxwing
Varied Thrush
Yellow Warbler
Wilson's Warbler
MacGillivray's Warbler
Common Yellowthroat

Perry Creek
Swainson's Thrush

Bench Thin
Swainson's Thrush
MacGillivray's Warbler
Dark-eyed Junco
American Robin
Spotted Towhee
Winter Wren

Murphy Creek
Swainson's Thrush
American Robin
Winter Wren
Varied Thrush
Cedar Waxwing

Frog Lake
Swainson's Thrush
American Robin
"Western" Flycatcher
Winter Wren

Beaver Lake
Swainson's Thrush
Song Sparrow
American Robin
"Western" Flycatcher
Common Yellowthroat
Red-breasted Sapsucker
Chestnut-backed Chickadee

Ten-year Means and Trends in Adult Population Size and Productivity

Table 5 gives mean annual numbers of individual adults captured (an index of adult population size), numbers of young captured, and proportions of young in the catch (an index o productivity) during the ten-year period 1992-2001 at each of the six stations and at all six stations pooled. Examination of all-species-pooled values at the bottom of the table indicates tha the highest mean annual breeding populations at Mount Baker occurred at the Monte Cristo Lake station, followed in descending order by Beaver Lake, Murphy Creek, Bench Thin, Frog Lake, and Perry Thin. Productivity followed a fairly similar sequence, being highest at Monte Cristo Lake, followed by Bench Thin, Beaver Lake, Frog Lake, Perry Thin, and Murphy Creek. Consideration of the habitat at each station (Table 1) indicated that both adult population sizes and productivity were higher at the two stations that included wet, open meadows or swamplands than at the other four stations found in closed-canopy forests. Overall, the ten-year mean numbers of adults captured per 600 net-hours was 87.3 and the mean productivity value was 0.22.

"Chain" indices of adult population size for each of the ten years (1992-2001) for 14 targe species (for which at least six individual adults were captured per year) and for all species pooled are shown in Figure 1. The graphs show consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.035 for a ten-year population trend) for four of the 14 species, "Western" Flycatcher, MacGillivray's Warbler, Common Yellowthroat, and Song Sparrow, although the trends for all four of these species were negative. Populations of six species, Hammond's Flycatcher, Warbling Vireo, Chestnut-backed Chickadee, Varied Thrush, Cedar

Waxwing, and Yellow Warbler showed wide interannual fluctuation (SE of the slope > 0.035) but no substantial linear trend (absolute $r < 0.5$); trends for five of these six species, however, were increasing. Substantial increasing trends ($r > 0.5$) were shown by two species, Swainson's Thrush (significant increase) and American Robin (highly significant). Substantial declining trends ($r < -0.5$) were also shown by two species, Winter Wren (not significant) and Dark-eyed Junco (significant). Overall, population trends were positive for seven species and were negative for seven species, while the population trend for all species pooled was substantially positive and nearly significant ($r = +0.557$, $P = 0.095$).

"Chain" indices of productivity for each of the ten years (1992-2001) for the same 14 targe species and for all species pooled are shown in Figure 2. Consistent and stable productivity (absolute $r < 0.5$ and standard error of the slope ≤ 0.020 for a ten-year productivity trend) were found for seven of the 14 species, Winter Wren, Swainson's Thrush, American Robin, Varied Thrush, Cedar Waxwing (for which no young were caught), Yellow Warbler, and Song Sparrow. Populations of two species, Warbling Vireo and Chestnut-backed Chickadee, showed wide interannual fluctuation (SE of the slope > 0.020) but no linear trend (absolute $r < 0.5$). Substantial increasing trends ($r > 0.5$) were shown by no species whereas substantial declining trends ($r < -0.5$) were shown by five species, Hammond's Flycatcher (nearly significant decline), "Western" Flycatcher (significant), MacGillivray's Warbler (significant), Common Yellowthroat (no significant), and Dark-eyed Junco (significant). Overall, productivity trends were positive for four species and were negative for nine species, while the productivity trend for all species pooled was negative but not quite substantial $r = -0.437$).

Thus, breeding populations have increased overall, reflecting dramatic increases in the two mos common species (Swainson's Thrush and American Robin), whereas productivity has shown a moderate and generally species wide decrease between 1992 and 2001 at Mount Baker.

Estimates of Adult Survivorship

Using all ten years of data (1992-2001), estimates of adult survival and recapture probabilities and proportion of residents were obtained for 12 of the 14 target species breeding in Mount Baker National Forest (Tables 6-7). Survival estimates could not be calculated for Chestnut-backed Chickadee and Cedar Waxwing due to low between-year recapture rates for these species. Table 6 indicates that the time-constant transient model ($\varphi p \tau$) was selected over all time-dependen transient models (by having a $QAIC_C$ that was at least 2.0 $QAIC_C$ units lower than any other model) for eight of the 12 species. For Winter Wren and Varied Thrush, respectively, models showing time-dependence in survival were selected or equivalent to (within 2.0 $QAIC_C$ units of) the time-constant model; for Common Yellowthroat, the model showing time-dependence in recapture probability was equivalent to the time-constant model; and for Swainson's Thrush, the model showing time-dependence in proportion of residents was equivalent to the time-constant model.

$\Delta QAIC_C$ (see Methods), a measure of the degree to which adult survival varied with time over the ten-year period, ranged from -4.9 in Winter Wren (indicating strong time-dependence in survival;

see below) to 17.6 in Warbling Vireo (indicating no time dependence in survival), and averaged 8.9 for the 12 species (indicating generally little time dependence in survival; Table 6).

Table 7 presents the maximum-likelihood estimates of annual adult survival probability, recapture probability, and the proportion of residents for the time-constant model and for equivalent time-dependent models selected in Table 6 for each target species. Survivorship estimates for the 12 species, using time-constant models, ranged from a low of 0.224 for Winter Wren to a high of 0.649 for Yellow Warbler, with a mean of 0.492. Recapture probability ranged from a low o 0.214 for Warbling Vireo to a high of 0.725 for Song Sparrow, with a mean of 0.441. Proportion of residents varied from a low of 0.311 for Warbling Vireo to a high of 1.000 for Dark-eyed Junco, with a mean of 0.559.

The two species with time-dependent survival values showed some similarities in patterns of interannual variation, which is not surprising since both are short-distance migrants that winter along the Pacific North American coast. For Winter Wren, overwinter survival was low during 1992-1993, 1993-1994, and 1995-1996, whereas survival was high during 1997-1998 and 1999-2000 (Table 7; the remaining four years showed intermediate survival for this species). For Varied Thrush, survival was low during 1992-1993, 1994-1995, and 2000-2001, whereas surviva was high during 1996-1997, 1997-1998, and 1999-2000 (Table 7). This variation likely reflects overwinter conditions (such as amount of snowfall or sub-freezing temperatures) at Mount Baker and along the Pacific coast. For Common Yellowthroat, recapture probability was low in 1993, 1994, and 1996, and high in 1997, 1998, and 2000 (Table 7). For Swainson's Thrush, proportion of residents was relatively low in 1996, 1999, and 2000, and high in 1993 and 1997. We currently have no explanations for the interannual variations in recapture probability and proportion of residents.

Productivity Indices and Adult Survival Rates as a Function of Body Mass

Figure 3 shows productivity indices and adult survival rate estimates recorded at Mount Baker National Forest as a function of mean body mass (log transformed) for 12 target species (for which survival could be estimated with $CV(\varphi) \leq 30$) using data from all six stations combined. The purpose of this figure is to determine which species at Mount Baker show higher or lower productivity or survival than might be expected given their body mass. Two regression lines are presented on each graph, one (solid) for all 12 target species at Mount Baker, and one (dashed) using data from 210 (productivity) and 89 (survival) species for which these parameters could be estimated using MAPS data from stations distributed across the North American continent. Species with larger body mass generally show lower productivity and higher survival than species with smaller body mass, which explains the negative and positive slopes, respectively, of the dashed regression lines.

For productivity, the slightly positive regression line based on data from the 12 species at Mount Baker differed from the negative line based on data from North America as a whole. This may have resulted from the smaller sample size at Mount Baker along with lower- or higher-than expected productivity values for certain species (see below). The approximate magnitude of the two lines were similar, however, indicating that overall productivity at Mount Baker may be

similar to that of North America as a whole. For survival, the two lines were practically identica in slope and magnitude, indicating very similar survival patterns among the species at Moun Baker as compared with that of the continent overall

Eight of the 12 species shown in Figure 3 (species alpha codes in lowercase letters) had generally stable population trends over the ten years at Mount Baker (see Fig. 1). Most of these species showed expected or counterbalanced survival and productivity indices, although productivity in Song Sparrow and Varied Thrush and survival of Yellow Warbler were, perhaps, slightly higher than expected given corresponding values of the other parameter.

Both of the two species with increasing population trends (species alpha codes in uppercase non-bold letters), Swainson's Thrush and American Robin, showed lower-than-expected productivity values that were counterbalanced by higher-than-expected survival values; thus, some other factor (such as high juvenile survival or a high immigration rate) may also be accounting for the increasing trend.

Both of the two species with declining population trends (species alpha codes in uppercase bold letters), Winter Wren and Dark-eyed Junco, showed lower-than expected survival values tha were not counterbalanced by higher-than-expected productivity values of the same magnitude. This indicates that low (and time-dependent in the case of Winter Wren) survival may be causing the population declines in these species.

Causes of Population Declines Based on All Demographic Data

Based on all of the above demographic data, we can make assessments as to whether ten-year population changes at Mount Baker (Fig. 1) were due to poor productivity on the breeding grounds, low survival which probably occurs on the winter grounds and/or during migration, both, or neither (Table 8). Assessments for each species are based on a synthesis of actua productivity indices (mean, ten-year values from Table 5) as compared to body mass (Fig. 3), productivity trends (Fig. 2), $\Delta QAIC_c$ values (Table 6), and actual survival values (Table 7) as compared with body mass (Fig. 3) during the ten years of data collection.

Using this approach both of the species with substantial declines ($r < - 0.5$) as shown in Figure 1 (Winter Wren and Dark-eyed Junco) appeared to have low survival (but not low productivity) as a contributing cause for the declines (although the significant negative productivity trend for Winter Wren may also be contributing). Likewise, both of the species with substantial increases (Fig. 1; Swainson's Thrush and American Robin) appeared to have high survival (but not productivity) as a probable contributing cause for the increases.

WENATCHEE NATIONAL FOREST, WASHINGTON

Within Wenatchee National Forest, the six stations are located (from highest to lowest elevation) as follows: (1) The Two Point station at 1512 m; (2) the Deep Creek station at 1195 m; (3) the Pleasant Valley station at 1000 m; (4) the Timothy Meadow station at 951 m; (5) the Quartz Creek 2 station at 853 m; and (6) the Rattlesnake Spring station at 817 m. The Quartz Creek 2

station was established in 1993 to replace the original Quartz Creek station which was discontinued after 1992 because of heavy human interference and a history of vandalism. The Quartz Creek 2 station is very close to the original Quartz Creek station but is located farther from the Quartz Creek campground. All stations are on the Naches Ranger District. See Table 9 for a summary of the habitats and 2001 operation of these stations.

A total of 2003.2 net-hours was accumulated at the six MAPS stations operated in Wenatchee National Forest in 2001 (Table 9). Of these, 1838.0 net-hours could be compared with data from 2000 in a constant-effort manner.

Indices of Adult Population Size and Post-fledging Productivity

The 2001 capture summary of the numbers of newly-banded, unbanded, and recaptured birds a Wenatchee National Forest is presented for each species at each of the six stations individually in Table 10 and for all stations combined in Table 12. A total of 1199 captures of 50 species was recorded during the summer of 2001. Newly banded birds comprised 64.8% of the total captures. The greatest number of total captures (348) was recorded at the Two Point station and the smallest number of total captures (94) was recorded at the Pleasant Valley station. The highes species richness (37 species) occurred at Quartz Creek 2 and the lowest species richness (19 species) occurred at Timothy Meadow.

The capture rates (per 600 net-hours) of individual adult and young birds and the percentage o young in the catch are presented for each species and for all species pooled at each station (Table 11) and for all stations combined (Table 12). We present capture rates (captures per 600 net-hours) of adults and young in this table so that the data can be compared among stations which, because of the vagaries of weather and accidental net damage, can differ from one another in effort expended (see Table 9). These capture indices indicate that the total adult population size in 2001 was greatest at Quartz Creek 2, followed in descending order by Two Point, Deep Creek, Rattlesnake Spring, Timothy Meadow, and Pleasant Valley. The capture rate of young of a species pooled at each station in 2001 followed a similar sequence to that of adults: Two Poin had the highest rate and was followed by Deep Creek, Quartz Creek 2, Rattlesnake Spring, Pleasant Valley, and Timothy Meadow. The index of productivity at the stations in 2001, i.e., the proportion of young in the catch, ranged from a high of 0.61 at Two Point, followed by Deep Creek, Quartz Creek 2, Rattlesnake Springs, and Pleasant Valley, to a low of 0.21 at Timoth Meadow. These values are much higher than those in 2000, which ranged from 0.23 to 0.09.

Among individual species, MacGillivray's Warbler was the most frequently captured species, followed by Dark-eyed Junco, Lincoln's Sparrow, Pine Siskin, Song Sparrow, Townsend's Warbler, Calliope Hummingbird, and Rufous Hummingbird (Table 12). Overall, the mos abundant breeding species at the six Wenatchee MAPS stations in 2001 (captured at a rate of a least 4.0 adults per 600 net-hours), in decreasing order, were MacGillivray's Warbler, Dark-eyed Junco, Pine Siskin, Townsend's Warbler, Lincoln's Sparrow, Evening Grosbeak, American Robin, Hammond's Flycatcher, Warbling Vireo, Song Sparrow, Yellow-rumped Warbler, Western Tanager, and Chestnut-backed Chickadee (Table 12; numbers of individual adult Calliope and Rufous hummingbirds captured could not be determined since these birds were no

banded). The following is a list of the common breeding species (captured at a rate of more than 6.0 adults per 600 net-hours), in decreasing order, at each station in 2001:

Two Point
MacGillivray's Warbler
Dark-eyed Junco
Lincoln's Sparrow
Townsend's Warbler
Warbling Vireo
American Robin
Lazuli Bunting
Hermit Thrush
Yellow-rumped Warbler
Western Tanager
Black-headed Grosbeak

Deep Creek
Evening Grosbeak
Pine Siskin
Dark-eyed Junco
Chestnut-backed Chickadee
Townsend's Warbler
Song Sparrow
Lincoln's Sparrow

Pleasant Valley
Pine Siskin
Lincoln's Sparrow
American Robin
Yellow-rumped Warbler
Chipping Sparrow
Hammond's Flycatcher
White-crowned Sparrow
Dark-eyed Junco

Timothy Meadow
Dark-eyed Junco
Lincoln's Sparrow
American Robin
Pine Siskin
Townsend's Warbler
Chipping Sparrow
Song Sparrow

Quartz Creek 2
MacGillivray's Warbler
Pine Siskin
Warbling Vireo
Western Wood-Pewee
Hammond's Flycatcher
Yellow Warbler
Song Sparrow
Townsend's Warbler
Dusky Flycatcher
American Robin
Dark-eyed Junco
Red-breasted Nuthatch
Swainson's Thrush
Cassin's Finch

Rattlesnake Springs
MacGillivray's Warbler
Dark-eyed Junco
Western Tanager
Hammond's Flycatcher

Ten-year Means and Trends in Adult Population Size and Productivity

Table 13 gives mean annual numbers of individual adults captured (an index of adult population size), numbers of young captured, and proportions of young in the catch (an index o productivity) during the ten-year period 1992-2001 at each of the six stations and at all six stations pooled. Examination of all-species-pooled values at the bottom of the table indicates tha the highest breeding populations at Wenatchee occurred at the Quartz Creek 2 station, followed by Two Point, Rattlesnake Springs, Deep Creek, Pleasant Valley, and Timothy Meadow. The sequence for productivity was different sequence, being highest at Two Point, followed by Deep Creek, Rattlesnake Springs, Timothy Meadow and Quartz Creek 2, and Pleasant Valley. Consideration of the habitat at each (Table 9) indicated few clues as to what variables consistently produced good breeding populations or productivity in the forest. Overall, the mean numbers o adults captured/600 net-hours was 124.9 and the mean productivity value was 0.32.

"Chain" indices of adult population size for each of the ten years (1992-2001) for 19 targe species (for which at least six individual adults were captured per year) and for all species pooled are shown in Figure 4. The graphs show consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.035 for a ten-year population trend) for six of the 19 species, Hammond's Flycatcher, Warbling Vireo, Hermit Thrush, Yellow Warbler, MacGillivray's Warbler, and Chipping Sparrow. Populations of four species, Chestnut-backed Chickadee,

Townsend's Warbler, Western Tanager, and Pine Siskin, showed wide interannual fluctuation (SE of the slope > 0.035) but no linear trend (absolute $r < 0.5$). Substantially increasing trends ($r >$ 0.5) were shown by two species, American Robin (highly significant), and Dark-eyed Junco (significant). By contrast, substantially declining trends ($r < -0.5$) were shown by seven species, Western Wood-Pewee (not significant), Dusky Flycatcher (significant), Golden-crowned Kingle (significant), Swainson's Thrush (near significant), Yellow-rumped Warbler (not significant), Song Sparrow (highly significant), and Lincoln's Sparrow (not significant). Overall, 12 of 19 species showed declining trends, while the population trend for all species pooled was essentially flat (APC = +0.0, r = +0.010).

"Chain" indices of productivity for each of the ten years (1992-2001) for the same 19 targe species and for all species pooled are shown in Figure 5. Consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.020 for a ten-year productivity trend) were found for eleven of the 19 species. Populations of six species, Chestnut-backed Chickadee, Yellow, Yellow-rumped, and Townsend's warblers, Western Tanager, and Pine Siskin, showed wide interannual fluctuation (SE of the slope > 0.020) but no linear trend (absolute $r < 0.5$). Increasing trends ($r> 0.5$) were shown by three species, Golden-crowned Kinglet (not significant), Swainson's Thrush (significant), and Chipping Sparrow (significant) whereas declining trends ($r <$ -0.5) were shown by no species. The productivity trend for all species pooled was essentially fla (PrT = -0.003, r = -0.085).

Thus, both breeding populations and productivity has remained fairly stable overall at Wenatchee; however, more species showed declines than increases in breeding populations whereas more species showed increases than declines in productivity.

Estimates of Adult Survivorship

Using all ten years of data (1992-2001), estimates of adult survival and recapture probabilities and proportion of residents were obtained for 13 of the 19 target species breeding in Wenatchee National Forest (Tables 14-15). Survival estimates could not be calculated for Chestnut-backed Chickadee, Golden-crowned Kinglet, Hermit Thrush, Townsend's Warbler, Western Tanager, and Pine Siskin due to low between-year recapture rates for these species. Table 14 indicates that the time-constant transient model ($\varphi p \tau$) was selected over all time-dependent transient models (b having a $QAIC_C$ that was at least 2.0 $QAIC_C$ units lower than any other model) for nine of the 13 species. For MacGillivray's Warbler and Song Sparrow, models showing time-dependence in survival were selected; and for Dusky Flycatcher and Lincoln's Sparrow, models showing time-dependence in recapture probability were equivalent to (within 2.0 $QAIC_C$ units of) the time-constant model

$\Delta QAIC_C$ (see Methods), a measure of the degree to which adult survival varied with time over the ten-year period, ranged from -4.7 in MacGillivray's Warbler (indicating considerable time-dependence in survival; see below) to 15.0 in American Robin (indicating no time dependence in survival), and averaged 7.8 for the 13 species (indicating generally little time dependence in survival; Table 14).

Table 15 presents the maximum-likelihood estimates of annual adult survival probability, recapture probability, and the proportion of residents for the time-constant model and for equivalent time-dependent models selected in Table 14 for each target species. Survivorship estimates for the 13 species, using time-constant models, ranged from a low of 0.375 for Chipping Sparrow to a high of 0.666 for American Robin, with a mean of 0.498. Recapture probability ranged from a low of 0.125 for American Robin to a high of 0.698 for MacGillivray's Warbler, with a mean of 0.421. Proportion of residents varied from a low of 0.232 for Dusky Flycatcher to a high of 1.000 for American Robin, with a mean of 0.560.

The two species with time-dependent survival values showed differing patterns of interannua variation, which is not surprising since one is a long-distance migrant and the other a resident or short-distance migrant. For MacGillivray's Warbler, overwinter survival was relatively low during 1994-1995, 1996-1997, and 1998-1999, whereas survival was relatively high during 1992-1993, 1993-1994, and 1997-1998 (Table 15; the remaining three years showing intermediate survival for this species). This variation likely reflects overwinter conditions (such as amount of rainfall) i western Mexico and Central America. For Song Sparrow, survival was relatively low during 1992-1993, 1997-1998, and 1998-1999, whereas survival was relatively high during 1993-1994 and 2000-2001 (Table 15). This variation likely reflects overwinter conditions (such as amount of snowfall or sub-freezing temperatures) at Wenatchee and along the Pacific coast. For Dusk Flycatcher, recapture probability was low in 1997, 1998, and 1999, and high in 1994, and for Lincoln's Sparrow, recapture probability was relatively low in 1999, 2000, and 2001, and relatively high in 1993 and 1994. We currently have no explanations for the interannual variations in recapture probability, although it is interesting that this probability for Lincoln's Sparrow has declined throughout the ten-year period.

Productivity Indices and Adult Survival Rates as a Function of Body Mass

Figure 6 shows productivity indices and adult survival rate estimates recorded at Wenatchee National Forest as a function of mean body mass (log transformed) for 12 target species (for which survival could be estimated with $CV(\varphi) \leq 30$; all but Chipping Sparrow), using data fro all six stations combined. The purpose of this figure is to determine which species at Wenatchee show higher or lower productivity or survival than might be expected given their body mass. Two regression lines are presented on each graph, one (solid) for all 12 target species a Wenatchee, and one (dashed) using data from 210 (productivity) and 89 (survival) species for which these parameters could be estimated using MAPS data from stations distributed across the North American continent. Species with larger body mass generally show lower productivity and higher survival than species with smaller body mass, which explains the negative and positive slopes, respectively, of the dashed regression lines.

For both productivity and survival, the regression lines based on data from the 12 species at Wenatchee were similar to those based on data from North America as a whole, in both slope and magnitude, indicating similar patterns among the species at Wenatchee as compared with that o the continent overall

Four of the 12 species shown in Figure 6 (species alpha codes in lowercase letters) had generally stable population trends over the ten years at Wenatchee (see Fig. 4). Most of these species showed expected or counterbalanced survival and productivity indices, although productivity o Warbling Vireo was lower than expected given its survival estimate.

Two species with increasing population trends are shown (see Fig. 4; species alpha codes in are shown in uppercase non-bold letters). For American Robin, productivity was slightly lower-than-expected whereas survival was slightly higher than expected; perhaps the magnitude of the survival residual was a bit higher, indicating that good survival may be contributing to the population increase. For Dark-eyed Junco, productivity was higher-than-expected whereas survival near to expected, indicating that high productivity may be contributing to the population increase.

Six species are shown with declining population trends (see Fig. 4; species alpha codes in uppercase bold letters). The relative positions of productivity and survival values indicates that low productivity (rather than survival) may be contributing to the declines of Dusky Flycatcher, Western Wood-Pewee, and Swainson's Thrush. For both Lincoln's and Song sparrows, survival was lower than expected; the low survival was balanced by high productivity for Song Sparrow but not for Lincoln's Sparrow. For Yellow-rumped Warbler, both productivity and survival were higher than expected, thus indicating that some other factor (such as low juvenile survival or a low immigration rate) may be accounting for the decreasing trends.

Causes of Population Declines Based on All Demographic Data

Based on all of the above demographic data, we can make assessments as to whether ten-year population changes at Wenatchee National Forest (Fig. 4) were due to poor productivity on the breeding grounds, low survival which probably occurs on the winter grounds and/or during migration, both, or neither (Table 16). Assessments for each species are based on a synthesis o actual productivity indices (mean, nine-year values from Table 13) as compared to body mass (Fig. 6), productivity trends (Fig. 5), $\Delta QAIC_c$ values (Table 14), and survival values (Table 15) as compared with body mass (Fig. 6) during the ten years of data collection.

Using this approach three of the seven species with substantial declines ($r < -0.5$) as shown in Figure 4 (Western Wood-Pewee, Dusky Flycatcher, and Swainson's Thrush) appeared to have low productivity (but not survival) as a contributing cause for the decline. Two species (Song and Lincoln's sparrows) appeared to have low survival (but not low productivity) as a contributing cause for the decline with Lincoln's Sparrow having time-dependence in survival (i.e., surviva being too low in certain years) as well. For another species (Golden-crowned Kinglet) we could not estimate survival so it could have been a contributing factor. None of the species appeared to have both low survival and low productivity, but for one species (Yellow-rumped Warbler) i appears as though neither low productivity nor low survival can explain the declines. Because examination of other parameters for this species indicates no obvious explanation, it appears tha some other factor (such as low juvenile survival or low emigration rates) may be contributing. Interestingly, Yellow-rumped Warbler appears to be an increasing species at MAPS stations elsewhere in western North America.

For the two species with increasing population trends, high productivity (but not survival) appears to be a contributing factor to the increase of one species (Dark-eyed Junco) whereas in the other species, American Robin, neither high productivity nor high survival appears to be contributing to the increase. Examination of other parameters for American Robin reveals no explanations, indicating again that other factors (such as high juvenile survival or high immigration rates) ma be contributing to the increase.

UMATILLA NATIONAL FOREST, OREGON

Within Umatilla National Forest, the six stations are located (from highest to lowest elevation) as follows: (1) The Buzzard Creek station at 1524 m; (2) the Buck Mountain Meadow station a 1378 m; (3) the Coyote Ridge station at 1341 m; (4) the Fry Meadow station at 1280 m; (5) the Brock Meadow station at 1244 m; and (6) the Phillips Creek station at 975 m. All stations were established in 1992 and are located on the Walla Ranger District. See Table 17 for a summary of the habitats and 2001 operation of these stations.

A total of 2273.8 net-hours was accumulated at the six MAPS stations operated in Umatilla National Forest in 2001 (Table 17). Of these, 2228.0 net-hours could be compared with data from 2000 in a constant-effort manner.

Indices of Adult Population Size and Post-fledging Productivity

The 2001 capture summary of the numbers of newly-banded, unbanded, and recaptured birds a Umatilla National Forest is presented for each species at each of the six stations individually in Table 18 and for all stations combined in Table 20. A total of 1153 captures of 51 species was recorded during the summer of 2001. Newly banded birds comprised 71.8% of the total captures. The greatest number of total captures (278) was recorded at the Brock Meadow station and the smallest number of total captures (126) was recorded at the Phillip's Creek station. Species richness was greatest at Coyote Ridge (30 species) and lowest at Fry Meadow (25 species).

The capture rates (per 600 net-hours) of individual adult and young birds and the percentage o young in the catch are presented for each species and for all species pooled at each station (Table 19) and for all stations combined (Table 20). We present capture rates (captures per 600 net-hours) of adults and young in this table so that the data can be compared among stations which, because of the vagaries of weather and accidental net damage, can differ from one another in effort expended (see Table 17). These capture indices indicate that the total adult population size in 2001 was greatest at Brock Meadow, followed in descending order by Buck Mountain Meadow, Fry Meadow, Coyote Ridge, Buzzard Creek, and Phillips Creek. The capture rate o young of all species pooled at each station in 2001 followed a sequence somewhat different fro that of adults: Buzzard Creek had the highest rate, followed in decreasing order by Buck Mountain Meadow, Coyote Ridge, Brock Meadow, Fry Meadow, and Phillips Creek. Productivity, i.e., the proportion of young in the catch, ranged from a high of 0.59 at Buzzard Creek, followed by Coyote Ridge, Buck Mt. Meadow, Fry Meadow, and Phillips Creek, to a low of 0.18 at Brock Meadow.

Among individual species, Golden-crowned Kinglet was the most frequently captured species, followed by MacGillivray's Warbler, Dark-eyed Junco, Lincoln's Sparrow, Townsend's Warbler, Ruby-crowned Kinglet and Swainson's Thrush, and Wilson's warblers (Table 20). Overall, the most abundant breeding species at the six Umatilla MAPS stations in 2001 (captured at a rate o at least 4.0 adults per 600 net-hours), in decreasing order, were MacGillivray's Warbler, Swainson's Thrush, Golden-crowned Kinglet, Townsend's Warbler, Ruby-crowned Kinglet Lincoln's Sparrow, Yellow-rumped Warbler and Dark-eyed Junco, Wilson's Warbler, Mountain Chickadee, and Western Tanager (Table 20). The following is a list of the common breeding species (captured at a rate of at least 6.0 adults per 600 net-hours), in decreasing order, at each station in 2001:

Buzzard Creek
Dark-eyed Junco
Townsend's Warbler
Golden-crowned Kinglet
Dusky Flycatcher
Ruby-crowned Kinglet
Yellow-rumped Warbler
Western Tanager
Chipping Sparrow

Buck Mountain Meadow
Golden-crowned Kinglet
Townsend's Warbler
Swainson's Thrush
Ruby-crowned Kinglet
Yellow-rumped Warbler
Wilson's Warbler
Chipping Sparrow
Winter Wren
Dark-eyed Junco
Hermit Thrush
Pine Siskin

Coyote Ridge
MacGillivray's Warbler
Dark-eyed Junco
Townsend's Warbler
Dusky Flycatcher
Golden-crowned Kinglet
Orange-crowned Warbler
Western Tanager
Yellow-rumped Warbler

Fry Meadow
Golden-crowned Kinglet
Ruby-crowned Kinglet
Mountain Chickadee
Swainson's Thrush
Lincoln's Sparrow
MacGillivray's Warbler
Yellow-rumped Warbler
Townsend's Warbler
Warbling Vireo

Brock Meadow
Lincoln's Sparrow
Wilson's Warbler
MacGillivray's Warbler
Swainson's Thrush
Ruby-crowned Kinglet
Red-naped Sapsucker
Hammond's Flycatcher
Yellow-rumped Warbler
Townsend's Warbler
Song Sparrow
Warbling Vireo
Golden-crowned Kinglet
Brown Creeper
Fox Sparrow

Phillips Creek
MacGillivray's Warbler
Swainson's Thrush

Ten-year Means and Trends in Adult Population Size and Productivity

Table 21 gives mean annual numbers of individual adults captured (an index of adult population size), numbers of young captured, and proportions of young in the catch (an index o productivity) during the ten-year period 1992-2001 at each of the six stations and at all six stations pooled. Examination of all-species-pooled values at the bottom of the table indicates tha the highest breeding populations at Umatilla occurred at the Buck Mountain Meadow station, followed in descending order by Brock Meadow, Coyote Ridge, Phillips Creek, Fry Meadow, and Buzzard Creek. Productivity followed a different sequence, being highest at Buzzard Creek, followed by Buck Mountain Meadow, Coyote Ridge, Fry Meadow, Brock Meadow, and Phillips Creek. Consideration of the habitat at each (Table 17) indicated a tendency for breeding

populations to be higher in montane meadows (e.g., Buck Mountain Meadow and Brock Meadow) and lower at the forest/scrub stations (Buzzard Creek, Phillips Creek). For productivity, there is a clear pattern of higher productivity at higher elevations (form Buzzard Creek the highest, to Phillips Creek, the lowest; Table 17). Overall, the mean numbers of adults captured/600 net-hours was 129.7 and the mean productivity value was 0.38.

"Chain" indices of adult population size for each of the ten years (1992-2001) for 22 targe species (for which at least six individual adults were captured per year) and for all species pooled are shown in Figure 7. The graphs show consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.035 for a ten-year population trend) for four of the 22 species, Golden-crowned Kinglet, American Robin, Western Tanager, and Fox Sparrow, although three of these four had negative trends. Populations of three species, Mountain Chickadee, Red-breasted Nuthatch, and Hermit Thrush, showed wide interannual fluctuation (SE of the slope > 0.035) but no linear trend (absolute $r < 0.5$). Increasing trends ($r > 0.5$) were shown by no species. By contrast, declining trends ($r < -0.5$) were shown by fifteen species. These declining trends were highly significant in six species (Dusky Flycatcher, Warbling Vireo, Yellow-rumped and Townsend's warblers, Chipping Sparrow, and Dark-eyed Junco), significant in six species (Red-naped Sapsucker, Hammond's Flycatcher, Ruby-crowned Kinglet, MacGillivray's Warbler, Wilson's Warbler, and Lincoln's Sparrow), and nearly significant in three species (Swainson's Thrush, Orange-crowned Warbler, and Pine Siskin). The population trend for all species pooled was negative and highly significant ($r = -0.849$, $P = 0.002$) and showed an annual percent change of -5.6% per year. This is despite the fact that populations of all species pooled actually increased during each of the last two years. Overall, 19 of 22 species showed negative trends.

"Chain" indices of productivity for each of the ten years (1992-2001) for the same 22 targe species and for all species pooled are shown in Figure 8. Consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.020 for a ten-year productivity trend) were found for 13 of the 22 species (Fig. 8). Populations of three species, Hammond's Flycatcher, Red-breasted Nuthatch, and Ruby-crowned Kinglet showed wide interannual fluctuation (SE of the slope > 0.020) but no linear trend (absolute $r < 0.5$). Increasing trends ($r > 0.5$) were shown by three species, no species whereas declining trends ($r < -0.5$) were shown by six species, Warbling Vireo, Swainson's Thrush, Hermit Thrush, Orange-crowned Warbler, Wilson's Warbler, and Fox Sparrow, those of Orange-crowned Warbler and Fox Sparrow being significant and those of the other four species being nearly significant. The productivity trend for all species pooled, however, was essentially flat ($PrT = +0.002$, $r = +0.071$), indicating (given trends with the target species) that many less-common species (< six adults per year) may have had positive trends.

Thus, breeding populations continued their long-term declines at Umatilla, and productivity although remaining flat when all species were pooled, showed substantial and significant or near-significant declines in six target species while no target species showed substantial increases.

Estimates of Adult Survivorship

Using all ten years of data (1992-2001), estimates of adult survival and recapture probabilities and proportion of residents were obtained for 19 of the 22 target species breeding in Umatilla

National Forest (Tables 22-23). Survival estimates could not be calculated for Red-breasted Nuthatch, Golden-crowned Kinglet, and Pine Siskin due to low between-year recapture rates for these species. Table 22 indicates that the time-constant transient model ($\varphi p \tau$) was selected over a time-dependent transient models (by having a $QAIC_C$ that was at least 2.0 $QAIC_C$ units lower than any other model) for 18 of the 19 species. For Ruby-crowned Kinglet, models showing time-dependence in survival and recapture probability were equivalent to (within 2.0 $QAIC_C$ units of) the time-constant model

$\Delta QAIC_C$ (see Methods), a measure of the degree to which adult survival varied with time over the ten-year period, ranged from 0.8 in Ruby-crowned Kinglet (indicating substantial time-dependence in survival; see below) to 15.3 in Fox Sparrow (indicating no time dependence in survival), and averaged 9.9 for the 19 species (indicating generally little time dependence in survival; Table 22).

Table 23 presents the maximum-likelihood estimates of annual adult survival probability, recapture probability, and the proportion of residents for the time-constant model and for equivalent time-dependent models selected in Table 22 for each target species. Survivorship estimates for the 19 species, using time-constant models, ranged from a low of 0.137 for Ruby-crowned Kinglet to a high of 0.727 for Fox Sparrow, with a mean of 0.466. Recapture probability ranged from a low of 0.140 for Yellow-rumped Warbler to a high of 0.633 for MacGillivray's Warbler, with a mean of 0.357. Proportion of residents varied from a low of 0.199 for Wilson's Warbler to a high of 1.000 for Hammond's Flycatcher, Yellow-rumped Warbler, and Lincoln's Sparrow, with a mean of 0.647.

For Ruby-crowned Kinglet, overwinter survival was low during 1992-1993, 1995-1996, 1997-1998, and 1999-2000, whereas survival was relatively high during 1993-1994, 1998-1999, and 2000-2001 (Table 23; the remaining two years showing intermediate survival for this species). This variation likely reflects overwinter conditions along the Pacific North American coast and in Mexico. Recapture rate for Ruby-crowned Kinglet was low in 1993, 1998, and 2000, and high in 1994, 1999, and 2001. We currently have no explanations for this interannual variability.

Productivity Indices and Adult Survival Rates as a Function of Body Mass

Figure 9 shows productivity indices and adult survival rate estimates recorded at Umatilla National Forest as a function of mean body mass (log transformed) for 18 target species (for which survival could be estimated with $CV(\varphi) \leq 30$; all but Ruby-crowned Kinglet), using data from all six stations combined. The purpose of this figure is to determine which species at Umatilla show higher or lower productivity or survival than might be expected given their body mass. Two regression lines are presented on each graph, one (solid) for all 18 target species a Umatilla, and one (dashed) using data from 210 (productivity) and 89 (survival) species for which these parameters could be estimated using MAPS data from stations distributed across the North American continent. Species with larger body mass generally show lower productivity and higher survival than species with smaller body mass, which explains the negative and positive slopes, respectively, of the dashed regression lines.

For both productivity and survival, the regression lines based on data from the 18 species at Umatilla were very similar to those based on data from North America as a whole, in both slope and magnitude, indicating similar patterns among the species at Umatilla as compared with tha of the continent overall

Five of the 18 species shown in Figure 9 (species alpha codes in lowercase letters) had generally stable population trends over the ten years at Umatilla (see Fig. 7). Most of these species showed expected or counterbalanced survival and productivity indices, although productivity of Mountain Chickadee and survival of Fox Sparrow were both higher than expected given corresponding values of the other parameter.

No species at Umatilla had increasing population trends but 13 species showed declining population trends (see Fig. 7; species alpha codes in uppercase bold letters). The relative positions of productivity and survival values indicates that low productivity (rather than survival) may be contributing to the declines of five species, Dusky Flycatcher, Warbling Vireo, Swainson's Thrush, Wilson's Warbler, and Chipping Sparrow. For Red-naped Sapsucker, lower-than-expected survival appears to be contributing to the decline. For three species, Hammond's Flycatcher, Yellow-rumped Warbler, and Lincoln's Sparrow both productivity and survival were slightly lower than expected, indicating that both factors might be contributing to the declines. For the remaining four species, Orange-crowned, Townsend's, and MacGillivray's, warblers, and Dark-eyed Junco, higher-than-expected productivity was not counterbalanced by lower-than-expected survival, indicating that some other factor (such as low juvenile survival or a low immigration rate) may be accounting for the decreasing trends.

Causes of Population Declines Based on All Demographic Data

Based on all of the above demographic data, we can make assessments as to whether ten-year population changes at Umatilla National Forest (Fig. 7) were due to poor productivity on the breeding grounds, low survival which probably occurs on the winter grounds and/or during migration, both, or neither (Table 24). Assessments for each species are based on a synthesis o actual productivity indices (mean, nine-year values from Table 21) as compared to body mass (Fig. 9), productivity trends (Fig. 8), $\Delta QAIC_c$ values (Table 19), and survival values (Table 20) as compared with body mass (Fig. 8) during the ten years of data collection.

Using this approach six of the 15 species with substantial declines ($r < - 0.5$) as shown in Figure 7 (Dusky Flycatcher, Warbling Vireo, Swainson's Thrush, Wilson's Warbler, Chipping Sparrow, and Pine Siskin) appeared to have low productivity (but not low survival) as a contributing cause for the decline. Three species (Red-naped Sapsucker, Ruby-crowned Kinglet, and Lincoln's Sparrow) appeared to have low survival (but not low productivity) as a contributing cause for the decline. Only Hammond's Flycatcher appeared to have both low survival and low productivity (although survival for Pine Siskin was unknown). For five species (Orange-crowned, Yellow-rumped, Townsend's, and MacGillivray's warblers, and Dark-eyed Junco) it appears as though neither low productivity nor low survival can explain the declines. Examination of other parameters for these five species reveals few patterns, although the significant decline in productivity trend for Orange-crowned Warbler may help explain its population decline.

Otherwise, this indicates that other factors (such as low juvenile survival or low immigration rates) may be contributing to the decreases. No species showed substantial increases at Umatilla.

WILLAMETTE NATIONAL FOREST, OREGON

Within Willamette National Forest, the six stations are located (from highest to lowest elevation) as follows: (1) the Clearcut station at 1292 m; (2) the Fingerboard Prairie station at 1195 m; (3) the Ikenick station at 1006 m; (4) the Brock Creek station at 792 m; (5) the Major Prairie station at 701 m; and (6) the Strube Flat station at 488 m. The Clearcut, Brock Creek, and Major Prairi stations are on the Oakridge Ranger District; Fingerboard Prairie and Ikenick are on the McKenzie Ranger District; and Strube Flat is on the Blue River Ranger District. See Table 25 for details of the habitats and 2001 operation of these stations.

A total of 2649.8 net-hours was accumulated at the six MAPS stations operated in Willamette National Forest in 2001 (Table 25). Of these, 2508.8 net-hours could be compared with data from 2000 in a constant-effort manner.

Indices of Adult Population Size and Post-fledging Productivity

The 2001 capture summary of the numbers of newly-banded, unbanded, and recaptured birds a Willamette National Forest is presented for each species at each of the six stations individually in Table 26 and for all stations combined in Table 28. A total of 1225 captures of 45 species was recorded during the summer of 2001. Newly banded birds comprised 52.6% of the total captures. The greatest number of total captures (304) was recorded at the Ikenick station and the smalles number of total captures (80) was recorded at the Strube Flat station. The greatest species richness (30 species) occurred at Finger Board Prairie and the lowest (16 species) occurred a Strube Flat.

The capture rates (per 600 net-hours) of individual adult and young birds and the percentage o young in the catch are presented for each species and for all species pooled at each station (Table 27) and for all stations combined (Table 28). We present capture rates (captures per 600 net-hours) of adults and young in this table so that the data can be compared among stations which, because of the vagaries of weather and accidental net damage, can differ from one another in effort expended (see Table 25). These capture indices indicate that the total adult population size in 2001 was greatest at Fingerboard Prairie, followed in descending order by Ikenick, Clearcut, Brock Creek, Major Prairie, and Strube Flat. The capture rate of young of all species pooled at each station in 2001 followed an identical sequence to that of adults. The index o productivity seen at the Willamette stations in 2001, i.e., the proportion of young in the catch, ranged from a high of 0.34 at Ikenick, followed by Clearcut, Fingerboard Prairie, Brock Creek, and Major Prairie, to a low of 0.20 at Strube Flat.

Among individual species, Swainson's Thrush was the most frequently captured species, followed by MacGillivray's Warbler, Dark-eyed Junco, Rufous Hummingbird, Common Yellowthroat, Song Sparrow, and Orange-crowned Warbler (Table 28). Overall, the most abundant breeding species at the six Willamette MAPS stations in 2001 (captured at a rate of a

least 4.0 adults per 600 net-hours), in decreasing order, were Swainson's Thrush, Dark-eyed Junco, MacGillivray's and Hermit warbler, Song Sparrow, Common Yellowthroat, Chestnut backed Chickadee, and "Traill's" Flycatcher (Table 28; the number of individual adult Rufous Hummingbirds captured could not be determined since the birds were not banded). The following is a list of the common breeding species (captured at a rate of at least 6.0 adults per 600 net-hours), in decreasing order, at each station in 2001:

Clearcut
Dark-eyed Junco
MacGillivray's Warbler
Swainson's Thrush
Orange-crowned Warbler
Wilson's Warbler
Hermit Warbler

Ikenick
Common Yellowthroat
Lincoln's Sparrow
"Traill's" Flycatcher
Song Sparrow
Pine Siskin
Swainson's Thrush
Hammond's Flycatcher

Fingerboard Prairie
Dark-eyed Junco
Swainson's Thrush
Hermit Warbler
MacGillivray's Warbler
Warbling Vireo
Chestnut-backed Chickadee
Orange-crowned Warbler
Pine Siskin
Hammond's Flycatcher
Hermit Thrush
Lincoln's Sparrow
Nashville Warbler

Strube Flat
Swainson's Thrush
Dark-eyed Junco

Brock Creek
Swainson's Thrush
Song Sparrow
Dark-eyed Junco
Chestnut-backed Chickadee
MacGillivray's Warbler
Warbling Vireo

Major Prairie
Swainson's Thrush
MacGillivray's Warbler
Song Sparrow
Hermit Warbler
Hammond's Flycatcher
Chestnut-backed Chickadee
Dark-eyed Junco

Ten-year Means and Trends in Adult Population Size and Productivity

Table 29 gives mean annual numbers of individual adults captured (an index of adult population size), numbers of young captured, and proportions of young in the catch (an index o productivity) during the ten-year period 1992-2001 at each of the six stations and at all six stations pooled. Examination of all-species-pooled values at the bottom of the table indicates tha the highest breeding populations at Willamette occurred at the Fingerboard Prairie station, followed in descending order by Ikenick, Clearcut, Brock Creek, Major Prairie, and Strube Flat. Productivity followed a similar sequence, being highest at Fingerboard Prairie, followed by Major Prairie, Ikenick and Clearcut, Brock Creek, and Strube Flat. Consideration of the habitat at each station (Table 25) indicated that both higher elevation and wetter stations were better for breeding populations and productivity at Willamette. Overall, the mean numbers of adults captured/600 net-hours was 101.4 and the mean productivity value was 0.32.

"Chain" indices of adult population size for each of the ten years (1992-2001) for 19 targe species (for which at least six individual adults were captured per year) and for all species pooled are shown in Figure 10. The graphs show consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.035 for a ten-year population trend) for five of the 19 species, Golden-crowned Kinglet, Swainson's Thrush, Hermit Warbler, MacGillivray's Warbler, and Lincoln's Sparrow. Populations of four species, "Western" Flycatcher, Warbling Vireo,

Chestnut-backed Chickadee, and American Robin, showed wide interannual fluctuation (SE of the slope > 0.035) but no linear trend (absolute $r < 0.5$). Increasing trends ($r > 0.5$) were shown by five species, "Traill's" Flycatcher (nearly significant), Hammond's Flycatcher (highly significant), Winter Wren (significant), Wilson's Warbler (significant), and Song Sparrow (not significant). Declining trends ($r < -0.5$) were also shown by five species, Dusky Flycatcher (highly significant), Orange-crowned Warbler (significant), Common Yellowthroat (significant), Dark-eyed Junco (no significant), and Pine Siskin (significant). Altogether, nine of the 19 species showed negative population trends. The population trend for all species pooled was also negative but not quite substantial ($r = -0.493$).

"Chain" indices of productivity for each of the ten years (1992-2001) for the same 19 targe species and for all species pooled are shown in Figure 11. Consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.020 for a ten-year productivity trend) were found for eight of the 19 species (Fig. 11). Populations of two species, Chestnut-backed Chickadee and Golden-crowned Kinglet, showed wide interannual fluctuation (SE of the slope > 0.020) but no linear trend (absolute $r < 0.5$). Increasing trends ($r > 0.5$) were shown by two species, "Traill's" Flycatcher (nearly significant) and Swainson's Thrush (significant), whereas declining trends ($r < -0.5$) were shown by seven species, Hammond's Flycatcher (significant), Winter Wren (significant), American Robin (nearly significant), Orange-crowned Warbler (significant), Wilson's Warbler (nearly significant), Song Sparrow (nearly significant), and Dark-eyed Junco (significant). The productivity trend for all species pooled was significantly negative ($r = -0.715$, $P = 0.020$).

Thus, both breeding populations and productivity have declined at Willamette, with the decline in productivity being significant.

Estimates of Adult Survivorship

Using all ten years of data (1992-2001), estimates of adult survival and recapture probabilities and proportion of residents were obtained for 15 of the 19 target species breeding in Willamette National Forest (Tables 30-31). Survival estimates could not be calculated for Golden-crowned Kinglet, Hermit Warbler, Wilson's Warbler, and Pine Siskin due to low between-year recapture rates for these species. Table 30 indicates that the time-constant transient model ($\varphi p \tau$) was selected over all time-dependent transient models (by having a $QAIC_C$ that was at least 2.0 $QAIC_C$ units lower than any other model) for 13 of the 15 species. For Dark-eyed Junco, the mode showing time-dependence in survival was selected and that showing time-dependence in both survival and proportion of residents was equivalent to (within 2.0 $QAIC_C$ units of) the selected model; and for Swainson's Thrush, the model showing time-dependence in recapture probability were equivalent to the time-constant model.

$\Delta QAIC_C$ (see Methods), a measure of the degree to which adult survival varied with time over the ten-year period, ranged from -5.7 in Dark-eyed Junco (indicating considerable time-dependence in survival; see below) to 14.7 in Chestnut-backed Chickadee (indicating no time dependence in survival), and averaged 8.7 for the 15 species (indicating generally little time dependence in survival; Table 30).

Table 31 presents the maximum-likelihood estimates of annual adult survival probability, recapture probability, and the proportion of residents for the time-constant model and for equivalent time-dependent models selected in Table 30 for each target species. Survivorship estimates for the 15 species, using time-constant models, ranged from a low of 0.329 for "Western" Flycatcher to a high of 0.661 for Orange-crowned Warbler, with a mean of 0.483. Recapture probability ranged from a low of 0.200 for Warbling Vireo to a high of 0.825 for "Traill's" Flycatcher, with a mean of 0.524. Proportion of residents varied from a low of 0.273 for Orange-crowned Warbler to a high of 0.794 for Lincoln's Sparrow with a mean of 0.499.

For Dark-eyed Junco, overwinter survival was low during 1999-2000 and 2000-2001 whereas survival was high during 1993-1994 and 1996-1997 (Table 31; the remaining six years showing intermediate survival for this species). This variation likely reflects overwinter conditions (such as amount of rainfall or sub-freezing temperatures) along the Pacific North American coast. Proportion of residents for Dark-eyed Junco was low in 1994, 1995, and 2000, and high in 1992, 1993, 1997, and 1998. For Swainson's Thrush, recapture probability was relatively low in 1999 and 2001, and relatively high in 1995. We currently have no explanations for the interannua variations in recapture probability and proportion of residents.

Productivity Indices and Adult Survival Rates as a Function of Body Mass

Figure 12 shows productivity indices and adult survival rate estimates recorded at Willamette National Forest as a function of mean body mass (log transformed) for 13 target species (for which survival could be estimated with $CV(\varphi) \leq 30$; all but "Western" Flycatcher and Winter Wren), using data from all six stations combined. The purpose of this figure is to determine which species at Willamette show higher or lower productivity or survival than might be expected given their body mass. Two regression lines are presented on each graph, one (solid) for all 13 target species at Willamette, and one (dashed) using data from 210 (productivity) and 89 (survival) species for which these parameters could be estimated using MAPS data from stations distributed across the North American continent. Species with larger body mass generally show lower productivity and higher survival than species with smaller body mass, which explains the negative and positive slopes, respectively, of the dashed regression lines.

For both productivity and survival, the regression lines based on data from the 13 species at Willamette were similar to those based on data from North America as a whole, in both slope and magnitude, indicating similar patterns among the species at Willamette as compared with that o the continent overall

Six of the 13 species shown in Figure 12 (species alpha codes in lowercase letters) had generally stable population trends over the ten years at Willamette (see Fig. 10). Most of these species showed expected or counterbalanced survival and productivity indices, although productivity o Warbling Vireo was lower than expected given its survival estimate.

Three species with increasing population trends are shown (see Fig. 10; species alpha codes in uppercase non-bold letters). For Song Sparrow, productivity was higher than expected whereas survival was as expected, indicating that good productivity may be contributing to the population

increase. For both Hammond's and "Traill's" Flycatchers productivity was lower than expected whereas survival was near to expected, indicating that some other factor (such as high juvenile survival or a high immigration rate) may be accounting for the increasing trends.

Four species are shown with declining population trends (see Fig. 10; species alpha codes in uppercase bold letters). The relative positions of productivity and survival values indicates that low productivity (rather than survival) may be contributing to the decline of Dusky Flycatcher. For the other three species, Orange-crowned Warbler, Common Yellowthroat, and Dark-eyed Junco, higher-than-expected productivity was not counterbalanced by lower-than-expected survival, indicating that some other factor (such as low juvenile survival or a low immigration rate) may be accounting for the decreasing trends.

Causes of Population Declines Based on All Demographic Data

Based on all of the above demographic data, we can make assessments as to whether ten-year population changes at Willamette National Forest (Fig. 10) were due to poor productivity on the breeding grounds, low survival which probably occurs on the winter grounds and/or during migration, both, or neither (Table 32). Assessments for each species are based on a synthesis o actual productivity indices (mean, nine-year values from Table 29) as compared to body mass (Fig. 12), productivity trends (Fig. 11), $\Delta QAIC_c$ values (Table 30), and actual survival values (Table 31) as compared with body mass (Fig. 12) during the ten years of data collection.

Using this approach two of the five species with substantial declines ($r < -0.5$) as shown in Figure 10 (Dusky Flycatcher and Pine Siskin) appeared to have low productivity (but not survival) as a contributing cause for the decline. No species appeared to have low survival (but no productivity), and no species appeared to have both low survival and low productivity as a contributing cause for the decline. For three species (Orange-crowned Warbler, Common Yellowthroat, and Dark-eyed Junco) it appeared that neither low productivity nor low survival can explain the declines. Examination of other parameters for these three species indicates tha both Orange-crowned Warbler and Dark-eyed Junco had significantly negative productivity trends, suggesting this as a contributing factor. For Dark-eyed Junco, furthermore, the $\Delta QAIC_c$ value was very low, indicating substantial time-dependence in survival. It is possible that surviva in certain years was too low to sustain the long-term population of this species. No explanations are apparent for the decline in Common Yellowthroat, suggesting that other factors (such as low juvenile survival or low immigration rates) may be contributing to the decrease in this species.

For the five species with increasing population trends, high productivity (but not survival) appears to be a contributing factor to the increases of two species (Winter Wren and Song Sparrow). No species appear to show high survival (but not productivity), although survival could not be estimated for Wilson's Warbler and it could be higher than expected. For two species ("Traill's" and Hammond's flycatchers), it appeared that neither high productivity nor high survival i contributing to the increases. Examination of other parameters for these two species reveals no explanations, indicating that other factors (such as high juvenile survival or high immigration rates) may be contributing to the increase in this species.

SIUSLAW NATIONAL FOREST, OREGON

Within Siuslaw National Forest, the six stations are located (from highest to lowest elevation) as follows: (1) the Mary's Peak station at 274 m; (2) the Cougar Creek station at 259 m; (3) the Crab Creek station at 219 m; (4) the Homestead station at 207 m; (5) the Beaver Ridge station at m; and (6) the Salvation Meadow station at 122 m. Salvation Meadow was established in 1993 t replace the 1992 Nettle Creek station which, because of its extremely rugged terrain, was too difficult to operate. All stations are on the Alsea Ranger District. See Table 33 for details on the habitats and 2001 operation of these stations.

A total of 2658.3 net-hours was accumulated at the six MAPS stations operated in Siuslaw National Forest in 2001 (Table 33). Of these, 2462.0 net-hours could be compared with data from 2000 in a constant-effort manner.

Indices of Adult Population Size and Post-fledging Productivity

The 2001 capture summary of the numbers of newly-banded, unbanded, and recaptured birds a Siuslaw National Forest is presented for each species at each of the six stations individually in Table 34 and for all stations combined in Table 36. A total of 1089 captures of 30 species was recorded during the summer of 2001. Newly banded birds comprised 49.2% of the total captures. The greatest number of total captures (259) was recorded at the Salvation Meadow station and the smallest number of total captures (94) was recorded at the Mary's Peak station. The greates species richness (16 species) was recorded at Salvation Meadow and the lowest species richness (11 species) was recorded at Crab Creek.

The capture rates (per 600 net-hours) of individual adult and young birds and the percentage o young in the catch are presented for each species and for all species pooled at each station (Table 35) and for all stations combined (Table 36). We present capture rates (captures per 600 net-hours) of adults and young in this table so that the data can be compared among stations which, because of the vagaries of weather and accidental net damage, can differ from one another in effort expended (see Table 33). These capture indices indicate that the total adult population size in 2001 was greatest at Salvation Meadow, followed by Cougar Creek, Beaver Ridge, Homestead, Crab Creek, and Mary's Peak. The capture rate of young of all species pooled a each station in 2001 followed a similar sequence to that of adults: Salvation Meadow was followed in decreasing order by Homestead, Beaver Ridge, Cougar Creek, Crab Creek, and Mary's Peak. The index of productivity at the Siuslaw stations in 2001, i.e., the proportion of young in the catch, ranged from a high of 0.25 at Salvation Meadow, followed by Homestead, Beaver Ridge, Crab Creek, and Cougar Creek, to a low of 0.09 at Mary's Peak.

Among individual species, Swainson's Thrush was the most frequently captured species by far, followed by Wilson's Warbler, Winter Wren, "Western" Flycatcher, Song Sparrow, Chestnut-backed Chickadee, and Rufous Hummingbird (Table 36). Overall, the most abundant breeding species at the six Siuslaw MAPS stations in 2001 (captured at a rate of at least 4.0 adults per 600 net-hours), in decreasing order, were Swainson's Thrush, Wilson's Warbler, Winter Wren, "Western" Flycatcher, Chestnut-backed Chickadee, and Song Sparrow (Table 36; the number o

individual adult Rufous Hummingbirds captured could not be determined since the birds were not banded). The following is a list of the common breeding species (captured at a rate of at least 6.0 adults per 600 net-hours), in decreasing order, at each station in 2001:

Mary's Peak	**Cougar Creek**	**Crab Creek**
Swainson's Thrush	Swainson's Thrush	Swainson's Thrush
Winter Wren	Wilson's Warbler	Winter Wren
"Western" Flycatcher	Winter Wren	Wilson's Warbler
Wilson's Warbler	Hammond's Flycatcher	Dark-eyed Junco
Chestnut-backed Chickadee	Chestnut-backed Chickadee	"Western" Flycatcher

Homestead	**Beaver Ridge**	**Salvation Meadow**
Swainson's Thrush	Swainson's Thrush	Swainson's Thrush
Wilson's Warbler	Wilson's Warbler	Wilson's Warbler
Winter Wren	"Western" Flycatcher	Song Sparrow
Song Sparrow	Winter Wren	"Western" Flycatcher
Chestnut-backed Chickadee		Chestnut-backed Chickadee

Ten-year Means and Trends in Adult Population Size and Productivity

Table 37 gives mean annual numbers of individual adults captured (an index of adult population size), numbers of young captured, and proportions of young in the catch (an index o productivity) during the ten-year period 1992-2001 at each of the six stations and at all six stations pooled. Examination of all-species-pooled values at the bottom of the table indicates tha the highest breeding populations at Siuslaw occurred at the Cougar Creek station, followed in descending order by Salvation Meadow, Beaver Ridge, Homestead, Crab Creek, and Mary's Peak. Productivity followed a somewhat different sequence, being highest at Salvation Meadow, followed by Homestead, Cougar Creek, Beaver Ridge, Mary's Peak, and Crab Creek. Consideration of the habitat at each station (Table 25) indicated that stations with more habitat diversity (including maple groves, grassy meadows, and riparian stands) were better than stations with uniform coniferous forests for breeding populations and productivity at Siuslaw. Overall, the mean numbers of adults captured/600 net-hours was 97.6 and the mean productivity value was 0.15.

"Chain" indices of adult population size for each of the ten years (1992-2001) for seven targe species (for which at least six individual adults were captured per year) and for all species pooled are shown in Figure 13. The graphs show consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.035 for a ten-year population trend) for two of the seven species, Swainson's Thrush, and Wilson's Warbler. Populations of two species, Chestnut-backed Chickadee, and Hermit Warbler, showed wide interannual fluctuation (SE of the slope > 0.035) but no linear trend (absolute $r < 0.5$). Increasing trends ($r > 0.5$) were shown by no species, whereas declining trends ($r < -0.5$) were shown by three species, "Western" Flycatcher (highly significant), Winter Wren (significant), and Song Sparrow (not significant). Overall, population trends for all seven species were negative. The population trend for all species pooled was also negative but not quite substantial $r = -0.429$).

"Chain" indices of productivity for each of the ten years (1992-2001) for the same seven targe species and for all species pooled are shown in Figure 14. Consistent and stable productivity (absolute $r < 0.5$ and standard error of the slope ≤ 0.020 for a ten-year productivity trend) were found for six of the seven species (Fig. 11). Productivity of the remaining species, Hermit Warbler, showed a substantial and nearly significant decline. The productivity trend for all species pooled was essentially flat ($PrT = -0.001$, $r = -0.109$).

Thus, breeding populations have declined slightly overall (and in three species versus none tha increased) while productivity has been relatively stable at Siuslaw.

Estimates of Adult Survivorship

Using all ten years of data (1992-2001), estimates of adult survival and recapture probabilities and proportion of residents were obtained for six of the seven target species breeding in Siuslaw National Forest (Tables 38-39). Survival estimates could not be calculated for Hermit Warbler due to low between-year recapture rates for this species. Table 38 indicates that the time-constan transient model ($\varphi p\tau$) was selected over all time-dependent transient models (by having a $QAIC_C$ that was at least 2.0 $QAIC_C$ units lower than any other model) for five of the six species. For Swainson's Thrush, the model showing time-dependence in survival was selected and tha showing time-dependence in recapture probability was equivalent to (within 2.0 $QAIC_C$ units of) the selected model.

$\Delta QAIC_C$ (see Methods), a measure of the degree to which adult survival varied with time over the ten-year period, ranged from -7.0 in Swainson's Thrush (indicating considerable time-dependence in survival; see below) to 11.5 in Chestnut-backed Chickadee (indicating little if any time dependence in survival), and averaged 6.5 for the six species (indicating some small amount o time dependence in survival; Table 38).

Table 39 presents the maximum-likelihood estimates of annual adult survival probability, recapture probability, and the proportion of residents for the time-constant model and for equivalent time-dependent models selected in Table 38 for each target species. Survivorship estimates for the six species, using time-constant models, ranged from a low of 0.158 for Chestnut-backed Chickadee to a high of 0.591 for Swainson's Thrush, with a mean of 0.431. Recapture probability ranged from a low of 0.243 for "Western" Flycatcher to a high of 0.709 for Song Sparrow, with a mean of 0.484. Proportion of residents varied from a low of 0.248 for Winter Wren to a high of 1.000 for Chestnut-backed Chickadee with a mean of 0.575.

For Swainson's Thrush, overwinter survival was relatively low during 1994-1995, 1997-1998, and 1999-2000, whereas survival was relatively high during 1998-1999 and 2000-2001 (Table 39; the remaining four years showing intermediate survival for this species). This variation likely reflects overwinter conditions (such as amount of rainfall) in western Mexico and Central America, where this population of Swainson's Thrush overwinters. Recapture probability for Swainson's Thrush was relatively low in 1995 and 1997, and relatively high in 1999 and 2001. We currently have no explanations for the interannual variations in recapture probability and proportion of residents.

Productivity Indices and Adult Survival Rates as a Function of Body Mass

Figure 15 shows productivity indices and adult survival rate estimates recorded at Siuslaw National Forest as a function of mean body mass (log transformed) for five target species (for which survival could be estimated with CV(φ) $\leq$ 30; all but Chestnut-backed Chickadee), using data from all six stations combined. The purpose of this figure is to determine which species at Siuslaw show higher or lower productivity or survival than might be expected given their body mass. Two regression lines are presented on each graph, one (solid) for all five target species a Siuslaw, and one (dashed) using data from 210 (productivity) and 89 (survival) species for which these parameters could be estimated using MAPS data from stations distributed across the North American continent. Species with larger body mass generally show lower productivity and higher survival than species with smaller body mass, which explains the negative and positive slopes, respectively, of the dashed regression lines.

For productivity, the slope of the regression line based on data from the five species at Siuslaw was similar to that based on data from North America as a whole, but the magnitude was higher. This indicates that the relationship with body mass was typical at Siuslaw, but that productivity was slightly higher than that found in North America as a whole. For survival, both lines were similar in both slope and magnitude, indicating similar survival patterns among the species a Siuslaw as compared with that of the continent overall

Two of the five species shown in Figure 15 (species alpha codes in lowercase letters) had generally stable population trends over the ten years at Siuslaw (see Fig. 13). Both of these species showed expected or counterbalanced survival and productivity indices.

Three species are shown with declining population trends (see Fig. 10; species alpha codes in uppercase bold letters). The relative positions of productivity and survival values indicates that low productivity (rather than low survival) may be contributing to the decline of "Western" Flycatcher. For the other two species, Winter Wren and Song Sparrow, as expected and higher-than-expected productivity, respectively, was not counterbalanced by lower-than-expected survival, indicating that some other factor (such as low juvenile survival or a low immigration rate) may be accounting for the decreasing trends.

Causes of Population Declines Based on All Demographic Data

Based on all of the above demographic data, we can make assessments as to whether ten-year population changes at Siuslaw National Forest (Fig. 13) were due to poor productivity on the breeding grounds, low survival which probably occurs on the winter grounds and/or during migration, both, or neither (Table 40). Assessments for each species are based on a synthesis o actual productivity indices (mean, nine-year values from Table 37) as compared to body mass (Fig. 15), productivity trends (Fig. 14), $\Delta QAIC_c$ values (Table 38), and actual survival values (Table 39) as compared with body mass (Fig. 15) during the ten years of data collection.

Using this approach one of the three species with substantial declines ($r < -0.5$) as shown in Figure 13 ("Western" Flycatcher) appeared to have low productivity (but not low survival) as a contributing cause for the decline. For the other two species (Winter Wren and Song Sparrow) it

appeared that neither low productivity nor low survival can explain the declines. Examination o other parameters for these two species indicated no apparent explanations, suggesting that other factors (such as low juvenile survival or low immigration rates) may be contributing to the decreases.

FREMONT NATIONAL FOREST, OREGON

Within Fremont National Forest, the six stations are located (from highest to lowest elevation) as follows: (1) The Sycan River station at 2003 m; (2) the Deadhorse station at 1944 m; (3) the Cold Creek station at 1926 m; (4) the Augur Creek station at 1847 m; (5) the Swamp Creek station at 1658 m; and (6) the Island station at 1628 m. All stations are on the Paisley Ranger District. See Table 41 for details on the habitats and 2001 operation of these stations.

A total of 1894.2 net-hours was accumulated at the six MAPS stations operated in Fremont National Forest in 2001 (Table 41). Of these, 1745.3 net-hours could be compared with data from 2000 in a constant-effort manner.

Indices of Adult Population Size and Post-fledging Productivity

The 2001 capture summary of the numbers of newly-banded, unbanded, and recaptured birds a Fremont National Forest is presented for each species at each of the six stations individually in Table 42 and for all stations combined in Table 44. A total of 1121 captures of 43 species was recorded during the summer of 2001. Newly banded birds comprised 66.5% of the total captures. The greatest number of total captures (325) was recorded at the Deadhorse station and the smallest number of total captures (101) was recorded at the Swamp Creek station. Species richness was highest at Deadhorse (33 species) and lowest at Swamp Creek (14 species).

The capture rates (per 600 net-hours) of individual adult and young birds and the percentage o young in the catch are presented for each species and for all species pooled at each station (Table 43) and for all stations combined (Table 44). We present capture rates (captures per 600 net-hours) of adults and young in this table so that the data can be compared among stations which, because of the vagaries of weather and accidental net damage, can differ from one another in effort expended (see Table 31). These capture indices indicate that the total adult population size in 2001 was greatest at Deadhorse, followed in descending order by Sycan River, Augur Creek, Island, Swamp Creek, and Cold Creek. The capture rate of young of all species pooled a each station in 2001 followed a sequence somewhat different from that of adults: Deadhorse was followed in decreasing order by Augur Creek, Sycan River, Cold Creek, Island, and Swamp Creek. Productivity at the Fremont stations in 2001, i.e., the proportion of young in the catch, ranged from a high of 0.42 at Augur Creek, followed by Deadhorse and Cold Creek, Island, and Sycan River, to a low of 0.20 at Swamp Creek.

Among individual species, Dark-eyed Junco was the most frequently captured species by far, followed by Yellow-rumped Warbler, American Robin, MacGillivray's Warbler, Orange-crowned Warbler, White-crowned Sparrow, Lincoln's Sparrow, Mountain Chickadee, Dusk Flycatcher, Warbling Vireo, and Red-breasted Sapsucker (Table 44). Overall, the most abundan

breeding species at the six Fremont MAPS stations in 2001 (captured at a rate of at least 4.0 adults per 600 net-hours), in decreasing order, were Dark-eyed Junco, American Robin, Yellow-rumped Warbler, MacGillivray's Warbler, Dusky Flycatcher, White-crowned Sparrow, Warbling Vireo, Lincoln's Sparrow, Mountain Chickadee, Red-breasted Sapsucker, and Orange-crowned Warbler (Table 44). The following is a list of the common breeding species (captured at a rate o at least 6.0 adults per 600 net-hours), in decreasing order, at each station in 2001:

Sycan Rive
Dusky Flycatcher
Lincoln's Sparrow
White-crowned Sparrow
MacGillivray's Warbler
Dark-eyed Junco
American Robin
Yellow-rumped Warbler
Ruby-crowned Kinglet
Orange-crowned Warbler
Red-breasted Sapsucker
Warbling Vireo

Cold Creek
Dark-eyed Junco
Lincoln's Sparrow
White-crowned Sparrow
Dusky Flycatcher
Mountain Chickadee
Yellow-rumped Warbler

Deadhorse
Yellow-rumped Warbler
Warbling Vireo
American Robin
Dusky Flycatcher
Dark-eyed Junco
Orange-crowned Warbler
MacGillivray's Warbler
White-crowned Sparrow
Red-naped Sapsucker
Hybrid Sapsucker
Red-breasted Sapsucker

Swamp Creek
"Western" Flycatcher
Dark-eyed Junco
Yellow-rumped Warbler
MacGillivray's Warbler
American Robin
Red-breasted Sapsucker

Augur Creek
Dark-eyed Junco
American Robin
Mountain Chickadee
MacGillivray's Warbler
Yellow-rumped Warbler
Warbling Vireo
White-crowned Sparrow

Island
Dark-eyed Junco
Hammond's Flycatcher
American Robin
Yellow-rumped Warbler
Red-breasted Sapsucker
Mountain Chickadee
Northern Flicker

Ten-year Means and Trends in Adult Population Size and Productivity

Table 29 gives mean annual numbers of individual adults captured (an index of adult population size), numbers of young captured, and proportions of young in the catch (an index o productivity) during the ten-year period 1992-2001 at each of the six stations and at all six stations pooled. Examination of all-species-pooled values at the bottom of the table indicates tha the highest breeding populations at Fremont occurred at the Sycan River station, followed in descending order by Deadhorse, Augur Creek, Island, Cold Creek, and Swamp Creek. Productivity followed a somewhat different sequence, being highest at Cold Creek, followed by Sycan River, Deadhorse, Augur Creek, Island, and Swamp Creek. Consideration of the habitat at each (Table 41) indicated that both higher elevation stations and stations with willow thickets tended to be better for breeding populations and productivity at Fremont. Overall, the mean numbers of adults captured/600 net-hours was 127.8 and the mean productivity value was 0.32.

"Chain" indices of adult population size for each of the ten years (1992-2001) for 19 targe species (for which at least six individual adults were captured per year) and for all species pooled are shown in Figure 16. The graphs show consistent and stable populations (absolute $r < 0.5$ and

standard error of the slope $\leq$ 0.035 for a ten-year population trend) for five of the 19 species, Red-breasted Sapsucker, Dusky Flycatcher, "Western" Flycatcher, Warbling Vireo, and Lincoln's Sparrow. Populations of six species, Western Wood-Pewee, Mountain Chickadee, American Robin, MacGillivray's Warbler, Cassin's Finch, and Pine Siskin showed wide interannua fluctuation (SE of the slope > 0.035) but no linear trend (absolute $r < 0.5$). Increasing trends ($r >$ 0.5) were shown by six species, Hammond's Flycatcher, Red-breasted Nuthatch, Brown Creeper, Yellow-rumped Warbler, White-crowned Sparrow, and Dark-eyed Junco. The increase for the junco was significant while the increases for the other five species were each highly significant. Declining trends ($r < -0.5$) were shown by two species, House Wren (nearly significant) and Hermit Thrush (highly significant). Overall, population trends for 12 of the 19 species were positive. The population trend for all species pooled was also positive but not quite substantial (r = +0.417).

"Chain" indices of productivity for each of the ten years (1992-2001) for the same 19 targe species and for all species pooled are shown in Figure 17. Consistent and stable populations (absolute $r < 0.5$ and standard error of the slope $\leq$ 0.020 for a ten-year productivity trend) were found for eleven of the 19 species (Fig. 17). Populations of five species, Red-breasted Nuthatch, Brown Creeper, House Wren, Yellow-rumped Warbler, and Pine Siskin showed wide interannual fluctuation (SE of the slope > 0.020) but no linear trend (absolute $r < 0.5$). An increasing trend ($r > 0.5$) was shown by one species, Cassin's Finch (nearly significant), whereas declining trends ($r < -0.5$) were shown by two species, "Western" Flycatcher (highly significant), and Mountain Chickadee (nearly significant). The productivity trend for all species pooled was slightly negative (PrT = -0.007, r = -0.198).

Thus, breeding populations have increased slightly while productivity has declined slightly a Fremont.

Estimates of Adult Survivorship

Using all ten years of data (1992-2001), estimates of adult survival and recapture probabilities and proportion of residents were obtained for 15 of the 19 target species breeding in Fremont National Forest (Tables 46-47). Survival estimates could not be calculated for Red-breasted Nuthatch, Brown Creeper, Cassin's Finch, and Pine Siskin due to low between-year recapture rates for these species. Table 46 indicates that the time-constant transient model ($\varphi p \tau$) was selected over all time-dependent transient models (by having a $QAIC_C$ that was at least 2.0 $QAIC_C$ units lower than any other model) for 10 of the 15 species. For "Western" Flycatcher and Dark-eyed Junco, models showing time-dependence in survival were equivalent to (within 2.0 $QAIC_C$ units of) the time-constant model; for Dusky Flycatcher and Mountain Chickadee, models showing time-dependence in recapture probability were selected; for Yellow-rumped Warbler, the model showing time-dependence in recapture probability was equivalent to the time-constan model; and for Dark-eyed Junco, the model showing time dependence in proportion of resident was equivalent to the time-constant model.

$\Delta QAIC_C$ (see Methods), a measure of the degree to which adult survival varied with time over the ten-year period, ranged from -1.4 in Dark-eyed Junco (indicating considerable time-dependence

in survival; see below) to 14.7 in Western Wood-Pewee (indicating no time dependence in survival), and averaged 7.1 for the 15 species (indicating generally little time dependence in survival; Table 46).

Table 47 presents the maximum-likelihood estimates of annual adult survival probability, recapture probability, and the proportion of residents for the time-constant model and for equivalent time-dependent models selected in Table 46 for each target species. Survivorship estimates for the 15 species, using time-constant models, ranged from a low of 0.291 for MacGillivray's Warbler to a high of 0.681 for American Robin, with a mean of 0.482. Recapture probability ranged from a low of 0.057 for Hermit Thrush to a high of 0.551 for Lincoln's Sparrow, with a mean of 0.369. Proportion of residents varied from a low of 0.337 for "Western" Flycatcher to a high of 1.000 for Red-breasted Sapsucker, Western Wood-Pewee, and Hammond's Flycatcher, with a mean of 0.637.

The two species with time-dependent survival values showed differing patterns of interannua variation, which is not surprising since one is a long-distance migrant and the other a resident or short-distance migrant. For "Western" Flycatcher, overwinter survival was low during the four overwinter periods between 1992 and 1996, whereas survival was high during the three overwinter periods between 1996 and 1999 (Table 47; the remaining two years showing intermediate survival for this species). This variation likely reflects overwinter conditions (such as amount of rainfall) in western Mexico, where this species overwinters. For Dark-eyed Junco, survival was relatively low during 1992-1993, 1994-1995, and 2000-2001, whereas survival was relatively high during 1993-1994, 1995-1996, and 1998-1999 (Table 47). This variation likely reflects overwinter conditions (such as amount of snowfall or sub-freezing temperatures) at Fremont and along the Pacific coast of Oregon and California. Variation in recapture probability among Dusky Flycatcher, Mountain Chickadee, and Yellow-rumped Warbler showed some similarities, all three species generally having higher probabilities during 1993-1996 and generally having lower probabilities during 1998-2001. For Dark-eyed Junco, proportion of residents was low in 2000 and high in 1993, 1997, and 1998. We currently have no explanations for the interannual variations in recapture probability or proportion of residents.

Productivity Indices and Adult Survival Rates as a Function of Body Mass

Figure 18 shows productivity indices and adult survival rate estimates recorded at Fremon National Forest as a function of mean body mass (log transformed) for 12 target species (for which survival could be estimated with CV(φ) $\leq$ 30; all but Western Wood-Pewee, House Wren, and Hermit Thrush), using data from all six stations combined. The purpose of this figure is to determine which species at Fremont show higher or lower productivity or survival than might be expected given their body mass. Two regression lines are presented on each graph, one (solid) for all 12 target species at Fremont, and one (dashed) using data from 210 (productivity) and 89 (survival) species for which these parameters could be estimated using MAPS data from stations distributed across the North American continent. Species with larger body mass generally show lower productivity and higher survival than species with smaller body mass, which explains the negative and positive slopes, respectively, of the dashed regression lines.

For both productivity and survival, the regression lines based on data from the 12 species at Fremont were similar to those based on data from North America as a whole, in both slope and magnitude, indicating similar patterns among the species at Fremont as compared with that of the continent overall.

Eight of the 12 species shown in Figure 18 (species alpha codes in lowercase letters) had generally stable population trends over the ten years at Fremont (see Fig. 16). Most of these species showed expected or counterbalanced survival and productivity indices, although productivity of Mountain Chickadee was higher than expected given its survival estimate and survival of MacGillivray's Warbler was lower than expected given its productivity estimate.

Four species with increasing population trends are shown (see Fig. 16; species alpha codes in uppercase non-bold letters). For Yellow-rumped Warbler and Dark-eyed Junco, productivity was higher than expected whereas survival was as expected or slightly higher than expected, indicating that good productivity may be contributing to the population increase. For Hammond's Flycatcher productivity was lower than expected whereas survival was near to expected, and for White-crowned Sparrow slightly higher-than-expected productivity was counterbalanced by slightly lower-than-expected survival, indicating that some other factor (such as high juvenile survival or a high immigration rate) may be accounting for the increasing trends.

Causes of Population Declines Based on All Demographic Data

Based on all of the above demographic data, we can make assessments as to whether ten-year population changes at Fremont National Forest (Fig. 15) were due to poor productivity on the breeding grounds, low survival which probably occurs on the winter grounds and/or during migration, both, or neither (Table 48). Assessments for each species are based on a synthesis o actual productivity indices (mean, nine-year values from Table 45) as compared to body mass (Fig. 18), productivity trends (Fig. 17), $\Delta QAIC_c$ values (Table 43), and survival values (Table 44) as compared with body mass (Fig. 18) during the ten years of data collection.

Using this approach one of the two species with substantial declines ($r < -0.5$) as shown in Figure 15 (Hermit Thrush) appeared to have low productivity (but not survival) as a contributing cause for the decline, while the other species (House Wren) appeared to have low survival (but no productivity) as a contributing cause for the decline.

For the six species with increasing population trends, high productivity (but not high survival) appeared to be a contributing factor to the increases of four species (Brown Creeper, Yellow-rumped Warbler, White-crowned Sparrow, and Dark-eyed Junco, although the high productivit of White-crowned Sparrow may have counterbalanced by low survival). High survival appeared to have contributed to the increase of none of the species, although survival of Red-breasted Nuthatch and Brown Creeper could not be estimated, so high survival could have been a factor. For the remaining species, Hammond's Flycatcher, neither high productivity nor high survival appeared to have contributed to the increases. Examination of other parameters for this species reveals no explanations, indicating that other factors (such as high juvenile survival or high immigration rates) may be contributing to the increase.

ALL SIX NATIONAL FORESTS, COMBINED

Ten-year Means and Trends in Adult Population Size and Productivity

Table 49 gives mean annual numbers of individual adults captured (an index of adult population size), numbers of young captured, and proportions of young in the catch (an index o productivity) during the ten-year period 1992-2001 on each of the six national forests and for a six forests pooled. Examination of all-species-pooled values at the bottom of the table indicates that the highest breeding populations in Forest Service Region Six during the ten-year period occurred at Umatilla, followed in descending order by Fremont, Wenatchee, Willamette, Siuslaw, and Mount Baker. Productivity followed a similar sequence, being highest at Umatilla, followed by Wenatchee, Willamette, and Fremont, Mount Baker, and Siuslaw. It is interesting that the locations with the highest breeding populations also tended to have higher productivity. Overall, the mean numbers of adults captured/600 net-hours was 110.9 and the mean productivity value was 0.30.

"Chain" indices of adult population size for each of the ten years (1992-2001) for 43 targe species (for which at least six individual adults were captured per year) and for all species pooled are shown in Figure 19. The graphs show consistent and stable populations (absolute $r < 0.5$ and standard error of the slope ≤ 0.035 for a ten-year population trend) for 17 of the 43 species, Red-breasted Sapsucker, Hairy Woodpecker, Western Wood-Pewee, "Traill's" Flycatcher, Red-breasted Nuthatch, Winter Wren, Golden-crowned Kinglet, Swainson's Thrush, Hermit Thrush, Yellow, Yellow-rumped, MacGillivray's, and Wilson's warblers, Western Tanager, Fox Sparrow, Song Sparrow, and Dark-eyed Junco, although trends for ten of the 17 species were negative. Populations of six species or forms, Hybrid Sapsucker, Steller's Jay, Chestnut-backed Chickadee, Cedar Waxwing, Hermit Warbler, and Cassin's Finch showed wide interannua fluctuation (SE of the slope > 0.035) but no substantial linear trend (absolute $r < 0.5$), although trends for four of the six species were positive. Substantial increasing trends ($r > 0.5$) were shown by seven species, Hammond's Flycatcher, Mountain Chickadee, Brown Creeper, American Robin, Varied Thrush, White-crowned Sparrow, and Black-headed Grosbeak; these increases were highly significant for Hammond's Flycatcher, American Robin, and Black-headed Grosbeak, significant for Brown Creeper and White-crowned Sparrow, and nearly significant for Mountain Chickadee and Varied Thrush. Substantial declining trends ($r < -0.5$) were shown by 13 species, Red-naped Sapsucker, Dusky Flycatcher, "Western" Flycatcher, Warbling Vireo, House Wren, Ruby-crowned Kinglet, Orange-crowned, Black-throated Gray, and Townsend's warblers, Common Yellowthroat, Chipping Sparrow, Lincoln's Sparrow, and Pine Siskin. These declines were highly significant for Dusky Flycatcher, "Western" Flycatcher, Warbling Vireo, and Chipping Sparrow; significant for Red-naped Sapsucker, House Wren, Orange-crowned and Townsend's warblers, Common Yellowthroat, Lincoln's Sparrow, and Pine Siskin; nearly significant for Ruby-crowned Kinglet; and not significant for Black-throated Gray Warbler. Overall, 25 of the 43 species showed negative population trends. The population trend for all species pooled was substantially negative (a change of -1.5% per year) but not significant ($r = -0.524$, $P = 0.120$). It is important to note that breeding populations rebounded significantly during the summer of 2001, especially populations of temperate-wintering species. This is shown by a comparison of the population trends for 1992-2000 and 1992-2001 for all species

pooled at all stations combined; there were -2.8% for 1992-2000 (P=0.000) and -1.5% for 1992-2001 (P=0.120).

"Chain" indices of productivity for each of the ten years (1992-2001) for the same 43 targe species and for all species pooled are shown in Figure 20. Consistent and stable productivity (absolute $r < 0.5$ and standard error of the slope ≤ 0.020 for a ten-year productivity trend) were found for 31 of the 43 species (Fig. 20). Populations of two species or forms, Hybrid Sapsucker and Chipping Sparrow, showed wide interannual fluctuation (SE of the slope > 0.020) but no linear trend (absolute $r < 0.5$). Substantial, but non-significant, increasing trends ($r > 0.5$) were shown by two species, Red-breasted Sapsucker and "Traill's" Flycatcher, whereas substantia declining trends ($r < -0.5$) were shown by eight species, Hairy Woodpecker (significant), Hammond's and Dusky flycatchers (both nearly significant), Mountain Chickadee (nearly significant), Hermit Thrush, American Robin, Hermit Warbler, and Fox Sparrow (highly significant). Overall, 32 of the 43 species showed negative trends. The productivity trend for a species pooled was also negative but not substantial ($r = -0.318$).

Thus, both breeding populations and productivity have shown ten-year (1992-2001) decreases in Forest Service Region Six, although population sizes for many species increased dramatically in 2001, presumably in response to the high productivity recorded on 2000. Because productivity in 2001 was sharply reduced from that in 2000, we expect populations to decrease again in 2003 and expect the eleven-year (1992-2002) population trends to be more negative than were the ten-year trends.

Productivity-Population Correlations

To see if productivity has had a direct effect on breeding population size the following year, we compared constant-effort changes in productivity during one between-year comparison (Δproductivity(t_{i+1}-t_i)) to changes in adult captures during the following between-year comparison (Δadults(t_{i+2}-t_{i+1})), for the 43 target species and all species pooled (Fig. 21). The slopes in Figure 21, hereafter termed "productivity-population correlations", are used as indicators of the strength of this relationship. The productivity-population correlation was positive for 28 of 42 species (that for Cedar Waxwing could not be calculated) and for all species pooled. Importantly, the correlations were positive for eight of the nine species with significant or nearly significan correlations (those for Red-breasted Sapsucker, Warbling Vireo, Winter Wren, Swainson's Thrush, Hermit Warbler, Wilson's Warbler, Song Sparrow, and Lincoln's Sparrow, but not for Red-naped Sapsucker), and the positive correlation for all species pooled was significant ($P = 0.030$). Thus, overall, the productivity-population correlations were positive, supporting the concept that changes in productivity one year generally bring about corresponding changes in population size the next year. As an example, the dramatic increase in productivity noted for a species pooled between 1999 and 2000 appears to have led to the dramatic increase in breeding populations of all species pooled between 2000 and 2001. Also of interest is the fact tha population trends were negative for six of the eight species with significant or near-significan positive productivity-population correlations. This suggests that low productivity may well be driving the population declines for those species.

Estimates of Adult Survivorship

Using all ten years of data (1992-2001), estimates of adult survival and recapture probabilities and proportion of residents were obtained for 38 of the 43 target species breeding in Region Si National Forests (Tables 50-51). Survival estimates could not be calculated for Steller's Jay, Golden-crowned Kinglet, Cedar Waxwing, Hermit Warbler, and Pine Siskin due to low between-year recapture rates for these species. Table 50 indicates that the time-constant transient mode ($\varphi p\tau$) was selected over all time-dependent transient models (by having a $QAIC_C$ that was at leas 2.0 $QAIC_C$ units lower than any other model) for 33 of the 43 species. Species showing time-dependence in survival (models either selected or equivalent to [within 2.0 $QAIC_C$ units of] the time-constant model), included Dusky Flycatcher, Ruby-crowned Kinglet, MacGillivray's Warbler, and Dark-eyed Junco; those showing time-dependence in recapture probability included Dusky Flycatcher, Mountain Chickadee, Ruby-crowned Kinglet, Hermit Thrush, and Common Yellowthroat; and those showing time-dependence in proportion of residents included Western Wood-Pewee, Dusky Flycatcher, Hermit Thrush, Chipping Sparrow, White-crowned Sparrow, and Dark-eyed Junco.

$\Delta QAIC_C$ (see Methods), a measure of the degree to which adult survival varied with time over the ten-year period, ranged from -14.0 in Dusky Flycatcher (indicating strong time-dependence in survival; see below) to 13.7 in Orange-crowned Warbler (indicating no time dependence in survival), and averaged 7.2 for the 38 species (indicating relatively little time dependence in survival; Table 46).

Table 51 presents the maximum-likelihood estimates of annual adult survival probability, recapture probability, and the proportion of residents for the time-constant model and for equivalent time-dependent models selected in Table 50 for each target species. Survivorship estimates for the 38 species, using time-constant models, ranged from a low of 0.213 for Cassin's Finch to a high of 0.710 for Fox Sparrow, with a mean of 0.468. Recapture probability ranged from a low of 0.121 for Western Tanager to a high of 0.710 for Song Sparrow, with a mean of 0.382. Proportion of residents varied from a low of 0.288 for Hermit Thrush to a high of 1.000 for Chestnut-backed Chickadee and Red-breasted Nuthatch, with a mean of 0.574.

The four species with time-dependent survival values showed differing patterns of interannua variation reflecting their migratory status. For the two long-distance migrants, Dusky Flycatcher and MacGillivray's Warbler, overwinter survival differed somewhat, being low in 1997-1998 and high in 1992-1993, 1993-1994, and 1999-2000 in the flycatcher (survival during the remaining five winters being intermediate) and it was relatively low during 1995-1996 and 1998-1999 and relatively high during 1993-1994, 1997-1998, and 2000-2001 in the warbler. This variation likely reflects overwinter conditions (such as amount of rainfall) in western Mexico and Central America, where these species overwinter; the differences may relate to differences in elevation or foraging strategy and prey between the two species. For the two short-distance migrants, Ruby-crowned Kinglet and Dark-eyed Junco, survival was relatively low during 1992-1993, 1994-1995, and 1999-2000, and relatively high during 1993-1994, 1998-1999, and 2000-2001. This variation likely reflects overwinter conditions (such as amount of snowfall or sub-

freezing temperatures) in the Pacific Northwest and along the Pacific coast of Oregon and California, where these two species overwinter.

Variation in recapture probability among Dusky Flycatcher, Mountain Chickadee, Ruby-crowned Kinglet, Hermit Thrush, and Common Yellowthroat showed few patterns, although it was lower in 1993 and higher in 2001 for several of these species. Variation in proportion of resident among Western Wood-Pewee, Dusky Flycatcher, Hermit Thrush, Chipping Sparrow, and White-crowned Sparrow also showed few patterns, although it was lower in 1995 and higher in 2000 for several of these species. We currently have no explanations for the interannual variations in recapture probability or proportion of residents.

Productivity Indices and Adult Survival Rates as a Function of Body Mass

Figure 22 shows productivity indices and adult survival rate estimates recorded in Region Six National Forests as a function of mean body mass (log transformed) for 33 target species (for which survival could be estimated with $CV(\varphi) \leq 30$; excluding Red-breasted Nuthatch, Brown Creeper, House Wren, Black-throated Gray Warbler, and Cassin's Finch), using data from all six forests combined. The purpose of this figure is to determine which species show higher or lower productivity or survival than might be expected given their body mass. Two regression lines are presented on each graph, one (solid) for all 33 target species in Region Six National Forests and one (dashed) using data from 210 (productivity) and 89 (survival) species for which these parameters could be estimated using MAPS data from stations distributed across the North American continent. Species with larger body mass generally show lower productivity and higher survival than species with smaller body mass, which explains the negative and positive slopes, respectively, of the dashed regression lines.

For both productivity and survival, the regression lines based on data from the 33 species i Region Six National Forests were very similar to those based on data from North America as a whole, in both slope and magnitude, indicating similar patterns among the species in Region Six as compared with that of the continent overall

Seventeen of the 33 species shown in Figure 22 (species alpha codes in lowercase letters) had generally stable population trends over the ten years (see Fig. 20). Most of these species showed expected or counterbalanced survival and productivity indices, although survival of Fox Sparrow was higher than expected given its productivity index.

Six species with increasing population trends are shown (see Fig. 20; species alpha codes in uppercase non-bold letters). For Mountain Chickadee and Varied Thrush, productivity was higher than expected given survival estimates, indicating that good productivity may be contributing to the population increase. For American Robin, survival was higher than expected given productivity estimates, indicating that good survival may be contributing to the population increase. For Hammond's Flycatcher, White-crowned Sparrow, and Black-headed Grosbeak productivity and survival appeared to be counterbalanced or slightly lower than expected, indicating that some other factor (such as high juvenile survival or a high immigration rate) ma be accounting for the increasing trends.

Ten species with decreasing population trends are shown (see Fig. 20; species alpha codes in uppercase bold letters). For four of these species, "Western" Flycatcher, Dusky Flycatcher, Warbling Vireo, and Chipping Sparrow, productivity was lower than expected given surviva estimates, indicating that poor productivity may be contributing to the population decrease. For Red-naped Sapsucker, Ruby-crowned Kinglet, and possibly Lincoln's Sparrow, survival was lower than expected given their productivity indices, indicating that poor survival may be contributing to the population decrease. For Orange-crowned Warbler, Townsend's Warbler, and Common Yellowthroat, productivity and survival appeared to be counterbalanced or slightly higher than expected, indicating that some other factor (such as low juvenile survival or immigration rate) may be accounting for the decreasing trends.

Causes of Population Declines Based on All Demographic Data

Based on all of the above demographic data, we can make assessments as to whether ten-year population changes in Region Six National Forests (Fig. 19) were due to poor productivity on the breeding grounds, low survival which probably occurs on the winter grounds and/or during migration, both, or neither (Table 52). Assessments for each species are based on a synthesis o actual productivity indices (mean, nine-year values from Table 49) as compared to body mass (Fig. 22), productivity trends (Fig. 20), productivity-population correlations (Fig. 21), $\Delta QAIC_c$ values (Table 50), and survival values (Table 51) as compared with body mass (Fig. 22) during the ten years of data collection. As an example, for Warbling Vireo, productivity was low (mean 0.06 during the ten-year period), the productivity trend was slightly negative (-0.006), the productivity-population correlation was significantly positive ($r = +0.706$, $P = 0.050$), $\Delta QAIC_c$ was moderately high (+8.1), and survival was moderately good (0.487). In this case, the combined evidence suggests that productivity is low and influencing the population dynamics of this species more than survival, which is moderately good; thus, we infer that low productivity is driving the population decline for Warbling Vireo in Region Six National Forests.

Using this approach seven of the 13 species with substantial declines ($r < - 0.5$) as shown in Figure 19 (Dusky Flycatcher, "Western" Flycatcher, Warbling Vireo, Black-throated Gra Warbler, Common Yellowthroat, Chipping Sparrow, and Pine Siskin) appeared to have low productivity (but not low survival) as a contributing cause for the decline. Three (or possibly four) of these species (Red-naped Sapsucker, House Wren, Ruby-crowned Kinglet, and possibly, Lincoln's Sparrow) appeared to have low survival (but not low productivity) as a contributing cause for the decline. None of the species appeared to have both low survival and low productivity (although survival for Pine Siskin was unknown), and for two species (Orange-crowned Warbler and Townsend's Warbler) it appears as though neither low productivity nor low survival can explain the declines. Examination of other parameters for these two species (and for Lincoln's Sparrow) indicates that all three had negative productivity trends, positive productivity-population correlations (significant for Lincoln's Sparrow), and high $\Delta QAIC_c$ values, suggesting that declining productivity may be a contributing factor. Alternatively, other factors (such as low juvenile survival or low immigration rates) may be contributing to the decreases.

For the seven species with increasing population trends, high productivity (but not high survival) appeared to be a contributing factor to the increases of three species (Brown Creeper, Varied Thrush, and White-crowned Sparrow), high survival (but not high productivity) may be contributing to the increase in American Robin, both high productivity and high survival may be contributing to the increase in Mountain Chickadee, and neither high productivity nor high survival appears to be contributing to the increases of Hammond's Flycatcher and Black-headed Grosbeak. Examination of other parameters for these two species reveals a positive productivity-population correlation for Hammond's Flycatcher but no potential explanation for Black-headed Grosbeak, indicating that other factors (such as high juvenile survival or high immigration rates) may be contributing to the increase in the latter species.

DISCUSSION AND CONCLUSIONS

Explanations for Population and Productivity Trends on Region-Six National Forests

Data collected during 2001, the tenth year of operation on Region Six national forests, indicates that population sizes rebounded dramatically in 2001, after showing a highly significant decline between 1992 and 2000. This rebound appears to be the result of an equally dramatic increase in productivity noted between 1999 and 2000. This increase in productivity was associated with the warm phase of the North Atlantic Oscillation which causes warm dry late winter and early spring conditions in the Pacific Northwest and promotes large outbreaks of defoliating insects, particularly western spruce budworm and Douglas fir tussock moth. MAPS data has shown tha productivity of Pacific Northwest landbirds, particularly temperate-wintering species, is strongly and positively correlated with the warm phase of the North Atlantic Oscillation, which was unusually strong in 2000 (Nott et al. 2002). Thus, despite the encouraging nature of the 2000 increase in productivity and 2001 increase in population sizes, both breeding populations and productivity have shown substantial ten-year declines in Region-Six national forests. Overall, 13 species showed substantial and in most cases significant declines in breeding population, while only seven species showed substantial increases in population size; and eight species showed substantial declines in productivity, while only two species showed substantial increases. Indeed, population sizes for all species pooled over all forests combined showed a substantial ten-year decline of -1.5% per year (r = -0.524, P = 0.120).

Among the six individual national forests, breeding populations of all species pooled showed ten-year declines at three forests, being most significant at Umatilla (Annual Percent Change (APC) = - 5.6%, r = -0.849, P = 0.002), followed by Willamette (APC = -1.8%, r = -0.493, P = 0.148) and Siuslaw APC = -1.9%, r = -0.429, P = 0.217); and it showed increases at three forests, being substantial (but not significant) at Mount Baker (APC = +2.5%, r = +0.557, P = 0.095), followed by Fremont (APC = +2.3%, r = +0.417, P = 0.231) and Wenatchee (APC = +0.0%, r = +0.010, P = 0.979). Productivity showed declines at five of the six forests, being most significant a Willamette (r = -0.715, P = 0.020), followed by Mount Baker (r = -0.437, P = 0.207), Fremont r = -0.198, P = 0.584), Siuslaw, and Wenatchee (r = -0.085, P = 0.815). Only at Umatilla (r = +0.071, P = 0.844) did productivity show a slight ten-year increase, which is good news in ligh of the large population declines noted there. Indeed, the dramatically increased productivity a Umatilla in 2000 caused a dramatic population increase at Umatilla in 2001 (which caused the ten-year 1992-2001 population trend there to be substantially less negative (APC = - 5.6%, r = -0.849, P = 0.002) than the nine-year 1992-2000 trend there (APC = - 7.6%, r = -0.961, P = 0.000).

Thus, it appears that the negative population declines observed throughout the Pacific Northwest were driven primarily by declines in the Oregon coast range, western slope of the Oregon Cascades, and northern Rocky Mountain region of Oregon, whereas declines in productivity appear to have been virtually region wide. The fact that constant-effort changes in productivity during a given between-year comparison ("productivity-population correlation") correlated positively with constant-effort changes in breeding population the following year for 28 of 42 species, that eight of nine significant or nearly significant productivity-population correlations

were positive, and that this correlation for all species pooled was significantly positive (P = 0.030), indicates that changes in productivity one year often bring about corresponding changes i population size the next year. Thus, we infer that the region wide declines in productivity may be one primary cause for the general declines in breeding populations seen throughout the Pacific Northwest.

In last year's report, we demonstrated that global weather patterns as measured by the El Niño/ Southern Oscillation Index (SOI), can account for some of the declines in productivity observed within Region-Six national forests. Indeed, Nott et a .*(*2002) showed that productivity of Pacifi Northwest landbirds, particularly Neotropical-wintering species, is also positively correlated with the warm phase of the El Niño/Southern Oscillation. Because the strongest El Nino (warm phase) years were early in the past decade and the strongest La Nina years were late in the past decade, we would expect productivity for these species to have decreased over the past decade. Nevertheless, because a substantial number of species with pronounced negative population trends had positive productivity trends, global climate cycles are not the only, and likely not the major, cause of the avian population declines in the region. It is important to note, moreover, that although a positive productivity-population correlation in a species suggests that annual variations in productivity may be causing the annual variations in population size, such a correlation does not necessarily imply that productivity is the driving force of the long-term population trend. A positive population-productivity correlation could be manifest in a species, and yet that species could display any of a number of population trends, ranging from significantly increasing to significantly decreasing. What is necessary for a population to be decreasing over the long term is for its average productivity (over the long term) to be too low to balance its average mortalit (over the long term). Or, viewed alternatively, that its average survivorship is too low to balance its average productivity. Thus, in order to identify the demographic causes of population decline, it is necessary to determine the magnitudes and patterns of survival rates, as well as productivity indices, and to enquire whether productivity or survival is lower than expected.

We were able to obtain survivorship estimates for 38 target species in Region-Six national forests, when all locations were combined. $\Delta QAIC_c$ values for survivorship models were relatively high ($\geq$ 6.0) in 28 of these 38 species, indicating that relatively little annual variation in survival occurred for many species. In order to assess whether or not productivity and survival in a given species were as expected, we regressed both productivity indices and survival estimates against body mass for 33 target species for which survival was estimated with $CV(\varphi) \leq 30$. For both productivity and survival, the regression lines based on data from the 33 species in Region-Six national forests were very similar to those based on data from 210 species throughout North America as a whole, in both slope and magnitude, indicating similar patterns among the species in Region Six as compared with that of the continent overall. The actual value of the productivity index or survival rate estimate for a given species on a given forest (or over the region as a whole) as compared to its expected value from the regression line, provided an indication as to whether or not productivity or survival for that species might be deficient on that forest (or over the region as a whole). We used this information along with information on the species' productivity trend, productivity-population correlation, and $\Delta QAIC_c$ values (an

indication of the amount of annual variation in survival) to identify the probable demographic cause of population change for each species on each forest (or over the region as a whole).

Based on all of these demographic data obtained to date on Region-Six national forests, we made assessments as to whether population declines were due to deficient productivity on the breeding grounds, deficient adult survival probably during migration and/or on the winter grounds, both, or neither. We conclude that, for seven of 13 species exhibiting substantial region-wide population declines (Dusky and "Western" flycatchers, Warbling Vireo, Black-throated Gra Warbler, Common Yellowthroat, Chipping Sparrow, and Pine Siskin), deficient (low or decreasing) productivity appeared to be driving or contributing to the negative population trends. We also conclude that deficient (low or time-dependent) survival appeared to be driving or contributing to negative population trends for at least four of the 13 species (Red-naped Sapsucker, House Wren, Ruby-crowned Kinglet, and possibly Lincoln's Sparrow). For the remaining two species with substantial region-wide population declines (Orange-crowned and Townsend's warblers), neither deficient productivity nor deficient adult survival seemed to be driving or contribution to the population declines. This indicates that some other factor (such as low juvenile survival or inadequate immigration rate) may be accounting for the decreasing trends.

In future analyses, we hope to be able to address the possibility that the declines in these latter species might be caused by low juvenile survival and/or recruitment. Indeed, we are working with researchers at the USGS/BRD Patuxent Wildlife Research Center to implement models, using MAPS data, for directly estimating the population growth rate, lambda, as well as the recruitment of young and adult birds into the breeding populations. The difficulty with these analyses is the incorporation of the transient model into models that provide for the direct estimation of lambda. If these difficulties can be overcome, we hope to be able to index juvenil survival by comparing annual productivity indices and analogous annual estimates of the recruitment of young.

We also examined demographic parameters for the seven species that demonstrated substantia region-wide population increases. We conclude that high productivity alone was driving or contributing to the population increases in three of seven species (Brown Creeper, Varied Thrush, and White-crowned Sparrow), that high adult survival was driving or contributing to the population increases in American Robin, that both high productivity and high adult survival was driving the increases in Mountain Chickadee, and that neither high productivity nor high adult survival was driving the increases in Hammond's Flycatcher and Black-headed Grosbeak (although Hammond's Flycatcher did show a positive productivity-population correlation). Again, we suspect that high juvenile survival and/or immigration may be contributing to the increases in these latter two species.

Among the individual forests, it also appeared that productivity was the driving force behind more population changes than was adult survival. Deficient productivity was implicated in the declines of 0/2 species at Mount Baker, 3/7 at Wenatchee, 6/15 at Umatilla, 2/5 of Willamette, 1/3 at Siuslaw, and ½ at Fremont (total 13 of 34 forest-species combinations), whereas low

survival was implicated in the declines of 2/2 species at Mount Baker, 1/7 at Wenatchee, 4/15 a Umatilla, 0/5 of Willamette, 0/3 at Siuslaw, and ½ at Fremont (total 8 of 34 combinations). Similarly, high productivity appeared to be driving population increases in 7 of 15 forest-species combinations, while high survival was driving population increases in only 2 of 15 combinations.

It will be important to examine various potential ultimate causes for the deficient productivity in these species, especially in those for which deficient productivity did not correlate with global climate as measured by SOI. We believe that the most parsimonious ultimate environmental cause for the avian population declines documented on Region-Six National Forests, including Umatilla National Forest, is loss and/or degradation of appropriate breeding habitat on and adjacent to the forest. We suggest that additional new analyses, outlined below, of the MAPS data alread collected through 2001 can lead to the development of management strategies, based on active habitat manipulation (or lack thereof), that will be effective in reversing these declines. Other potential ultimate causes for the very substantial and highly significant declines at Umatilla tha should also be investigated include local and regional land-use practices off, as well as on, the forest, pesticide use in this heavily farmed area, and the proximity of Hanford Nuclear Testing Facility.

Formulating and Implementing Management Strategies to Reverse Landbird Declines on Region 6 National Forests — A Plan for Future Work

We have recently developed and evaluated at multiple spatial scales two new types of analyses to help us further understand the population dynamics of landbirds and formulate potential management guidelines and actions to assist their populations. First, we have demonstrated that we can identify the proximate demographic cause(s) of population declines by modeling spatia variation in vital rates (productivity and survivorship) as a function of spatial variation in population trends (DeSante et al. 2001). In a series of analyses using data from various spatia scales in eastern North America, we modeled productivity indices and time-constant annual adult survival-rate estimates from MAPS data for six target species for which BBS population trends or MAPS trends in adult captures were significantly negative in one area and positive in another, and used AIC to select the most appropriate (area-dependent or -independent) models. We found, in all cases, that we could identify the proximate demographic cause of population decline, and showed that predicted population trends modeled from MAPS vital rates were significantly positively correlated with actual population trends. Analyses of spatial variation in productivity and survival as a function of spatial variation in population trends, therefore, appear to be very effective in aiding the identification of the proximate demographic causes of different population trends in various areas and at different spatial scales.

Second, we have found that patterns of landscape structure detected within a two- to four-kilometer radius area of each MAPS station are good predictors, not only of the numbers of birds of each species captured, but also and more importantly, of their productivity levels as well (No 2000b). This study, based on MAPS data from military installations in eastern United States, revealed the existence of critical threshold values of woodland/forest patch size above which productivity levels could be maximized for four forest-interior species (Acadian Flycatcher, Wood Thrush, Kentucky Warbler, and Hood Warbler). It thus provided an extremely powerfu

tool to identify and formulate management actions aimed at increasing populations of these locally or globally declining species. By coupling station-specific and landscape-leve information on habitat characteristics with spatially explicit weather data and estimates and indices of population trends and vital rates of target species in a GIS-based framework, we w be able to control for large-scale weather and climate effects and identify the landscape-leve habitat characteristics associated with both low and high productivity and low and high surviva rates for each target species. Then, using these results, we will be able to identify generalized management guidelines, and formulate specific management actions, to reverse the population declines of the target landbird species. By this approach, we aim to develop optimal, multi-use management strategies for reversing population declines and maintaining stable or increasing populations.

Preliminary work to evaluate the use of this technique on Region Six national forests allows us to provide an example of the type of management guidelines we will be creating. We found, for example, that the breeding population size and number of young Wilson's Warblers correlated positively and highly significantly with the proportion of deciduous or mixed forest in an otherwise coniferous landscape, within 2 km of the stations, but that productivity was independent of this proportion. This suggests that increasing the deciduous component o coniferous forests will serve to increase the breeding population size of Wilson's Warblers without adversely affecting their productivity.

We have now secured a challenge grant from the National Fish and Wildlife Foundation (federal share provided by the USDA Forest Service) to undertake both of these types of analyses using data from Region 6 national forests and other appropriate locations in the Northwestern Region of North America. The first major objective of this work is to include station-specific and landscape-level habitat data into the analytical models described above to provide comprehensive analyses, from eleven years (1992-2002) of MAPS data collected at the 36 stations on the six Region Six national forests, as well as additional MAPS data from other appropriate locations i the Northwest, of the manner in which these variables affect landbird productivity and survivorship. This will provide the critical information needed to complete the second major objective of this work, which is to identify generalized management guidelines and formulate specific management actions for altering habitat characteristics from those associated with low productivity (or low survivorship) for the target species to those associated with high productivity (or high survivorship).

Fortunately, the development of the enhanced analytical models for productivity and survivorship that will include the spatially explicit landscape-level habitat variables mentioned above, as well as historical spatially explicit weather data from appropriate meteorological monitoring stations, have already been created by means of funding from the Department of Defense Legac Resource Management Program. Thus, we envision that only one and one-half years will be needed to achieve these two objectives. Our goal is to complete these analyses and the formulation of management guidelines and actions by April 2004.

The third and final major objective for this proposed work will be to implement the generalized management guidelines and specific management actions on select districts on select Region 6 national forests beginning in FY-2004. Continued monitoring of the demographic parameters and trends in the populations targeted for management will enable us to track the effectiveness of the guidelines and actions implemented, and to modify them as appropriate. In this way we can evaluate the effectiveness of the management actions and implement them in a truly adaptive management framework. In order to accomplish this final major objective, we will need to work very closely with district foresters and natural resource managers on the Region 6 national forests during the latter part of 2003 and early in 2004 to identify opportunities where the managemen guidelines and actions we propose can be integrated into existing or new actions designed to manage or harvest forest products or enhance the forest's wildlife or other natural resources. The goal will be to modify (or maintain) various landscape-level habitat characteristics in such a manner as to increase the particular vital rate (productivity or survivorship or both) that is driving the population decline (or increase) in the target species.

As documented in this report, we have operated 36 MAPS stations on the six Region 6 national forests for ten consecutive years, from 1992 through 2001. As of this writing, the operation o stations during 2002 and the computer entry and verification of all 2002 data have also been completed. Looking to the future, we envision that, when the management guidelines and actions to be identified by this project are fully implemented, we will continue operating about 12 of the 36 current stations as controls, will have discontinued operation of the other approximately 24 current stations, and will have replaced them with an equal number of new stations designed specifically to monitor the effectiveness of the management actions. We will not know, however, which stations will best serve as controls until late in 2003 or early in 2004, when plans to implement the management actions have been developed and refined. It is critical, therefore, to continue operation of all 36 existing MAPS stations at the six national forests during 2003, because survival estimation from mark-recapture models requires continuous datasets.

Conclusions

Assimilating all of our results, we can make the following conclusions. Populations of man species of landbirds on six national forests in Region 6 have declined substantially and often significantly between 1992 and 2001. The decline for all species pooled over all six nationa forests is a substantial -1.5% per year. Declines have been most pronounced on Siuslaw, Willamette, and especially, Umatilla National Forest where avian populations have declined b nearly 50% since 1992. Productivity has also declined on Region 6 national forests, and annua variations in productivity appear to be an important factor in causing annual variations in population trends for many declining species in the Region. For many species, especially Neotropical-wintering migrants, the trend in global climate during the 1990's, as characterized b the El Niño/Southern Oscillation, appears to have caused the decreasing trends in productivity which, in turn, have likely contributed to the population declines. For most declining species, however, low overall productivity (regardless of the productivity trend) or low average survival rates (or both), that are unrelated to climate, appear to provide the major cause(s) of the population declines. We suspect that the ultimate environmental cause for these deficient vita rates, especially low productivity, relates to habitat loss and/or degradation. In future analyses,

we also hope to include estimates of recruitment of young and indices of first-year survival, as well as productivity and adult survival, in order to fully understand what parameters are most affecting population changes in each target species.

The population declines in landbirds that we have documented on Region Six national forests, especially those that can be shown to be caused by low productivity on the breeding grounds, are potentially within the ability of the U.S. Forest Service to correct. We have demonstrated elsewhere how MAPS data can be used, in conjunction with station-specific and landscape-leve habitat data and spatially explicit weather data, to describe relationships between habita characteristics and the vital rate(s) or demographic parameter(s) that is(are) responsible for the population decline. Such analyses can lead to the identification of general management guidelines and the formulation of specific management actions which, if implemented, can lead to the reversal of population declines and the maintenance of stable or increasing populations.

We suggest, therefore, that the indices and estimates of primary demographic parameters produced by MAPS can be extremely useful for the management and conservation of landbirds on Region Six national forests and, in combination with similar data from other areas, across all o North America. We conclude that the MAPS protocol is very well-suited to provide a critica component of natural resource monitoring on the national forests. Based on the above information, we recommended that the operation of the 36 MAPS stations currently active on the Mount Baker/ Snoqualmie, Wenatchee, Umatilla, Willamette, Siuslaw, and Fremont national forests be sustained through 2003, while analyses are conducted to identify and formulate management strategies to reverse the declines. We further suggest some of these managemen guidelines and actions can be implemented beginning in 2004, and that new MAPS stations can be established in 2004 in appropriate locations to evaluate the effectiveness of the managemen strategies actually implemented, while a subset of the current MAPS stations can continue to be operated to serve as critical controls for that work.

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Table 1. Summary of the 2001 MAPS program on Mount Baker National Forest.

Station						2001 operation		
Name	Code	No.	Major Habitat Type	Latitude-longitud	Avg. Elev. (m)	Total number of net-hours[1]	No. of periods	Inclusive dates
Monte Cristo Lake	MCLA	11144	Wet open meadow, riparian alder corridor, dense mixed coniferous forest	46º57'40"N,120º55'20"W	610	369.8 (367.0)	7	5/27-7/30
Perry Creek	PECR	11143	Dense mixed coniferous forest, riparian alder corridor	46º57'40"N,120º55'20"W	512	345.0 (344.3)	7	6/13-7/31
Bench Thin	BETH	11908	Thinned mixed coniferous forest, dense mixe coniferous forest	46º57'40"N,120º55'20"W	354	383.0 (378.7)	7	5/30-8/03
Frog Lake	FRLA	11139	Dense mixed coniferous lacustrine forest	46º57'40"N,120º55'20"W	317	335.3 (323.2)	7	5/29-8/02
Beaver Lake	BEL	11141	Semi-wet dense mixed coniferous forest, wet open swampland, beaver pond	46º57'40"N,120º55'20"W	299	397.7 (385.2)	7	5/26-8/01
Murphy Creek	MUCR	11140	Disturbed dense mixed coniferous forest, riparian alder corridor	46º57'40"N,120º55'20"W	244	400.0 (381.3)	7	5/31-8/04
ALL STATIONS COMBINED						2230.8 (2179.7)	7	5/26-8/04

[1] Total net-hours in 2001. Net-hours in 2001 that could be compared in a constant-effort manner to 2000 are shown in parentheses.

Table 2. Capture summary for the six individual MAPS stations operated on Mount Baker National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Monte Cristo Lak			Perry Creek			Bench Thin			Frog Lake			Beaver Lake			Murphy Creek		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Northern Pygmy-Owl		1																
Rufous Hummingbird		33			12			9			5			6			4	
Red-breasted Sapsucker	4												5			1		
Hairy Woodpecker				3			2								1			1
Western Wood-Pewee	1																	
"Traill's" Flycatcher	2									1			1			1		
Hammond's Flycatcher	1						1			1		1	1					
"Western" Flycatcher	1			1			2		1	4		4	6			2		
Unidentified Empidonax					1													
Warbling Vireo	3		1							1			1					
Steller's Jay							1	2		1			1					
Chestnut-backed Chickadee	7			6			3	1		2	2		8			3		
Brown Creepe							2			3								
Winter Wren				2		1	8	3	1	6	2		2	3		11	1	2
Golden-crowned Kinglet							4			2			3	1	1	1		
Swainson's Thrush	19	1	23	12		15	6		9	10		19	20		32	25		31
American Robin	21		5	2		1	7			11		6	7	2	2	7	1	2
Varied Thrush	8		2	1		1	3			1		2	3			6		
Cedar Waxwing	13		1										1			5		
Yellow Warbler	6		6										1					
Yellow-rumped Warbler	1																	
Black-throated Gray Warbler													4	1	1			
MacGillivray's Warbler	2		3	1			6	1	3							1		
Common Yellowthroat	3		1	1									6		2			
Wilson's Warbler	5		1							3			2			2	1	
Spotted Towh							4	1	4				1					
Song Sparro	10	2	14	2	3	2	1			3		2	12	1	9	4		1
Dark-eyed Junco							6	1	3									

Table 2. Capture summary for the six individual MAPS stations operated on Mount Baker National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Monte Cristo Lak			Perry Creek			Bench Thin			Frog Lake			Beaver Lake			Murphy Creek		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Black-headed Grosbeak							2		1				2			2		
ALL SPECIES POOLED	107	37	57	31	16	20	58	18	22	49	9	34	87	14	48	71	7	37
TOTAL NUMBER OF CAPTURES		201			67			98			92			149			115	
NUMBER OF SPECIES	17	4	10	10	2	5	16	7	7	14	3	6	20	6	7	14	4	5
TOTAL NUMBER OF SPECIES		19			11			17			15			22			16	

Table 3. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Mount Baker National Forest in 2001.

	Monte Cristo Lak			Perry Creek			Bench Thin			Frog Lake			Beaver Lake			Murphy Creek		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Red-breasted Sapsucker	0.0	6.5	1.00										7.5	0.0	0.00	1.5	0.0	0.00
Hairy Woodpecker				1.7	3.5	0.67	1.6	1.6	0.50				1.5	0.0	0.00	1.5	0.0	0.00
Western Wood-Pewee	1.6	0.0	0.00															
"Traill's" Flycatcher	3.2	0.0	0.00										1.5	0.0	0.00	1.5	0.0	0.00
Hammond's Flycatcher	1.6	0.0	0.00				1.6	0.0	0.00	1.8	0.0	0.00						
"Western" Flycatcher	0.0	1.6	1.00	1.7	0.0	0.00	4.7	0.0	0.00	8.9	0.0	0.00	9.1	0.0	0.00	0.0	3.0	1.00
Warbling Vireo	4.9	1.6	0.25							1.8	0.0	0.00	1.5	0.0	0.00			
Steller's Jay							1.6	0.0	0.00	1.8	0.0	0.00	0.0	1.5	1.00			
Chestnut-backed Chickadee	4.9	6.5	0.57	5.2	5.2	0.50	4.7	0.0	0.00	3.6	0.0	0.00	7.5	4.5	0.38	3.0	1.5	0.33
Brown Creepe							0.0	3.1	1.00	0.0	5.4	1.00						
Winter Wren				1.7	1.7	0.50	6.3	9.4	0.60	7.2	3.6	0.33	3.0	0.0	0.00	9.0	7.5	0.46
Golden-crowned Kinglet							3.1	3.1	0.50	3.6	0.0	0.00	4.5	0.0	0.00	1.5	0.0	0.00
Swainson's Thrush	40.6	3.2	0.07	26.1	0.0	0.00	12.5	1.6	0.11	30.4	1.8	0.06	46.8	3.0	0.06	55.5	0.0	0.00
American Robin	30.8	8.1	0.21	5.2	0.0	0.00	7.8	3.1	0.29	23.3	3.6	0.13	13.6	0.0	0.00	12.0	0.0	0.00
Varied Thrush	11.4	4.9	0.30	3.5	0.0	0.00	1.6	3.1	0.67	1.8	0.0	0.00	3.0	1.5	0.33	9.0	0.0	0.00
Cedar Waxwing	19.5	0.0	0.00										1.5	0.0	0.00	7.5	0.0	0.00
Yellow Warbler	11.4	3.2	0.22										1.5	0.0	0.00			
Yellow-rumped Warbler	1.6	0.0	0.00															
Blk-thrtd Gray Warbler													4.5	1.5	0.25			
MacGillivray's Warbler	6.5	0.0	0.00	1.7	0.0	0.00	11.0	0.0	0.00							1.5	0.0	0.00
Common Yellowthroat	6.5	0.0	0.00	1.7	0.0	0.00							9.1	0.0	0.00			
Wilson's Warbler	8.1	1.6	0.17							3.6	1.8	0.33	3.0	0.0	0.00	3.0	0.0	0.00
Spotted Towh							7.8	0.0	0.00				1.5	0.0	0.00			
Song Sparro	21.1	4.9	0.19	3.5	0.0	0.00	0.0	1.6	1.00	3.6	3.6	0.50	19.6	7.5	0.28	1.5	4.5	0.75
Dark-eyed Junco							9.4	1.6	0.14									
Black-headed Grosbeak							1.6	1.6	0.50				1.5	1.5	0.50	3.0	0.0	0.00

Table 3. (cont.) Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Mount Baker National Forest in 2001.

	Monte Cristo Lak			Perry Creek			Bench Thin			Frog Lake			Beaver Lake			Murphy Creek		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
ALL SPECIES POOLED	173.6	42.2	0.20	52.2	10.4	0.17	75.2	29.8	0.28	91.3	19.7	0.18	141.8	21.1	0.13	111.0	16.5	0.13
NUMBER OF SPECIES	15	10		10	3		14	10		12	6		19	7		14	4	
TOTAL NUMBER OF SPECIES		17			10			16			13			20			15	

Table 4. Summary of results for all six Mount Baker National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		Prop. Young
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Northern Pygmy-Owl		1				
Rufous Hummingbird		69				
Red-breasted Sapsucker	10			1.6	1.1	0.40
Hairy Woodpecker	5		2	1.1	0.8	0.43
Western Wood-Pewee	1			0.3	0.0	0.00
"Traill's" Flycatcher	5			1.1	0.0	0.00
Hammond's Flycatcher	4		1	0.8	0.0	0.00
"Western" Flycatcher	16		5	4.0	0.8	0.17
Unidentified Empidonax		1				
Warbling Vireo	5		1	1.3	0.3	0.17
Steller's Jay	3	2		0.5	0.3	0.33
Chestnut-backed Chickadee	29	3		4.8	3.0	0.38
Brown Creepe	5			0.0	1.3	1.00
Winter Wren	29	9	4	4.6	3.8	0.45
Golden-crowned Kinglet	10	1	1	2.2	0.5	0.20
Swainson's Thrush	92	1	129	35.8	1.6	0.04
American Robin	55	3	16	15.3	2.4	0.14
Varied Thrush	22		5	5.1	1.6	0.24
Cedar Waxwing	19		1	4.8	0.0	0.00
Yellow Warbler	7		6	2.2	0.5	0.20
Yellow-rumped Warbler	1			0.3	0.0	0.00
Black-throated Gray Warbler	4	1	1	0.8	0.3	0.25
MacGillivray's Warbler	10	1	6	3.5	0.0	0.00
Common Yellowthroat	10		3	3.0	0.0	0.00
Wilson's Warbler	12	1	1	3.0	0.5	0.15
Spotted Towh	5	1	4	1.6	0.0	0.00
Song Sparro	32	6	28	8.3	3.8	0.31
Dark-eyed Junco	6	1	3	1.6	0.3	0.14
Black-headed Grosbeak	6		1	1.1	0.5	0.33
ALL SPECIES POOLED	403	101	218	108.7	23.4	0.18
TOTAL NUMBER OF CAPTURES		722				
NUMBER OF SPECIES	26	14	19	25	18	
TOTAL NUMBER OF SPECIES		28			26	

Table 5. Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Mount Bake National Forest averaged over the ten years, 1992-2001 (nine years, 1993-2001 for Bench Thin). Data are included only from stations that lie within the breeding range of the target species.

	Monte Cristo Lake			Perry Creek			Bench Thin			Frog Lake			Beaver Lake			Murphy Creek			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Sharp-shinned Hawk							0.2	0.0	0.00							0.1	0.0	0.00			
Spotted Sandpiper	0.1	0.0	0.00																		
Red-naped Sapsucke	0.2	0.0	0.00																		
Red-breasted Sapsucke	4.6	2.6	0.38	0.3	0.0	0.00	0.5	0.0	0.00				1.7	0.1	0.08	0.2	0.0	0.00	1.2	0.5	0.29
Downy Woodpecke	0.1	0.1	0.50	0.1	0.0	0.00							0.1	0.3	0.50	0.0	0.1	1.00	0.1	0.1	0.27
Hairy Woodpecke	1.3	0.9	0.39	0.9	1.6	0.63	0.5	0.7	0.50	0.3	0.4	0.56	1.0	0.7	0.44	1.0	0.7	0.50	0.8	0.9	0.54
Northern Flicke	0.0	0.2	1.00				0.2	0.0	0.00										0.0	0.0	0.50
Pileated Woodpecke													0.1	0.0	0.00						
Olive-sided Flycatcher	0.2	0.0	0.00																		
Western Wood-Pewee	0.4	0.0	0.00																0.1	0.0	0.00
"Traill's" Flycatche	4.0	0.0	0.00	0.4	0.0	0.00	0.2	0.0	0.00	0.5	0.0	0.00	0.7	0.0	0.00	0.3	0.0	0.00	1.0	0.0	0.00
Hammond's Flycatcher	4.6	1.5	0.17	3.1	0.7	0.13	1.7	0.2	0.14	1.5	0.3	0.22	2.7	0.0	0.00	2.8	0.5	0.09	2.8	0.6	0.15
Dusky Flycatcher	0.4	0.0	0.00										0.0	0.1	1.00	0.3	0.0	0.00	0.1	0.0	0.08
"Western" Flycatche	1.2	0.4	0.24	0.8	0.0	0.00	4.8	1.8	0.19	4.8	1.3	0.19	5.2	0.4	0.05	1.1	0.6	0.43	2.9	0.7	0.17
Warbling Vireo	5.5	0.8	0.12	2.9	0.4	0.09				0.5	0.0	0.00	0.6	0.0	0.00	0.3	0.0	0.00	1.7	0.2	0.12
Red-eyed Vireo													0.1	0.0	0.00						
Gray Jay	0.0	0.1	1.00																0.0	0.0	1.00
Steller's Ja	0.9	0.1	0.08				0.3	0.0	0.00	0.5	0.0	0.00	1.0	0.6	0.43				0.5	0.1	0.19
Black-capped Chickadee													0.3	0.4	0.67				0.0	0.1	0.67
Chestnut-backed Chick.	4.0	1.9	0.23	1.6	2.7	0.62	1.7	0.5	0.12	2.5	1.9	0.31	3.2	1.7	0.31	2.3	0.8	0.16	2.6	1.7	0.37
Red-breasted Nuthatch										0.1	0.0	0.00	0.0	0.1	1.00				0.0	0.0	0.50
Brown Creepe	0.0	0.3	1.00	0.0	0.1	1.00	1.0	1.6	0.57	0.2	0.6	0.67	0.7	0.2	0.40				0.3	0.5	0.56
Winter Wren	0.8	1.4	0.60	3.6	1.4	0.23	6.8	4.5	0.34	6.8	2.2	0.22	5.0	2.6	0.31	10.9	3.6	0.21	5.6	2.7	0.30
American Dipper	0.0	0.3	1.00	0.0	0.2	1.00													0.0	0.1	1.00
Golden-crowned Kinglet	0.3	0.1	0.33	0.3	0.0	0.00	0.7	0.3	0.17	0.6	0.2	0.17	0.5	0.1	0.50	0.8	0.0	0.00	0.5	0.1	0.20
Swainson's Thrush	30.3	2.7	0.08	22.9	0.8	0.03	17.5	2.5	0.11	23.3	1.7	0.07	43.6	8.2	0.16	34.4	2.6	0.08	28.7	3.0	0.10
Hermit Thrush	0.0	0.1	1.00	0.1	0.0	0.00													0.0	0.0	0.50
American Robin	11.3	2.3	0.13	6.0	0.6	0.12	3.1	1.0	0.17	9.5	1.9	0.17	12.9	2.2	0.14	10.0	1.1	0.09	8.8	1.5	0.15
Varied Thrush	8.7	7.1	0.44	5.0	0.7	0.09	1.2	1.3	0.46	4.9	1.8	0.30	0.7	1.6	0.66	3.5	1.7	0.25	4.0	2.4	0.37
European Starling													0.1	0.0	0.00						

Table 5. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Mount Baker National Forest averaged over the ten years, 1992-2001 (nine years, 1993-2001 for Bench Thin). Data are included only from stations that lie within the breeding range of the target species.

	Monte Cristo Lake			Perry Creek			Bench Thin			Frog Lake			Beaver Lake			Murphy Creek			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Cedar Waxwing	9.9	0.0	0.00				0.2	0.0	0.00	0.1	0.0	0.00	8.7	0.0	0.00	1.0	0.0	0.00	3.4	0.0	0.00
Orange-crowned Warbler	0.4	0.3	0.40	0.1	0.5	0.80	0.0	0.1	1.00	0.0	0.1	1.00							0.1	0.2	0.62
Nashville Warble	0.2	0.0	0.00																		
Yellow Warble	9.9	3.4	0.25	0.1	0.0	0.00							0.5	0.1	0.20	0.1	0.0	0.00	1.8	0.6	0.23
Yellow-rumped Warble	0.3	0.0	0.00	0.2	0.0	0.00													0.1	0.0	0.00
Blk-throated Gray Warb.	0.3	0.0	0.00				0.8	0.0	0.00	0.6	0.1	0.20	1.5	0.4	0.21	1.2	0.1	0.06	0.7	0.1	0.14
Townsend's Warbler				0.1	0.0	0.00	0.2	0.0	0.00												
MacGillivray's Warble	12.0	4.8	0.26	2.6	0.8	0.18	7.9	0.7	0.10	0.7	0.1	0.13	4.1	2.5	0.35	1.0	0.1	0.14	4.7	1.6	0.22
Common Yellowthroat	6.4	3.8	0.26	0.2	0.1	0.50							8.6	2.5	0.20	0.5	0.0	0.00	2.7	1.1	0.24
Wilson's Warbler	3.4	3.2	0.57	1.2	0.8	0.33	0.3	0.0	0.00	4.3	1.2	0.20	0.9	0.0	0.00	3.0	0.1	0.02	2.2	0.9	0.32
Western Tanage	1.0	0.0	0.00				0.3	0.0	0.00				0.3	0.0	0.00	0.4	0.0	0.00	0.4	0.0	0.00
Spotted Towhee							1.8	0.3	0.17				0.2	0.2	0.50				0.3	0.1	0.31
Chipping Sparrow							0.3	0.0	0.00												
Song Sparrow	12.4	10.7	0.46	1.2	1.1	0.51	0.6	1.0	0.67	1.4	1.7	0.56	15.8	9.9	0.36	0.6	0.8	0.35	5.3	4.3	0.43
Dark-eyed Junco	0.4	0.7	0.44	2.0	0.7	0.09	12.5	3.6	0.20	0.9	0.1	0.05	0.3	0.3	0.67	2.2	0.5	0.15	2.9	0.9	0.22
Black-headed Grosbeak	0.4	0.0	0.00				0.2	0.2	0.50	1.0	0.2	0.08	0.9	0.3	0.20	0.3	0.0	0.00	0.5	0.1	0.12
Lazuli Bunting							0.2	0.0	0.00												
Red-winged Blackbird	0.3	0.0	0.00																		
Pine Siskin	0.5	0.0	0.00	0.0	0.1	1.00							0.3	0.0	0.00				0.1	0.0	0.17
Evening Grosbeak													0.6	0.0	0.00				0.1	0.0	0.00
ALL SPECIES POOLED	136.9	50.0	0.27	55.7	13.4	0.18	65.5	20.2	0.23	65.0	15.8	0.19	122.8	35.5	0.22	78.3	13.5	0.15	87.3	25.1	0.22
NUMBER OF SPECIES	34	25		23	17		27	16		21	17		32	23		24	14		32	26	
TOTAL NUMBER OF SPECIES	39			26			28			22			34			25			34		

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

Table 6. Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Mount Baker National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Hammond's Flycatcher	49.2* (1.000)	62.6 (1.000)	62.4 (1.000)	59.8 (1.000)	74.4 (1.000)	76.4 (1.000)	76.3 (1.000)	91.4 (1.000)	13.4
"Western" Flycatcher	48.8* (1.000)	54.7 (1.000)	58.0 (1.000)	58.1 (1.000)	70.1 (1.000)	72.2 (1.000)	72.5 (1.000)	88.4 (1.000)	6.0
Warbling Vireo	42.2* (1.000)	59.8 (1.000)	58.4 (1.000)	56.4 (1.000)	77.1 (1.000)	84.3 (1.000)	79.4 (1.000)	108.0 (1.000)	17.6
Winter Wren	68.6 (1.000)	63.7* (1.000)	73.1 (1.000)	79.8 (1.000)	77.8 (1.000)	78.9 (1.000)	90.3 (1.000)	92.1 (1.000)	-4.9
Swainson's Thrush	235.6* (0.479)	243.1 (0.502)	240.6 (0.580)	237.3* (0.682)	248.7 (0.562)	249.1 (0.586)	241.1 (0.821)	252.9 (0.682)	7.5
American Robin	138.4* (0.921)	146.6 (0.938)	144.8 (0.957)	148.8 (0.911)	157.8 (0.916)	156.5 (0.949)	157.0 (0.944)	167.3 (0.924)	8.2
Varied Thrush	82.4* (1.000)	82.4* (1.000)	89.6 (1.000)	87.1 (1.000)	95.3 (1.000)	93.6 (1.000)	97.8 (1.000)	105.2 (1.000)	0.1
Yellow Warbler	72.5* (1.000)	89.0 (1.000)	81.8 (1.000)	88.8 (1.000)	101.4 (1.000)	111.8 (1.000)	105.2 (1.000)	132.9 (1.000)	16.5
MacGillivray's Warbler	102.7* (0.999)	114.1 (0.999)	107.3 (1.000)	108.8 (1.000)	120.0 (1.000)	122.8 (1.000)	116.9 (1.000)	131.4 (1.000)	11.4

Table 6. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Mount Baker National Forest. $QAIC_C$[1] and $(GOF)^2$ are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Common Yellowthroat	82.0* (0.999)	84.9 (1.000)	81.4* (1.000)	88.5 (1.000)	94.6 (1.000)	97.9 (1.000)	94.2 (1.000)	108.1 (1.000)	2.9
Song Sparro	87.0* (1.000)	93.3 (1.000)	97.5 (1.000)	97.6 (1.000)	101.7 (1.000)	102.7 (1.000)	109.3 (1.000)	112.6 (1.000)	6.3
Dark-eyed Junco	68.2* (1.000)	75.7 (1.000)	79.6 (1.000)	77.0 (1.000)	90.7 (1.000)	91.4 (1.000)	95.4 (1.000)	104.9 (1.000)	7.4

[1] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample sizes and overdispersion of data.

[2] Goodness-of-fit is a measure of how well the actual distribution of data fits the theoretical distribution calculated using the estimates provided by the model. The larger the value provided by the GOF test the better the model describes the data.

[3] $\varphi p\tau$ Model: Transient model with temporally-constant survival probability, recapture probability, and proportion of residents (invariable from year to year).

[4] $\varphi_t p\tau$ Model: Transient model with temporally-variable survival probability; and temporally-constant recapture probability and proportion of residents.

[5] $\varphi p_t\tau$ Model: Transient model with temporally-variable recapture probability; and temporally-constant survival probability and proportion of residents.

[6] $\varphi p\tau_t$ Model: Transient model with temporally-variable proportion of residents; and temporally-constant survival and recapture probabilities.

[7] $\varphi_t p_t\tau$ Model: Transient model with temporally-variable survival and recapture probabilities; and temporally-constant proportion of residents.

[8] $\varphi_t p\tau_t$ Model: Transient model with temporally-variable survival probability and proportion of residents; and temporally-constant recapture probability.

[9] $\varphi p_t\tau_t$ Model: Transient model with temporally-variable recapture probability and proportion of residents; and temporally-constant survival probability.

[10] $\varphi_t p_t\tau_t$ Model: Transient model with temporally-variable survival probability, recapture probability, and proportion of residents.

[11] $\Delta QAIC_C$ is defined as the difference in $QAIC_C$ between th $\varphi p\tau$ model and th $\varphi_t p\tau$ model.

* The chosen models are the model with the lowest $QAIC_C$ and the models with $QAIC_C$s within 2.0 units of the model with the lowest $QAIC_C$.

Table 7. Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 12 species breeding at MAPS stations on Mount Baker National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Hammond's Flycatcher	4	96	126	9	$\varphi p \tau$	49.2	0.476 (0.139)	29.2	0.247 (0.143)	0.370 (0.232)
"Western" Flycatcher	5	112	138	8	$\varphi p \tau$	48.8	0.476 (0.143)	30.1	0.227 (0.145)	0.356 (0.243)
Warbling Vireo	3	55	79	7	$\varphi p \tau$	42.2	0.632 (0.154)	24.3	0.214 (0.126)	0.311 (0.219)
Winter Wren	5	211	321	21	$\varphi p \tau$*	68.6	0.224 (0.068)	30.3	0.574 (0.195)	0.555 (0.228)
					$\varphi_t p \tau$	63.7	a0.000 (0.468)	--.-	0.631 (0.188)	0.569 (0.221)
							b0.000 (0.481)	--.-		
							c0.276 (0.174)	63.0		
							d0.059 (0.060)	101.7		
							e0.249 (0.124)	49.8		
							f0.769 (0.274)	35.6		
							g0.147 (0.087)	59.2		
							h0.322 (0.170)	52.8		
							i0.114 (0.114)	100.0		
Swainson's Thrush	5	797	1988	388	$\varphi p \tau$	235.6	0.574 (0.022)	3.7	0.650 (0.030)	0.614 (0.053)
					$\varphi p \tau_t$	237.3	0.571 (0.021)	3.7	0.655 (0.030)	a0.574 (0.130)
										b0.839 (0.159)
										c0.686 (0.145)
										d0.630 (0.140)
										e0.530 (0.103)
										f1.000 (0.166)
										g0.540 (0.120)
										h0.410 (0.125)
										i0.414 (0.129)
American Robin	5	310	430	51	$\varphi p \tau$	138.4	0.629 (0.061)	9.7	0.245 (0.056)	0.529 (0.134)

Table 7. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 12 species breeding at MAPS stations on Mount Baker National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Varied Thrush	5	139	206	28	$\varphi p\tau$	82.4	0.437 (0.078)	17.9	0.590 (0.129)	0.453 (0.151)
					$\varphi_t p\tau$	82.4	a0.000 (1.186)	--.-	0.596 (0.137)	0.495 (0.155)
							b0.417 (0.238)	57.1		
							c0.000 (0.557)	--.-		
							d0.432 (0.175)	40.5		
							e0.960 (0.271)	28.2		
							f0.497 (0.182)	36.6		
							g0.281 (0.162)	57.7		
							h0.515 (0.236)	45.8		
							i0.202 (0.144)	71.3		
Yellow Warbler	2	54	95	19	$\varphi p\tau$	72.5	0.649 (0.099)	15.2	0.324 (0.105)	0.808 (0.307)
MacGillivray's Warbler	2	123	244	40	$\varphi p\tau$	102.7	0.557 (0.064)	11.5	0.502 (0.091)	0.497 (0.138)
Common Yellowthroat	2	86	142	19	$\varphi p\tau$	82.0	0.545 (0.092)	16.8	0.391 (0.120)	0.443 (0.183)
					$\varphi p_t\tau$	81.4	0.511 (0.092)	16.8	a0.000 (0.940)	0.530 (0.221)
									b0.000 (0.795)	
									c0.502 (0.300)	
									d0.000 (0.613)	
									e0.729 (0.257)	
									f0.692 (0.260)	
									g0.166 (0.152)	
									h0.643 (0.295)	
									i0.559 (0.411)	
Song Sparro	4	163	319	48	$\varphi p\tau$	87.0	0.380 (0.058)	15.2	0.725 (0.101)	0.770 (0.190)
Dark-eyed Junco	3	86	154	23	$\varphi p\tau$	68.2	0.325 (0.077)	23.9	0.608 (0.160)	1.000 (0.369)

Table 7. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 12 species breeding at MAPS stations on Mount Baker National Forest obtained from ten years (1992-2001) of mark-recapture data.

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[1] Number of stations where the species was a regular or usual breeder at which adults of the species were captured.
[2] Number of adult individuals captured at stations where the species was a regular or usual breeder (i.e., number of capture histories).
[3] Total number of captures of adult birds of the species at stations where the species was a regular or usual breeder.
[4] Total number of returns. A return is the first recapture in a given year of a bird originally banded at the same station in a previous year.
[5] Models included are those chosen by $QAIC_C$ (those models marked with * in Table 6) plus th $\varphi p\tau$ model in all cases. See Table 6 for definitions of the models.
[6] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample size and overdispersion of data.
[7] Survival probability presented as the maximum likelihood estimate (standard error of the estimate).
a The survival probability between the years 1992-1993 in a temporally variable model.
b The survival probability between the years 1993-1994 in a temporally variable model.
c The survival probability between the years 1994-1995 in a temporally variable model.
d The survival probability between the years 1995-1996 in a temporally variable model.
e The survival probability between the years 1996-1997 in a temporally variable model.
f The survival probability between the years 1997-1998 in a temporally variable model.
g The survival probability between the years 1998-1999 in a temporally variable model.
h The survival probability between the years 1999-2000 in a temporally variable model.
i The survival probability between the years 2000-2001 in a temporally variable model.
[8] The coefficient of variation for survival probability.
[9] Recapture probability presented as the maximum likelihood estimate (standard error of the estimate).
a The recapture probability in 1993 in a temporally variable model.
b The recapture probability in 1994 in a temporally variable model.
c The recapture probability in 1995 in a temporally variable model.
d The recapture probability in 1996 in a temporally variable model.
e The recapture probability in 1997 in a temporally variable model.
f The recapture probability in 1998 in a temporally variable model.
g The recapture probability in 1999 in a temporally variable model.
h The recapture probability in 2000 in a temporally variable model.
i The recapture probability in 2001 in a temporally variable model.

Table 7. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 12 species breeding at MAPS stations on Mount Baker National Forest obtained from ten years (1992-2001) of mark-recapture data.

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[10] The proportion of residents among newly captured adults presented as the maximum likelihood estimate (standard error of the estimate).

a The proportion of residents in the adult population in 1992 in a temporally variable model.
b The proportion of residents in the adult population in 1993 in a temporally variable model.
c The proportion of residents in the adult population in 1994 in a temporally variable model.
d The proportion of residents in the adult population in 1995 in a temporally variable model.
e The proportion of residents in the adult population in 1996 in a temporally variable model.
f The proportion of residents in the adult population in 1997 in a temporally variable model.
g The proportion of residents in the adult population in 1998 in a temporally variable model.
h The proportion of residents in the adult population in 1999 in a temporally variable model.
i The proportion of residents in the adult population in 2000 in a temporally variable model.

* Time-constant model that was not marked by $QAIC_C$, but that is shown only for comparison to other species.

Table 8. Relative values of vital rates (lower-than-expected, as-expected, higher-than-expected) for selected study species on Mount Baker National Forest in relation to the direction and significance of their adult population trends over the ten years 1992-2001.

Species	Significance of the trend[1]	Productivity	Survival Probability
A. Declining Species			
Winter Wren		expected	lower
Dark-eyed Junco	**	expected	lower
B. Increasing Species			
Swainson's Thrush	**	lower	higher
American Robin	***	expected	higher

[1] Direction and significance of the trends in adult population size as based on data from all six stations (Fig. 1); *** $P < 0.01$, ** $0.01 \leq P < 0.05$, * $0.05 \leq P < 0.10$.

Table 9. Summary of the 2001 MAPS program on Wenatchee National Forest.

Station						2001 operation		
Name	Code	No.	Major Habitat Type	Latitude-longitud	Avg. Elev. (m)	Total number of net-hours[1]	No. of periods	Inclusive dates
Two Point	TWPO	11147	Dry grazed montane meadow, open disturbed mixed coniferous forest	46°57'40"N,120°55'20"W	1512	329.0 (312.3)	7	6/06-8/06
Deep Creek	DECR	11150	Undisturbed fir/spruce bog, dense mixed coniferous forest	46°46'40"N,121°20'20"W	1195	246.7 (241.3)	7	6/04-8/05
Pleasant Valley	PLVA	11148	Wet open meadow, riparian alder corridor, open spruce forest, dense mixed coniferous forest	46°56'50"N,121°18'50"W	1000	350.3 (293.3)	7	6/02-8/02
Timothy Meadow	TIME	11145	Wet alder/huckleberry marshland, open spruce woodland, mixed coniferous forest	47°04'50"N,121°15'20"W	951	341.7 (297.5)	7	6/03-7/31
Quartz Creek 2	QCR2	11902	Riparian alder river-bottom, open mixed coniferous forest, beaver ponds, open shrubland	47°01'10"N,121°07'50"W	853	333.8 (300.7)	7	6/01-8/04
Rattlesnake Springs	RASP	11149	Riparian alder/aspen grove, chaparral, mixed coniferous forest	46°48'20"N,121°02'40"W	817	401.7 (392.8)	7	6/05-8/03
ALL STATIONS COMBINED						2003.2 (1838.0)	7	6/01-8/06

[1] Total net-hours in 2001. Net-hours in 2001 that could be compared in a constant-effort manner to 2000 are shown in parentheses.

Table 10. Capture summary for the six individual MAPS stations operated on Wenatchee National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Two Point			Deep Creek			Pleasant Valley			Timothy Meado			Quartz Creek 2			Rattlesnake Sp.		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Blue Grouse														1				
Calliope Hummingbird		32			6			2			5			13			6	
Rufous Hummingbird		24			3			4			9			11			9	
Williamson's Sapsucker													2					
Red-naped Sapsucker				1			1			1			2		1	3		3
Hairy Woodpecker				1						1								
White-headed Woodpecker																1		
Northern Flicker													1			1		
Olive-sided Flycatcher				2		1												
Western Wood-Pewee				1			1						9		6	3		
Hammond's Flycatcher	3			4	1		2		2	2			8		6	5		8
Dusky Flycatcher	1						1						4		7	1		
"Western" Flycatcher	1						1						5		1	2		
Cassin's Vireo				1												2		
Warbling Vireo	7		1							2			9		3	2		1
Gray Jay	2			1														
Mountain Chickadee	5												2		2	8	1	1
Chestnut-backed Chickadee	2	1		14		2				2			2					
Red-breasted Nuthatch	1			2						1			5		1	5		1
Brown Creepe	2												1			1		
House Wren							2						2	1				
Golden-crowned Kinglet	26	2		1			1			1			2		1			
Ruby-crowned Kinglet	1																	
Western Bluebird																1		
Townsend's Solitair																3		
Swainson's Thrush				1									1		4			
Hermit Thrush	3		1	1									2					
American Robin	5	1	3	3			5			3	1	2	5	1	1	2	1	2

Table 10. (cont.) Capture summary for the six individual MAPS stations operated on Wenatchee National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Two Point			Deep Creek			Pleasant Valley			Timothy Meado			Quartz Creek 2			Rattlesnake Sp.		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Cedar Waxwing																2		
Orange-crowned Warbler	10																	
Nashville Warbler	12			2									2			3		2
Yellow Warbler													11		8			
Yellow-rumped Warbler	5		2	1			10		4	1			5			5		
Townsend's Warbler	25		1	30						4	1		5		2			
MacGillivray's Warbler	37	3	25				1						25	2	18	11		21
Wilson's Warbler				1			1			1			3	1				
Yellow-breasted Chat													1					
Western Tanager	3		1							1			3			10	2	
Chipping Sparro	2			4			4		2	4						4		1
Fox Sparro	1		1															
Song Sparro	1			2		3	3			11		5	17	5	21	1		1
Lincoln's Sparro	12	2	8	10		10	9	2	5	11	1	8	3		2			
White-crowned Sparro							4		5						2			
Dark-eyed Junco	42	6	7	21	2	4	5		1	10	1	6	9	1	3	18	2	
Black-headed Grosbeak	4		1										1			4		1
Lazuli Bunting	2		7				1						1					
Brown-headed Cowbird	1																	
Cassin's Finch				1		1							5		1			
Pine Siskin	1			24	1		13			6			27	1	1	1		
Evening Grosbeak				20	1		1	1					3			1		
ALL SPECIES POOLED	217	71	58	149	14	21	66	9	19	62	18	21	183	37	91	100	21	42
TOTAL NUMBER OF CAPTURES		346			184			94			101			311			163	
NUMBER OF SPECIES	28	8	12	24	6	6	19	4	6	17	6	4	33	10	20	26	6	11
TOTAL NUMBER OF SPECIES		30			26			21			19			37			28	

Table 11. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Wenatchee National Forest in 2001.

	Two Point			Deep Creek			Pleasant Valley			Timothy Meado			Quartz Creek 2			Rattlesnake Springs		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Williamson's Sapsucker													0.0	3.6	1.00			
Red-naped Sapsucker				2.4	0.0	0.00	1.7	0.0	0.00	1.8	0.0	0.00	3.6	0.0	0.00	3.0	1.5	0.33
Hairy Woodpecker				2.4	0.0	0.00				1.8	0.0	0.00						
White-headed Woodpecker																1.5	0.0	0.00
Northern Flicker													0.0	1.8	1.00	1.5	0.0	0.00
Olive-sided Flycatcher				4.9	0.0	0.00												
Western Wood-Pewee				2.4	0.0	0.00	1.7	0.0	0.00				14.4	10.8	0.43	4.5	0.0	0.00
Hammond's Flycatcher	1.8	3.6	0.67	4.9	4.9	0.50	6.9	0.0	0.00	3.5	0.0	0.00	14.4	5.4	0.27	9.0	1.5	0.14
Dusky Flycatcher	1.8	0.0	0.00				1.7	0.0	0.00				9.0	0.0	0.00	1.5	0.0	0.00
"Western" Flycatcher							1.7	0.0	0.00				5.4	3.6	0.40	3.0	0.0	0.00
Cassin's Vireo				0.0	2.4	1.00										0.0	3.0	1.00
Warbling Vireo	12.7	1.8	0.13							3.5	0.0	0.00	16.2	3.6	0.18	3.0	0.0	0.00
Gray Jay	3.6	0.0	0.00	0.0	2.4	1.00												
Mountain Chickadee	5.5	3.6	0.40										1.8	1.8	0.50	4.5	9.0	0.67
Chestnut-backed Chick.	0.0	3.6	1.00	26.8	7.3	0.21				3.5	0.0	0.00	1.8	1.8	0.50			
Red-breasted Nuthatch	0.0	1.8	1.00	0.0	4.9	1.00				1.8	0.0	0.00	7.2	3.6	0.33	4.5	3.0	0.40
Brown Creepe	0.0	3.6	1.00										0.0	1.8	1.00	0.0	1.5	1.00
House Wren							1.7	1.7	0.50				0.0	3.6	1.00			
Golden-crowned Kinglet	5.5	41.9	0.88	0.0	2.4	1.00	1.7	0.0	0.00	1.8	0.0	0.00	3.6	0.0	0.00			
Ruby-crowned Kinglet	1.8	0.0	0.00															
Western Bluebird																1.5	0.0	0.00
Townsend's Solitair																3.0	1.5	0.33
Swainson's Thrush				2.4	0.0	0.00							7.2	0.0	0.00			
Hermit Thrush	7.3	0.0	0.00	2.4	0.0	0.00							1.8	1.8	0.50			
American Robin	10.9	0.0	0.00	0.0	7.3	1.00	8.6	0.0	0.00	10.5	0.0	0.00	9.0	1.8	0.17	3.0	1.5	0.33
Cedar Waxwing																3.0	0.0	0.00
Orange-crowned Warbler	1.8	16.4	0.90															

Table 11. (cont.) Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Wenatchee National Forest in 2001.

	Two Point			Deep Creek			Pleasant Valley			Timothy Meado			Quartz Creek 2			Rattlesnake Springs		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Nashville Warbler	1.8	20.0	0.92	4.9	0.0	0.00							1.8	1.8	0.50	4.5	0.0	0.00
Yellow Warbler													14.4	9.0	0.39			
Yellow-rumped Warbler	7.3	1.8	0.20	2.4	0.0	0.00	8.6	10.3	0.54	1.8	0.0	0.00	3.6	5.4	0.60	4.5	3.0	0.40
Townsend's Warbler	16.4	29.1	0.64	26.8	46.2	0.63				7.0	0.0	0.00	10.8	0.0	0.00			
MacGillivray's Warbler	71.0	18.2	0.20				0.0	1.7	1.00				41.3	18.0	0.30	17.9	3.0	0.14
Wilson's Warbler				2.4	0.0	0.00	1.7	0.0	0.00	1.8	0.0	0.00	5.4	0.0	0.00			
Yellow-breasted Chat													1.8	0.0	0.00			
Western Tanager	7.3	0.0	0.00							1.8	0.0	0.00	5.4	0.0	0.00	10.5	6.0	0.36
Chipping Sparro	3.6	0.0	0.00	0.0	9.7	1.00	8.6	0.0	0.00	7.0	0.0	0.00				6.0	0.0	0.00
Fox Sparro	1.8	0.0	0.00															
Song Sparro	1.8	0.0	0.00	7.3	2.4	0.25	3.4	1.7	0.33	7.0	12.3	0.64	12.6	21.6	0.63	1.5	0.0	0.00
Lincoln's Sparro	18.2	7.3	0.29	7.3	19.5	0.73	10.3	6.9	0.40	12.3	7.0	0.36	1.8	3.6	0.67			
White-crowned Sparro							6.9	0.0	0.00				1.8	0.0	0.00			
Dark-eyed Junco	32.8	51.0	0.61	29.2	26.8	0.48	6.9	1.7	0.20	22.8	0.0	0.00	9.0	10.8	0.54	17.9	9.0	0.33
Black-headed Grosbeak	7.3	0.0	0.00										1.8	0.0	0.00	6.0	0.0	0.00
Lazuli Bunting	9.1	0.0	0.00				1.7	0.0	0.00				1.8	0.0	0.00			
Brown-headed Cowbird	1.8	0.0	0.00															
Cassin's Finch				2.4	0.0	0.00							7.2	1.8	0.20			
Pine Siskin	1.8	0.0	0.00	36.5	21.9	0.38	15.4	6.9	0.31	10.5	0.0	0.00	41.3	7.2	0.15	1.5	0.0	0.00
Evening Grosbeak				48.7	0.0	0.00	3.4	0.0	0.00				5.4	0.0	0.00	1.5	0.0	0.00
ALL SPECIES POOLED	234.9	203.9	0.47	216.5	158.1	0.42	92.5	30.8	0.25	100.1	19.3	0.16	262.4	124.0	0.32	118.0	43.3	0.27
NUMBER OF SPECIES	24	14		18	13		18	7		17	2		30	22		24	12	
TOTAL NUMBER OF SPECIES		27			24			19			17			34			26	

Table 12. Summary of results for all six Wenatchee National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		
	Newly banded	Un-banded	Recap-tured	Adults	Young	Prop. Young
Blue Grouse		1				
Calliope Hummingbird		64				
Rufous Hummingbird		60				
Williamson's Sapsucker	2			0.0	0.6	1.00
Red-naped Sapsucker	8		4	2.1	0.3	0.13
Hairy Woodpecker	2			0.6	0.0	0.00
White-headed Woodpecker	1			0.3	0.0	0.00
Northern Flicker	2			0.3	0.3	0.50
Olive-sided Flycatcher	2		1	0.6	0.0	0.00
Western Wood-Pewee	14		6	3.9	1.8	0.32
Hammond's Flycatcher	24	1	16	6.9	2.4	0.26
Dusky Flycatcher	7		7	2.4	0.0	0.00
"Western" Flycatcher	9		1	1.8	0.6	0.25
Cassin's Vireo	3			0.0	0.9	1.00
Warbling Vireo	20		5	6.0	0.9	0.13
Gray Jay	3			0.6	0.3	0.33
Mountain Chickadee	15	1	3	2.1	2.7	0.56
Chestnut-backed Chickadee	20	1	2	4.2	1.8	0.30
Red-breasted Nuthatch	14		2	2.4	2.1	0.47
Brown Creepe	4			0.0	1.2	1.00
House Wren	4	1		0.3	0.9	0.75
Golden-crowned Kinglet	31	2	1	2.1	7.2	0.77
Ruby-crowned Kinglet	1			0.3	0.0	0.00
Western Bluebird	1			0.3	0.0	0.00
Townsend's Solitair	3			0.6	0.3	0.33
Swainson's Thrush	2		4	1.5	0.0	0.00
Hermit Thrush	6		1	1.8	0.3	0.14
American Robin	23	4	8	7.2	1.5	0.17
Cedar Waxwing	2			0.6	0.0	0.00
Orange-crowned Warbler	10			0.3	2.7	0.90
Nashville Warbler	19		2	2.1	3.6	0.63
Yellow Warbler	11		8	2.4	1.5	0.39
Yellow-rumped Warbler	27		6	4.8	3.6	0.43
Townsend's Warbler	64	1	3	9.0	10.5	0.54
MacGillivray's Warbler	74	5	64	22.2	6.9	0.24
Wilson's Warbler	6	1		1.8	0.0	0.00
Yellow-breasted Chat	1			0.3	0.0	0.00
Western Tanager	17	2	1	4.5	1.2	0.21
Chipping Sparro	18		3	4.5	1.2	0.21
Fox Sparro	1		1	0.3	0.0	0.00
Song Sparro	35	5	30	5.4	6.3	0.54
Lincoln's Sparro	45	5	33	8.1	6.6	0.45

White-crowned Sparro	4	7	1.5	0.0	0.00

Table 12. (cont.) Summary of results for all six Wenatchee National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		Prop. Young
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Dark-eyed Junco	105	12	21	19.2	15.6	0.45
Black-headed Grosbeak	9		2	2.7	0.0	0.00
Lazuli Bunting	4		7	2.1	0.0	0.00
Brown-headed Cowbird	1			0.3	0.0	0.00
Cassin's Finch	6		2	1.5	0.3	0.17
Pine Siskin	72	2	1	16.5	5.1	0.24
Evening Grosbeak	25	2		7.8	0.0	0.00
ALL SPECIES POOLED	777	170	252	165.9	91.1	0.35
TOTAL NUMBER OF CAPTURES		1199				
NUMBER OF SPECIES	47	18	30	44	31	
TOTAL NUMBER OF SPECIES		50			47	

Table 13. Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Wenatchee National Forest averaged over the ten years, 1992-2001 (nine years, 1993-2001 for Quartz Creek 2). Data are included only from stations that lie within the breeding range of the target species.

	Two Point			Deep Creek			Pleasant Valle			Timothy Meadow			Quartz Creek 2			Rattlesnake Springs			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Spotted Sandpiper																					
Northern Pygmy-Owl																0.1	0.0	0.00			
Williamson's Sapsucker	1.0	0.2	0.17	0.0	0.1	1.00	0.2	0.0	0.00				0.7	1.5	0.71	0.0	0.4	1.00	0.3	0.3	0.56
Red-naped Sapsucke				0.9	0.1	0.10	0.7	0.4	0.29	0.7	0.4	0.33	1.9	1.8	0.46	2.7	0.9	0.23	1.1	0.6	0.34
Hybrid Sapsucke							0.4	0.0	0.00				0.8	0.0	0.00	0.7	0.0	0.00	0.3	0.0	0.00
Red-breasted Sapsucke				0.3	0.0	0.00	0.1	0.0	0.00	0.1	0.0	0.00	0.2	0.0	0.00	0.6	0.0	0.00	0.2	0.0	0.00
Downy Woodpecke	0.1	0.1	0.50										1.4	0.0	0.00	0.6	0.1	0.11	0.3	0.1	0.17
Hairy Woodpecke	0.1	0.1	0.50	1.7	0.5	0.18	0.3	0.1	0.33	0.7	0.5	0.33	0.9	0.0	0.00	0.5	0.1	0.20	0.7	0.2	0.22
White-headed Woodpeck.																0.3	0.1	0.25	0.1	0.0	0.25
Three-toed Woodpecke				0.5	0.0	0.00													0.1	0.0	0.00
Northern Flicke	0.1	0.0	0.00	0.7	0.0	0.00	0.3	0.0	0.00	0.0	0.1	1.00	0.3	0.2	0.33	0.5	0.0	0.00	0.3	0.0	0.13
Olive-sided Flycatcher				2.2	0.0	0.00	0.2	0.0	0.00				0.3	0.0	0.00				0.4	0.0	0.00
Western Wood-Pewee				2.5	0.1	0.05	4.0	0.0	0.00	0.5	0.0	0.00	9.5	1.5	0.07	4.7	0.0	0.00	3.4	0.2	0.05
"Traill's" Flycatche							0.1	0.0	0.00												
Hammond's Flycatcher	0.8	1.0	0.60	3.6	2.0	0.33	7.5	0.5	0.08	3.2	0.4	0.11	8.6	0.8	0.04	4.7	0.9	0.16	4.6	0.9	0.20
Dusky Flycatcher	2.5	0.6	0.12	0.4	0.0	0.00	0.7	0.0	0.00	0.5	0.0	0.00	7.2	0.5	0.05	5.9	0.6	0.11	2.8	0.3	0.09
"Western" Flycatche							0.7	0.0	0.00	0.1	0.1	0.50	1.1	0.4	0.20	1.0	0.6	0.22	0.5	0.2	0.27
Cassin's Vireo	0.0	0.2	1.00	0.0	0.2	1.00				0.1	0.0	0.00	0.7	0.3	0.50	0.6	0.3	0.33	0.2	0.2	0.46
Warbling Vireo	6.6	0.4	0.11	0.3	0.0	0.00	4.6	0.2	0.06	1.4	0.0	0.00	12.2	0.9	0.05	4.8	0.3	0.03	4.9	0.3	0.05
Gray Jay	0.7	0.4	0.58	0.7	1.5	0.67	0.0	0.1	1.00	0.1	0.0	0.00							0.2	0.3	0.54
Steller's Ja	0.1	0.0	0.00										0.3	0.0	0.00				0.1	0.0	0.00
Clark's Nutcracker				0.1	0.0	0.00															
Tree Swallo							0.4	0.0	0.00										0.1	0.0	0.00
Violet-green Swallo							1.3	0.2	0.05										0.2	0.0	0.05
N. Rough-winged Swallo							2.0	0.0	0.00				0.5	0.0	0.00				0.4	0.0	0.00
Black-capped Chickadee													0.7	0.1	0.33				0.1	0.0	0.33
Mountain Chickadee	2.1	3.5	0.63	0.0	0.1	1.00							1.4	0.2	0.10	4.6	4.5	0.49	1.4	1.5	0.47
Chestnut-backed Chick.	0.5	0.6	0.33	6.6	5.5	0.43	2.0	2.1	0.43	3.0	1.2	0.21	1.3	1.2	0.52				2.1	1.7	0.41
Red-breasted Nuthatch	0.4	2.1	0.79	1.5	3.1	0.53	0.5	0.0	0.00	1.1	0.4	0.28	2.6	0.8	0.33	1.8	2.1	0.54	1.3	1.4	0.46
Pygmy Nuthatch																0.1	0.0	0.00			
Brown Creepe	0.4	0.6	0.50	0.4	0.2	0.22	0.3	0.0	0.00	0.0	0.3	1.00	0.8	0.5	0.50	0.3	0.4	0.75	0.4	0.3	0.57

Table 13. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Wenatchee National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Two Point			Deep Creek			Pleasant Valle			Timothy Meadow			Quartz Creek 2			Rattlesnake Springs			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
House Wren	0.0	0.4	1.00				0.5	0.9	0.70	0.0	0.1	1.00	2.6	1.7	0.47	1.2	1.3	0.51	0.7	0.7	0.55
Winter Wren	0.2	0.0	0.00	0.4	0.6	0.75	0.4	0.0	0.00	0.1	0.4	0.75				0.0	0.1	1.00	0.2	0.2	0.53
Golden-crowned Kinglet	2.6	14.0	0.74	1.5	5.8	0.71	2.1	0.7	0.18	2.9	1.6	0.35	2.3	0.2	0.07	0.6	0.0	0.00	2.0	3.7	0.56
Ruby-crowned Kinglet	0.7	0.3	0.33										0.3	0.0	0.00				0.2	0.0	0.17
Western Bluebird																0.1	0.0	0.00			
Townsend's Solitaire							0.1	0.0	0.00							0.8	0.7	0.47	0.2	0.1	0.39
Swainson's Thrush	0.2	0.0	0.00	2.3	0.2	0.04	1.5	0.2	0.17	1.0	0.1	0.07	5.3	0.5	0.06	1.9	0.6	0.08	2.0	0.2	0.09
Hermit Thrush	3.1	1.4	0.22	2.6	0.7	0.24	0.3	0.0	0.00	0.2	0.1	0.33	0.4	0.4	0.50	3.9	0.9	0.11	1.8	0.6	0.22
American Robin	6.3	0.7	0.09	1.2	0.7	0.20	8.7	0.6	0.06	4.7	0.2	0.03	6.5	1.0	0.12	3.0	0.6	0.17	5.0	0.6	0.10
Varied Thrush	0.0	0.1	1.00	2.3	0.8	0.24				0.4	0.4	0.50	0.0	0.1	1.00				0.5	0.2	0.37
Cedar Waxwing							0.1	0.0	0.00	0.4	0.0	0.00	2.1	0.0	0.00	1.8	0.0	0.00	0.7	0.0	0.00
Orange-crowned Warbler	2.2	13.9	0.82	0.1	0.4	0.75	0.0	0.7	1.00	0.0	0.3	1.00	0.3	0.5	0.50	0.3	0.3	0.67	0.5	2.8	0.79
Nashville Warble	1.3	14.7	0.90	1.0	0.2	0.31	0.6	0.7	0.62	0.1	0.2	0.75	0.7	1.0	0.50	5.6	2.2	0.29	1.6	3.2	0.65
Yellow Warble	0.0	1.9	1.00	1.5	0.0	0.00	7.2	1.3	0.14	0.6	0.2	0.27	12.5	2.3	0.13	0.1	0.0	0.00	3.4	0.9	0.16
Yellow-rumped Warble	3.8	1.5	0.25	0.5	0.0	0.00	6.1	8.3	0.44	5.3	1.1	0.24	7.2	5.0	0.33	5.9	2.5	0.26	4.8	3.0	0.37
Townsend's Warbler	4.4	22.9	0.72	6.2	8.4	0.53	2.1	3.5	0.44	5.2	2.7	0.29	4.2	1.6	0.30	0.9	0.3	0.30	3.7	6.4	0.58
Townsend's x Hermit W.				0.1	0.0	0.00															
MacGillivray's Warble	46.0	24.8	0.33	0.7	0.4	0.45	6.9	3.1	0.33	5.9	1.8	0.25	27.0	9.0	0.25	14.9	3.9	0.20	16.9	7.2	0.29
Common Yellowthroat							0.1	0.0	0.00	0.2	0.0	0.00	0.4	0.0	0.00				0.1	0.0	0.00
Wilson's Warbler	0.6	0.4	0.50	0.8	0.2	0.40	1.4	0.1	0.17	0.9	0.0	0.00	3.5	0.3	0.06	1.2	0.0	0.00	1.3	0.2	0.13
Yellow-breasted Chat													0.2	0.0	0.00						
Western Tanage	1.8	0.1	0.08				0.4	0.2	0.33	0.5	0.0	0.00	1.6	0.0	0.00	8.7	2.4	0.23	2.2	0.5	0.15
Spotted Towhee	0.2	0.0	0.00													0.7	0.6	0.33	0.2	0.1	0.28
Chipping Sparrow	5.1	1.3	0.11	0.0	1.0	1.00	2.9	0.5	0.16	1.8	0.2	0.05	1.6	0.6	0.17	6.0	0.8	0.11	3.0	0.7	0.16
Vesper Sparrow							0.2	0.0	0.00												
Savannah Sparrow							0.1	0.0	0.00												
Fox Sparrow	0.3	0.0	0.00																0.1	0.0	0.00
Song Sparrow	0.6	0.8	0.64	3.6	1.5	0.35	5.5	2.9	0.36	8.6	5.9	0.39	13.0	12.2	0.42	2.4	3.7	0.57	5.4	4.3	0.43
Lincoln's Sparrow	11.1	8.2	0.38	17.3	6.9	0.27	12.4	3.1	0.16	23.7	7.3	0.23	0.4	2.9	0.81	0.2	0.1	0.50	11.0	4.7	0.29
White-crowned Sparro							0.7	0.0	0.00	0.0	0.1	1.00	2.0	0.9	0.19				0.4	0.2	0.21
Dark-eyed Junco	19.9	22.1	0.50	17.0	8.8	0.32	7.4	2.3	0.20	10.5	3.3	0.22	7.3	5.5	0.42	11.9	6.4	0.30	12.2	8.0	0.38

Table 13. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Wenatchee National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Two Point			Deep Creek			Pleasant Valle			Timothy Meadow			Quartz Creek 2			Rattlesnake Springs			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Black-headed Grosbeak	3.2	0.9	0.20										1.2	0.0	0.00	1.8	0.1	0.03	1.0	0.2	0.20
Lazuli Bunting	5.1	0.4	0.05				0.4	0.0	0.00				0.2	0.0	0.00	0.0	0.1	1.00	1.0	0.1	0.06
Brown-headed Cowbird	0.4	0.1	0.25				0.0	0.1	1.00	0.2	0.0	0.00	1.1	0.5	0.19	0.1	0.0	0.00	0.3	0.1	0.18
Pine Grosbeak				0.1	0.0	0.00															
Purple Finch	0.1	0.0	0.00				0.1	0.0	0.00				0.1	0.0	0.00	1.9	2.1	0.44	0.4	0.4	0.43
Cassin's Finch	0.8	0.0	0.00	1.0	0.1	0.08	0.9	0.0	0.00				4.4	1.2	0.30	4.5	0.6	0.07	1.9	0.3	0.11
House Finch	0.0	0.1	1.00													0.0	0.2	1.00	0.0	0.1	1.00
Red Crossbill				0.2	0.0	0.00										0.1	0.0	0.00			0.00
Pine Siskin	3.5	1.3	0.24	23.1	10.4	0.21	14.2	4.2	0.15	4.5	0.3	0.07	23.2	2.1	0.07	3.1	4.8	0.19	11.5	3.8	0.22
Evening Grosbeak	0.1	0.0	0.00	8.2	0.5	0.07	0.8	0.0	0.00	0.7	0.0	0.00	2.1	0.0	0.00	1.2	0.0	0.00	2.0	0.1	0.04
ALL SPECIES POOLED	139.3	142.6	0.48	114.1	61.3	0.33	110.7	36.8	0.23	90.2	29.7	0.24	187.2	60.3	0.24	119.2	46.7	0.28	124.9	62.4	0.32
NUMBER OF SPECIES	39	35		37	29		47	25		34	27		50	35		46	36		59	45	
TOTAL NUMBER OF SPECIES		44			41			50			39			51			50			60	

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

Table 14. Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Wenatchee National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Western Wood-Pewee	92.0* (0.999)	103.8 (0.999)	99.5 (1.000)	99.0 (1.000)	109.1 (1.000)	113.3 (1.000)	111.6 (1.000)	119.8 (1.000)	11.8
Hammond's Flycatcher	91.2* (1.000)	103.7 (1.000)	102.2 (1.000)	104.0 (1.000)	113.0 (1.000)	117.1 (1.000)	116.5 (1.000)	126.7 (1.000)	12.5
Dusky Flycatcher	61.1* (1.000)	66.0 (1.000)	59.3* (1.000)	68.7 (1.000)	72.5 (1.000)	81.1 (1.000)	75.9 (1.000)	91.9 (1.000)	4.9
Warbling Vireo	89.4* (1.000)	103.7 (1.000)	100.5 (1.000)	94.0 (1.000)	112.0 (1.000)	110.1 (1.000)	106.8 (1.000)	117.8 (1.000)	14.3
Swainson's Thrush	80.2* (0.998)	90.7 (0.999)	86.1 (1.000)	89.3 (1.000)	99.7 (1.000)	105.5 (1.000)	100.6 (1.000)	120.6 (1.000)	10.4
American Robin	104.1* (0.999)	119.1 (0.996)	116.3 (0.998)	116.1 (0.999)	126.3 (0.999)	133.0 (0.995)	127.4 (0.999)	141.8 (0.997)	15.0
Yellow Warbler	86.4* (1.000)	94.2 (1.000)	97.1 (1.000)	100.6 (1.000)	106.1 (1.000)	112.7 (1.000)	115.2 (1.000)	124.7 (1.000)	7.8
Yellow-rumped Warbler	77.7* (1.000)	88.8 (1.000)	87.0 (1.000)	84.4 (1.000)	98.8 (1.000)	96.1 (1.000)	95.0 (1.000)	106.4 (1.000)	11.0
MacGillivray's Warbler	155.5 (0.995)	150.8* (1.000)	163.5 (0.997)	160.0 (0.999)	160.4 (1.000)	160.1 (1.000)	168.9 (1.000)	170.2 (1.000)	-4.7

Table 14. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Wenatchee National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Chipping Sparro	32.9* (1.000)	39.8 (1.000)	40.8 (1.000)	45.1 (1.000)	57.6 (1.000)	61.6 (1.000)	61.2 (1.000)	79.6 (1.000)	6.9
Song Sparro	99.4 (1.000)	97.3* (1.000)	102.7 (1.000)	110.8 (1.000)	111.2 (1.000)	109.8 (1.000)	115.4 (1.000)	122.5 (1.000)	-2.1
Lincoln's Sparro	154.4* (0.953)	158.5 (0.986)	154.2* (0.996)	166.7 (0.922)	167.1 (0.988)	168.7 (0.987)	163.9 (0.997)	180.8 (0.967)	4.1
Dark-eyed Junco	120.6* (1.000)	130.1 (1.000)	131.1 (1.000)	131.0 (1.000)	139.4 (1.000)	139.3 (1.000)	139.8 (1.000)	149.2 (1.000)	9.5

[1] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample sizes and overdispersion of data.

[2] Goodness-of-fit is a measure of how well the actual distribution of data fits the theoretical distribution calculated using the estimates provided by the model. The larger the value provided by the GOF test the better the model describes the data.

[3] $\varphi p\tau$ Model: Transient model with temporally-constant survival probability, recapture probability, and proportion of residents (invariable from year to year).

[4] $\varphi_t p\tau$ Model: Transient model with temporally-variable survival probability; and temporally-constant recapture probability and proportion of residents.

[5] $\varphi p_t\tau$ Model: Transient model with temporally-variable recapture probability; and temporally-constant survival probability and proportion of residents.

[6] $\varphi p\tau_t$ Model: Transient model with temporally-variable proportion of residents; and temporally-constant survival and recapture probabilities.

[7] $\varphi_t p_t\tau$ Model: Transient model with temporally-variable survival and recapture probabilities; and temporally-constant proportion of residents.

[8] $\varphi_t p\tau_t$ Model: Transient model with temporally-variable survival probability and proportion of residents; and temporally-constant recapture probability.

[9] $\varphi p_t\tau_t$ Model: Transient model with temporally-variable recapture probability and proportion of residents; and temporally-constant survival probability.

[10] $\varphi_t p_t\tau_t$ Model: Transient model with temporally-variable survival probability, recapture probability, and proportion of residents.

[11] $\Delta QAIC_C$ is defined as the difference in $QAIC_C$ between th $\varphi p\tau$ model and th $\varphi_t p\tau$ model.

* The chosen models are the model with the lowest $QAIC_C$ and the models with $QAIC_C$s within 2.0 units of the model with the lowest $QAIC_C$.

Table 15. Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 13 species breeding at MAPS stations on Wenatchee National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Western Wood-Pewee	4	113	176	28	$\varphi p \tau$	92.0	0.589 (0.075)	12.7	0.468 (0.102)	0.339 (0.115)
Hammond's Flycatcher	6	161	260	35	$\varphi p \tau$	91.2	0.537 (0.072)	13.4	0.421 (0.094)	0.490 (0.145)
Dusky Flycatcher	3	98	170	12	$\varphi p \tau$	61.1	0.496 (0.111)	22.4	0.344 (0.141)	0.232 (0.133)
					$\varphi p_t \tau$	59.3	0.665 (0.190)	28.6	a0.634 (0.396) b1.000 (0.684) c0.365 (0.244) d0.267 (0.213) e0.000 (0.691) f0.000 (0.765) g0.000 (0.854) h0.217 (0.211) i0.137 (0.179)	0.266 (0.146)
Warbling Vireo	4	157	263	36	$\varphi p \tau$	89.4	0.437 (0.067)	15.3	0.541 (0.110)	0.556 (0.163)
Swainson's Thrush	5	66	122	18	$\varphi p \tau$	80.2	0.611 (0.096)	15.7	0.335 (0.109)	0.546 (0.223)
American Robin	6	179	242	30	$\varphi p \tau$	104.1	0.666 (0.079)	11.9	0.125 (0.049)	1.000 (0.389)
Yellow Warbler	2	97	223	34	$\varphi p \tau$	86.4	0.479 (0.069)	14.4	0.488 (0.105)	0.814 (0.245)
Yellow-rumped Warbler	5	180	239	17	$\varphi p \tau$	77.7	0.577 (0.102)	17.6	0.244 (0.093)	0.239 (0.108)

Table 15. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 13 species breeding at MAPS stations on Wenatchee National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
MacGillivray's Warbler	5	544	1213	165	$\varphi p\tau$*	155.5	0.485 (0.031)	6.4	0.698 (0.048)	0.433 (0.061)
					$\varphi_t p\tau$	105.8	a0.682 (0.132)	19.4	0.680 (0.050)	0.421 (0.059)
							b0.602 (0.094)	15.6		
							c0.424 (0.075)	17.7		
							d0.490 (0.096)	19.6		
							e0.408 (0.087)	21.3		
							f0.700 (0.105)	15.0		
							g0.229 (0.060)	26.2		
							h0.588 (0.108)	18.4		
							i0.532 (0.112)	21.1		
Chipping Sparro	5	119	141	5	$\varphi p\tau$	32.9	0.375 (0.190)	50.5	0.131 (0.148)	0.621 (0.671)
Song Sparro	6	187	482	47	$\varphi p\tau$*	99.4	0.402 (0.051)	12.7	0.609 (0.098)	0.408 (0.134)
					$\varphi_t p\tau$	97.3	a0.296 (0.155)	52.4	0.591 (0.102)	0.358 (0.116)
							b0.848 (0.197)	23.2		
							c0.443 (0.132)	29.8		
							d0.433 (0.134)	30.9		
							e0.522 (0.169)	32.4		
							f0.065 (0.065)	100.0		
							g0.203 (0.111)	54.7		
							h0.436 (0.177)	40.6		
							i0.610 (0.244)	40.0		

Table 15. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 13 species breeding at MAPS stations on Wenatchee National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Lincoln's Sparro	4	334	916	137	$\varphi p\tau$	154.4	0.417 (0.033)	7.8	0.667 (0.057)	0.913 (0.133)
					$\varphi p_t\tau$	154.2	0.462 (0.037)	8.0	a0.838 (0.104)	0.860 (0.122)
									b0.805 (0.109)	
									c0.704 (0.113)	
									d0.622 (0.120)	
									e0.658 (0.118)	
									f0.701 (0.134)	
									g0.375 (0.103)	
									h0.297 (0.120)	
									i0.229 (0.115)	
Dark-eyed Junco	6	436	675	72	$\varphi p\tau$	120.6	0.400 (0.048)	12.0	0.407 (0.074)	0.692 (0.150)

[1] Number of stations where the species was a regular or usual breeder at which adults of the species were captured.
[2] Number of adult individuals captured at stations where the species was a regular or usual breeder (i.e., number of capture histories).
[3] Total number of captures of adult birds of the species at stations where the species was a regular or usual breeder.
[4] Total number of returns. A return is the first recapture in a given year of a bird originally banded at the same station in a previous year.
[5] Models included are those chosen by $QAIC_C$ (those models marked with * in Table 14) plus th $\varphi p\tau$ model in all cases. See Table 14 for definitions of the models.
[6] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample size and overdispersion of data.

Table 15. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 13 species breeding at MAPS stations on Wenatchee National Forest obtained from ten years (1992-2001) of mark-recapture data.

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

a The survival probability between the years 1992-1993 in a temporally variable model.
b The survival probability between the years 1993-1994 in a temporally variable model.
c The survival probability between the years 1994-1995 in a temporally variable model.
d The survival probability between the years 1995-1996 in a temporally variable model.
e The survival probability between the years 1996-1997 in a temporally variable model.
f The survival probability between the years 1997-1998 in a temporally variable model.
g The survival probability between the years 1998-1999 in a temporally variable model.
h The survival probability between the years 1999-2000 in a temporally variable model.
i The survival probability between the years 2000-2001 in a temporally variable model.

[8] The coefficient of variation for survival probability.

[9] Recapture probability presented as the maximum likelihood estimate (standard error of the estimate).

a The recapture probability in 1993 in a temporally variable model.
b The recapture probability in 1994 in a temporally variable model.
c The recapture probability in 1995 in a temporally variable model.
d The recapture probability in 1996 in a temporally variable model.
e The recapture probability in 1997 in a temporally variable model.
f The recapture probability in 1998 in a temporally variable model.
g The recapture probability in 1999 in a temporally variable model.
h The recapture probability in 2000 in a temporally variable model.
i The recapture probability in 2001 in a temporally variable model.

[10] The proportion of residents among newly captured adults presented as the maximum likelihood estimate (standard error of the estimate).

* Time-constant model that was not marked by $QAIC_C$, but that are shown only for comparison to other species.

Table 16. Relative values of vital rates (lower-than-expected, as-expected, higher-than-expected) for selected study species at Wenatchee National Forest in relation to the direction and significance of their adult population trends over the ten years 1992-2001.

Species	Significance of the trend[1]	Productivity	Survival Probability[2]
A. Declining Species			
Western Wood-Pewee		lower	higher
Dusky Flycatcher	**	lower	expected
Golden-crowned Kinglet	**	expected	
Swainson's Thrush	*	lower	higher
Yellow-rumped Warbler		higher	higher
Song Sparrow	***	higher	lower
Lincoln's Sparrow		expected	expected
B. Increasing Species			
American Robin	***	expected	expected
Dark-eyed Junco	**	higher	expected

[1] Direction and significance of the trends in adult population size as based on data from all six stations (Fig. 1); *** $P < 0.01$, ** $0.01 \leq P < 0.05$, * $0.05 \leq P < 0.10$.

[2] A question mark (?) indicates that survival could not be estimated due to low recapture rates.

Table 17. Summary of the 2001 MAPS program on Umatilla National Forest.

Station			Major Habitat Type	Latitude-longitud	Avg. Elev. (m)	2001 operation		
Name	Code	No.				Total number of net-hours[1]	No. of periods	Inclusive dates
Buzzard Creek	BUCR	11151	Disturbed coniferous forest, successional alder scrub	45°50'00"N,117°57'20"W	1524	358.3 (350.0)	7	6/06-8/03
Buck Mountain Meado	BMME	11155	Montane meadow, dens coniferous forest	45°40'40"N,118°06'40"W	1378	331.0 (328.0)	7	6/04-7/31
Coyote Ridg	CORI	11154	Successional disturbed mixed coniferous forest	45°44'50"N,118°10'10"W	1341	395.0 (380.0)	7	5/28-8/01
Fry Meado	FRME	11153	Montane meadow, coniferous forest	45°47'40"N,117°50'30"W	1280	404.5 (403.0)	7	5/27-8/02
Brock Meadow	BRME	11152	Montane meadow, coniferous forest, riparian willows	45°48'50"N,117°51'40"W	1244	368.0 (354.3)	7	6/07-7/30
Phillips Creek	PHCR	11156	Riparian willow/alder, dry chaparral, open mixe conifer/oak forest	45°35'20"N,118°02'10"W	975	417.0 (412.7)	7	5/26-8/04
ALL STATIONS COMBINED						2273.8 (2228.0)	7	5/26-8/04

[1] Total net-hours in 2001. Net-hours in 2001 that could be compared in a constant-effort manner to 2000 are shown in parentheses.

Table 18. Capture summary for the six individual MAPS stations operated on Umatilla National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Buzzard Creek			Buck Mt. Meado			Coyote Ridg			Fry Meado			Brock Meadow			Phillips Creek		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Cooper's Hawk																	1	
Ruffed Grous		1						2										
Northern Saw-whet Owl					1													
Calliope Hummingbird					5			8			1			1			10	
Rufous Hummingbird					4													
Williamson's Sapsucker									1									
Red-naped Sapsucker				1									6			2		
Downy Woodpecker									1			1						
Hairy Woodpecker							1			1						1	1	
Three-toed Woodpecker	1																	
Northern Flicker							1									1		
Pileated Woodpecker		3						1										
Olive-sided Flycatcher																1		
"Traill's" Flycatcher													9	1	6			
Hammond's Flycatcher				2		2				2			7		4	1		
Hammond's/Dusky Flycatcher		2												1				
Dusky Flycatcher	4						5		3	1	1							
Unidentified Flycatcher														1				
Cassin's Vireo							7											
Warbling Vireo										5			3		3	4		1
Gray Jay				1														
Steller's Jay							1											
Black-capped Chickadee							4		1				1					
Mountain Chickadee	5			2		4	1			9			3			1		
Chestnut-backed Chickadee	1			2						3			1			1		
Red-breasted Nuthatch	1			4	1		1			1	1		2			3		
Brown Creepe	6			4								2	5		1	2		
Winter Wren	1			6	1			1					3		1	3	1	
Golden-crowned Kinglet	46	1	1	67	4	3	13	1	2	22		3	11	2	1	2	1	1

Table 18. (cont.) Capture summary for the six individual MAPS stations operated on Umatilla National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Buzzard Creek			Buck Mt. Meado			Coyote Ridg			Fry Meado			Brock Meadow			Phillips Creek		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Ruby-crowned Kinglet	8		1	9	1	4	7		2	15	3	2	11	1	2	2		
Swainson's Thrush	2		2	7		5	2		1	9		2	10		9	7	1	11
Hermit Thrush	3			4		2	5		3									
American Robin										1						5		
Varied Thrush	1											1	1					
Orange-crowned Warbler							7		1				2			2		
Nashville Warbler	2						1			1								
Yellow Warbler							1											
Yellow-rumped Warbler	5	1		5		2	5			5		3	8		2	1		
Townsend's Warbler	12		1	16		4	11	1	3	8		1	6		1	3	2	1
MacGillivray's Warbler	16		2	6		2	43	3	10	9		6	19		15	16	1	21
Wilson's Warbler	2			7			1						17	1	22			
Western Tanager	4			3			5									6		
Chipping Sparro	4			6			2											
Fox Sparro	2			1			2		2	3	1	3	2	1	5			
Song Sparro	1									1			8	1	3	2		
Lincoln's Sparro				4		3				8	1	6	24	4	23			
Dark-eyed Junco	19		2	11	1	3	25		4	6		1	1			2		
Black-headed Grosbeak							1									3	1	
Lazuli Bunting				3						1								
Brown-headed Cowbird				1									1					
Cassin's Finch																1		
Pine Siskin	2			4						3			5					
ALL SPECIES POOLED	148	8	9	176	18	34	152	17	34	114	8	31	166	14	98	72	19	35
TOTAL NUMBER OF CAPTURES		165			228			203			153			278			126	
NUMBER OF SPECIES	23	5	6	24	8	11	24	7	13	21	6	12	25	9	15	24	9	5
TOTAL NUMBER OF SPECIES		26			27			30			25			27			26	

Table 19. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Umatilla National Forest in 2001.

	Buzzard Creek			Buck Mt. Meado			Coyote Ridg			Fry Meado			Brock Meadow			Phillips Creek		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Williamson's Sapsucker							1.5	0.0	0.00									
Red-naped Sapsucker				0.0	1.8	1.00							9.8	0.0	0.00	2.9	0.0	0.00
Downy Woodpecker							1.5	0.0	0.00	1.5	0.0	0.00						
Hairy Woodpecker							1.5	0.0	0.00	1.5	0.0	0.00				1.4	0.0	0.00
Three-toed Woodpecker	1.7	0.0	0.00															
Northern Flicker							0.0	1.5	1.00							0.0	1.4	1.00
Olive-sided Flycatcher																0.0	1.4	1.00
"Traill's" Flycatcher													14.7	0.0	0.00			
Hammond's Flycatcher				3.6	1.8	0.33				3.0	0.0	0.00	9.8	1.6	0.14	1.4	0.0	0.00
Dusky Flycatcher	6.7	0.0	0.00				7.6	0.0	0.00	3.0	0.0	0.00						
Cassin's Vireo							4.6	3.0	0.40									
Warbling Vireo										7.4	0.0	0.00	8.2	0.0	0.00	2.9	4.3	0.60
Gray Jay				0.0	1.8	1.00												
Steller's Jay							1.5	0.0	0.00									
Black-capped Chickadee							1.5	4.6	0.75				0.0	1.6	1.00			
Mountain Chickadee	5.0	3.3	0.40	3.6	3.6	0.50	1.5	0.0	0.00	13.4	0.0	0.00	3.3	1.6	0.33	0.0	1.4	1.00
Chestnut-backed Chick.	1.7	0.0	0.00	0.0	3.6	1.00				4.5	0.0	0.00	1.6	0.0	0.00	1.4	0.0	0.00
Red-breasted Nuthatch	1.7	0.0	0.00	5.4	1.8	0.25	1.5	0.0	0.00	0.0	1.5	1.00	3.3	0.0	0.00	2.9	1.4	0.33
Brown Creepe	3.3	6.7	0.67	5.4	1.8	0.25				1.5	0.0	0.00	6.5	1.6	0.20	2.9	0.0	0.00
Winter Wren	0.0	1.7	1.00	9.1	1.8	0.17							3.3	1.6	0.33	5.8	0.0	0.00
Golden-crowned Kinglet	8.4	68.7	0.89	39.9	81.6	0.67	7.6	12.2	0.62	17.8	14.8	0.46	8.2	9.8	0.55	1.4	1.4	0.50
Ruby-crowned Kinglet	6.7	6.7	0.50	16.3	3.6	0.18	4.6	6.1	0.57	14.8	7.4	0.33	17.9	3.3	0.15	2.9	0.0	0.00
Swainson's Thrush	5.0	0.0	0.00	18.1	0.0	0.00	4.6	0.0	0.00	13.4	0.0	0.00	22.8	0.0	0.00	17.3	0.0	0.00
Hermit Thrush	3.3	1.7	0.33	7.3	1.8	0.20	3.0	4.6	0.60									
American Robin										1.5	0.0	0.00				5.8	1.4	0.20
Varied Thrush	1.7	0.0	0.00							1.5	0.0	0.00	1.6	0.0	0.00			
Orange-crowned Warbler							7.6	4.6	0.38				3.3	0.0	0.00	2.9	0.0	0.00

Table 19. (cont.) Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Umatilla National Forest in 2001.

	Buzzard Creek			Buck Mt. Meado			Coyote Ridg			Fry Meado			Brock Meadow			Phillips Creek		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Nashville Warbler	1.7	1.7	0.50				0.0	1.5	1.00	0.0	1.5	1.00						
Yellow Warbler							0.0	1.5	1.00									
Yellow-rumped Warbler	6.7	1.7	0.20	12.7	0.0	0.00	6.1	1.5	0.20	8.9	0.0	0.00	9.8	4.9	0.33	1.4	0.0	0.00
Townsend's Warbler	13.4	6.7	0.33	25.4	9.1	0.26	13.7	4.6	0.25	8.9	4.5	0.33	9.8	1.6	0.14	2.9	1.4	0.33
MacGillivray's Warbler	0.0	26.8	1.00	5.4	7.3	0.57	21.3	50.1	0.70	10.4	7.4	0.42	24.5	13.0	0.35	30.2	5.8	0.16
Wilson's Warbler	1.7	1.7	0.50	10.9	1.8	0.14	1.5	0.0	0.00				31.0	3.3	0.10			
Western Tanager	6.7	0.0	0.00	5.4	0.0	0.00	7.6	0.0	0.00							5.8	2.9	0.33
Chipping Sparro	6.7	0.0	0.00	10.9	0.0	0.00	3.0	0.0	0.00									
Fox Sparro	3.3	0.0	0.00	1.8	0.0	0.00	1.5	1.5	0.50	4.5	3.0	0.40	6.5	0.0	0.00			
Song Sparro	0.0	1.7	1.00							0.0	1.5	1.00	9.8	4.9	0.33	0.0	2.9	1.00
Lincoln's Sparro				5.4	1.8	0.25				11.9	3.0	0.20	37.5	4.9	0.12			
Dark-eyed Junco	15.1	18.4	0.55	9.1	14.5	0.62	15.2	22.8	0.60	3.0	7.4	0.71	0.0	1.6	1.00	2.9	0.0	0.00
Black-headed Grosbeak							1.5	0.0	0.00							2.9	1.4	0.33
Lazuli Bunting				5.4	0.0	0.00				1.5	0.0	0.00						
Brown-headed Cowbird				0.0	1.8	1.00							1.6	0.0	0.00			
Cassin's Finch																1.4	0.0	0.00
Pine Siskin	1.7	1.7	0.50	7.3	0.0	0.00				3.0	1.5	0.33	8.2	0.0	0.00			
ALL SPECIES POOLED	102.1	149.0	0.59	208.5	141.4	0.40	121.5	120.0	0.50	136.5	53.4	0.28	252.7	55.4	0.18	99.3	27.3	0.22
NUMBER OF SPECIES	20	14		20	17		23	14		21	11		23	14		20	12	
TOTAL NUMBER OF SPECIES		23			24			26			24			25			24	

Table 20. Summary of results for all six Umatilla National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		
	Newly banded	Un-banded	Recap-tured	Adults	Young	Prop. Young
Cooper's Hawk		1				
Ruffed Grous		3				
Northern Saw-whet Owl		1				
Calliope Hummingbird		25				
Rufous Hummingbird		4				
Williamson's Sapsucker			1	0.3	0.0	0.00
Red-naped Sapsucker	9			2.1	0.3	0.11
Downy Woodpecker			2	0.5	0.0	0.00
Hairy Woodpecker	3	1		0.8	0.0	0.00
Three-toed Woodpecker	1			0.3	0.0	0.00
Northern Flicker	2			0.0	0.5	1.00
Pileated Woodpecker		4				
Olive-sided Flycatcher	1			0.0	0.3	1.00
"Traill's" Flycatcher	9	1	6	2.4	0.0	0.00
Hammond's Flycatcher	12		6	2.9	0.5	0.15
Hammond's/Dusky Flycatcher		3				
Dusky Flycatcher	10	1	3	2.9	0.0	0.00
Unidentified Flycatcher		1				
Cassin's Vireo	7			0.8	0.5	0.40
Warbling Vireo	12		4	3.2	0.8	0.20
Gray Jay	1			0.0	0.3	1.00
Steller's Jay	1			0.3	0.0	0.00
Black-capped Chickadee	5		1	0.3	1.1	0.80
Mountain Chickadee	21		4	4.5	1.6	0.26
Chestnut-backed Chickadee	8			1.6	0.5	0.25
Red-breasted Nuthatch	12	2		2.4	0.8	0.25
Brown Creepe	17		3	3.2	1.6	0.33
Winter Wren	13	3	1	2.9	0.8	0.21
Golden-crowned Kinglet	161	9	11	13.2	29.3	0.69
Ruby-crowned Kinglet	52	5	11	10.3	4.5	0.30
Swainson's Thrush	37	1	30	13.5	0.0	0.00
Hermit Thrush	12		5	2.1	1.3	0.39
American Robin	6			1.3	0.3	0.17
Varied Thrush	2		1	0.8	0.0	0.00
Orange-crowned Warbler	11		1	2.4	0.8	0.25
Nashville Warbler	4			0.3	0.8	0.75
Yellow Warbler	1			0.0	0.3	1.00
Yellow-rumped Warbler	29	1	7	7.4	1.3	0.15
Townsend's Warbler	56	3	11	11.9	4.5	0.27
MacGillivray's Warbler	109	4	56	15.8	18.2	0.54
Wilson's Warbler	27	1	22	7.1	1.1	0.13
Western Tanager	18			4.2	0.5	0.11

Chipping Sparro	12	3.2	0.0	0.00

Table 20.(cont.) Summary of results for all six Umatilla National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		Prop. Young
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Fox Sparro	10	2	10	2.9	0.8	0.21
Song Sparro	12	1	3	1.6	1.8	0.54
Lincoln's Sparro	36	5	32	9.0	1.6	0.15
Dark-eyed Junco	64	1	10	7.4	10.6	0.59
Black-headed Grosbeak	4	1		0.8	0.3	0.25
Lazuli Bunting	4			1.1	0.0	0.00
Brown-headed Cowbird	2			0.3	0.3	0.50
Cassin's Finch	1			0.3	0.0	0.00
Pine Siskin	14			3.2	0.5	0.14
ALL SPECIES POOLED	828	84	241	150.9	88.1	0.37
TOTAL NUMBER OF CAPTURES		1153				
NUMBER OF SPECIES	42	24	24	4	32	
TOTAL NUMBER OF SPECIES		51			44	

Table 21. Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Umatilla National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Buzzard Creek			Buck Mountain Meadow			Coyote Ridge			Fry Meadow			Brock Meadow			Phillips Creek			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Sharp-shinned Hawk				0.0	0.3	1.00										0.1	0.0	0.00	0.0	0.0	0.75
Williamson's Sapsucker				0.5	0.1	0.17	0.7	0.0	0.00				0.1	0.0	0.00				0.2	0.0	0.07
Red-naped Sapsucke	0.7	0.0	0.00	0.7	0.8	0.57	1.9	0.2	0.08	0.9	0.1	0.08	4.9	1.5	0.14	2.7	0.6	0.15	1.9	0.5	0.19
Hybrid Sapsucke													0.3	0.0	0.00						
Downy Woodpecke							0.4	0.0	0.00	0.6	0.0	0.00	0.5	0.0	0.00				0.2	0.0	0.00
Hairy Woodpecke	0.3	0.0	0.00	0.1	0.0	0.00	0.6	0.4	0.33	0.1	0.0	0.00	0.1	0.0	0.00	0.1	0.1	0.50	0.2	0.1	0.29
Three-toed Woodpecke	0.3	0.0	0.00										0.1	0.0	0.00				0.1	0.0	0.00
Northern Flicke	0.3	0.1	0.33	0.2	0.0	0.00	0.0	0.3	1.00				0.1	0.0	0.00	0.0	0.1	1.00	0.1	0.1	0.33
Olive-sided Flycatcher										0.1	0.0	0.00	0.3	0.0	0.00	0.0	0.1	1.00	0.1	0.0	0.33
"Traill's" Flycatche							0.1	0.0	0.00				6.3	0.1	0.01	0.3	0.0	0.00	1.1	0.0	0.01
Hammond's Flycatcher	0.3	0.4	0.63	4.1	2.6	0.31	0.4	0.3	0.38	0.4	0.3	0.50	2.8	0.6	0.25	8.1	0.6	0.06	2.6	0.8	0.23
Gray Flycatcher				0.1	0.0	0.00	0.5	0.1	0.13	0.1	0.0	0.00	0.4	0.0	0.00	0.1	0.0	0.00	0.2	0.0	0.04
Dusky Flycatcher	1.9	0.1	0.07	0.1	0.3	0.67	12.6	1.4	0.08	3.8	1.5	0.12	0.6	0.0	0.00	1.0	0.5	0.33	3.5	0.6	0.11
"Western" Flycatche	0.1	0.0	0.00	0.6	0.0	0.00	0.2	0.0	0.00				0.0	0.1	1.00	2.2	0.0	0.00	0.5	0.0	0.04
Cassin's Vireo	0.0	0.2	1.00	0.1	0.0	0.00	1.9	1.5	0.22	0.0	0.2	1.00	0.3	1.5	0.63	0.9	0.5	0.30	0.6	0.6	0.35
Warbling Vireo	2.0	0.1	0.14	0.9	0.0	0.00	6.2	0.7	0.05	3.3	0.0	0.00	11.1	1.8	0.09	6.0	1.5	0.17	4.8	0.7	0.09
Gray Jay	0.5	0.4	0.29	0.3	0.2	0.33				0.4	0.1	0.17	0.1	0.0	0.00				0.2	0.1	0.35
Steller's Ja	0.1	0.0	0.00				0.3	0.2	0.33							0.1	0.0	0.00	0.1	0.0	0.22
Black-capped Chickadee				0.0	0.1	1.00	0.8	1.3	0.73				0.0	0.2	1.00	0.0	0.6	1.00	0.1	0.4	0.79
Mountain Chickadee	1.9	1.3	0.28	3.6	5.2	0.55	2.7	1.8	0.20	2.9	2.2	0.27	1.4	0.5	0.37	1.8	0.7	0.40	2.4	1.9	0.45
Chestnut-backed Chick.	0.2	0.4	0.50	1.7	3.4	0.61				1.3	0.5	0.25	0.5	0.4	0.40	1.2	1.0	0.35	0.8	1.0	0.49
Red-breasted Nuthatch	0.7	1.5	0.58	4.4	5.4	0.46	1.8	0.1	0.11	1.2	0.7	0.39	1.7	0.7	0.26	1.5	1.1	0.57	1.9	1.6	0.44
Brown Creepe	1.6	2.1	0.53	2.8	1.7	0.42	1.1	1.6	0.58	1.3	1.1	0.26	0.8	0.6	0.64	1.0	0.4	0.31	1.4	1.2	0.46
Rock Wren							0.1	0.0	0.00												
House Wren	0.0	0.1	1.00				0.5	0.7	0.54							0.0	0.2	1.00	0.1	0.2	0.68
Winter Wren	0.1	0.3	0.67	3.8	1.8	0.37	0.2	0.3	0.50	0.2	0.0	0.00	0.5	0.2	0.17	1.6	0.6	0.29	1.0	0.5	0.46
Golden-crowned Kinglet	4.4	19.5	0.66	19.7	93.2	0.78	3.2	5.8	0.54	9.0	22.8	0.65	2.5	17.5	0.84	2.2	2.5	0.62	6.8	26.4	0.77
Ruby-crowned Kinglet	6.0	3.4	0.34	11.6	5.8	0.29	3.0	1.6	0.41	10.9	2.1	0.15	11.5	9.0	0.27	0.6	0.0	0.00	7.1	3.4	0.27
Mountain Bluebird				0.0	0.1	1.00													0.0	0.0	1.00
Townsend's Solitaire				0.2	0.0	0.00										0.3	0.3	0.50	0.1	0.1	0.40
Veery																0.2	0.0	0.00			
Swainson's Thrush	8.6	0.1	0.01	15.2	0.3	0.02	4.6	0.0	0.00	6.4	0.0	0.00	14.7	0.3	0.02	18.6	5.0	0.20	11.2	1.0	0.08
Hermit Thrush	2.7	0.3	0.10	3.0	1.1	0.13	2.5	3.0	0.59	0.0	1.4	1.00				0.6	0.4	0.50	1.5	1.0	0.32

Table 21. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Umatilla National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Buzzard Creek			Buck Mountain Meadow			Coyote Ridge			Fry Meadow			Brock Meadow			Phillips Creek			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
American Robin	0.1	0.0	0.00	0.7	0.0	0.00	0.4	0.3	0.25	1.9	0.5	0.07	4.7	1.5	0.24	3.7	0.1	0.02	1.9	0.4	0.16
Varied Thrush	0.2	0.0	0.00	0.7	0.1	0.17				0.6	0.0	0.00	0.3	0.0	0.00	0.0	0.1	1.00	0.3	0.0	0.19
Orange-crowned Warbler	1.7	8.1	0.77	0.3	4.2	0.92	13.7	9.5	0.36	0.0	0.6	1.00	2.4	5.8	0.43	3.9	0.9	0.15	3.7	4.7	0.47
Nashville Warble	0.4	1.5	0.71				0.4	0.4	0.60	0.0	0.3	1.00	0.0	1.1	1.00	0.2	0.2	0.50	0.2	0.5	0.64
Yellow Warble							0.0	0.3	1.00										0.0	0.1	1.00
Yellow-rumped Warble	7.8	1.5	0.16	11.5	4.6	0.20	7.0	1.3	0.15	3.6	3.7	0.20	6.7	3.8	0.28	4.2	0.7	0.05	6.8	2.5	0.24
Townsend's Warbler	12.3	8.9	0.34	26.5	17.9	0.33	10.1	3.8	0.25	7.0	2.9	0.22	10.6	11.9	0.39	6.8	2.2	0.23	12.1	7.8	0.35
MacGillivray's Warble	0.7	9.5	0.94	6.4	3.9	0.35	23.0	20.9	0.42	6.7	1.8	0.14	18.5	8.8	0.30	27.1	9.1	0.24	13.8	9.0	0.37
Wilson's Warbler	6.8	3.2	0.32	12.7	1.6	0.10	0.8	0.2	0.21	0.2	0.1	0.25	17.7	5.4	0.25	3.9	0.8	0.12	6.9	1.8	0.19
Western Tanage	1.9	0.0	0.00	6.8	0.1	0.02	7.4	0.6	0.05	1.8	1.2	0.10	1.1	0.2	0.10	4.2	1.1	0.18	3.9	0.5	0.09
Green-tailed Towhee	0.0	0.1	1.00				0.0	0.1	1.00										0.0	0.0	1.00
Spotted Towhee							0.4	0.4	0.50							0.8	0.0	0.00	0.2	0.1	0.33
Chipping Sparrow	8.8	1.3	0.07	10.5	2.0	0.10	4.2	1.3	0.14	1.9	0.6	0.13	0.3	0.2	0.50	0.9	0.6	0.25	4.5	1.0	0.10
Fox Sparrow	1.0	0.2	0.20	2.6	0.9	0.17	1.4	1.6	0.47	1.9	0.4	0.11	3.5	0.8	0.17	0.0	0.5	1.00	1.7	0.8	0.26
Song Sparrow	0.0	0.2	1.00	0.0	0.2	1.00	0.0	0.1	1.00	0.0	0.5	1.00	2.6	1.7	0.34	0.5	1.0	0.58	0.5	0.6	0.42
Lincoln's Sparrow	0.1	0.0	0.00	4.3	3.1	0.29	0.0	0.2	1.00	11.4	2.7	0.20	30.4	8.0	0.20				7.4	2.3	0.23
Dark-eyed Junco	14.4	23.3	0.57	12.7	14.7	0.50	7.2	13.9	0.62	8.7	8.0	0.35	5.0	2.3	0.37	8.4	4.1	0.27	9.4	11.3	0.52
Black-headed Grosbeak				0.1	0.0	0.00	0.5	0.0	0.00				0.9	0.0	0.00	2.5	0.5	0.08	0.7	0.1	0.06
Lazuli Bunting				0.5	0.0	0.00	0.1	0.1	0.50	0.1	0.0	0.00	0.1	0.3	0.67	0.0	0.1	1.00	0.1	0.1	0.58
Brown-headed Cowbird				0.0	0.2	1.00	0.1	0.0	0.00				0.3	0.0	0.00	0.4	0.0	0.00	0.1	0.0	0.13
Cassin's Finch				0.8	0.2	0.10	0.4	0.0	0.00	0.3	0.0	0.00	0.1	0.0	0.00	1.4	0.2	0.08	0.5	0.1	0.07
Red Crossbill				0.4	0.1	0.33													0.1	0.0	0.33
Pine Siskin	1.0	0.2	0.10	9.2	0.9	0.05	0.4	0.0	0.00	1.8	0.5	0.14	7.6	0.8	0.04	2.1	0.0	0.00	3.5	0.3	0.05
Evening Grosbeak	0.6	0.0	0.00	0.9	0.0	0.00							1.5	0.4	0.25	0.2	0.0	0.00	0.5	0.1	0.25
ALL SPECIES POOLED	90.5	88.4	0.48	181.2	177.2	0.45	123.5	76.6	0.36	91.1	56.7	0.32	175.8	88.1	0.29	122.5	38.9	0.23	129.7	86.5	0.38
NUMBER OF SPECIES	34	28		39	33		40	35		31	26		42	31		39	35		50	40	
TOTAL NUMBER OF SPECIES	38			44			45			36			45			46			51		

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

Table 22. Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Umatilla National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p \tau$[3]	$\varphi_t p \tau$[4]	$\varphi p_t \tau$[5]	$\varphi p \tau_t$[6]	$\varphi_t p_t \tau$[7]	$\varphi_t p \tau_t$[8]	$\varphi p_t \tau_t$[9]	$\varphi_t p_t \tau_t$[10]	$\Delta QAIC_C$
Red-naped Sapsucker	53.2* (1.000)	62.4 (1.000)	63.4 (1.000)	64.6 (1.000)	78.1 (1.000)	84.0 (1.000)	81.4 (1.000)	102.2 (1.000)	9.2
Hammond's Flycatcher	75.6* (1.000)	80.6 (1.000)	81.9 (1.000)	90.3 (1.000)	95.3 (1.000)	97.7 (1.000)	100.6 (1.000)	111.2 (1.000)	5.0
Dusky Flycatcher	84.1* (1.000)	91.2 (1.000)	89.9 (1.000)	88.0 (1.000)	101.4 (1.000)	100.1 (1.000)	99.0 (1.000)	110.3 (1.000)	7.2
Warbling Vireo	89.8* (1.000)	100.4 (1.000)	103.0 (1.000)	95.8 (1.000)	109.8 (1.000)	107.7 (1.000)	109.3 (1.000)	120.9 (1.000)	10.6
Mountain Chickadee	51.9* (1.000)	63.1 (1.000)	58.0 (1.000)	62.9 (1.000)	73.4 (1.000)	84.0 (1.000)	77.4 (1.000)	98.2 (1.000)	11.2
Ruby-crowned Kinglet	55.6* (1.000)	56.4* (1.000)	54.7* (1.000)	63.6 (1.000)	67.4 (1.000)	68.3 (1.000)	68.7 (1.000)	79.3 (1.000)	0.8
Swainson's Thrush	157.9* (0.997)	171.4 (0.992)	168.3 (0.997)	172.1 (0.990)	180.6 (0.992)	186.5 (0.975)	183.9 (0.987)	195.7 (0.969)	13.5
Hermit Thrush	47.4* (1.000)	61.9 (1.000)	62.9 (1.000)	60.8 (1.000)	79.7 (1.000)	88.4 (1.000)	86.3 (1.000)	116.3 (1.000)	14.5
American Robin	48.6* (1.000)	60.9 (1.000)	63.7 (1.000)	61.7 (1.000)	79.7 (1.000)	82.8 (1.000)	80.2 (1.000)	103.3 (1.000)	12.4

Table 22. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Umatilla National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p \tau$[3]	$\varphi_t p \tau$[4]	$\varphi p_t \tau$[5]	$\varphi p \tau_t$[6]	$\varphi_t p_t \tau$[7]	$\varphi_t p \tau_t$[8]	$\varphi p_t \tau_t$[9]	$\varphi_t p_t \tau_t$[10]	$\Delta QAIC_C$
Orange-crowned Warbler	60.5* (1.000)	74.3 (1.000)	72.6 (1.000)	71.3 (1.000)	83.4 (1.000)	87.4 (1.000)	84.7 (1.000)	96.2 (1.000)	13.8
Yellow-rumped Warbler	72.5* (1.000)	79.6 (1.000)	81.7 (1.000)	84.7 (1.000)	90.3 (1.000)	96.4 (1.000)	95.7 (1.000)	105.6 (1.000)	7.0
Townsend's Warbler	126.2* (0.999)	134.4 (1.000)	138.0 (0.999)	134.3 (1.000)	146.3 (1.000)	144.1 (1.000)	146.9 (1.000)	155.8 (1.000)	8.2
MacGillivray's Warbler	153.3* (0.979)	159.1 (0.992)	161.9 (0.984)	157.1 (0.996)	172.1 (0.979)	166.7 (0.997)	168.9 (0.994)	178.0 (0.992)	5.8
Wilson's Warbler	102.3* (0.999)	114.1 (0.998)	110.3 (1.000)	111.4 (0.999)	121.8 (1.000)	126.4 (0.995)	120.6 (1.000)	141.3 (0.988)	11.8
Western Tanager	66.0* (1.000)	72.4 (1.000)	75.4 (1.000)	78.0 (1.000)	79.8 (1.000)	87.4 (1.000)	83.0 (1.000)	92.9 (1.000)	6.4
Chipping Sparro	66.7* (1.000)	74.7 (1.000)	74.0 (1.000)	69.6 (1.000)	86.8 (1.000)	86.6 (1.000)	86.1 (1.000)	99.8 (1.000)	8.0
Fox Sparro	67.2* (1.000)	82.5 (1.000)	75.3 (1.000)	81.4 (1.000)	95.0 (1.000)	105.9 (1.000)	95.6 (1.000)	124.8 (1.000)	15.3
Lincoln's Sparro	101.1* (1.000)	115.5 (1.000)	115.5 (1.000)	116.0 (1.000)	129.8 (1.000)	131.1 (1.000)	131.6 (1.000)	144.1 (1.000)	14.4

Table 22. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Umatilla National Forest. $QAIC_C$[1] and $(GOF)^2$ are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Dark-eyed Junco	117.6* (1.000)	130.5 (1.000)	128.2 (1.000)	130.1 (1.000)	136.4 (1.000)	142.8 (1.000)	140.2 (1.000)	147.2 (1.000)	12.9

[1] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample sizes and overdispersion of data.

[2] Goodness-of-fit is a measure of how well the actual distribution of data fits the theoretical distribution calculated using the estimates provided by the model. The larger the value provided by the GOF test the better the model describes the data.

[3] $\varphi p\tau$ Model: Transient model with temporally-constant survival probability, recapture probability, and proportion of residents (invariable from year to year).

[4] $\varphi_t p\tau$ Model: Transient model with temporally-variable survival probability; and temporally-constant recapture probability and proportion of residents.

[5] $\varphi p_t\tau$ Model: Transient model with temporally-variable recapture probability; and temporally-constant survival probability and proportion of residents.

[6] $\varphi p\tau_t$ Model: Transient model with temporally-variable proportion of residents; and temporally-constant survival and recapture probabilities.

[7] $\varphi_t p_t\tau$ Model: Transient model with temporally-variable survival and recapture probabilities; and temporally-constant proportion of residents.

[8] $\varphi_t p\tau_t$ Model: Transient model with temporally-variable survival probability and proportion of residents; and temporally-constant recapture probability.

[9] $\varphi p_t\tau_t$ Model: Transient model with temporally-variable recapture probability and proportion of residents; and temporally-constant survival probability.

[10] $\varphi_t p_t\tau_t$ Model: Transient model with temporally-variable survival probability, recapture probability, and proportion of residents.

[11] $\Delta QAIC_C$ is defined as the difference in $QAIC_C$ between th $\varphi p\tau$ model and th $\varphi_t p\tau$ model.

* The chosen models are the model with the lowest $QAIC_C$ and the models with $QAIC_C$s within 2.0 units of the model with the lowest $QAIC_C$.

Table 23. Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 19 species breeding at MAPS stations on Umatilla National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Red-naped Sapsucker	6	71	116	15	$\varphi p\tau$	53.2	0.389 (0.100)	25.7	0.540 (0.176)	0.630 (0.290)
Hammond's Flycatcher	4	89	150	25	$\varphi p\tau$	75.6	0.378 (0.080)	21.2	0.525 (0.141)	1.000 (0.361)
Dusky Flycatcher	5	126	199	25	$\varphi p\tau$	84.1	0.546 (0.076)	14.0	0.362 (0.099)	0.426 (0.152)
Warbling Vireo	5	168	268	38	$\varphi p\tau$	89.8	0.413 (0.066)	15.9	0.485 (0.107)	0.647 (0.191)
Mountain Chickadee	6	90	104	10	$\varphi p\tau$	51.9	0.525 (0.149)	28.4	0.256 (0.159)	0.535 (0.382)
Ruby-crowned Kinglet	5	298	375	17	$\varphi p\tau$	55.6	0.137 (0.066)	47.8	0.561 (0.280)	0.704 (0.387)
					$\varphi_t p\tau$	56.4	a0.000 (0.652)	--.-	0.432 (0.290)	0.575 (0.300)
							b0.499 (0.369)	73.9		
							c0.197 (0.148)	75.1		
							d0.053 (0.058)	109.4		
							e0.211 (0.171)	81.0		
							f0.055 (0.058)	105.5		
							g0.599 (0.524)	87.5		
							h0.000 (0.764)	--.-		
							i0.576 (0.469)	81.4		
					$\varphi p_t\tau$	54.7	0.152 (0.074)	48.7	a0.000 (0.000)	0.777 (0.444)
									b1.000 (0.765)	
									c0.551 (0.401)	
									d0.151 (0.167)	
									e0.468 (0.364)	
									f0.000 (0.000)	
									g0.974 (0.607)	
									h0.000 (0.000)	
									i1.000 (0.760)	
Swainson's Thrush	6	353	775	137	$\varphi p\tau$	157.9	0.602 (0.033)	5.5	0.565 (0.047)	0.416 (0.066)

Table 23. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 19 species breeding at MAPS stations on Umatilla National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Hermit Thrush	3	54	79	7	φpτ	47.4	0.522 (0.150)	28.7	0.240 (0.152)	0.520 (0.364)
American Robin	6	73	91	10	φpτ	48.6	0.552 (0.138)	25.0	0.145 (0.102)	0.899 (0.658)
Orange-crowned Warbler	3	137	183	12	φpτ	60.5	0.493 (0.119)	24.1	0.167 (0.093)	0.554 (0.320)
Yellow-rumped Warbler	6	275	333	23	φpτ	72.5	0.403 (0.090)	22.4	0.140 (0.080)	1.000 (0.585)
Townsend's Warbler	6	462	604	64	φpτ	126.2	0.425 (0.053)	12.5	0.264 (0.065)	0.824 (0.224)
MacGillivray's Warbler	6	479	893	124	φpτ	153.3	0.464 (0.037)	7.9	0.633 (0.058)	0.471 (0.074)
Wilson's Warbler	4	254	443	38	φpτ	102.3	0.522 (0.062)	12.0	0.445 (0.088)	0.199 (0.066)
Western Tanager	6	155	178	13	φpτ	66.0	0.558 (0.118)	21.2	0.160 (0.092)	0.496 (0.303)
Chipping Sparro	6	184	226	19	φpτ	66.7	0.417 (0.091)	21.7	0.187 (0.095)	0.833 (0.441)
Fox Sparro	4	54	89	13	φpτ	67.2	0.727 (0.112)	15.4	0.246 (0.102)	0.510 (0.244)
Lincoln's Sparro	3	265	526	59	φpτ	101.1	0.357 (0.050)	14.2	0.477 (0.091)	1.000 (0.236)
Dark-eyed Junco	6	350	521	62	φpτ	117.6	0.427 (0.051)	12.0	0.390 (0.075)	0.617 (0.143)

[1] Number of stations where the species was a regular or usual breeder at which adults of the species were captured.
[2] Number of adult individuals captured at stations where the species was a regular or usual breeder (i.e., number of capture histories).
[3] Total number of captures of adult birds of the species at stations where the species was a regular or usual breeder.
[4] Total number of returns. A return is the first recapture in a given year of a bird originally banded at the same station in a previous year.
[5] Models included are those chosen by $QAIC_C$ (those models marked with * in Table 22) plus th φpτ model in all cases. See Table 22 for definitions of the models.
[6] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample size and over dispersion of data.

Table 23. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 19 species breeding at MAPS stations on Umatilla National Forest obtained from ten years (1992-2001) of mark-recapture data.

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

a The survival probability between the years 1992-1993 in a temporally variable model.
b The survival probability between the years 1993-1994 in a temporally variable model.
c The survival probability between the years 1994-1995 in a temporally variable model.
d The survival probability between the years 1995-1996 in a temporally variable model.
e The survival probability between the years 1996-1997 in a temporally variable model.
f The survival probability between the years 1997-1998 in a temporally variable model.
g The survival probability between the years 1998-1999 in a temporally variable model.
h The survival probability between the years 1999-2000 in a temporally variable model.
i The survival probability between the years 2000-2001 in a temporally variable model.

[8] The coefficient of variation for survival probability.

[9] Recapture probability presented as the maximum likelihood estimate (standard error of the estimate).

a The recapture probability in 1993 in a temporally variable model.
b The recapture probability in 1994 in a temporally variable model.
c The recapture probability in 1995 in a temporally variable model.
d The recapture probability in 1996 in a temporally variable model.
e The recapture probability in 1997 in a temporally variable model.
f The recapture probability in 1998 in a temporally variable model.
g The recapture probability in 1999 in a temporally variable model.
h The recapture probability in 2000 in a temporally variable model.
i The recapture probability in 2001 in a temporally variable model.

[10] The proportion of residents among newly captured adults presented as the maximum likelihood estimate (standard error of the estimate).

* Time-constant model that was not marked by $QAIC_C$, but that are shown only for comparison to other species.

Table 24. Relative values of vital rates (lower-than-expected, as-expected, higher-than-expected) for selected study species at Umatilla National Forest in relation to the direction and significance of their adult population trends over the ten years 1992-2001.

Species	Significance of the trend[1]	Productivity	Survival Probability[2]
A. Declining Species			
Red-naped Sapsucker	**	expected	lower
Hammond's Flycatcher	**	expected	lower
Dusky Flycatcher	***	lower	higher
Warbling Vireo	***	lower	expected
Ruby-crowned Kinglet	**	higher	lower?
Swainson's Thrush	*	lower	higher
Orange-crowned Warbler	*	higher	expected
Yellow-rumped Warbler	***	expected	expected
Townsend's Warbler	***	expected	expected
MacGillivray's Warbler	**	higher	expected
Wilson's Warbler	**	lower	expected
Chipping Sparrow	***	lower	expected
Lincoln's Sparrow	**	expected	lower
Dark-eyed Junco	***	higher	expected
Pine Siskin	*	lower	
B. Increasing Species			
None			

[1] Direction and significance of the trends in adult population size as based on data from all six stations (Fig. 7); *** $P < 0.01$, ** $0.01 \leq P < 0.05$, * $0.05 \leq P < 0.10$.

[2] A question mark (?) indicates inferences based on survival estimates for which CV of the estimate > 30% and are thus less reliable, or that survival could not be estimated due to low recapture rates.

Table 25. Summary of the 2001 MAPS program on Willamette National Forest.

Station						2001 operation		
Name	Code	No.	Major Habitat Type	Latitude-longitud	Avg. Elev. (m)	Total number of net-hours[1]	No. of periods	Inclusive dates
Clearcut	CLCU	11160	Disturbed open mixed coniferous forest with dry mixed evergreen shrub component	43°57'10"N,122°12'10"W	1292	425.0 (420.0)	8	5/23-8/05
Fingerboard Prairie	FIPR	11158	Disturbed wet open meado complex with alder/ willo thickets, fairly open mixed coniferous forest, dense deciduous/coniferous forest	44°11'50"N,121°57'10"W	1195	396.5 (323.7)	8	5/19-8/01
Ikenick	IKEN	11157	Very wet open meadow, mature mixed coniferous forest edge, disturbed mixed coniferous forest	44°22'00"N,122°01'00"W	1006	451.7 (440.0)	8	5/18-7/31
Brock Creek	BRCR	11162	Thinned mixed coniferous forest, dense mixed coniferous forest	43°52'50"N,122°12'20"W	792	422.7 (407.3)	8	5/20-8/04
Major Prairie	MAPR	11161	Dense buckthorn meadow, mixed coniferous forest	43°53'10"N,122°15'50"W	701	480.0 (476.0)	8	5/22-8/03
Strube Flat	STFL	11159	Deciduous riparian woodland, mixed coniferous forest	44°08'40"N,122°15'10"W	488	474.0 (441.8)	8	5/21-8/02
ALL STATIONS COMBINED						2649.8 (2508.8)	8	5/18-8/05

[1] Total net-hours in 2001. Net-hours in 2001 that could be compared in a constant-effort manner to 2000 are shown in parentheses.

Table 26. Capture summary for the six individual MAPS stations operated on Willamette National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Clearcut			Fingerboard Prairi			Ikenick			Brock Cree			Major Prairie			Strube Flat		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Ruffed Grous														1			1	
Northern Pygmy-Owl											1							
Anna's Hummingbird											1							
Calliope Hummingbird								1									1	
Rufous Hummingbird		16			28			42			4			16			2	
Red-breasted Sapsucker	1						1			1			4			1		
Hairy Woodpecker	1									1			1			1		
Northern Flicker													1					
"Traill's" Flycatcher	1			2			10		10	1		1	1					
Hammond's Flycatcher	3			5		2	4		1	1			3	1	6			1
Dusky Flycatcher	2		2	1														
"Western" Flycatcher	2									2			1					
Unidentified Empidonax								1										
Unidentified Flycatcher								1										
Hutton's Vireo	1									2			6		1			
Warbling Vireo	1		2	7	1	1			1	5								
Gray Jay				1		1												
Chestnut-backed Chickadee	3		3	18	1	1	4			6			7			1		
Red-breasted Nuthatch				2	1		4											
Brown Creepe				1			1			2						6		
Winter Wren	1			2		1				1		4	3			3		1
Golden-crowned Kinglet	16		3	6		3	3		1	2								
Swainson's Thrush	8		13	19		15	5	2		26	1	25	18	1	16	14		23
Hermit Thrush				3		3												
American Robin							3			4	2					1	1	
Varied Thrush	1																	
Orange-crowned Warbler	16	1	3	15	1	5	6		1	1		1						
Nashville Warbler	3		1	11		3												

Table 26. (cont.) Capture summary for the six individual MAPS stations operated on Willamette National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Clearcut			Fingerboard Prairi			Ikenick			Brock Cree			Major Prairie			Strube Flat		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Yellow Warbler							2		1									
Yellow-rumped Warbler	2		1	3		1	2		1									
Black-throated Gray Warbler																1		
Townsend's Warbler					1													
Hermit Warbler	5		4	14	1	2	4			2			9		4			
MacGillivray's Warbler	16	1	19	17	2	18	7		1	5		6	13	1	15	1		
Common Yellowthroat	1			2			34	8	52	1								
Wilson's Warbler	7	2	8	1		1	3											
Western Tanager	3		1	1														
Spotted Towh											1		4		1			
Fox Sparro	1	1	4	2		4												
Song Sparro	1			3		1	16	1	22	8	1	4	8		21	3		2
Lincoln's Sparro				4	1	11	9	1	18									
White-crowned Sparro				1														
Dark-eyed Junco	21	1	21	19	1	11	4		1	12	1	3	7		4	12		3
Lazuli Bunting				2														
Purple Finch							2			2		4				1		
Pine Siskin	2			8			8	1										
Evening Grosbeak	2			1	1		4											
ALL SPECIES POOLED	121	22	85	171	39	84	136	58	110	85	12	48	86	20	68	45	5	30
TOTAL NUMBER OF CAPTURES		228			294			304			145			174			80	
NUMBER OF SPECIES	26	6	14	28	11	18	22	7	12	20	8	8	15	5	8	12	4	5
TOTAL NUMBER OF SPECIES		27			30			25			24			17			16	

Table 27. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Willamette National Forest in 2001.

	Clearcut			Fingerboard Prairi			Ikenick			Brock Cree			Major Prairie			Strube Flat		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Red-breasted Sapsucker	1.4	0.0	0.00				1.3	0.0	0.00	1.4	0.0	0.00	1.3	3.8	0.75	1.3	0.0	0.00
Hairy Woodpecker	1.4	0.0	0.00							1.4	0.0	0.00	1.3	0.0	0.00	0.0	1.3	1.00
Northern Flicker													1.3	0.0	0.00			
"Traill's" Flycatcher	1.4	0.0	0.00	3.0	0.0	0.00	14.6	2.7	0.15	2.8	0.0	0.00	1.3	0.0	0.00			
Hammond's Flycatcher	2.8	1.4	0.33	9.1	0.0	0.00	6.6	0.0	0.00	1.4	0.0	0.00	7.5	0.0	0.00	1.3	0.0	0.00
Dusky Flycatcher	4.2	0.0	0.00	1.5	0.0	0.00												
"Western" Flycatcher	1.4	1.4	0.50							2.8	0.0	0.00	1.3	0.0	0.00			
Hutton's Vireo	1.4	0.0	0.00							2.8	0.0	0.00	5.0	2.5	0.33			
Warbling Vireo	4.2	0.0	0.00	12.1	0.0	0.00	1.3	0.0	0.00	7.1	0.0	0.00						
Gray Jay				3.0	0.0	0.00												
Chestnut-backed Chick	4.2	2.8	0.40	10.6	18.2	0.63	2.7	2.7	0.50	8.5	0.0	0.00	6.3	2.5	0.29	1.3	0.0	0.00
Red-breasted Nuthatch				1.5	1.5	0.50	1.3	4.0	0.75									
Brown Creepe				1.5	0.0	0.00	0.0	1.3	1.00	1.4	1.4	0.50				3.8	3.8	0.50
Winter Wren	0.0	1.4	1.00	3.0	0.0	0.00				2.8	0.0	0.00	2.5	1.3	0.33	5.1	0.0	0.00
Golden-crowned Kinglet	0.0	22.6	1.00	4.5	4.5	0.50	4.0	0.0	0.00	2.8	0.0	0.00						
Swainson's Thrush	18.4	0.0	0.00	22.7	6.1	0.21	8.0	0.0	0.00	32.7	18.5	0.36	25.0	5.0	0.17	24.1	0.0	0.00
Hermit Thrush				7.6	0.0	0.00												
American Robin							4.0	0.0	0.00	5.7	0.0	0.00				1.3	0.0	0.00
Varied Thrush	1.4	0.0	0.00															
Orange-crowned Warbler	12.7	9.9	0.44	10.6	13.6	0.56	1.3	6.6	0.83	0.0	1.4	1.00						
Nashville Warbler	2.8	1.4	0.33	6.1	10.6	0.64												
Yellow Warbler							2.7	0.0	0.00									
Yellow-rumped Warbler	2.8	0.0	0.00	4.5	0.0	0.00	2.7	0.0	0.00									
Black-throated Gray W.																1.3	0.0	0.00
Hermit Warbler	8.5	0.0	0.00	19.7	3.0	0.13	4.0	1.3	0.25	2.8	0.0	0.00	12.5	0.0	0.00			
MacGillivray's Warbler	19.8	9.9	0.33	15.1	12.1	0.44	5.3	4.0	0.43	8.5	2.8	0.25	15.0	5.0	0.25	1.3	0.0	0.00
Common Yellowthroat	1.4	0.0	0.00	0.0	3.0	1.00	35.9	27.9	0.44	1.4	0.0	0.00						

Table 27. (cont.) Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Willamette National Forest in 2001.

	Clearcut			Fingerboard Prairi			Ikenick			Brock Cree			Major Prairie			Strube Flat		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Wilson's Warbler	11.3	4.2	0.27	3.0	0.0	0.00	2.7	1.3	0.33									
Western Tanager	5.6	0.0	0.00	1.5	0.0	0.00												
Spotted Towh													3.8	1.3	0.25			
Fox Sparro	4.2	0.0	0.00	3.0	0.0	0.00												
Song Sparro	1.4	0.0	0.00	0.0	4.5	1.00	14.6	10.6	0.42	11.4	4.3	0.27	13.8	2.5	0.15	2.5	1.3	0.33
Lincoln's Sparro				7.6	1.5	0.17	15.9	5.3	0.25									
White-crowned Sparro				1.5	0.0	0.00												
Dark-eyed Junco	26.8	12.7	0.32	30.3	7.6	0.20	2.7	4.0	0.60	9.9	8.5	0.46	6.3	3.8	0.38	8.9	6.3	0.42
Lazuli Bunting				3.0	0.0	0.00												
Purple Finch							1.3	1.3	0.50	4.3	1.4	0.25						
Pine Siskin	2.8	0.0	0.00	10.6	1.5	0.13	9.3	1.3	0.13									
Evening Grosbeak	2.8	0.0	0.00	1.5	0.0	0.00	5.3	0.0	0.00									
ALL SPECIES POOLED	145.4	67.8	0.32	198.2	87.8	0.31	147.5	74.4	0.34	112.1	38.3	0.26	103.8	27.5	0.21	51.9	12.7	0.20
NUMBER OF SPECIES	24	10		26	13		22	14		19	7		15	9		11	4	
TOTAL NUMBER OF SPECIES		26			28			23			20			15			12	

Table 28. Summary of results for all six Willamette National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		
	Newly banded	Un-banded	Recap-tured	Adults	Young	Prop. Young
Ruffed Grous		2				
Northern Pygmy-Owl		1				
Anna's Hummingbird		1				
Calliope Hummingbird		2				
Rufous Hummingbird		108				
Red-breasted Sapsucker	8			1.1	0.7	0.38
Hairy Woodpecker	4			0.7	0.2	0.25
Northern Flicker	1			0.2	0.0	0.00
"Traill's" Flycatcher	15		11	3.8	0.5	0.11
Hammond's Flycatcher	16	1	10	4.8	0.2	0.05
Dusky Flycatcher	3		2	0.9	0.0	0.00
"Western" Flycatcher	5			0.9	0.2	0.20
Unidentified Empidonax		1				
Unidentified Flycatcher		1				
Hutton's Vireo	9		1	1.6	0.5	0.22
Warbling Vireo	13	1	4	3.8	0.0	0.00
Gray Jay	1		1	0.5	0.0	0.00
Chestnut-backed Chickadee	39	1	4	5.4	4.1	0.43
Red-breasted Nuthatch	6	1		0.5	0.9	0.67
Brown Creepe	10			1.1	1.1	0.50
Winter Wren	10		6	2.3	0.5	0.17
Golden-crowned Kinglet	27		7	1.8	4.3	0.70
Swainson's Thrush	90	4	92	21.7	4.8	0.18
Hermit Thrush	3		3	1.1	0.0	0.00
American Robin	8	3		1.8	0.0	0.00
Varied Thrush	1			0.2	0.0	0.00
Orange-crowned Warbler	38	2	10	3.8	5.0	0.56
Nashville Warbler	14		4	1.4	1.8	0.57
Yellow Warbler	2		1	0.5	0.0	0.00
Yellow-rumped Warbler	7		3	1.6	0.0	0.00
Black-throated Gray Warbl	1			0.2	0.0	0.00
Townsend's Warbler		1				
Hermit Warbler	34	1	10	7.7	0.7	0.08
MacGillivray's Warbler	59	4	59	10.6	5.4	0.34
Common Yellowthroat	38	8	52	6.6	5.2	0.44
Wilson's Warbler	11	2	9	2.7	0.9	0.25
Western Tanager	4		1	1.1	0.0	0.00
Spotted Towh	4	1	1	0.7	0.2	0.25
Fox Sparro	3	1	8	1.1	0.0	0.00
Song Sparro	39	2	50	7.5	3.8	0.34
Lincoln's Sparro	13	2	29	3.8	1.1	0.23
White-crowned Sparro	1			0.2	0.0	0.00

Dark-eyed Junco	75	3	43	13.6	7.0	0.34

Table 28. (cont.) Summary of results for all six Willamette National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		Prop. Young
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Lazuli Bunting	2			0.5	0.0	0.00
Purple Finch	5		4	0.9	0.5	0.33
Pine Siskin	18	1		3.6	0.5	0.11
Evening Grosbeak	7	1		1.6	0.0	0.00
ALL SPECIES POOLED	644	156	425	124.1	50.0	0.29
TOTAL NUMBER OF CAPTURES		1225				
NUMBER OF SPECIES	39	24	26	39	24	
TOTAL NUMBER OF SPECIES		45			39	

Table 29. Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Willamette National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Clearcut			Fingerboard Prairie			Ikenick			Brock Creek			Major Prairie			Strube Flat			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Sharp-shinned Hawk							0.1	0.0	0.00							0.3	0.0	0.00	0.1	0.0	0.00
Common Snipe							0.1	0.1	0.50										0.0	0.0	0.50
Red-naped Sapsucke	0.4	0.1	0.17				0.1	0.0	0.00				0.1	0.0	0.00				0.1	0.0	0.13
Red-breasted Sapsucke	0.8	0.2	0.17	0.9	0.1	0.20	1.5	0.4	0.12	0.6	0.2	0.29	1.3	1.2	0.47	1.7	0.1	0.07	1.1	0.4	0.24
Downy Woodpecke	0.1	0.0	0.00										0.3	0.9	0.85				0.1	0.2	0.68
Hairy Woodpecke	0.5	0.4	0.50	0.1	0.1	0.50	0.2	0.3	0.33	0.1	0.0	0.00	0.8	0.8	0.42	0.3	0.3	0.50	0.3	0.3	0.47
Northern Flicke	0.3	0.1	0.33							0.1	0.1	0.50	0.1	0.0	0.00				0.1	0.0	0.30
Olive-sided Flycatcher	0.1	0.0	0.00																		
Western Wood-Pewee							0.2	0.0	0.00												
"Traill's" Flycatche	0.9	0.0	0.00	1.1	0.0	0.00	13.0	1.0	0.06	3.3	0.0	0.00	1.1	0.1	0.20	0.2	0.0	0.00	3.3	0.2	0.04
Hammond's Flycatcher	0.9	0.3	0.17	5.5	2.6	0.27	4.4	0.8	0.12	1.5	0.0	0.00	4.4	0.5	0.14	2.2	0.0	0.00	3.1	0.7	0.16
Dusky Flycatcher	10.3	0.6	0.04	2.9	0.3	0.05	0.9	0.0	0.00	0.2	0.0	0.00	0.5	0.0	0.00	0.1	0.0	0.00	2.5	0.1	0.04
"Western" Flycatche	1.4	0.3	0.11	1.1	0.1	0.08	0.6	0.1	0.33	3.5	1.2	0.19	2.4	0.5	0.09	1.1	0.1	0.04	1.7	0.4	0.16
Cassin's Vireo	0.1	0.0	0.00	0.3	0.0	0.00	0.1	0.0	0.00	0.3	0.0	0.00	0.4	0.0	0.00	0.1	0.0	0.00	0.2	0.0	0.00
Hutton's Vireo	0.1	0.0	0.00							0.4	0.1	0.33	0.8	0.9	0.56	0.1	0.0	0.00	0.3	0.2	0.33
Warbling Vireo	4.8	0.1	0.02	5.5	0.0	0.00	2.8	0.0	0.00	2.8	0.0	0.00							2.6	0.0	0.01
Gray Jay	0.4	0.1	0.33	0.6	0.0	0.00				0.2	0.0	0.00	0.0	0.1	1.00				0.2	0.0	0.25
Steller's Ja	0.4	0.0	0.00	0.3	0.0	0.00	0.1	0.0	0.00	0.4	0.0	0.00	0.3	0.3	0.50	1.0	0.1	0.06	0.4	0.1	0.07
Black-capped Chickadee				0.1	0.0	0.00															
Chestnut-backed Chick.	1.8	2.1	0.45	5.9	8.3	0.41	1.8	1.6	0.37	4.6	0.2	0.06	4.4	4.3	0.49	1.8	0.5	0.17	3.3	2.7	0.43
Bushtit																					
Red-breasted Nuthatch	0.1	0.6	0.88	1.7	1.6	0.45	0.4	0.5	0.44	0.6	0.3	0.40	0.2	0.3	0.50				0.5	0.5	0.50
Brown Creepe	0.0	0.3	1.00	0.4	0.4	0.50	0.2	0.2	0.50	1.1	0.7	0.48	0.3	0.7	0.52	1.2	1.1	0.37	0.5	0.6	0.45
House Wren	0.0	0.1	1.00	0.1	0.1	0.50													0.0	0.0	0.75
Winter Wren	0.1	0.2	0.67	1.9	2.1	0.48	0.5	0.1	0.20	0.8	0.0	0.00	1.0	0.9	0.63	3.9	0.8	0.20	1.4	0.7	0.39
Marsh Wren													0.0	0.1	1.00				0.0	0.0	1.00
Golden-crowned Kinglet	0.6	3.8	0.65	5.0	5.6	0.42	0.8	0.4	0.33	1.1	0.0	0.00	0.5	0.1	0.33	0.3	0.0	0.00	1.3	1.6	0.49
Townsend's Solitaire				0.1	0.0	0.00				0.0	0.1	1.00							0.0	0.0	0.50
Swainson's Thrush	10.9	0.1	0.01	11.7	1.5	0.11	7.0	0.1	0.03	26.7	6.3	0.17	19.5	1.8	0.07	22.8	1.1	0.04	16.5	1.8	0.09
Hermit Thrush	0.4	0.1	0.17	4.0	0.4	0.10	0.2	0.1	0.25	0.3	0.0	0.00							0.8	0.1	0.11
American Robin	0.2	0.2	0.50	1.0	0.0	0.00	1.5	0.0	0.00	4.9	1.5	0.18	1.3	0.1	0.06	2.8	0.3	0.06	2.0	0.4	0.14
Varied Thrush	0.4	0.0	0.00	0.4	0.0	0.00				0.1	0.0	0.00	0.1	0.0	0.00	1.2	0.0	0.00	0.4	0.0	0.00
Cedar Waxwing							0.3	0.0	0.00	0.4	0.0	0.00	0.1	0.0	0.00				0.1	0.0	0.00
Orange-crowned Warbler	8.3	10.5	0.52	12.0	49.5	0.72	1.0	3.2	0.75	0.6	0.6	0.50	0.3	0.4	0.60				3.6	9.8	0.67

Table 29. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Willamette National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Clearcut			Fingerboard Prairie			Ikenick			Brock Creek			Major Prairie			Strube Flat			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Nashville Warble	1.9	0.6	0.29	1.7	4.2	0.60	0.7	0.0	0.00	0.8	0.0	0.00	0.1	0.1	0.50	0.3	0.0	0.00	0.9	0.7	0.45
Yellow Warble	0.3	0.3	0.33	0.1	0.1	0.50	5.3	1.3	0.14	0.4	0.3	0.67							1.0	0.3	0.15
Yellow-rumped Warble	1.1	0.3	0.17	3.5	0.4	0.07	3.3	0.0	0.00				0.1	0.0	0.00				1.3	0.1	0.06
Black-throated Gray W.										0.2	0.1	0.25				2.4	0.1	0.14	0.4	0.0	0.19
Townsend's Warbler	0.0	0.2	1.00	0.3	0.9	0.63	0.3	0.0	0.00				0.2	0.0	0.00				0.1	0.2	0.45
Townsend's x Hermit W.													0.2	0.0	0.00						
Hermit Warble	5.2	3.4	0.33	13.5	6.7	0.27	3.9	0.9	0.19	2.3	0.1	0.03	5.0	0.0	0.00	0.1	0.0	0.00	4.9	1.8	0.25
MacGillivray's Warble	13.8	4.4	0.20	14.9	9.0	0.31	5.6	1.9	0.33	11.0	4.1	0.25	11.5	5.4	0.29	0.5	0.1	0.20	9.5	4.1	0.29
Common Yellowthroat	0.1	0.0	0.00	0.0	0.6	1.00	34.8	22.7	0.39	0.4	0.1	0.25	0.0	0.1	1.00				5.9	3.9	0.40
Wilson's Warbler	4.0	1.4	0.20	7.1	3.3	0.30	3.3	0.4	0.11	0.6	0.1	0.25	1.5	0.4	0.18	0.8	0.0	0.00	2.8	0.9	0.25
Western Tanage	1.9	0.0	0.00	1.2	0.0	0.00	1.5	0.0	0.00	0.5	0.1	0.13	0.7	0.1	0.13	0.2	0.0	0.00	1.0	0.0	0.02
Spotted Towhee										0.5	0.2	0.22	0.5	0.3	0.42				0.2	0.1	0.25
Chipping Sparrow	0.3	0.0	0.00	0.3	0.1	0.33				0.1	0.0	0.00							0.1	0.0	0.17
Fox Sparrow	4.6	0.4	0.09	0.3	0.0	0.00	0.5	0.1	0.25				0.0	0.1	1.00				0.9	0.1	0.12
Song Sparrow	0.4	0.1	0.17	0.2	0.7	0.75	11.2	8.2	0.43	9.8	7.7	0.41	10.3	8.7	0.46	3.1	1.5	0.32	5.9	4.6	0.45
Lincoln's Sparrow	0.0	0.1	1.00	7.3	2.0	0.21	13.8	6.4	0.30	0.1	0.0	0.00							3.4	1.4	0.28
White-crowned Sparro							0.2	0.1	0.33										0.0	0.0	0.33
Dark-eyed Junco	18.7	8.7	0.30	21.7	24.5	0.41	4.4	3.2	0.40	5.7	9.8	0.59	6.2	3.5	0.35	1.7	0.8	0.18	9.5	8.0	0.43
Black-headed Grosbeak				0.6	0.0	0.00	0.5	0.0	0.00	1.2	0.0	0.00	0.1	0.0	0.00	0.3	0.0	0.00	0.4	0.0	0.00
Lazuli Bunting				0.6	0.0	0.00	0.4	0.0	0.00	0.4	0.0	0.00							0.2	0.0	0.00
Red-winged Blackbird							0.3	0.0	0.00												
Purple Finch	0.4	0.0	0.00	0.3	0.0	0.00	1.1	0.6	0.39	3.8	0.8	0.11	2.0	0.1	0.03				1.3	0.3	0.17
Cassin's Finch	0.1	0.0	0.00	0.1	0.0	0.00	0.1	0.0	0.00	0.1	0.1	0.50	0.4	0.0	0.00				0.2	0.0	0.06
House Finch							0.2	0.0	0.00												
Pine Siskin	2.0	0.0	0.00	8.5	2.1	0.19	7.0	0.8	0.04				0.3	0.0	0.00				2.8	0.4	0.10
Evening Grosbeak	0.4	0.0	0.00	4.3	0.0	0.00	7.6	0.1	0.00										1.9	0.0	0.00
ALL SPECIES POOLED	99.5	40.3	0.28	149.6	127.6	0.40	144.0	55.8	0.28	92.5	34.9	0.27	79.5	33.0	0.29	50.4	6.9	0.12	101.4	47.9	0.32
NUMBER OF SPECIES	40	30		42	27		45	27		40	23		37	28		26	13		48	33	
TOTAL NUMBER OF SPECIES	44			43			45			41			41			26			48		

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

Table 30. Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Willamette National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
"Traill's" Flycatcher	92.6* (1.000)	106.3 (1.000)	107.4 (0.999)	97.9 (1.000)	122.5 (0.997)	114.1 (1.000)	114.5 (1.000)	129.3 (1.000)	13.7
Hammond's Flycatcher	79.8* (1.000)	87.2 (1.000)	91.9 (1.000)	87.1 (1.000)	99.5 (1.000)	98.1 (1.000)	105.0 (1.000)	109.4 (1.000)	7.4
Dusky Flycatcher	84.8* (0.994)	89.0 (1.000)	87.7 (1.000)	87.1 (1.000)	98.0 (1.000)	96.6 (1.000)	93.1 (1.000)	105.4 (1.000)	4.3
"Western" Flycatcher	33.1* (1.000)	43.7 (1.000)	42.0 (1.000)	45.2 (1.000)	61.9 (1.000)	64.6 (1.000)	61.6 (1.000)	86.0 (1.000)	10.6
Warbling Vireo	61.7* (1.000)	70.1 (1.000)	71.7 (1.000)	76.2 (1.000)	85.4 (1.000)	90.4 (1.000)	89.2 (1.000)	105.1 (1.000)	8.3
Chestnut-backed Chickadee	59.0* (1.000)	73.7 (1.000)	71.2 (1.000)	72.8 (1.000)	82.3 (1.000)	89.8 (1.000)	86.3 (1.000)	99.3 (1.000)	14.7
Winter Wren	33.0* (1.000)	45.3 (1.000)	49.7 (1.000)	45.6 (1.000)	72.0 (1.000)	74.5 (1.000)	75.6 (1.000)	110.7 (1.000)	12.3
Swainson's Thrush	173.9* (0.998)	175.8 (1.000)	172.7* (1.000)	180.5 (0.999)	180.1 (1.000)	187.7 (1.000)	181.2 (1.000)	193.9 (1.000)	1.9
American Robin	55.6* (1.000)	67.5 (1.000)	68.8 (1.000)	64.9 (1.000)	83.9 (1.000)	84.9 (1.000)	85.7 (1.000)	102.2 (1.000)	11.9
Orange-crowned Warbler	58.2* (1.000)	69.5 (1.000)	66.3 (1.000)	69.9 (1.000)	80.4 (1.000)	87.5 (1.000)	83.8 (1.000)	98.9 (1.000)	11.3

Table 30. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Willamette National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
MacGillivray's Warbler	126.7* (1.000)	136.8 (1.000)	131.8 (1.000)	131.8 (1.000)	140.7 (1.000)	143.5 (1.000)	137.1 (1.000)	149.8 (1.000)	10.1
Common Yellowthroat	114.0* (1.000)	122.5 (1.000)	117.8 (1.000)	123.2 (1.000)	128.3 (1.000)	132.2 (1.000)	129.8 (1.000)	137.6 (1.000)	8.5
Song Sparro	98.3* (1.000)	109.6 (1.000)	109.3 (1.000)	110.7 (1.000)	115.2 (1.000)	123.0 (1.000)	122.2 (1.000)	128.0 (1.000)	11.3
Lincoln's Sparro	93.3* (1.000)	103.5 (1.000)	99.0 (1.000)	101.8 (1.000)	110.1 (1.000)	112.8 (1.000)	110.0 (1.000)	119.6 (1.000)	10.2
Dark-eyed Junco	144.9 (0.843)	139.2* (0.991)	144.3 (0.971)	147.9 (0.941)	150.4 (0.987)	140.7* (1.000)	148.3 (0.995)	147.4 (1.000)	-5.7

[1] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample sizes and overdispersion of data.

[2] Goodness-of-fit is a measure of how well the actual distribution of data fits the theoretical distribution calculated using the estimates provided by the model. The larger the value provided by the GOF test the better the model describes the data.

[3] $\varphi p\tau$ Model: Transient model with temporally-constant survival probability, recapture probability, and proportion of residents (invariable from year to year).

[4] $\varphi_t p\tau$ Model: Transient model with temporally-variable survival probability; and temporally-constant recapture probability and proportion of residents.

[5] $\varphi p_t\tau$ Model: Transient model with temporally-variable recapture probability; and temporally-constant survival probability and proportion of residents.

[6] $\varphi p\tau_t$ Model: Transient model with temporally-variable proportion of residents; and temporally-constant survival and recapture probabilities.

[7] $\varphi_t p_t\tau$ Model: Transient model with temporally-variable survival and recapture probabilities; and temporally-constant proportion of residents.

[8] $\varphi_t p\tau_t$ Model: Transient model with temporally-variable survival probability and proportion of residents; and temporally-constant recapture probability.

[9] $\varphi p_t\tau_t$ Model: Transient model with temporally-variable recapture probability and proportion of residents; and temporally-constant survival probability.

[10] $\varphi_t p_t\tau_t$ Model: Transient model with temporally-variable survival probability, recapture probability, and proportion of residents.

[11] $\Delta QAIC_C$ is defined as the difference in $QAIC_C$ between th $\varphi p\tau$ model and th $\varphi_t p\tau$ model.

* The chosen models are the model with the lowest $QAIC_C$ and the models with $QAIC_C$s within 2.0 units of the model with the lowest $QAIC_C$.

Table 31. Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 15 species breeding at MAPS stations on Willamette National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
"Traill's" Flycatcher	3	102	202	37	$\varphi p \tau$	92.6	0.524 (0.072)	13.8	0.825 (0.089)	0.372 (0.109)
Hammond's Flycatcher	6	122	179	26	$\varphi p \tau$	79.8	0.481 (0.093)	19.3	0.471 (0.127)	0.614 (0.220)
Dusky Flycatcher	5	100	156	19	$\varphi p \tau$	84.8	0.590 (0.088)	14.9	0.345 (0.105)	0.340 (0.139)
"Western" Flycatcher	5	73	87	6	$\varphi p \tau$	33.1	0.329 (0.163)	49.5	0.526 (0.313)	0.304 (0.242)
Warbling Vireo	4	111	152	14	$\varphi p \tau$	61.7	0.567 (0.116)	20.5	0.200 (0.101)	0.613 (0.332)
Chestnut-backed Chickadee	6	147	181	17	$\varphi p \tau$	59.0	0.379 (0.104)	27.4	0.328 (0.151)	0.714 (0.377)
Winter Wren	6	57	85	6	$\varphi p \tau$	33.0	0.387 (0.177)	45.7	0.527 (0.296)	0.306 (0.230)
Swainson's Thrush	6	569	1416	239	$\varphi p \tau$ $\varphi p_t \tau$	173.9 172.7	0.574 (0.026) 0.585 (0.027)	4.6 4.6	0.686 (0.037) a0.601 (0.102) b0.718 (0.090) c0.950 (0.049) d0.657 (0.086) e0.671 (0.088) f0.627 (0.095) g0.523 (0.095) h0.717 (0.096) i0.523 (0.103)	0.419 (0.051) 0.424 (0.052)
American Robin	6	84	108	12	$\varphi p \tau$	55.6	0.489 (0.118)	24.2	0.386 (0.162)	0.381 (0.199)
Orange-crowned Warbler	1	88	114	11	$\varphi p \tau$	58.2	0.661 (0.110)	16.7	0.225 (0.105)	0.273 (0.148)
MacGillivray's Warbler	5	358	858	105	$\varphi p \tau$	126.7	0.461 (0.039)	8.4	0.684 (0.062)	0.471 (0.083)

Table 31. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 15 species breeding at MAPS stations on Willamette National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Common Yellowthroat	1	204	554	79	$\varphi p\tau$	114.0	0.466 (0.044)	9.3	0.691 (0.071)	0.604 (0.126)
Song Sparro	5	206	562	78	$\varphi p\tau$	98.3	0.438 (0.045)	10.3	0.775 (0.071)	0.659 (0.131)
Lincoln's Sparro	2	113	451	55	$\varphi p\tau$	93.3	0.485 (0.053)	10.9	0.710 (0.082)	0.794 (0.192)
Dark-eyed Junco	6	391	666	77	$\varphi p\tau$*	144.9	0.410 (0.046)	11.1	0.482 (0.075)	0.624 (0.128)
					$\varphi_t p\tau$	139.2	a0.514 (0.158)	30.7	0.429 (0.077)	0.558 (0.116)
							b0.591 (0.157)	26.6		
							c0.279 (0.093)	33.3		
							d0.459 (0.141)	30.7		
							e0.634 (0.170)	26.8		
							f0.325 (0.116)	35.7		
							g0.487 (0.166)	34.1		
							h0.077 (0.055)	71.4		
							i1.000 (0.274)	27.4		
					$\varphi_t p\tau_t$	140.7	a0.326 (0.235)	72.1	0.485 (0.082)	a1.000 (0.760)
							b0.410 (0.146)	35.6		b1.000 (0.475)
							c0.336 (0.115)	34.2		c0.145 (0.151)
							d0.569 (0.191)	33.6		d0.278 (0.178)
							e0.652 (0.197)	30.2		e0.446 (0.224)
							f0.292 (0.119)	40.8		f0.976 (0.749)
							g0.378 (0.159)	42.1		g1.000 (0.632)
							h0.063 (0.062)	98.4		h0.833 (1.165)
							i1.000 (0.299)	29.9		i0.206 (0.124)

[1] Number of stations where the species was a regular or usual breeder at which adults of the species were captured.
[2] Number of adult individuals captured at stations where the species was a regular or usual breeder (i.e., number of capture histories).
[3] Total number of captures of adult birds of the species at stations where the species was a regular or usual breeder.
[4] Total number of returns. A return is the first recapture in a given year of a bird originally banded at the same station in a previous year.
[5] Models included are those chosen by $QAIC_C$ (those models marked with * in Table 30) plus th $\varphi p\tau$ model in all cases. See Table 30 for definitions of the models.

Table 31. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 15 species breeding at MAPS stations on Willamette National Forest obtained from ten years (1992-2001) of mark-recapture data.

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[6] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample size and over dispersion of data.

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

a The survival probability between the years 1992-1993 in a temporally variable model.
b The survival probability between the years 1993-1994 in a temporally variable model.
c The survival probability between the years 1994-1995 in a temporally variable model.
d The survival probability between the years 1995-1996 in a temporally variable model.
e The survival probability between the years 1996-1997 in a temporally variable model.
f The survival probability between the years 1997-1998 in a temporally variable model.
g The survival probability between the years 1998-1999 in a temporally variable model.
h The survival probability between the years 1999-2000 in a temporally variable model.
i The survival probability between the years 2000-2001 in a temporally variable model.

[8] The coefficient of variation for survival probability.

[9] Recapture probability presented as the maximum likelihood estimate (standard error of the estimate).

a The recapture probability in 1993 in a temporally variable model.
b The recapture probability in 1994 in a temporally variable model.
c The recapture probability in 1995 in a temporally variable model.
d The recapture probability in 1996 in a temporally variable model.
e The recapture probability in 1997 in a temporally variable model.
f The recapture probability in 1998 in a temporally variable model.
g The recapture probability in 1999 in a temporally variable model.
h The recapture probability in 2000 in a temporally variable model.
i The recapture probability in 2001 in a temporally variable model.

[10] The proportion of residents among newly captured adults presented as the maximum likelihood estimate (standard error of the estimate).

a The proportion of residents in the adult population in 1992 in a temporally variable model.
b The proportion of residents in the adult population in 1993 in a temporally variable model.
c The proportion of residents in the adult population in 1994 in a temporally variable model.
d The proportion of residents in the adult population in 1995 in a temporally variable model.
e The proportion of residents in the adult population in 1996 in a temporally variable model.
f The proportion of residents in the adult population in 1997 in a temporally variable model.
g The proportion of residents in the adult population in 1998 in a temporally variable model.
h The proportion of residents in the adult population in 1999 in a temporally variable model.
i The proportion of residents in the adult population in 2000 in a temporally variable model.

* Time-constant model that was not marked by $QAIC_C$, but that is shown only for comparison to other species.

Table 32. Relative values of vital rates (lower-than-expected, as-expected, higher-than-expected) for selected study species at Willamette National Forest in relation to the direction and significance of their adult population trends over the ten years 1992-2001.

Species	Significance of the trend[1]	Productivity	Survival Probability[2]
A. Declining Species			
Dusky Flycatcher	***	lower	higher
Orange-crowned Warbler	**	higher	higher
Common Yellowthroat	**	higher	expected
Dark-eyed Junco		higher	expected
Pine Siskin	**	lower	
B. Increasing Species			
"Traill's" Flycatcher	*	lower	expected
Hammond's Flycatcher	***	lower	expected
Winter Wren	**	higher	expected
Wilson's Warbler	**	expected	
Song Sparrow		higher	expected

[1] Direction and significance of the trends in adult population size as based on data from all six stations (Fig. 9); *** $P < 0.01$, ** $0.01 \leq P < 0.05$, * $0.05 \leq P < 0.10$.

[2] A question mark (?) indicates inferences based on survival estimates for which CV of the estimate > 30% and are thus less reliable, or that survival could not be estimated due to low recapture rates.

Table 33. Summary of the 2001 MAPS program on Siuslaw National Forest.

Station						2001 operation		
Name	Code	No.	Major Habitat Type	Latitude-longitud	Avg. Elev. (m)	Total number of net-hours[1]	No. of periods	Inclusive dates
Mary's Peak	MAPE	11163	Mature Douglas fir-dominated mixed coniferous forest	44º30'50"N,123º29'40"W	274	474.0 (350.8)	8	5/21-8/04
Cougar Creek	COUC	11167	Mature semi-dense Douglas fir forest, young disturbed Douglas fir forest, post-clearcut vine maple grov	44º16'20"N,123º51'40"W	259	448.3 (436.0)	8	5/18-7/30
Crab Creek	CRCR	11168	Young dense disturbed Douglas fir forest	44º15'20"N,123º51'30"W	219	480.0 (467.0)	8	5/23-8/02
Homestead	HOME	11165	Mature Douglas fir forest, mature red alder stands, grassy meadow	44º30'20"N,123º37'40"W	207	405.0 (389.2)	8	5/22-8/03
Beaver Ridge	BERI	11166	Young dense disturbed Douglas fir forest	44º18'40"N,123º50'20"W	158	399.7 (392.3)	8	5/19-7/31
Salvation Meadow	SAME	11903	Wet meadow, riparian corridor, second-growth Douglas fir-dominated mixed coniferous forest	44º15'30"N,123º44'30"W	122	451.3 (426.7)	8	5/20-8/01
ALL STATIONS COMBINED						2658.3 (2462.0)	8	5/18-8/04

[1] Total net-hours in 2001. Net-hours in 2001 that could be compared in a constant-effort manner to 2000 are shown in parentheses.

Table 34. Capture summary for the six individual MAPS stations operated on Siuslaw National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Mary's Peak			Cougar Creek			Crab Creek			Homestead			Beaver Ridg			Salvation Mead.		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Sharp-shinned Hawk														1				
Ruffed Grous								1										
Northern Pygmy-Owl	1										1			1				
Rufous Hummingbird		2			8						2			1			5	
Downy Woodpecker													1					
Hairy Woodpecker	3			1	1		1			1			1		2			
"Traill's" Flycatcher																1		
Hammond's Flycatcher				5	1	4			1									
"Western" Flycatcher	8		6	3			5		4	4	1	1	7		3	5		3
Hutton's Vireo																1	1	1
Gray Jay	2															2		
Steller's Jay	1																1	
Chestnut-backed Chickadee	6	1		6	1	1				5			1			5		1
Brown Creepe	1		3	3														
Winter Wren	12	1	7	8	2	15	20	1	18	12	1	4	8	4	3	6	1	
Golden-crowned Kinglet																1		
Swainson's Thrush	10		11	37	1	85	38		55	29		39	46	2	58	70	2	94
Hermit Thrush				1														
American Robin															2		1	
Varied Thrush							3		1	2		1				2		
Wrentit				3						3								
Black-throated Gray Warbler										1			1		1	1		
Hermit Warbler				2			1											
MacGillivray's Warbler													1					
Wilson's Warbler	10	2	6	24		20	6	2	2	24		12	15	4	11	27	3	7
Western Tanager				1									1					
Spotted Towh	1																	
Song Sparro							1			7		3	3		3	9	1	4

Table 34. (cont.) Capture summary for the six individual MAPS stations operated on Siuslaw National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Mary's Peak			Cougar Creek			Crab Creek			Homestead			Beaver Ridg			Salvation Mead.		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Dark-eyed Junco							5		3	1								
Black-headed Grosbeak																3		1
ALL SPECIES POOLED	55	6	33	94	14	125	80	4	84	89	5	60	85	13	83	133	15	111
TOTAL NUMBER OF CAPTURES		94			233			168			154			181			259	
NUMBER OF SPECIES	11	4	5	12	6	5	9	3	7	11	4	6	11	6	8	13	8	7
TOTAL NUMBER OF SPECIES		12			13			11			13			15			16	

Table 35. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Siusla National Forest in 2001.

	Mary's Peak			Cougar Creek			Crab Creek			Homestead			Beaver Ridg			Salvation Meado		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Northern Pygmy-Owl	0.0	1.3	1.00															
Downy Woodpecker													1.5	0.0	0.00			
Hairy Woodpecker	1.3	2.5	0.67	1.3	0.0	0.00	1.3	0.0	0.00	1.5	0.0	0.00	1.5	1.5	0.50			
"Traill's" Flycatcher																1.3	0.0	0.00
Hammond's Flycatcher				8.0	0.0	0.00	1.3	0.0	0.00									
"Western" Flycatcher	13.9	0.0	0.00	4.0	0.0	0.00	6.3	1.3	0.17	5.9	1.5	0.20	12.0	1.5	0.11	6.6	0.0	0.00
Hutton's Vireo																1.3	1.3	0.50
Gray Jay	2.5	0.0	0.00													1.3	1.3	0.50
Steller's Jay	1.3	0.0	0.00															
Chestnut-backed Chickadee	6.3	1.3	0.17	6.7	1.3	0.17				7.4	0.0	0.00	1.5	0.0	0.00	6.6	0.0	0.00
Brown Creepe	1.3	0.0	0.00	2.7	1.3	0.33												
Winter Wren	16.5	0.0	0.00	12.0	5.4	0.31	23.8	6.3	0.21	10.4	8.9	0.46	9.0	1.5	0.14	5.3	2.7	0.33
Golden-crowned Kinglet																0.0	1.3	1.00
Swainson's Thrush	19.0	0.0	0.00	85.7	1.3	0.02	63.8	3.8	0.06	51.9	5.9	0.10	85.6	12.0	0.12	102.4	21.3	0.17
Hermit Thrush				1.3	0.0	0.00												
American Robin													1.5	0.0	0.00			
Varied Thrush							3.8	0.0	0.00	3.0	0.0	0.00				1.3	1.3	0.50
Wrentit				1.3	2.7	0.67				1.5	3.0	0.67						
Blk-throated Gray Warbler										1.5	0.0	0.00	3.0	0.0	0.00	1.3	0.0	0.00
Hermit Warbler				2.7	0.0	0.00	1.3	0.0	0.00									
MacGillivray's Warbler													0.0	1.5	1.00			
Wilson's Warbler	12.7	1.3	0.09	30.8	5.4	0.15	7.5	2.5	0.25	38.5	3.0	0.07	28.5	3.0	0.09	17.3	19.9	0.54
Western Tanager				1.3	0.0	0.00							1.5	0.0	0.00			
Spotted Towh	0.0	1.3	1.00															
Song Sparro							0.0	1.3	1.00	10.4	1.5	0.13	3.0	1.5	0.33	12.0	1.3	0.10
Dark-eyed Junco							7.5	0.0	0.00	1.5	0.0	0.00						
Black-headed Grosbeak																2.7	1.3	0.33

Table 35. (cont.) Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Siuslaw National Forest in 2001.

	Mary's Peak			Cougar Creek			Crab Creek			Homestead			Beaver Ridg			Salvation Meado		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
ALL SPECIES POOLED	74.7	7.6	0.09	157.9	17.4	0.10	116.3	15.0	0.11	133.3	23.7	0.15	148.6	22.5	0.13	159.5	51.8	0.25
NUMBER OF SPECIES	9	5		12	6		9	5		11	6		11	7		12	9	
TOTAL NUMBER OF SPECIES		11			12			10			11			12			13	

Table 36. Summary of results for all six Siuslaw National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		Prop. Young
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Sharp-shinned Hawk		1				
Ruffed Grous		1				
Northern Pygmy-Owl	1	2		0.0	0.2	1.00
Rufous Hummingbird		18				
Downy Woodpecker	1			0.2	0.0	0.00
Hairy Woodpecker	7	1	2	1.1	0.7	0.38
"Traill's" Flycatcher	1			0.2	0.0	0.00
Hammond's Flycatcher	5	1	5	1.6	0.0	0.00
"Western" Flycatcher	32	1	17	8.1	0.7	0.08
Hutton's Vireo	1	1	1	0.2	0.2	0.50
Gray Jay	4			0.7	0.2	0.25
Steller's Jay	1	1		0.2	0.0	0.00
Chestnut-backed Chickadee	23	2	2	4.7	0.5	0.09
Brown Creepe	4		3	0.7	0.2	0.25
Winter Wren	66	10	47	13.1	4.1	0.24
Golden-crowned Kinglet	1			0.0	0.2	1.00
Swainson's Thrush	230	5	342	67.5	7.2	0.10
Hermit Thrush	1			0.2	0.0	0.00
American Robin		1	2	0.2	0.0	0.00
Varied Thrush	7		2	1.4	0.2	0.14
Wrentit	6			0.5	0.9	0.67
Black-throated Gray Warbler	3		1	0.9	0.0	0.00
Hermit Warbler	3			0.7	0.0	0.00
MacGillivray's Warbler	1			0.0	0.2	1.00
Wilson's Warbler	106	11	58	21.9	5.9	0.21
Western Tanager	2			0.5	0.0	0.00
Spotted Towh	1			0.0	0.2	1.00
Song Sparro	20	1	10	4.1	0.9	0.18
Dark-eyed Junco	6		3	1.6	0.0	0.00
Black-headed Grosbeak	3		1	0.5	0.2	0.33
ALL SPECIES POOLED	536	57	496	130.7	22.8	0.15
TOTAL NUMBER OF CAPTURES		1089				
NUMBER OF SPECIES	26	15	15	23	17	
TOTAL NUMBER OF SPECIES		30			27	

Table 37. Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Siusla National Forest averaged over the ten years, 1992-2001 (nine years, 1993-2001 for Salvation Meadow). Data are included only from stations that lie within the breeding range of the target species.

	Mary's Peak			Cougar Creek			Crab Creek			Homestead			Beaver Ridge			Salvation Meadow			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Sharp-shinned Hawk				0.1	0.0	0.00				0.1	0.0	0.00									
Northern Pygmy-Owl	0.0	0.1	1.00	0.4	0.0	0.00				0.2	0.0	0.00							0.1	0.0	0.20
Red-breasted Sapsucke	0.5	0.0	0.00																0.1	0.0	0.00
Downy Woodpecke													0.2	0.0	0.00	0.5	0.0	0.00	0.1	0.0	0.00
Hairy Woodpecke	0.3	0.4	0.50	0.7	0.5	0.36	0.3	0.0	0.00	0.4	0.0	0.00	1.0	0.3	0.14	1.0	0.0	0.00	0.6	0.2	0.20
"Traill's" Flycatche	0.1	0.0	0.00							0.1	0.0	0.00				1.4	0.0	0.00	0.3	0.0	0.00
Hammond's Flycatcher				2.8	0.0	0.00	0.4	0.0	0.00	0.6	0.0	0.00	0.8	0.0	0.00	0.2	0.0	0.00	0.8	0.0	0.00
"Western" Flycatche	23.0	2.6	0.08	2.8	0.6	0.17	7.6	0.1	0.02	8.8	0.6	0.06	6.6	0.3	0.02	5.7	1.1	0.16	9.2	0.9	0.08
Hutton's Vireo				0.1	0.0	0.00	0.4	0.0	0.00				0.6	0.0	0.00	0.7	0.1	0.17	0.3	0.0	0.07
Warbling Vireo													1.0	0.0	0.00	1.8	0.0	0.00	0.4	0.0	0.00
Gray Jay	0.4	0.0	0.00	0.3	0.3	0.50				0.4	0.5	0.50				0.3	0.1	0.25	0.2	0.2	0.37
Steller's Ja	0.6	0.0	0.00	0.3	0.1	0.50	0.1	0.0	0.00	0.5	0.2	0.40	0.1	0.0	0.00	0.1	0.0	0.00	0.3	0.1	0.20
Black-capped Chickadee																0.6	0.0	0.00	0.1	0.0	0.00
Chestnut-backed Chick.	3.8	0.5	0.08	8.5	1.7	0.14	1.4	0.9	0.29	3.4	0.1	0.04	1.9	0.5	0.20	2.0	1.0	0.35	3.5	0.8	0.17
Red-breasted Nuthatch	0.2	0.0	0.00	0.2	0.1	0.33													0.1	0.0	0.33
Brown Creepe	0.8	0.8	0.46	1.3	0.4	0.20				0.1	0.0	0.00	0.1	0.2	0.75	0.1	0.0	0.00	0.4	0.3	0.38
Bewick's Wren				0.0	0.1	1.00							0.0	0.1	1.00				0.0	0.0	1.00
House Wren										0.1	0.0	0.00				0.0	0.1	1.00	0.0	0.0	0.50
Winter Wren	11.6	3.3	0.24	11.1	5.0	0.27	8.7	2.8	0.21	13.5	7.6	0.34	8.6	3.6	0.28	5.7	2.0	0.22	10.0	4.1	0.28
Golden-crowned Kinglet	0.1	0.0	0.00	0.0	0.5	1.00	0.2	0.0	0.00	0.2	0.0	0.00	0.0	0.1	1.00	0.0	0.1	1.00	0.1	0.1	0.42
Swainson's Thrush	12.8	0.5	0.03	60.2	4.1	0.07	44.1	2.3	0.05	30.3	3.1	0.09	54.4	5.4	0.08	61.0	8.3	0.11	43.4	4.0	0.08
Hermit Thrush	0.2	0.0	0.00	0.2	0.2	0.33	0.0	0.2	1.00	0.0	0.1	1.00							0.1	0.1	0.31
American Robin	0.2	0.0	0.00	0.7	0.0	0.00	1.2	0.0	0.00	2.0	0.1	0.13	1.7	0.1	0.03	0.7	0.0	0.00	1.1	0.0	0.03
Varied Thrush	1.5	0.1	0.03	0.9	0.1	0.07	0.9	0.0	0.00	1.0	0.1	0.17	0.3	0.0	0.00	0.3	0.3	0.50	0.8	0.1	0.09
Wrentit	0.3	0.1	0.33	2.2	1.3	0.36	0.1	0.0	0.00	0.1	0.3	0.67	1.2	0.5	0.24	0.5	0.6	0.42	0.8	0.5	0.35
Cedar Waxwing																0.1	0.0	0.00			
Orange-crowned Warbler				0.0	0.1	1.00	0.1	0.0	0.00							1.5	0.0	0.00	0.3	0.0	0.20
Black-throated Gray W.				0.1	0.1	0.50	0.9	0.1	0.08	0.1	0.0	0.00	1.5	0.0	0.00	0.6	0.0	0.00	0.5	0.0	0.05
Hermit Warble	1.0	0.1	0.04	3.2	1.3	0.07	1.0	0.0	0.00	0.6	0.0	0.00	1.3	0.0	0.00	0.2	0.1	0.50	1.2	0.3	0.07
MacGillivray's Warble				0.3	0.2	0.40				0.4	0.5	0.60	0.1	0.2	0.50	2.7	0.4	0.11	0.6	0.2	0.28

Table 37. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Siuslaw National Forest averaged over the ten years, 1992-2001 (nine years, 1993-2001 for Salvation Meadow). Data are included only from stations that lie within the breeding range of the target species.

	Mary's Peak			Cougar Creek			Crab Creek			Homestead			Beaver Ridge			Salvation Meadow			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Common Yellowthroat										0.0	0.1	1.00				0.4	0.1	0.33	0.1	0.0	0.44
Wilson's Warbler	14.4	1.0	0.07	27.3	6.7	0.19	3.8	0.5	0.09	24.4	3.7	0.14	18.1	3.1	0.14	16.2	11.8	0.40	17.3	4.4	0.20
Western Tanage				0.4	0.0	0.00				0.1	0.0	0.00	0.5	0.0	0.00				0.2	0.0	0.00
Spotted Towhee	0.0	0.1	1.00	0.1	0.0	0.00													0.0	0.0	0.50
Song Sparrow	0.0	0.1	1.00	0.2	0.0	0.00	0.1	0.9	0.83	4.3	1.9	0.37	1.3	1.7	0.57	13.1	4.0	0.20	2.9	1.4	0.31
Dark-eyed Junco	0.3	0.0	0.00				2.2	0.1	0.06	0.4	0.3	0.25	0.0	0.1	1.00				0.5	0.1	0.08
Black-headed Grosbeak							0.7	0.0	0.00	0.3	0.0	0.00	0.3	0.0	0.00	4.5	0.3	0.09	0.9	0.0	0.09
Purple Finch				0.1	0.0	0.00				0.1	0.0	0.00	0.1	0.0	0.00				0.1	0.0	0.00
Red Crossbill	0.1	0.0	0.00																		
American Goldfinch																0.2	0.0	0.00			
Evening Grosbeak													0.2	0.0	0.00						
ALL SPECIES POOLED	72.3	9.9	0.12	124.6	23.5	0.16	74.3	7.9	0.09	92.7	19.3	0.17	101.7	16.2	0.13	122.4	30.5	0.19	97.6	17.8	0.15
NUMBER OF SPECIES	20	13		25	19		19	9		26	15		23	14		27	16		33	17	
TOTAL NUMBER OF SPECIES	23			28			20			28			26			29			33		

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

Table 38. Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Siuslaw National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
"Western" Flycatcher	147.1* (0.958)	158.3 (0.943)	159.2 (0.934)	156.2 (0.962)	165.0 (0.964)	165.7 (0.969)	169.4 (0.933)	175.4 (0.958)	11.2
Chestnut-backed Chickadee	34.4* (1.000)	45.9 (1.000)	44.6 (1.000)	48.3 (1.000)	60.5 (1.000)	64.9 (1.000)	63.2 (1.000)	79.1 (1.000)	11.5
Winter Wren	104.9* (1.000)	114.4 (1.000)	114.5 (1.000)	111.2 (1.000)	122.3 (1.000)	118.1 (1.000)	119.8 (1.000)	126.9 (1.000)	9.5
Swainson's Thrush	231.0 (0.000)	224.0* (0.017)	225.6* (0.011)	239.7 (0.000)	228.8 (0.038)	234.1 (0.015)	235.4 (0.010)	240.1 (0.019)	-7.0
Wilson's Warbler	169.9* (0.985)	175.7 (0.995)	181.0 (0.979)	173.5 (0.997)	187.2 (0.989)	186.5 (0.994)	187.1 (0.993)	196.4 (0.989)	5.8
Song Sparro	64.3* (1.000)	72.1 (1.000)	68.8 (1.000)	74.1 (1.000)	78.0 (1.000)	87.1 (1.000)	80.8 (1.000)	92.8 (1.000)	7.8

[1] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample sizes and overdispersion of data.

[2] Goodness-of-fit is a measure of how well the actual distribution of data fits the theoretical distribution calculated using the estimates provided by the model. The larger the value provided by the GOF test the better the model describes the data.

[3] $\varphi p\tau$ Model: Transient model with temporally-constant survival probability, recapture probability, and proportion of residents (invariable from year to year).

[4] $\varphi_t p\tau$ Model: Transient model with temporally-variable survival probability; and temporally-constant recapture probability and proportion of residents.

[5] $\varphi p_t\tau$ Model: Transient model with temporally-variable recapture probability; and temporally-constant survival probability and proportion of residents.

Table 38. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Siuslaw National Forest. $QAIC_C$[1] and $(GOF)^2$ are presented for all models.

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[6] $\varphi p \tau_t$ Model: Transient model with temporally-variable proportion of residents; and temporally-constant survival and recapture probabilities.
[7] $\varphi_t p_t \tau$ Model: Transient model with temporally-variable survival and recapture probabilities; and temporally-constant proportion of residents.
[8] $\varphi_t p \tau_t$ Model: Transient model with temporally-variable survival probability and proportion of residents; and temporally-constant recapture probability.
[9] $\varphi p_t \tau_t$ Model: Transient model with temporally-variable recapture probability and proportion of residents; and temporally-constant survival probability.
[10] $\varphi_t p_t \tau_t$ Model: Transient model with temporally-variable survival probability, recapture probability, and proportion of residents.
[11] $\Delta QAIC_C$ is defined as the difference in $QAIC_C$ between th $\varphi p \tau$ model and th $\varphi_t p \tau$ model.

* The chosen models are the model with the lowest $QAIC_C$ and the models with $QAIC_C$s within 2.0 units of the model with the lowest $QAIC_C$.

Table 39. Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for six species breeding at MAPS stations on Siuslaw National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
"Western" Flycatcher	6	391	566	66	$\varphi p\tau$	147.1	0.525 (0.051)	9.6	0.243 (0.052)	0.699 (0.165)
Chestnut-backed Chickadee	6	167	189	10	$\varphi p\tau$	34.4	0.158 (0.103)	65.3	0.369 (0.322)	1.000 (0.956)
Winter Wren	6	435	665	54	$\varphi p\tau$	104.9	0.431 (0.053)	12.2	0.529 (0.089)	0.248 (0.064)
Swainson's Thrush	6	1487	3464	616	$\varphi p\tau$*	231.0	0.591 (0.017)	2.8	0.624 (0.023)	0.498 (0.035)
					$\varphi_t p\tau$	224.0	a0.666 (0.068)	10.2	0.607 (0.024)	0.483 (0.034)
							b0.605 (0.054)	8.9		
							c0.508 (0.050)	9.8		
							d0.626 (0.054)	8.6		
							e0.627 (0.057)	9.1		
							f0.507 (0.051)	10.0		
							g0.679 (0.057)	8.4		
							h0.447 (0.044)	9.8		
							i0.897 (0.074)	8.2		
					$\varphi p_t\tau$	225.6	0.575 (0.017)	3.0	a0.641 (0.070)	0.495 (0.035)
									b0.641 (0.056)	
									c0.510 (0.056)	
									d0.652 (0.055)	
									e0.524 (0.058)	
									f0.600 (0.055)	
									g0.735 (0.052)	
									h0.582 (0.055)	
									i0.900 (0.078)	
Wilson's Warbler	6	697	1128	143	$\varphi p\tau$	169.9	0.451 (0.035)	7.7	0.430 (0.051)	0.664 (0.099)
Song Sparro	3	116	200	24	$\varphi p\tau$	64.3	0.427 (0.078)	18.4	0.709 (0.134)	0.339 (0.128)

Table 39. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for six species breeding at MAPS stations on Siuslaw National Forest obtained from ten years (1992-2001) of mark-recapture data.

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[1] Number of stations where the species was a regular or usual breeder at which adults of the species were captured.

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

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

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

[5] Models included are those chosen by $QAIC_C$ (those models marked with * in Table 38) plus th $\varphi p\tau$ model in all cases. See Table 38 for definitions of the models.

[6] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample size and overdispersion of data.

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

a The survival probability between the years 1992-1993 in a temporally variable model.
b The survival probability between the years 1993-1994 in a temporally variable model.
c The survival probability between the years 1994-1995 in a temporally variable model.
d The survival probability between the years 1995-1996 in a temporally variable model.
e The survival probability between the years 1996-1997 in a temporally variable model.
f The survival probability between the years 1997-1998 in a temporally variable model.
g The survival probability between the years 1998-1999 in a temporally variable model.
h The survival probability between the years 1999-2000 in a temporally variable model.
i The survival probability between the years 2000-2001 in a temporally variable model.

[8] The coefficient of variation for survival probability.

[9] Recapture probability presented as the maximum likelihood estimate (standard error of the estimate).

a The recapture probability in 1993 in a temporally variable model.
b The recapture probability in 1994 in a temporally variable model.
c The recapture probability in 1995 in a temporally variable model.
d The recapture probability in 1996 in a temporally variable model.
e The recapture probability in 1997 in a temporally variable model.
f The recapture probability in 1998 in a temporally variable model.
g The recapture probability in 1999 in a temporally variable model.
h The recapture probability in 2000 in a temporally variable model.
i The recapture probability in 2001 in a temporally variable model.

[10] The proportion of residents among newly captured adults presented as the maximum likelihood estimate (standard error of the estimate).

* Time-constant model that was not marked by $QAIC_C$, but that are shown only for comparison to other species.

Table 40. Relative values of vital rates (lower-than-expected, as-expected, higher-than-expected) for selected study species at Siuslaw National Forest in relation to the direction and significance of their adult population trends over the ten years 1992-2001.

Species	Significance of the trend[1]	Productivity	Survival Probability
A. Declining Species			
"Western" Flycatcher	***	lower	expected
Winter Wren	**	expected	expected
Song Sparrow		expected	expected
B. Increasing Species			
None			

[1] Direction and significance of the trends in adult population size as based on data from all six stations (Fig. 13); *** $P < 0.01$, ** $0.01 \leq P < 0.05$, * $0.05 \leq P < 0.10$.

Table 41. Summary of the 2001 MAPS program on Fremont National Forest.

Station						2001 operation		
Name	Code	No.	Major Habitat Type	Latitude-longitud	Avg. Elev. (m)	Total number of net-hours[1]	No. of periods	Inclusive dates
Sycan River	SYRI	11169	Wet willow/bogbirch riparian meadow, mixed coniferous forest	42°40'20"N,120°49'00"W	2003	310.7 (280.5)	7	6/07-8/02
Deadhorse	DEAD	11170	Dense willow-dominated meadow, mixed coniferous forest	42°35'30"N,120°48'50"W	1944	348.3 (323.3)	7	6/02-7/30
Cold Creek	COLC	11171	Open wet meadow with willow/ bogbirch/aspen groves, mixed coniferous forest	42°35'00"N,120°55'10"W	1926	299.8 (264.8)	7	6/06-8/01
Augur Creek	AUCR	11172	Semi-wet riparian meado with aspen groves, sag brushland and mixed coniferous forest	42°31'10"N,120°42'40"W	1847	340.7 (311.0)	7	6/08-8/04
Swamp Creek	SWCR	11174	Riparian meadow, mahogany shrubland, mixed pine forest	42°25'50"N,120°34'00"W	1658	311.7 (300.0)	7	6/09-8/03
Island	ISLA	11173	Open riparian meadow with willow thickets, mixed coniferous forest and dry brushland	42°30'20"N,120°39'40"W	1628	283.0 (265.7)	7	6/04-7/31
ALL STATIONS COMBINED						1894.2 (1745.3)	7	6/02-8/04

[1] Total net-hours in 2001. Net-hours in 2001 that could be compared in a constant-effort manner to 2000 are shown in parentheses.

Table 42. Capture summary for the six individual MAPS stations operated on Fremont National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

Species	Sycan River			Deadhorse			Cold Creek			Augur Creek			Swamp Creek			Island		
	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Sharp-shinned Hawk					1													
Calliope Hummingbird		9			4						3						1	
Rufous Hummingbird		4			13			3			4			3			2	
Belted Kingfisher					1													
Williamson's Sapsucker							1			1								
Red-naped Sapsucker				5		5				1			1					
Hybrid Sapsucker	1			3		2	1		3	1						1		
Red-breasted Sapsucker	3		5	12		4			1	3			3		5	2		3
Downy Woodpecker										1								
Hairy Woodpecker	2					1	2						4			3		
Northern Flicker				1			2			1						3		
Western Wood-Pewee				2		2										2		
Hammond's Flycatcher	2									2						8		6
Dusky Flycatcher	11		11	9		5	4	1	3	1								
"Western" Flycatcher										2			7		6	1		
Unidentified Empidonax		1															1	
Cassin's Vireo				2						1								
Warbling Vireo	3		3	11		11	1		2	4		3	2		2	1		1
Gray Jay				1			2		1									
Mountain Chickadee	3		1	3			4		2	17	1	3	2		4	5		1
Red-breasted Nuthatch	2		1	1		1	3		3	3			4			1		
Brown Creepe	6	1		1			5		2	4			1	1	1	1		2
House Wren	1			1		4	1			2								
Golden-crowned Kinglet							3			3		1						
Ruby-crowned Kinglet	5	1	1															
Hermit Thrush				2														
American Robin	11		7	19	2	2	3			13		7	9			13	1	2
Orange-crowned Warbler	6		5	41	1	7	1			6	2					2		

Table 42. (cont.) Capture summary for the six individual MAPS stations operated on Fremont National Forest in 2001.
N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	Sycan River			Deadhorse			Cold Creek			Augur Creek			Swamp Creek			Island		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Nashville Warbler	3		3	3						3						1		
Yellow-rumped Warbler	15		1	58		1	7			9		2	9			14		2
MacGillivray's Warbler	12		10	12	2	5	1			10		16	7	1	9			
Wilson's Warbler	3		4	1														
Western Tanager	1			2						2			1					
Chipping Sparro				1														
Brewer's Sparrow	1				1					1								
Savannah Sparrow							1											
Song Sparro																1		
Lincoln's Sparro	20		17	3		2	4	1	3	3		7						
White-crowned Sparrow	15	1	10	13		2	8		4	8		1						
Dark-eyed Junco	14	1	10	24	4	8	14		3	57	5	17	10	1	7	20	2	9
Cassin's Finch				2			1									1		
Pine Siskin	1			1														
Lesser Goldfinch										1								
Evening Grosbeak										2								
ALL SPECIES POOLED	141	18	89	234	29	62	69	5	27	162	15	57	60	6	34	80	7	26
TOTAL NUMBER OF CAPTURES		248			325			101			234			100			113	
NUMBER OF SPECIES	23	6	15	27	9	16	21	3	11	28	5	9	13	4	7	18	4	8
TOTAL NUMBER OF SPECIES		25			33			23			30			14			20	

Table 43. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Fremont National Forest in 2001.

	Sycan River			Deadhorse			Cold Creek			Augur Creek			Swamp Creek			Island		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Williamson's Sapsucker							2.0	0.0	0.00	1.8	0.0	0.00						
Red-naped Sapsucker				8.6	3.4	0.29				1.8	0.0	0.00	0.0	1.9	1.00			
Hybrid Sapsucker	1.9	0.0	0.00	6.9	0.0	0.00	4.0	0.0	0.00	1.8	0.0	0.00				2.1	0.0	0.00
Red-breasted Sapsucker	7.7	1.9	0.20	6.9	15.5	0.69	2.0	0.0	0.00	5.3	0.0	0.00	7.7	0.0	0.00	8.5	0.0	0.00
Downy Woodpecker										1.8	0.0	0.00						
Hairy Woodpecker	0.0	3.9	1.00	1.7	0.0	0.00	2.0	2.0	0.50				3.9	3.9	0.50	4.2	2.1	0.33
Northern Flicker				1.7	0.0	0.00	4.0	0.0	0.00	1.8	0.0	0.00				6.4	0.0	0.00
Western Wood-Pewee				5.2	0.0	0.00										2.1	2.1	0.50
Hammond's Flycatcher	3.9	0.0	0.00							3.5	0.0	0.00				21.2	0.0	0.00
Dusky Flycatcher	30.9	0.0	0.00	24.1	0.0	0.00	8.0	0.0	0.00	1.8	0.0	0.00						
"Western" Flycatcher										3.5	0.0	0.00	21.2	0.0	0.00	2.1	0.0	0.00
Cassin's Vireo				3.4	0.0	0.00				1.8	0.0	0.00						
Warbling Vireo	7.7	0.0	0.00	31.0	0.0	0.00	4.0	0.0	0.00	8.8	0.0	0.00	3.9	0.0	0.00	2.1	0.0	0.00
Gray Jay				1.7	0.0	0.00	4.0	2.0	0.33									
Mountain Chickadee	3.9	1.9	0.33	3.4	1.7	0.33	6.0	6.0	0.50	14.1	19.4	0.58	3.9	1.9	0.33	8.5	4.2	0.33
Red-breasted Nuthatch	1.9	1.9	0.50	3.4	0.0	0.00	2.0	6.0	0.75	3.5	1.8	0.33	5.8	1.9	0.25	2.1	0.0	0.00
Brown Creepe	1.9	9.7	0.83	1.7	0.0	0.00	4.0	8.0	0.67	5.3	1.8	0.25	3.9	0.0	0.00	4.2	0.0	0.00
House Wren	0.0	1.9	1.00	5.2	0.0	0.00	0.0	2.0	1.00	3.5	0.0	0.00						
Golden-crowned Kinglet							0.0	6.0	1.00	5.3	0.0	0.00						
Ruby-crowned Kinglet	9.7	1.9	0.17															
Hermit Thrush				3.4	0.0	0.00												
American Robin	23.2	7.7	0.25	25.8	8.6	0.25	4.0	2.0	0.33	21.1	5.3	0.20	9.6	7.7	0.44	21.2	8.5	0.29
Orange-crowned Warbler	9.7	5.8	0.38	20.7	51.7	0.71	0.0	2.0	1.00	3.5	8.8	0.71				2.1	2.1	0.50
Nashville Warbler	5.8	0.0	0.00	5.2	0.0	0.00				5.3	0.0	0.00				0.0	2.1	1.00
Yellow-rumped Warbler	17.4	13.5	0.44	36.2	63.7	0.64	6.0	8.0	0.57	12.3	5.3	0.30	15.4	1.9	0.11	17.0	17.0	0.50
MacGillivray's Warbler	27.0	0.0	0.00	20.7	0.0	0.00	2.0	0.0	0.00	14.1	7.0	0.33	11.6	1.9	0.14			
Wilson's Warbler	3.9	1.9	0.33	1.7	0.0	0.00												

Table 43. (cont.) Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Fremont National Forest in 2001.

	Sycan River			Deadhorse			Cold Creek			Augur Creek			Swamp Creek			Island		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Western Tanager	1.9	0.0	0.00	3.4	0.0	0.00				3.5	0.0	0.00	1.9	0.0	0.00			
Chipping Sparro				1.7	0.0	0.00												
Brewer's Sparrow	1.9	0.0	0.00							0.0	1.8	1.00						
Savannah Sparro							2.0	0.0	0.00									
Song Sparro																2.1	0.0	0.00
Lincoln's Sparro	29.0	15.5	0.35	1.7	5.2	0.75	10.0	0.0	0.00	5.3	1.8	0.25						
White-crowned Sparro	29.0	1.9	0.06	15.5	6.9	0.31	10.0	6.0	0.38	8.8	5.3	0.38						
Dark-eyed Junco	27.0	5.8	0.18	24.1	20.7	0.46	20.0	12.0	0.38	38.7	72.2	0.65	19.3	5.8	0.23	40.3	14.8	0.27
Cassin's Finch				3.4	0.0	0.00	0.0	2.0	1.00							0.0	2.1	1.00
Pine Siskin	1.9	0.0	0.00	1.7	0.0	0.00												
Lesser Goldfinch										1.8	0.0	0.00						
Evening Grosbeak										3.5	0.0	0.00						
ALL SPECIES POOLED	247.2	75.3	0.23	270.4	177.4	0.40	96.1	64.0	0.40	183.2	130.3	0.42	107.8	27.0	0.20	146.3	55.1	0.27
NUMBER OF SPECIES	21	14		28	9		18	13		27	11		12	8		16	9	
TOTAL NUMBER OF SPECIES		23			28			22			28			13			18	

Table 44. Summary of results for all six Fremont National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		Prop. Young
	Newly banded	Un-banded	Recap-tured	Adults	Young	
Sharp-shinned Hawk		1				
Calliope Hummingbird		17				
Rufous Hummingbird		29				
Belted Kingfisher		1				
Williamson's Sapsucker	2			0.6	0.0	0.00
Red-naped Sapsucker	7		5	1.9	1.0	0.33
Hybrid Sapsucker	7		5	2.9	0.0	0.00
Red-breasted Sapsucker	23		18	6.3	3.2	0.33
Downy Woodpecker	1			0.3	0.0	0.00
Hairy Woodpecker	11		1	1.9	1.9	0.50
Northern Flicker	7			2.2	0.0	0.00
Western Wood-Pewee	4		2	1.3	0.3	0.20
Hammond's Flycatcher	12		6	4.4	0.0	0.00
Dusky Flycatcher	25	1	19	11.1	0.0	0.00
"Western" Flycatcher	10		6	4.4	0.0	0.00
Unidentified Empidonax		2				
Cassin's Vireo	3			1.0	0.0	0.00
Warbling Vireo	22		22	10.1	0.0	0.00
Gray Jay	3		1	1.0	0.3	0.25
Mountain Chickadee	34	1	11	6.7	6.0	0.48
Red-breasted Nuthatch	14		5	3.2	1.9	0.38
Brown Creepe	18	2	5	3.5	3.2	0.48
House Wren	5		4	1.6	0.6	0.29
Golden-crowned Kinglet	6		1	1.0	1.0	0.50
Ruby-crowned Kinglet	5	1	1	1.6	0.3	0.17
Hermit Thrush	2			0.6	0.0	0.00
American Robin	68	3	18	17.7	6.7	0.27
Orange-crowned Warbler	56	3	12	6.3	12.7	0.67
Nashville Warbler	10		3	2.9	0.3	0.10
Yellow-rumped Warbler	112		6	17.7	19.0	0.52
MacGillivray's Warbler	42	3	40	13.0	1.6	0.11
Wilson's Warbler	4		4	1.0	0.3	0.25
Western Tanager	6			1.9	0.0	0.00
Chipping Sparro	1			0.3	0.0	0.00
Brewer's Sparrow	2	1		0.3	0.3	0.50
Savannah Sparro	1			0.3	0.0	0.00
Song Sparro	1			0.3	0.0	0.00
Lincoln's Sparro	30	1	29	7.6	3.8	0.33
White-crowned Sparro	44	1	17	10.8	3.5	0.24
Dark-eyed Junco	139	13	54	28.2	22.8	0.45
Cassin's Finch	4			0.6	0.6	0.50

Pine Siskin	2	0.6	0.0	0.00

Table 44.(cont.) Summary of results for all six Fremont National Forest MAPS stations combined in 2001.

Species	Birds captured			Birds/600net-hours		
	Newly banded	Un-banded	Recap-tured	Adults	Young	Prop. Young
Lesser Goldfinch	1			0.3	0.0	0.00
Evening Grosbeak	2			0.6	0.0	0.00
ALL SPECIES POOLED	746	80	295	178.0	91.2	0.34
TOTAL NUMBER OF CAPTURES		1121				
NUMBER OF SPECIES	39	15	25	39	22	
TOTAL NUMBER OF SPECIES		43			39	

Table 45. Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Fremont National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Sycan River			Deadhorse			Cold Creek			Augur Creek			Swamp Creek			Island			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Belted Kingfisher																					
Williamson's Sapsucker	0.0	0.9	1.00	0.1	0.1	0.50	1.4	0.0	0.00	1.8	0.2	0.13	0.4	0.1	0.17	0.4	0.7	0.50	0.7	0.3	0.32
Red-naped Sapsucke	0.4	0.3	0.30	4.5	1.3	0.21	0.4	0.8	0.63	0.6	0.5	0.42	0.2	0.2	0.33	0.0	0.1	1.00	1.0	0.5	0.29
Hybrid Sapsucke	1.9	0.8	0.16	3.0	1.6	0.12	1.7	1.2	0.33	0.8	0.6	0.17	0.4	0.0	0.00	1.5	0.4	0.26	1.5	0.8	0.18
Red-breasted Sapsucke	3.7	1.2	0.16	6.1	3.4	0.24	1.5	0.5	0.30	2.4	0.3	0.07	3.3	0.4	0.09	3.3	0.9	0.17	3.4	1.1	0.21
Downy Woodpecke	0.1	0.0	0.00	1.1	0.1	0.07	0.0	0.1	1.00	1.0	0.0	0.00				0.3	0.0	0.00	0.4	0.0	0.07
Hairy Woodpecke	0.8	0.6	0.33	0.9	0.3	0.25	0.8	0.7	0.48	1.2	0.3	0.14	1.4	0.9	0.38	1.1	0.4	0.39	1.0	0.5	0.28
White-headed Woodpecke													0.2	0.0	0.00						
Black-backed Woodpecke	0.1	0.0	0.00				0.3	0.0	0.00										0.1	0.0	0.00
Northern Flicke	0.5	0.0	0.00	0.8	0.0	0.00	0.5	0.2	0.33	1.0	0.0	0.00	0.1	0.1	0.50	1.5	0.3	0.25	0.7	0.1	0.17
Western Wood-Pewee	0.2	0.0	0.00	5.3	0.0	0.00	0.5	0.0	0.00	1.0	0.2	0.13				2.0	0.3	0.10	1.5	0.1	0.05
Hammond's Flycatcher	4.1	0.4	0.13	1.7	0.1	0.33	0.1	0.2	0.50	4.2	0.3	0.06	0.0	0.2	1.00	6.7	0.7	0.11	2.8	0.3	0.11
Gray Flycatcher	1.6	0.0	0.00	0.5	0.2	0.33				0.4	0.0	0.00				0.2	0.0	0.00	0.4	0.0	0.14
Dusky Flycatcher	23.2	1.2	0.04	22.9	1.1	0.04	2.3	0.0	0.00	1.1	0.2	0.14	0.3	0.0	0.00	2.2	0.5	0.19	8.6	0.5	0.05
"Western" Flycatche	1.3	0.1	0.11	2.5	0.8	0.21	0.9	0.1	0.10	1.6	0.6	0.18	15.2	1.2	0.05	1.4	0.0	0.00	3.8	0.5	0.11
Cassin's Vireo	0.0	0.3	1.00	0.7	0.5	0.42	0.0	0.1	1.00	0.4	0.4	0.42	0.3	0.0	0.00	0.1	0.0	0.00	0.3	0.2	0.48
Warbling Vireo	7.9	0.3	0.06	18.3	1.9	0.09	2.2	0.0	0.00	13.5	0.8	0.04	1.2	0.0	0.00	4.4	0.1	0.02	8.0	0.5	0.05
Gray Jay	0.3	0.0	0.00	0.8	0.3	0.29	2.5	1.3	0.32	0.3	0.4	0.50	0.2	0.2	0.33				0.7	0.4	0.30
Steller's Ja	0.0	0.2	1.00	0.5	0.1	0.25							0.2	0.2	0.50	0.5	0.5	0.39	0.2	0.2	0.32
Clark's Nutcracker																0.1	0.0	0.00			
Tree Swallo	0.2	0.0	0.00													0.1	0.0	0.00	0.1	0.0	0.00
Mountain Chickadee	4.3	5.2	0.44	4.5	2.1	0.26	8.1	5.9	0.41	10.1	11.1	0.45	2.6	1.9	0.47	5.1	5.7	0.37	5.8	5.3	0.43
Red-breasted Nuthatch	0.5	1.1	0.71	1.5	1.1	0.32	2.2	1.8	0.28	4.6	0.9	0.13	1.0	0.7	0.45	3.0	0.7	0.18	2.2	1.0	0.27
White-breasted Nuthatch				0.1	0.0	0.00				0.3	0.0	0.00	0.1	0.0	0.00	0.5	0.1	0.25	0.2	0.0	0.10
Pygmy Nuthatch										1.1	0.5	0.40							0.2	0.1	0.40
Brown Creepe	2.5	2.0	0.30	1.4	1.1	0.31	2.0	2.3	0.47	3.5	1.4	0.23	1.9	1.7	0.41	4.3	2.7	0.22	2.6	1.8	0.37
House Wren	1.1	2.1	0.75	5.8	4.9	0.34	0.0	0.7	1.00	5.4	1.5	0.18				0.2	0.2	0.50	2.1	1.5	0.36
American Dipper				0.1	0.0	0.00															
Golden-crowned Kinglet	0.2	0.1	0.33	0.1	0.0	0.00	0.4	1.0	0.50	2.3	0.4	0.14	0.0	0.2	1.00	0.5	0.0	0.00	0.6	0.3	0.22
Ruby-crowned Kinglet	6.6	0.9	0.12	0.3	0.0	0.00				0.0	0.1	1.00							1.1	0.2	0.12
Mountain Bluebird										0.5	0.1	0.25				0.1	0.1	0.50	0.1	0.0	0.17

Table 45. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Fremont National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Sycan River			Deadhorse			Cold Creek			Augur Creek			Swamp Creek			Island			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Townsend's Solitaire	0.4	0.2	0.17	0.2	0.5	0.58	0.4	0.0	0.00	0.3	0.0	0.00	1.1	0.4	0.26	1.0	0.0	0.00	0.6	0.2	0.17
Swainson's Thrush																0.2	0.0	0.00			
Hermit Thrush	1.8	0.0	0.00	2.1	0.9	0.15	2.1	0.1	0.05	2.5	1.2	0.31	0.0	0.2	1.00	1.4	0.2	0.10	1.7	0.4	0.15
American Robin	13.6	1.8	0.09	12.1	3.4	0.19	3.1	1.0	0.26	11.5	1.6	0.12	7.0	1.4	0.11	12.3	3.0	0.18	9.9	2.0	0.15
European Starling										0.1	0.0	0.00				0.1	0.0	0.00			
Cedar Waxwing																0.1	0.0	0.00			
Orange-crowned Warbler	14.2	24.8	0.55	13.9	26.6	0.57	0.2	1.4	0.90	1.7	3.7	0.67	0.0	0.2	1.00	0.4	0.3	0.38	5.1	9.5	0.58
Nashville Warble	2.1	1.0	0.26	4.1	0.3	0.06	0.0	0.1	1.00	3.4	0.4	0.26	0.1	0.0	0.00	0.3	0.2	0.33	1.7	0.3	0.17
Yellow Warble	0.1	0.0	0.00	0.0	0.1	1.00				0.3	0.0	0.00				0.1	0.0	0.00	0.1	0.0	0.25
Yellow-rumped Warble	19.0	27.4	0.47	12.7	18.4	0.41	5.9	16.2	0.59	8.7	2.1	0.12	7.6	1.5	0.17	13.5	4.4	0.22	11.2	11.7	0.45
Townsend's Warbler				0.0	0.2	1.00													0.0	0.0	1.00
MacGillivray's Warble	7.5	2.4	0.20	14.8	2.1	0.13	0.2	0.2	0.50	5.3	1.2	0.12	4.6	0.4	0.06	0.7	0.0	0.00	5.6	1.1	0.15
Wilson's Warbler	3.0	1.0	0.26	1.1	0.4	0.26	0.1	0.0	0.00	0.5	0.3	0.30				0.4	0.2	0.33	0.8	0.3	0.27
Western Tanage	0.7	0.0	0.00	1.8	0.0	0.00	0.5	0.0	0.00	1.2	0.2	0.08	0.4	0.1	0.25	0.6	0.0	0.00	0.9	0.0	0.03
Green-tailed Towhee	0.1	0.2	0.50	0.0	0.3	1.00	0.0	0.1	1.00										0.0	0.1	0.50
Spotted Towhee				0.0	0.1	1.00													0.0	0.0	1.00
Chipping Sparrow	0.2	0.3	0.50	0.6	1.5	0.54	0.3	0.1	0.17	0.6	0.1	0.25	0.0	0.3	1.00	0.4	0.1	0.17	0.4	0.4	0.35
Brewer's Sparrow	2.3	1.2	0.21	0.6	0.5	0.54	0.2	0.2	0.50	0.0	0.2	1.00				0.8	0.1	0.50	0.6	0.4	0.48
Vesper Sparrow				0.0	0.2	1.00										0.1	0.0	0.00	0.0	0.0	0.67
Savannah Sparrow							0.2	0.0	0.00												
Fox Sparrow	0.0	0.1	1.00																0.0	0.0	1.00
Song Sparrow	0.0	0.2	1.00	0.1	0.1	0.50										0.4	0.0	0.00	0.1	0.1	0.25
Lincoln's Sparrow	17.9	9.9	0.33	5.7	3.5	0.36	7.7	5.1	0.37	0.9	0.3	0.25				0.0	0.6	1.00	5.3	3.2	0.36
White-crowned Sparro	17.9	11.5	0.34	6.2	3.3	0.29	2.4	1.6	0.34	3.3	0.9	0.12	0.1	0.0	0.00	0.1	0.0	0.00	5.0	2.9	0.33
Dark-eyed Junco	23.8	15.9	0.38	18.5	16.4	0.42	23.2	14.2	0.35	21.3	25.0	0.43	24.4	6.4	0.19	26.4	10.9	0.29	22.9	15.0	0.38
Black-headed Grosbeak				0.1	0.0	0.00															
Lazuli Bunting				1.5	0.0	0.00	0.2	0.0	0.00	0.3	0.0	0.00				0.1	0.0	0.00	0.3	0.0	0.00
Red-winged Blackbird	0.2	0.0	0.00																		
Brewer's Blackbird	0.3	0.0	0.00													0.6	0.1	0.13	0.2	0.0	0.10
Brown-headed Cowbird	0.2	0.6	0.63				0.1	0.0	0.00							0.8	0.0	0.00	0.2	0.1	0.25
Purple Finch	0.2	0.2	0.50	0.1	0.3	0.67				0.1	0.0	0.00							0.1	0.1	0.53

Table 45. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on Fremont National Forest averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Sycan River			Deadhorse			Cold Creek			Augur Creek			Swamp Creek			Island			All stations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Cassin's Finch	3.1	1.0	0.17	2.5	0.1	0.04	0.1	0.2	0.50	2.7	0.2	0.11				0.6	0.4	0.40	1.5	0.3	0.17
Red Crossbill	0.3	0.0	0.00	0.1	0.1	0.50	0.0	0.2	1.00										0.1	0.1	0.50
Pine Siskin	7.8	0.8	0.09	2.7	1.9	0.21	1.4	0.2	0.20	2.3	0.1	0.03				3.0	0.5	0.20	2.9	0.6	0.16
Lesser Goldfinch	0.1	0.0	0.00							0.2	0.0	0.00									
Evening Grosbeak				0.7	0.0	0.00	0.2	0.1	0.33	1.2	0.0	0.00				0.1	0.0	0.00	0.4	0.0	0.02
ALL SPECIES POOLED	198.8	118.2	0.34	185.8	102.3	0.31	76.2	57.8	0.38	127.3	58.2	0.28	74.2	18.8	0.20	104.1	35.7	0.25	127.8	65.2	0.32
NUMBER OF SPECIES	45	36		46	41		36	31		44	35		25	22		48	30		51	41	
TOTAL NUMBER OF SPECIES	50			51			42			46			30			50			52		

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

Table 46. Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Fremont National Forest. $QAIC_C$[1] and (GOF)[2] are presented for all models.

Species	Transient Models								$\Delta QAIC_C$
	$\varphi p \tau$[3]	$\varphi_t p \tau$[4]	$\varphi p_t \tau$[5]	$\varphi p \tau_t$[6]	$\varphi_t p_t \tau$[7]	$\varphi_t p \tau_t$[8]	$\varphi p_t \tau_t$[9]	$\varphi_t p_t \tau_t$[10]	
Red-breasted Sapsucker	74.7* (1.000)	81.5 (1.000)	85.9 (1.000)	86.6 (1.000)	92.8 (1.000)	96.5 (1.000)	102.5 (1.000)	107.4 (1.000)	6.8
Western Wood-Pewee	46.1* (1.000)	60.8 (1.000)	58.3 (1.000)	59.4 (1.000)	78.4 (1.000)	84.0 (1.000)	76.9 (1.000)	108.3 (1.000)	14.7
Hammond's Flycatcher	58.0* (1.000)	69.1 (1.000)	70.2 (1.000)	74.4 (1.000)	87.7 (1.000)	91.9 (1.000)	90.8 (1.000)	111.2 (1.000)	11.0
Dusky Flycatcher	155.3 (0.690)	156.7 (0.873)	151.3* (0.948)	163.8 (0.705)	161.9 (0.933)	165.6 (0.900)	161.4 (0.954)	175.7 (0.867)	1.4
"Western" Flycatcher	64.9* (1.000)	64.1* (1.000)	68.6 (1.000)	69.3 (1.000)	80.1 (1.000)	77.6 (1.000)	82.0 (1.000)	93.6 (1.000)	-0.9
Warbling Vireo	126.8* (1.000)	135.1 (1.000)	132.2 (1.000)	136.0 (1.000)	142.0 (1.000)	143.2 (1.000)	142.3 (1.000)	150.6 (1.000)	8.3
Mountain Chickadee	104.8 (0.991)	106.6 (0.999)	95.4* (1.000)	101.7 (1.000)	103.3 (1.000)	113.4 (1.000)	99.5 (1.000)	109.2 (1.000)	1.8
House Wren	50.0* (1.000)	57.8 (1.000)	58.7 (1.000)	57.3 (1.000)	73.3 (1.000)	71.9 (1.000)	72.1 (1.000)	88.3 (1.000)	7.9
Hermit Thrush	38.6* (1.000)	50.9 (1.000)	48.5 (1.000)	50.8 (1.000)	67.2 (1.000)	70.8 (1.000)	66.7 (1.000)	88.6 (1.000)	12.3

Table 46. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Fremont National Forest. $QAIC_C$[1] and $(GOF)^2$ are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
American Robin	151.8* (0.932)	163.2 (0.908)	160.1 (0.946)	160.9 (0.938)	171.8 (0.913)	171.1 (0.941)	169.3 (0.959)	181.0 (0.921)	11.4
Yellow-rumped Warbler	119.5* (0.997)	126.2 (0.999)	120.0* (1.000)	128.2 (0.998)	130.0 (1.000)	136.6 (0.999)	129.8 (1.000)	139.9 (1.000)	6.7
MacGillivray's Warbler	75.5* (1.000)	83.8 (1.000)	86.4 (1.000)	79.2 (1.000)	94.9 (1.000)	91.6 (1.000)	92.1 (1.000)	101.9 (1.000)	8.3
Lincoln's Sparro	100.4* (1.000)	112.9 (1.000)	112.4 (1.000)	112.8 (1.000)	122.6 (1.000)	127.2 (1.000)	125.4 (1.000)	139.5 (0.999)	12.5
White-crowned Sparro	88.3* (1.000)	94.1 (1.000)	95.3 (1.000)	91.5 (1.000)	103.6 (1.000)	100.7 (1.000)	100.5 (1.000)	110.9 (1.000)	5.8
Dark-eyed Junco	211.7* (0.855)	210.3* (0.977)	213.2 (0.958)	211.3* (0.972)	212.8 (0.996)	218.2 (0.986)	217.7 (0.988)	221.6 (0.997)	-1.4

[1] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample sizes and overdispersion of data.

[2] Goodness-of-fit is a measure of how well the actual distribution of data fits the theoretical distribution calculated using the estimates provided by the model. The larger the value provided by the GOF test the better the model describes the data.

[3] $\varphi p\tau$ Model: Transient model with temporally-constant survival probability, recapture probability, and proportion of residents (invariable from year to year).

[4] $\varphi_t p\tau$ Model: Transient model with temporally-variable survival probability; and temporally-constant recapture probability and proportion of residents.

[5] $\varphi p_t\tau$ Model: Transient model with temporally-variable recapture probability; and temporally-constant survival probability and proportion of residents.

[6] $\varphi p\tau_t$ Model: Transient model with temporally-variable proportion of residents; and temporally-constant survival and recapture probabilities.

Table 46. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from six MAPS stations at Fremont National Forest. $QAIC_C$[1] and $(GOF)^2$ are presented for all models.

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[7] $\varphi_t p_t \tau$ Model: Transient model with temporally-variable survival and recapture probabilities; and temporally-constant proportion of residents.
[8] $\varphi_t p \tau_t$ Model: Transient model with temporally-variable survival probability and proportion of residents; and temporally-constant recapture probability.
[9] $\varphi p_t \tau_t$ Model: Transient model with temporally-variable recapture probability and proportion of residents; and temporally-constant survival probability.
[10] $\varphi_t p_t \tau_t$ Model: Transient model with temporally-variable survival probability, recapture probability, and proportion of residents.
[11] $\Delta QAIC_C$ is defined as the difference in $QAIC_C$ between th $\varphi p \tau$ model and th $\varphi_t p \tau$ model.

* The chosen models are the model with the lowest $QAIC_C$ and the models with $QAIC_C$s within 2.0 units of the model with the lowest $QAIC_C$.

Table 47. Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 15 species breeding at MAPS stations on Fremont National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Red-breasted Sapsucker	6	116	205	22	$\varphi p \tau$	74.7	0.462 (0.093)	20.2	0.296 (0.108)	1.000 (0.403)
Western Wood-Pewee	4	54	71	8	$\varphi p \tau$	46.1	0.501 (0.159)	31.7	0.185 (0.141)	1.000 (0.792)
Hammond's Flycatcher	3	88	136	15	$\varphi p \tau$	58.0	0.464 (0.116)	24.9	0.237 (0.116)	1.000 (0.516)
Dusky Flycatcher	4	294	514	78	$\varphi p \tau$*	155.3	0.548 (0.045)	8.2	0.514 (0.064)	0.390 (0.079)
					$\varphi p_t \tau$	151.3	0.554 (0.048)	8.7	a0.767 (0.135)	0.425 (0.086)
									b0.630 (0.151)	
									c0.581 (0.137)	
									d0.694 (0.166)	
									e0.359 (0.121)	
									f0.129 (0.071)	
									g0.248 (0.107)	
									h0.515 (0.164)	
									i0.591 (0.198)	
"Western" Flycatcher	6	141	188	18	$\varphi p \tau$	64.9	0.434 (0.102)	23.6	0.492 (0.157)	0.337 (0.144)
					$\varphi_t p \tau$	64.1	a0.000 (0.666)	--.-	0.542 (0.159)	0.375 (0.154)
							b0.000 (1.639)	--.-		
							c0.000 (0.961)	--.-		
							d0.000 (0.000)	--.-		
							e0.537 (0.287)	53.4		
							f0.709 (0.259)	36.5		
							g0.693 (0.286)	41.3		
							h0.318 (0.181)	56.9		
							i0.477 (0.254)	53.2		
Warbling Vireo	6	280	463	68	$\varphi p \tau$	126.8	0.519 (0.051)	9.8	0.476 (0.071)	0.473 (0.101)

Table 47. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 15 species breeding at MAPS stations on Fremont National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Mountain Chickadee	6	228	297	33	$\varphi p\tau$*	104.8	0.501 (0.071)	14.2	0.412 (0.099)	0.360 (0.113)
					$\varphi p_t\tau$	95.4	0.493 (0.076)	15.4	a1.000 (0.465)	0.322 (0.094)
									b0.978 (0.117)	
									c0.153 (0.120)	
									d1.000 (0.000)	
									e0.397 (0.172)	
									f0.103 (0.106)	
									g0.362 (0.232)	
									h0.100 (0.110)	
									i0.661 (0.342)	
House Wren	3	92	117	10	$\varphi p\tau$	50.0	0.320 (0.123)	38.4	0.462 (0.233)	0.490 (0.313)
Hermit Thrush	5	73	89	5	$\varphi p\tau$	38.6	0.592 (0.183)	31.0	0.057 (0.064)	0.914 (0.984)
American Robin	6	373	497	59	$\varphi p\tau$	151.8	0.681 (0.051)	7.4	0.194 (0.042)	0.479 (0.115)
Yellow-rumped Warbler	6	433	518	44	$\varphi p\tau$	119.5	0.556 (0.064)	11.6	0.192 (0.056)	0.515 (0.160)
					$\varphi p_t\tau$	120.0	0.571 (0.073)	12.8	a0.289 (0.171)	0.503 (0.153)
									b0.000 (0.380)	
									c0.169 (0.089)	
									d0.433 (0.148)	
									e0.206 (0.088)	
									f0.204 (0.088)	
									g0.130 (0.073)	
									h0.138 (0.081)	
									i0.139 (0.082)	
MacGillivray's Warbler	4	203	371	26	$\varphi p\tau$	75.5	0.291 (0.073)	25.1	0.461 (0.149)	0.815 (0.300)
Lincoln's Sparro	3	181	390	46	$\varphi p\tau$	100.4	0.439 (0.056)	12.8	0.551 (0.095)	0.548 (0.147)

Table 47. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 15 species breeding at MAPS stations on Fremont National Forest obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
White-crowned Sparro	3	163	293	32	$\varphi p\tau$	88.3	0.385 (0.067)	17.5	0.527 (0.121)	0.638 (0.204)
Dark-eyed Junco	6	734	1333	229	$\varphi p\tau$	211.7	0.539 (0.028)	5.2	0.481 (0.038)	0.601 (0.068)
					$\varphi_t p\tau$	210.3	a0.430 (0.028)	6.5	0.500 (0.039)	0.605 (0.068)
							b0.650 (0.108)	16.6		
							c0.371 (0.074)	19.9		
							d0.612 (0.097)	15.8		
							e0.593 (0.083)	14.0		
							f0.513 (0.073)	14.2		
							g0.717 (0.097)	13.5		
							h0.522 (0.080)	15.3		
							i0.321 (0.072)	22.4		
					$\varphi p\tau_t$	211.3	0.533 (0.028)	5.3	0.490 (0.039)	a0.494 (0.125)
										b0.805 (0.197)
										c0.368 (0.132)
										d0.696 (0.189)
										e0.620 (0.164)
										f0.914 (0.199)
										g0.748 (0.174)
										h0.593 (0.149)
										i0.144 (0.101)

[1] Number of stations where the species was a regular or usual breeder at which adults of the species were captured.
[2] Number of adult individuals captured at stations where the species was a regular or usual breeder (i.e., number of capture histories).
[3] Total number of captures of adult birds of the species at stations where the species was a regular or usual breeder.
[4] Total number of returns. A return is the first recapture in a given year of a bird originally banded at the same station in a previous year.
[5] Models included are those chosen by $QAIC_C$ (those models marked with * in Table 46) plus th $\varphi p\tau$ model in all cases. See Table 46 for definitions of the models.
[6] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample size and overdispersion of data.

Table 47. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 15 species breeding at MAPS stations on Fremont National Forest obtained from ten years (1992-2001) of mark-recapture data.

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

a The survival probability between the years 1992-1993 in a temporally variable model.
b The survival probability between the years 1993-1994 in a temporally variable model.
c The survival probability between the years 1994-1995 in a temporally variable model.
d The survival probability between the years 1995-1996 in a temporally variable model.
e The survival probability between the years 1996-1997 in a temporally variable model.
f The survival probability between the years 1997-1998 in a temporally variable model.
g The survival probability between the years 1998-1999 in a temporally variable model.
h The survival probability between the years 1999-2000 in a temporally variable model.
i The survival probability between the years 2000-2001 in a temporally variable model.

[8] The coefficient of variation for survival probability.

[9] Recapture probability presented as the maximum likelihood estimate (standard error of the estimate).

a The recapture probability in 1993 in a temporally variable model.
b The recapture probability in 1994 in a temporally variable model.
c The recapture probability in 1995 in a temporally variable model.
d The recapture probability in 1996 in a temporally variable model.
e The recapture probability in 1997 in a temporally variable model.
f The recapture probability in 1998 in a temporally variable model.
g The recapture probability in 1999 in a temporally variable model.
h The recapture probability in 2000 in a temporally variable model.
i The recapture probability in 2001 in a temporally variable model.

[10] The proportion of residents among newly captured adults presented as the maximum likelihood estimate (standard error of the estimate).

a The proportion of residents in the adult population in 1992 in a temporally variable model.
b The proportion of residents in the adult population in 1993 in a temporally variable model.
c The proportion of residents in the adult population in 1994 in a temporally variable model.
d The proportion of residents in the adult population in 1995 in a temporally variable model.
e The proportion of residents in the adult population in 1996 in a temporally variable model.
f The proportion of residents in the adult population in 1997 in a temporally variable model.
g The proportion of residents in the adult population in 1998 in a temporally variable model.
h The proportion of residents in the adult population in 1999 in a temporally variable model.
i The proportion of residents in the adult population in 2000 in a temporally variable model.

* Time-constant model that was not marked by $QAIC_C$, but that are shown only for comparison to other species.

Table 48. Relative values of vital rates (lower-than-expected, as-expected, higher-than-expected) for selected study species at Fremont National Forest in relation to the direction and significance of their adult population trends over the ten years 1992-2001.

Species	Significance of the trend[1]	Productivity	Survival Probability[2]
A. Declining Species			
House Wren	*	higher	lower?
Hermit Thrush	***	lower	expected
B. Increasing Species			
Hammond's Flycatcher	***	lower	expected
Red-breasted Nuthatch	***	expected	
Brown Creeper	***	higher	
Yellow-rumped Warbler	***	higher	expected
White-crowned Sparrow	***	higher	lower
Dark-eyed Junco	**	higher	expected

[1] Direction and significance of the trends in adult population size as based on data from all six stations (Fig. 15); *** $P < 0.01$, ** $0.01 \leq P < 0.05$, * $0.05 \leq P < 0.10$.

[2] A question mark (?) indicates inferences based on survival estimates for which CV of the estimate > 30% and are thus less reliable, or that survival could not be estimated due to low recapture rates.

Table 49. Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS locations operated in Forest Service Region 6 averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Mount Baker			Wenatchee			Umatilla			Willamette			Siuslaw			Fremont			All locations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Sharp-shinned Hawk							0.0	0.0	0.75	0.1	0.0	0.00							0.0	0.0	0.17
Spotted Sandpiper																					
Common Snipe										0.0	0.0	0.50							0.0	0.0	0.50
Northern Pygmy-Owl													0.1	0.0	0.20				0.0	0.0	0.20
Belted Kingfisher																					
Williamson's Sapsucker				0.3	0.3	0.56	0.2	0.0	0.07							0.7	0.3	0.32	0.2	0.1	0.37
Red-naped Sapsucke				1.1	0.6	0.34	1.9	0.5	0.19	0.1	0.0	0.13				1.0	0.5	0.29	0.7	0.3	0.27
Hybrid Sapsucke				0.3	0.0	0.00										1.5	0.8	0.18	0.3	0.1	0.16
Red-breasted Sapsucke	1.2	0.5	0.29	0.2	0.0	0.00				1.1	0.4	0.24	0.1	0.0	0.00	3.4	1.1	0.21	1.0	0.3	0.23
Downy Woodpecke	0.1	0.1	0.27	0.3	0.1	0.17	0.2	0.0	0.00	0.1	0.2	0.68	0.1	0.0	0.00	0.4	0.0	0.07	0.2	0.1	0.16
Hairy Woodpecke	0.8	0.9	0.54	0.7	0.2	0.22	0.2	0.1	0.29	0.3	0.3	0.47	0.6	0.2	0.20	1.0	0.5	0.28	0.6	0.4	0.36
White-headed Woodpecke				0.1	0.0	0.25													0.0	0.0	0.17
Three-toed Woodpecke				0.1	0.0	0.00	0.1	0.0	0.00												
Black-backed Woodpecke																0.1	0.0	0.00			
Northern Flicke	0.0	0.0	0.50	0.3	0.0	0.13	0.1	0.1	0.33	0.1	0.0	0.30				0.7	0.1	0.17	0.2	0.1	0.20
Pileated Woodpecke																					
Olive-sided Flycatcher				0.4	0.0	0.00	0.1	0.0	0.33										0.1	0.0	0.04
Western Wood-Pewee	0.1	0.0	0.00	3.4	0.2	0.05										1.5	0.1	0.05	0.8	0.0	0.05
"Traill's" Flycatche	1.0	0.0	0.00				1.1	0.0	0.01	3.3	0.2	0.04	0.3	0.0	0.00				1.0	0.0	0.03
Hammond's Flycatcher	2.8	0.6	0.15	4.6	0.9	0.20	2.6	0.8	0.23	3.1	0.7	0.16	0.8	0.0	0.00	2.8	0.3	0.11	2.7	0.5	0.16
Gray Flycatcher							0.2	0.0	0.04							0.4	0.0	0.14	0.1	0.0	0.14
Dusky Flycatcher	0.1	0.0	0.08	2.8	0.3	0.09	3.5	0.6	0.11	2.5	0.1	0.04				8.6	0.5	0.05	2.9	0.3	0.07
"Western" Flycatche	2.9	0.7	0.17	0.5	0.2	0.27	0.5	0.0	0.04	1.7	0.4	0.16	9.2	0.9	0.08	3.8	0.5	0.11	3.2	0.5	0.12
Cassin's Vireo				0.2	0.2	0.46	0.6	0.6	0.35	0.2	0.0	0.00				0.3	0.2	0.48	0.2	0.2	0.37
Hutton's Vireo										0.3	0.2	0.33	0.3	0.0	0.07				0.1	0.0	0.18
Warbling Vireo	1.7	0.2	0.12	4.9	0.3	0.05	4.8	0.7	0.09	2.6	0.0	0.01	0.4	0.0	0.00	8.0	0.5	0.05	3.6	0.3	0.06
Red-eyed Vireo																					
Gray Jay	0.0	0.0	1.00	0.2	0.3	0.54	0.2	0.1	0.35	0.2	0.0	0.25	0.2	0.2	0.37	0.7	0.4	0.30	0.3	0.2	0.34
Steller's Ja	0.5	0.1	0.19	0.1	0.0	0.00	0.1	0.0	0.22	0.4	0.1	0.07	0.3	0.1	0.20	0.2	0.2	0.32	0.3	0.1	0.20
Clark's Nutcracker																					
Tree Swallo				0.1	0.0	0.00										0.1	0.0	0.00			

Table 49. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS locations operated in Forest Service Region 6 averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Mount Baker			Wenatchee			Umatilla			Willamette			Siuslaw			Fremont			All locations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Violet-green Swallo				0.2	0.0	0.05													0.0	0.0	0.05
Northern Rough-winged				0.4	0.0	0.00													0.1	0.0	0.00
Black-capped Chickadee	0.0	0.1	0.67	0.1	0.0	0.33	0.1	0.4	0.79				0.1	0.0	0.00				0.1	0.1	0.48
Mountain Chickadee				1.4	1.5	0.47	2.4	1.9	0.45							5.8	5.3	0.43	1.5	1.5	0.45
Chestnut-backed Chick.	2.6	1.7	0.37	2.1	1.7	0.41	0.8	1.0	0.49	3.3	2.7	0.43	3.5	0.8	0.17				2.1	1.3	0.37
Bushtit																					
Red-breasted Nuthatch	0.0	0.0	0.50	1.3	1.4	0.46	1.9	1.6	0.44	0.5	0.5	0.50	0.1	0.0	0.33	2.2	1.0	0.27	0.9	0.8	0.40
White-breasted Nuthatch																0.2	0.0	0.10	0.0	0.0	0.10
Pygmy Nuthatch																0.2	0.1	0.40	0.0	0.0	0.33
Brown Creepe	0.3	0.5	0.56	0.4	0.3	0.57	1.4	1.2	0.46	0.5	0.6	0.45	0.4	0.3	0.38	2.6	1.8	0.37	0.9	0.8	0.42
Rock Wren																					
Bewick's Wren													0.0	0.0	1.00				0.0	0.0	1.00
House Wren				0.7	0.7	0.55	0.1	0.2	0.68	0.0	0.0	0.75	0.0	0.0	0.50	2.1	1.5	0.36	0.5	0.4	0.44
Winter Wren	5.6	2.7	0.30	0.2	0.2	0.53	1.0	0.5	0.46	1.4	0.7	0.39	10.0	4.1	0.28				3.1	1.4	0.30
Marsh Wren										0.0	0.0	1.00							0.0	0.0	1.00
American Dipper	0.0	0.1	1.00																0.0	0.0	0.67
Golden-crowned Kinglet	0.5	0.1	0.20	2.0	3.7	0.56	6.8	26.4	0.77	1.3	1.6	0.49	0.1	0.1	0.42	0.6	0.3	0.22	1.9	5.2	0.71
Ruby-crowned Kinglet				0.2	0.0	0.17	7.1	3.4	0.27							1.1	0.2	0.12	1.4	0.6	0.26
Western Bluebird																					
Mountain Bluebird							0.0	0.0	1.00							0.1	0.0	0.17	0.0	0.0	0.33
Townsend's Solitaire				0.2	0.1	0.39	0.1	0.1	0.40	0.0	0.0	0.50				0.6	0.2	0.17	0.1	0.1	0.31
Veery																					
Swainson's Thrush	28.7	3.0	0.10	2.0	0.2	0.09	11.2	1.0	0.08	16.5	1.8	0.09	43.4	4.0	0.08				17.5	1.7	0.09
Hermit Thrush	0.0	0.0	0.50	1.8	0.6	0.22	1.5	1.0	0.32	0.8	0.1	0.11	0.1	0.1	0.31	1.7	0.4	0.15	1.0	0.4	0.26
American Robin	8.8	1.5	0.15	5.0	0.6	0.10	1.9	0.4	0.16	2.0	0.4	0.14	1.1	0.0	0.03	9.9	2.0	0.15	4.6	0.8	0.14
Varied Thrush	4.0	2.4	0.37	0.5	0.2	0.37	0.3	0.0	0.19	0.4	0.0	0.00	0.8	0.1	0.09				1.0	0.4	0.30
Wrentit													0.8	0.5	0.35				0.1	0.1	0.35
European Starling																					
Cedar Waxwing	3.4	0.0	0.00	0.7	0.0	0.00				0.1	0.0	0.00							0.7	0.0	0.00
Orange-crowned Warbler	0.1	0.2	0.62	0.5	2.8	0.79	3.7	4.7	0.47	3.6	9.8	0.67	0.3	0.0	0.20	5.1	9.5	0.58	2.2	4.6	0.63
Nashville Warble				1.6	3.2	0.65	0.2	0.5	0.64	0.9	0.7	0.45				1.7	0.3	0.17	0.7	0.8	0.51

Table 49. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS locations operated in Forest Service Region 6 averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Mount Baker			Wenatchee			Umatilla			Willamette			Siuslaw			Fremont			All locations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Yellow Warble	1.8	0.6	0.23	3.4	0.9	0.16	0.0	0.1	1.00	1.0	0.3	0.15				0.1	0.0	0.25	1.0	0.3	0.22
Yellow-rumped Warble	0.1	0.0	0.00	4.8	3.0	0.37	6.8	2.5	0.24	1.3	0.1	0.06				11.2	11.7	0.45	3.9	2.8	0.39
Black-throated Gray W.	0.7	0.1	0.14							0.4	0.0	0.19	0.5	0.0	0.05				0.3	0.0	0.10
Townsend's Warbler				3.7	6.4	0.58	12.1	7.8	0.35	0.1	0.2	0.45				0.0	0.0	1.00	2.5	2.3	0.44
Townsend's x Hermit W.																			0.0	0.0	0.00
Hermit Warble										4.9	1.8	0.25	1.2	0.3	0.07				1.1	0.4	0.23
MacGillivray's Warble	4.7	1.6	0.22	16.9	7.2	0.29	13.8	9.0	0.37	9.5	4.1	0.29	0.6	0.2	0.28	5.6	1.1	0.15	8.3	3.8	0.30
Common Yellowthroat	2.7	1.1	0.24	0.1	0.0	0.00				5.9	3.9	0.40	0.1	0.0	0.44				1.5	0.9	0.37
Wilson's Warbler	2.2	0.9	0.32	1.3	0.2	0.13	6.9	1.8	0.19	2.8	0.9	0.25	17.3	4.4	0.20	0.8	0.3	0.27	5.5	1.5	0.21
Yellow-breasted Chat																					
Western Tanage	0.4	0.0	0.00	2.2	0.5	0.15	3.9	0.5	0.09	1.0	0.0	0.02	0.2	0.0	0.00	0.9	0.0	0.03	1.4	0.2	0.10
Green-tailed Towhee							0.0	0.0	1.00							0.0	0.1	0.50	0.0	0.0	0.67
Spotted Towhee	0.3	0.1	0.31	0.2	0.1	0.28	0.2	0.1	0.33	0.2	0.1	0.25	0.0	0.0	0.50	0.0	0.0	1.00	0.1	0.1	0.37
Chipping Sparrow				3.0	0.7	0.16	4.5	1.0	0.10	0.1	0.0	0.17				0.4	0.4	0.35	1.3	0.3	0.17
Brewer's Sparrow																0.6	0.4	0.48	0.1	0.1	0.48
Vesper Sparrow																0.0	0.0	0.67	0.0	0.0	0.33
Savannah Sparrow																					
Fox Sparrow				0.1	0.0	0.00	1.7	0.8	0.26	0.9	0.1	0.12				0.0	0.0	1.00	0.5	0.1	0.23
Song Sparrow	5.3	4.3	0.43	5.4	4.3	0.43	0.5	0.6	0.42	5.9	4.6	0.45	2.9	1.4	0.31	0.1	0.1	0.25	3.4	2.5	0.43
Lincoln's Sparrow				11.0	4.7	0.29	7.4	2.3	0.23	3.4	1.4	0.28				5.3	3.2	0.36	4.4	1.9	0.30
White-crowned Sparro				0.4	0.2	0.21				0.0	0.0	0.33				5.0	2.9	0.33	0.9	0.5	0.32
Dark-eyed Junco	2.9	0.9	0.22	12.2	8.0	0.38	9.4	11.3	0.52	9.5	8.0	0.43	0.5	0.1	0.08	22.9	15.0	0.38	9.3	7.1	0.42
Black-headed Grosbeak	0.5	0.1	0.12	1.0	0.2	0.20	0.7	0.1	0.06	0.4	0.0	0.00	0.9	0.0	0.09				0.6	0.1	0.10
Lazuli Bunting				1.0	0.1	0.06	0.1	0.1	0.58	0.2	0.0	0.00				0.3	0.0	0.00	0.3	0.0	0.09
Red-winged Blackbird																					
Brewer's Blackbird																0.2	0.0	0.10	0.0	0.0	0.10
Brown-headed Cowbird				0.3	0.1	0.18	0.1	0.0	0.13							0.2	0.1	0.25	0.1	0.0	0.25
Pine Grosbeak																					
Purple Finch				0.4	0.4	0.43				1.3	0.3	0.17	0.1	0.0	0.00	0.1	0.1	0.53	0.3	0.1	0.25
Cassin's Finch				1.9	0.3	0.11	0.5	0.1	0.07	0.2	0.0	0.06				1.5	0.3	0.17	0.6	0.1	0.15
House Finch				0.0	0.1	1.00													0.0	0.0	0.50

Table 49. (cont.) Mean numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS locations operated in Forest Service Region 6 averaged over the ten years, 1992-2001. Data are included only from stations that lie within the breeding range of the target species.

	Mount Baker			Wenatchee			Umatilla			Willamette			Siuslaw			Fremont			All locations pooled		
Species	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.	Ad.	Yg.	Prop.[1] Yg.
Red Crossbill							0.1	0.0	0.33							0.1	0.1	0.50	0.0	0.0	0.36
Pine Siskin	0.1	0.0	0.17	11.5	3.8	0.22	3.5	0.3	0.05	2.8	0.4	0.10				2.9	0.6	0.16	3.4	0.8	0.16
Lesser Goldfinch																					
American Goldfinch																					
Evening Grosbeak	0.1	0.0	0.00	2.0	0.1	0.04	0.5	0.1	0.25	1.9	0.0	0.00				0.4	0.0	0.02	0.8	0.0	0.09
ALL SPECIES POOLED	87.3	25.1	0.22	124.9	62.4	0.32	129.7	86.5	0.38	101.4	47.9	0.32	97.6	17.8	0.15	127.8	65.2	0.32	110.9	50.2	0.30
NUMBER OF SPECIES	32	26		59	45		50	40		48	33		33	17		51	41		62	51	
TOTAL NUMBER OF SPECIES	34			60			51			48			33			52			62		

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

Table 50. Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from thirty-six MAPS stations in Forest Service Region 6. $QAIC_C$[1] and $(GOF)^2$ are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Red-naped Sapsucker	80.0* (1.000)	93.2 (1.000)	94.1 (1.000)	88.9 (1.000)	102.2 (1.000)	105.9 (1.000)	104.1 (1.000)	115.0 (1.000)	13.2
Hybrid Sapsucker	71.3* (0.999)	80.3 (1.000)	77.0 (1.000)	74.8 (1.000)	90.4 (1.000)	95.0 (1.000)	89.1 (1.000)	113.1 (1.000)	8.9
Red-breasted Sapsucker	100.0* (1.000)	106.6 (1.000)	110.6 (1.000)	108.9 (1.000)	117.7 (1.000)	117.5 (1.000)	122.5 (1.000)	127.3 (1.000)	6.6
Hairy Woodpecker	77.0* (1.000)	90.5 (1.000)	81.9 (1.000)	93.6 (1.000)	91.3 (1.000)	107.0 (1.000)	96.0 (1.000)	107.2 (1.000)	13.5
Western Wood-Pewee	108.5* (0.990)	119.7 (0.989)	117.6 (0.993)	108.0* (1.000)	124.4 (0.998)	122.7 (1.000)	118.6 (1.000)	127.2 (1.000)	11.2
"Traill's" Flycatcher	111.9* (0.985)	121.3 (0.989)	125.2 (0.972)	114.0 (0.999)	134.0 (0.982)	125.3 (0.998)	127.1 (0.999)	135.6 (1.000)	9.4
Hammond's Flycatcher	154.5* (0.995)	165.0 (0.994)	167.1 (0.990)	166.7 (0.990)	173.7 (0.995)	172.7 (0.998)	178.6 (0.986)	179.1 (0.999)	10.5
Dusky Flycatcher	213.4 (0.039)	199.4* (0.425)	199.5* (0.423)	212.9 (0.114)	202.5 (0.572)	200.7* (0.669)	202.2 (0.619)	210.1 (0.588)	-14.0
"Western" Flycatcher	173.4* (0.878)	184.7 (0.835)	181.3 (0.897)	177.4 (0.948)	186.4 (0.942)	187.4 (0.945)	185.9 (0.959)	193.9 (0.956)	11.3

Table 50. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from thirty-six MAPS stations in Forest Service Region 6. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Warbling Vireo	170.1* (1.000)	178.2 (1.000)	182.6 (0.999)	178.6 (1.000)	186.4 (1.000)	190.2 (1.000)	188.2 (1.000)	196.1 (1.000)	8.1
Mountain Chickadee	118.5* (0.999)	128.9 (0.999)	118.1* (1.000)	131.1 (0.998)	125.6 (1.000)	142.1 (0.999)	131.2 (1.000)	140.3 (1.000)	10.4
Chestnut-backed Chickadee	87.3* (1.000)	100.0 (1.000)	92.8 (1.000)	102.4 (1.000)	104.3 (1.000)	113.2 (1.000)	107.6 (1.000)	117.7 (1.000)	12.7
Red-breasted Nuthatch	53.3* (1.000)	55.4 (1.000)	60.3 (1.000)	59.1 (1.000)	67.6 (1.000)	70.5 (1.000)	72.6 (1.000)	82.0 (1.000)	2.1
Brown Creepe	55.1* (1.000)	65.8 (1.000)	65.8 (1.000)	67.1 (1.000)	75.7 (1.000)	81.9 (1.000)	79.9 (1.000)	89.9 (1.000)	10.6
House Wren	50.1* (1.000)	60.1 (1.000)	61.3 (1.000)	60.6 (1.000)	74.2 (1.000)	72.9 (1.000)	74.9 (1.000)	87.0 (1.000)	10.0
Winter Wren	127.2* (0.999)	130.0 (1.000)	136.8 (0.999)	132.5 (1.000)	137.4 (1.000)	131.5 (1.000)	142.2 (1.000)	138.4 (1.000)	2.8
Ruby-crowned Kinglet	75.3 (1.000)	71.7* (1.000)	70.1* (1.000)	81.2 (1.000)	77.1 (1.000)	84.0 (1.000)	81.0 (1.000)	86.7 (1.000)	-3.6
Swainson's Thrush	218.5* (0.002)	228.9 (0.002)	228.8 (0.002)	229.0 (0.002)	238.3 (0.002)	239.7 (0.002)	236.9 (0.005)	252.8 (0.000)	10.4

Table 50. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from thirty-six MAPS stations in Forest Service Region 6. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Hermit Thrush	102.0* (0.986)	108.0 (0.996)	102.0* (1.000)	100.5* (1.000)	112.5 (1.000)	108.3 (1.000)	101.1* (1.000)	114.3 (1.000)	6.0
American Robin	229.4* (0.498)	238.7 (0.471)	236.8 (0.530)	238.9 (0.464)	248.4 (0.397)	249.9 (0.382)	246.8 (0.485)	254.9 (0.434)	9.3
Varied Thrush	85.4* (1.000)	93.4 (1.000)	92.6 (1.000)	94.3 (1.000)	98.3 (1.000)	105.3 (1.000)	101.8 (1.000)	108.6 (1.000)	8.0
Orange-crowned Warbler	89.8* (0.999)	103.5 (0.998)	103.3 (0.998)	99.5 (1.000)	115.8 (0.997)	114.6 (0.999)	114.1 (0.999)	125.9 (0.998)	13.7
Yellow Warbler	124.9* (0.999)	134.1 (1.000)	135.3 (1.000)	138.8 (0.998)	139.8 (1.000)	148.1 (0.999)	149.7 (0.999)	157.3 (1.000)	9.2
Yellow-rumped Warbler	154.8* (0.996)	164.3 (0.996)	159.9 (0.999)	166.5 (0.993)	169.8 (0.999)	175.1 (0.996)	170.9 (0.999)	181.3 (0.998)	9.5
Black-throated Gray Warbler	29.8* (1.000)	42.0 (1.000)	45.0 (1.000)	43.1 (1.000)	65.0 (1.000)	68.0 (1.000)	67.9 (1.000)	96.8 (1.000)	12.1
Townsend's Warbler	123.6* (1.000)	133.4 (1.000)	136.6 (1.000)	133.5 (1.000)	145.0 (1.000)	143.7 (1.000)	146.8 (1.000)	154.6 (1.000)	9.8
MacGillivray's Warbler	244.6 (0.345)	239.4* (0.744)	250.6 (0.400)	244.7 (0.585)	244.4 (0.812)	246.3 (0.792)	248.4 (0.735)	255.3 (0.727)	-5.2

Table 50. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from thirty-six MAPS stations in Forest Service Region 6. $QAIC_C$[1] and $(GOF)^2$ are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Common Yellowthroat	135.2* (0.998)	137.5 (1.000)	135.7* (1.000)	139.2 (1.000)	142.8 (1.000)	144.3 (1.000)	142.7 (1.000)	148.0 (1.000)	2.3
Wilson's Warbler	202.0* (0.791)	210.2 (0.803)	213.1 (0.712)	208.8 (0.835)	221.7 (0.702)	220.5 (0.770)	221.2 (0.748)	232.7 (0.595)	8.2
Western Tanager	75.9* (1.000)	86.9 (1.000)	85.4 (1.000)	87.5 (1.000)	97.9 (1.000)	99.9 (1.000)	96.5 (1.000)	108.0 (1.000)	11.0
Chipping Sparro	76.8 (1.000)	76.5 (1.000)	78.3 (1.000)	73.8* (1.000)	88.8 (1.000)	88.0 (1.000)	88.4 (1.000)	100.3 (1.000)	-0.3
Fox Sparro	89.7* (0.999)	99.4 (1.000)	94.7 (1.000)	98.8 (1.000)	106.8 (1.000)	115.2 (1.000)	106.8 (1.000)	124.3 (1.000)	9.7
Song Sparro	141.0* (1.000)	150.7 (1.000)	152.8 (1.000)	153.1 (1.000)	162.1 (1.000)	160.6 (1.000)	165.6 (1.000)	170.9 (1.000)	9.7
Lincoln's Sparro	204.3* (0.834)	211.4 (0.868)	209.4 (0.902)	217.3 (0.730)	219.5 (0.867)	223.6 (0.799)	221.8 (0.843)	233.8 (0.705)	7.1
White-crowned Sparro	91.3* (1.000)	97.6 (1.000)	103.1 (1.000)	93.1* (1.000)	107.9 (1.000)	102.7 (1.000)	107.5 (1.000)	114.2 (1.000)	6.3
Dark-eyed Junco	265.3* (0.377)	264.5* (0.650)	269.6 (0.488)	264.7* (0.644)	273.0 (0.615)	268.6 (0.781)	273.8 (0.624)	275.2 (0.781)	-0.8

Table 50. (cont.) Summary statistics for survival analyses with temporally variable survival and recapture probabilities and proportion of residents in transient models using ten years (1992-2001) of mark-recapture data from thirty-six MAPS stations in Forest Service Region 6. $QAIC_C$[1] and (GOF)[2] are presented for all models.

	Transient Models								
Species	$\varphi p\tau$[3]	$\varphi_t p\tau$[4]	$\varphi p_t\tau$[5]	$\varphi p\tau_t$[6]	$\varphi_t p_t\tau$[7]	$\varphi_t p\tau_t$[8]	$\varphi p_t\tau_t$[9]	$\varphi_t p_t\tau_t$[10]	$\Delta QAIC_C$
Black-headed Grosbeak	59.8* (1.000)	70.9 (1.000)	63.8 (1.000)	72.4 (1.000)	77.3 (1.000)	86.3 (1.000)	79.2 (1.000)	95.6 (1.000)	11.1
Cassin's Finch	34.7* (1.000)	38.5 (1.000)	37.1 (1.000)	44.0 (1.000)	52.0 (1.000)	57.2 (1.000)	55.1 (1.000)	71.4 (1.000)	3.8

[1] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample sizes and overdispersion of data.

[2] Goodness-of-fit is a measure of how well the actual distribution of data fits the theoretical distribution calculated using the estimates provided by the model. The larger the value provided by the GOF test the better the model describes the data.

[3] $\varphi p\tau$ Model: Transient model with temporally-constant survival probability, recapture probability, and proportion of residents (invariable from year to year).

[4] $\varphi_t p\tau$ Model: Transient model with temporally-variable survival probability; and temporally-constant recapture probability and proportion of residents.

[5] $\varphi p_t\tau$ Model: Transient model with temporally-variable recapture probability; and temporally-constant survival probability and proportion of residents.

[6] $\varphi p\tau_t$ Model: Transient model with temporally-variable proportion of residents; and temporally-constant survival and recapture probabilities.

[7] $\varphi_t p_t\tau$ Model: Transient model with temporally-variable survival and recapture probabilities; and temporally-constant proportion of residents.

[8] $\varphi_t p\tau_t$ Model: Transient model with temporally-variable survival probability and proportion of residents; and temporally-constant recapture probability.

[9] $\varphi p_t\tau_t$ Model: Transient model with temporally-variable recapture probability and proportion of residents; and temporally-constant survival probability.

[10] $\varphi_t p_t\tau_t$ Model: Transient model with temporally-variable survival probability, recapture probability, and proportion of residents.

[11] $\Delta QAIC_C$ is defined as the difference in $QAIC_C$ between th $\varphi p\tau$ model and th $\varphi_t p\tau$ model.

* The chosen models are the model with the lowest $QAIC_C$ and the models with $QAIC_C$s within 2.0 units of the model with the lowest $QAIC_C$.

Table 51. Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 38 species breeding at MAPS stations in Forest Service Region 6 obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Red-naped Sapsucker	10	127	230	29	$\varphi p\tau$	80.0	0.414 (0.072)	17.3	0.553 (0.123)	0.586 (0.194)
Hybrid Sapsucker	8	46	110	19	$\varphi p\tau$	71.3	0.628 (0.094)	14.9	0.556 (0.131)	0.452 (0.188)
Red-breasted Sapsucker	14	208	331	34	$\varphi p\tau$	100.0	0.452 (0.074)	16.3	0.278 (0.086)	0.892 (0.299)
Hairy Woodpecker	32	140	167	21	$\varphi p\tau$	77.0	0.503 (0.095)	19.0	0.237 (0.106)	0.798 (0.401)
Western Wood-Pewee	9	170	251	36	$\varphi p\tau$	108.5	0.553 (0.068)	12.3	0.397 (0.089)	0.445 (0.131)
					$\varphi p\tau_t$	108.0	0.556 (0.069)	12.4	0.392 (0.089)	a0.650 (0.356)
										b0.264 (0.186)
										c0.759 (0.361)
										d0.000 (0.916)
										e0.000 (0.919)
										f0.946 (0.435)
										g0.789 (0.507)
										h0.000 (0.831)
										i0.764 (0.435)
"Traill's" Flycatcher	6	176	315	47	$\varphi p\tau$	111.9	0.548 (0.061)	11.1	0.606 (0.087)	0.362 (0.093)
Hammond's Flycatcher	26	587	887	112	$\varphi p\tau$	154.5	0.458 (0.041)	8.8	0.396 (0.056)	0.640 (0.111)
Dusky Flycatcher	17	618	1039	134	$\varphi p\tau$*	213.4	0.544 (0.034)	6.2	0.437 (0.046)	0.364 (0.057)
					$\varphi_t p\tau$	199.4	a0.813 (0.131)	16.1	0.416 (0.047)	0.367 (0.056)
							b0.681 (0.117)	17.2		
							c0.651 (0.114)	17.5		
							d0.540 (0.115)	21.3		
							e0.431 (0.104)	24.1		
							f0.209 (0.068)	32.5		
							g0.616 (0.156)	25.3		
							h0.677 (0.167)	24.7		
							i0.551 (0.166)	30.1		

Table 51. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 38 species breeding at MAPS stations in Forest Service Region 6 obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Dusky Flycatcher (cont.)					$\varphi p_t \tau$	199.5	0.578 (0.037)	6.4	a0.599 (0.105)	0.384 (0.060)
									b0.562 (0.104)	
									c0.425 (0.090)	
									d0.480 (0.100)	
									e0.332 (0.083)	
									f0.088 (0.042)	
									g0.179 (0.065)	
									h0.416 (0.108)	
									i0.369 (0.118)	
					$\varphi_t p \tau_t$	200.7	a0.748 (0.142)	19.0	0.416 (0.048)	a0.392 (0.115)
							b0.825 (0.144)	17.5		b0.137 (0.080)
							c0.561 (0.119)	21.2		c0.515 (0.177)
							d0.635 (0.145)	22.8		d0.171 (0.103)
							e0.422 (0.127)	30.1		e0.439 (0.206)
							f0.136 (0.063)	46.3		f0.841 (0.526)
							g0.859 (0.231)	26.9		g0.147 (0.090)
							h0.512 (0.172)	33.6		h0.871 (0.394)
							i0.527 (0.174)	33.0		i0.481 (0.359)
"Western" Flycatcher	23	732	997	99	$\varphi p \tau$	173.4	0.502 (0.042)	8.3	0.273 (0.046)	0.530 (0.101)
Warbling Vireo	24	792	1248	163	$\varphi p \tau$	170.1	0.487 (0.032)	6.7	0.435 (0.046)	0.501 (0.070)
Mountain Chickadee	15	367	469	53	$\varphi p \tau$	118.5	0.516 (0.058)	11.2	0.385 (0.077)	0.395 (0.099)
					$\varphi p_t \tau$	118.1	0.523 (0.064)	12.2	a0.879 (0.167)	0.335 (0.076)
									b0.627 (0.226)	
									c0.329 (0.139)	
									d0.734 (0.171)	
									e0.392 (0.137)	
									f0.235 (0.122)	
									g0.426 (0.182)	
									h0.115 (0.087)	
									i0.575 (0.234)	

Table 51. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 38 species breeding at MAPS stations in Forest Service Region 6 obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Chestnut-backed Chickadee	22	506	588	39	$\varphi p\tau$	87.3	0.371 (0.068)	18.4	0.163 (0.070)	1.000 (0.449)
Red-breasted Nuthatch	25	245	277	13	$\varphi p\tau$	53.3	0.309 (0.116)	37.7	0.141 (0.124)	1.000 (0.902)
Brown Creepe	19	194	237	16	$\varphi p\tau$	55.1	0.270 (0.100)	37.2	0.325 (0.182)	0.809 (0.491)
House Wren	4	108	142	11	$\varphi p\tau$	50.1	0.281 (0.112)	40.0	0.433 (0.231)	0.597 (0.379)
Winter Wren	21	746	1133	81	$\varphi p\tau$	127.2	0.360 (0.042)	11.6	0.511 (0.078)	0.316 (0.066)
Ruby-crowned Kinglet	6	342	432	20	$\varphi p\tau$*	75.3	0.286 (0.085)	29.8	0.248 (0.123)	0.647 (0.321)
					$\varphi_t p\tau$	71.7	a0.000 (0.866)	--.-	0.214 (0.126)	0.547 (0.265)
							b0.715 (0.438)	61.3		
							c0.464 (0.262)	56.5		
							d0.188 (0.119)	63.3		
							e0.520 (0.320)	61.5		
							f0.055 (0.058)	105.5		
							g0.924 (0.778)	84.2		
							h0.000 (0.873)	--.-		
							i1.000 (0.717)	71.7		
					$\varphi p_t\tau$	70.1	0.267 (0.096)	36.0	a0.000 (0.980)	0.528 (0.240)
									b0.769 (0.411)	
									c0.282 (0.213)	
									d0.084 (0.094)	
									e0.445 (0.280)	
									f0.000 (0.708)	
									g0.457 (0.394)	
									h0.000 (1.132)	
									i0.982 (0.588)	
Swainson's Thrush	28	3272	7765	1398	$\varphi p\tau$	218.5	0.585 (0.011)	1.9	0.629 (0.015)	0.503 (0.024)
Hermit Thrush	12	209	300	29	$\varphi p\tau$	102.0	0.494 (0.071)	14.3	0.409 (0.102)	0.288 (0.098)

Table 51. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 38 species breeding at MAPS stations in Forest Service Region 6 obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Hermit Thrush (cont.)					$\varphi p_t \tau$	102.0	0.471 (0.076)	16.1	a0.283 (0.210) b0.238 (0.175) c0.628 (0.216) d0.744 (0.233) e0.471 (0.201) f0.113 (0.106) g0.438 (0.230) h0.000 (0.755) i0.993 (0.647)	0.305 (0.104)
					$\varphi p \tau_t$	100.5	0.511 (0.071)	13.9	0.418 (0.102)	a0.411 (0.237) b0.346 (0.242) c0.000 (0.754) d0.470 (0.269) e0.194 (0.192) f0.000 (0.650) g0.000 (0.755) h0.721 (0.480) i1.000 (0.986)
					$\varphi p_t \tau_t$	101.1	0.457 (0.072)	15.8	a0.192 (0.154) b0.196 (0.141) c0.685 (0.238) d0.752 (0.229) e0.536 (0.215) f0.206 (0.183) g0.924 (0.292) h0.000 (0.576) i0.774 (0.723)	a0.733 (0.532) b0.469 (0.353) c0.000 (0.000) d0.379 (0.223) e0.198 (0.200) f0.000 (0.000) g0.000 (0.523) h1.000 (1.133) i1.000 (1.122)
American Robin	34	1063	1431	169	$\varphi p \tau$	229.4	0.640 (0.032)	5.0	0.200 (0.027)	0.581 (0.084)
Varied Thrush	16	213	294	31	$\varphi p \tau$	85.4	0.470 (0.073)	15.6	0.501 (0.113)	0.308 (0.099)
Orange-crowned Warbler	5	237	311	24	$\varphi p \tau$	89.8	0.558 (0.080)	14.4	0.189 (0.068)	0.418 (0.163)

Table 51. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 38 species breeding at MAPS stations in Forest Service Region 6 obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Yellow Warbler	5	188	403	60	$\varphi p \tau$	124.9	0.527 (0.053)	10.0	0.388 (0.069)	0.822 (0.184)
Yellow-rumped Warbler	19	937	1150	88	$\varphi p \tau$	154.8	0.529 (0.045)	8.6	0.193 (0.040)	0.492 (0.108)
Black-throated Gray Warbler	8	66	77	4	$\varphi p \tau$	29.8	0.567 (0.209)	36.8	0.123 (0.130)	0.449 (0.487)
Townsend's Warbler	11	602	759	68	$\varphi p \tau$	123.6	0.411 (0.052)	12.6	0.268 (0.064)	0.712 (0.189)
MacGillivray's Warbler	23	1725	3605	462	$\varphi p \tau$*	244.6	0.463 (0.019)	4.0	0.639 (0.030)	0.473 (0.039)
					$\varphi_t p \tau$	239.4	a0.530 (0.062)	11.7	0.627 (0.031)	0.465 (0.038)
							b0.549 (0.056)	10.2		
							c0.476 (0.050)	10.5		
							d0.420 (0.050)	11.9		
							e0.449 (0.053)	11.8		
							f0.544 (0.058)	10.7		
							g0.302 (0.043)	14.2		
							h0.439 (0.058)	13.2		
							i0.578 (0.070)	12.1		
Common Yellowthroat	3	290	696	98	$\varphi p \tau$	135.2	0.483 (0.039)	8.2	0.615 (0.064)	0.538 (0.101)
					$\varphi p_t \tau$	135.7	0.465 (0.040)	8.6	a0.729 (0.184)	0.538 (0.100)
									b0.606 (0.156)	
									c0.703 (0.156)	
									d0.409 (0.132)	
									e0.840 (0.126)	
									f0.729 (0.157)	
									g0.349 (0.111)	
									h0.588 (0.136)	
									i1.000 (0.242)	
Wilson's Warbler	19	1138	1866	202	$\varphi p \tau$	202.0	0.459 (0.028)	6.2	0.468 (0.043)	0.437 (0.055)
Western Tanager	23	321	355	20	$\varphi p \tau$	75.9	0.534 (0.096)	18.1	0.121 (0.069)	0.555 (0.329)

Table 51. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 38 species breeding at MAPS stations in Forest Service Region 6 obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Chipping Sparro	11	303	367	24	$\varphi p\tau$*	76.8	0.410 (0.082)	20.1	0.169 (0.079)	0.752 (0.359)
					$\varphi p\tau_t$	73.8	0.428 (0.079)	18.5	0.233 (0.090)	a1.000 (0.495)
										b1.000 (0.510)
										c0.336 (0.260)
										d0.000 (1.375)
										e0.233 (0.243)
										f0.000 (1.561)
										g0.000 (1.934)
										h0.000 (1.884)
										i0.435 (0.455)
Fox Sparro	5	82	150	23	$\varphi p\tau$	89.7	0.710 (0.084)	11.9	0.281 (0.083)	0.522 (0.186)
Song Sparro	19	688	1597	198	$\varphi p\tau$	141.0	0.405 (0.027)	6.6	0.710 (0.048)	0.581 (0.075)
Lincoln's Sparro	12	893	2283	297	$\varphi p\tau$	204.3	0.415 (0.022)	5.4	0.618 (0.039)	0.808 (0.081)
White-crowned Sparro	4	171	310	36	$\varphi p\tau$	91.3	0.408 (0.064)	15.7	0.540 (0.112)	0.587 (0.177)
					$\varphi p\tau_t$	93.1	0.422 (0.063)	14.9	0.572 (0.109)	a1.000 (0.464)
										b0.000 (0.907)
										c0.000 (1.386)
										d1.000 (0.575)
										e0.485 (0.329)
										f0.755 (0.489)
										g0.569 (0.381)
										h0.351 (0.339)
										i0.000 (1.249)
Dark-eyed Junco	28	2012	3370	466	$\varphi p\tau$	265.3	0.464 (0.019)	4.1	0.462 (0.028)	0.617 (0.051)

Table 51. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 38 species breeding at MAPS stations in Forest Service Region 6 obtained from ten years (1992-2001) of mark-recapture data.

Species	Num. sta[1]	Num. ind.[2]	Num. caps.[3]	Num. ret.[4]	Model[5]	$QAIC_C$[6]	Survival probability[7]	Surv. C.V.[8]	Recapture probability[9]	Proportion of residents[10]
Dark-eyed Junco (cont.)					$\varphi_t p\tau$	264.5	a0.395 (0.058)	14.7	0.468 (0.029)	0.622 (0.051)
							b0.550 (0.062)	11.3		
							c0.364 (0.045)	12.4		
							d0.523 (0.060)	11.5		
							e0.538 (0.056)	10.4		
							f0.414 (0.048)	11.6		
							g0.571 (0.061)	10.7		
							h0.371 (0.048)	12.9		
							i0.406 (0.060)	14.8		
					$\varphi p\tau_t$	264.7	0.460 (0.019)	4.1	0.469 (0.029)	a0.605 (0.099)
										b0.839 (0.126)
										c0.436 (0.092)
										d0.620 (0.122)
										e0.734 (0.123)
										f0.698 (0.129)
										g0.732 (0.128)
										h0.480 (0.102)
										i0.329 (0.107)
Black-headed Grosbeak	9	102	128	14	$\varphi p\tau$	59.8	0.555 (0.115)	20.7	0.362 (0.138)	0.332 (0.159)
Cassin's Finch	7	130	147	6	$\varphi p\tau$	34.7	0.213 (0.149)	69.9	0.253 (0.274)	0.696 (0.739)

[1] Number of stations where the species was a regular or usual breeder at which adults of the species were captured.
[2] Number of adult individuals captured at stations where the species was a regular or usual breeder (i.e., number of capture histories).
[3] Total number of captures of adult birds of the species at stations where the species was a regular or usual breeder.
[4] Total number of returns. A return is the first recapture in a given year of a bird originally banded at the same station in a previous year.
[5] Models included are those chosen by $QAIC_C$ (those models marked with * in Table 50) plus th $\varphi p\tau$ model in all cases. See Table 50 for definitions of the models.
[6] Akaike Information Criterion ($QAIC_C$) given as -2(log-likelihood) + 2(number of estimable parameters) with corrections for small sample size and over dispersion of data.

Table 51. (cont.) Estimates of adult survival and recapture probabilities and proportion of residents using both temporally variable and time-constant models for 38 species breeding at MAPS stations in Forest Service Region 6 obtained from ten years (1992-2001) of mark-recapture data.

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

a The survival probability between the years 1992-1993 in a temporally variable model.
b The survival probability between the years 1993-1994 in a temporally variable model.
c The survival probability between the years 1994-1995 in a temporally variable model.
d The survival probability between the years 1995-1996 in a temporally variable model.
e The survival probability between the years 1996-1997 in a temporally variable model.
f The survival probability between the years 1997-1998 in a temporally variable model.
g The survival probability between the years 1998-1999 in a temporally variable model.
h The survival probability between the years 1999-2000 in a temporally variable model.
i The survival probability between the years 2000-2001 in a temporally variable model.

[8] The coefficient of variation for survival probability.

[9] Recapture probability presented as the maximum likelihood estimate (standard error of the estimate).

a The recapture probability in 1993 in a temporally variable model.
b The recapture probability in 1994 in a temporally variable model.
c The recapture probability in 1995 in a temporally variable model.
d The recapture probability in 1996 in a temporally variable model.
e The recapture probability in 1997 in a temporally variable model.
f The recapture probability in 1998 in a temporally variable model.
g The recapture probability in 1999 in a temporally variable model.
h The recapture probability in 2000 in a temporally variable model.
i The recapture probability in 2001 in a temporally variable model.

[10] The proportion of residents among newly captured adults presented as the maximum likelihood estimate (standard error of the estimate).

a The proportion of residents in the adult population in 1992 in a temporally variable model.
b The proportion of residents in the adult population in 1993 in a temporally variable model.
c The proportion of residents in the adult population in 1994 in a temporally variable model.
d The proportion of residents in the adult population in 1995 in a temporally variable model.
e The proportion of residents in the adult population in 1996 in a temporally variable model.
f The proportion of residents in the adult population in 1997 in a temporally variable model.
g The proportion of residents in the adult population in 1998 in a temporally variable model.
h The proportion of residents in the adult population in 1999 in a temporally variable model.
i The proportion of residents in the adult population in 2000 in a temporally variable model.

* Time-constant model that was not marked by $QAIC_C$, but that is shown only for comparison to other species.

Table 52. Relative values of vital rates (lower-than-expected, as-expected, higher-than-expected) for selected study species in Region Six National Forests in relation to the direction and significance of their adult population trends over the ten years 1992-2001.

Species	Significanc of the trend[1]	Productivity	Pop.-Prod. correlation[2]	Survival Probability[3]
A. Declining Species				
Red-naped Sapsucker	**	expected		lower
Dusky Flycatcher	***	lower	positive	expected
"Western" Flycatcher	***	lower	positive	expected
Warbling Vireo	***	lower	positive*	expected
House Wren	**	higher	positive	lower?
Ruby-crowned Kinglet		expected	positive	lower?
Orange-crowned Warbler	**	higher	positive	higher
Black-throated Gray Warbler		lower	positive	expected
Townsend's Warbler	**	higher	positive	expected
Common Yellowthroat	**	lower	positive	expected
Chipping Sparro	***	lower		expected
Lincoln's Sparro	**	expected	positive**	possibly lower
Pine Siskin	**	lower	positive	?
B. Increasing Species				
Hammond's Flycatcher	***	lower	positive	expected
Mountain Chickadee		higher	positive	higher
Brown Creepe	**	higher	positive	lower?
American Robin	***	expected	positive	higher
Varied Thrush		higher	positive	expected
White-crowned Sparro	**	higher		lower
Black-headed Grosbeak	***	lower		expected

[1] Direction and significance of the trends in adult population size as based on data from all six locations (Fig. 19); *** $P < 0.01$, ** $0.01 \leq P < 0.05$, * $0.05 \leq P < 0.10$.

[2] Direction and significance of the correlation between the trends in adult population size and productivity as based on data from all six locations (Fig. 21); $P < 0.01$, ** $0.01 \leq P < 0.05$, * $0.05 \leq P < 0.10$.

[3] A question mark (?) indicates inferences based on survival estimates for which CV of the estimate > 30% and are thus less reliable, or that survival could not be estimated due to low recapture rates.

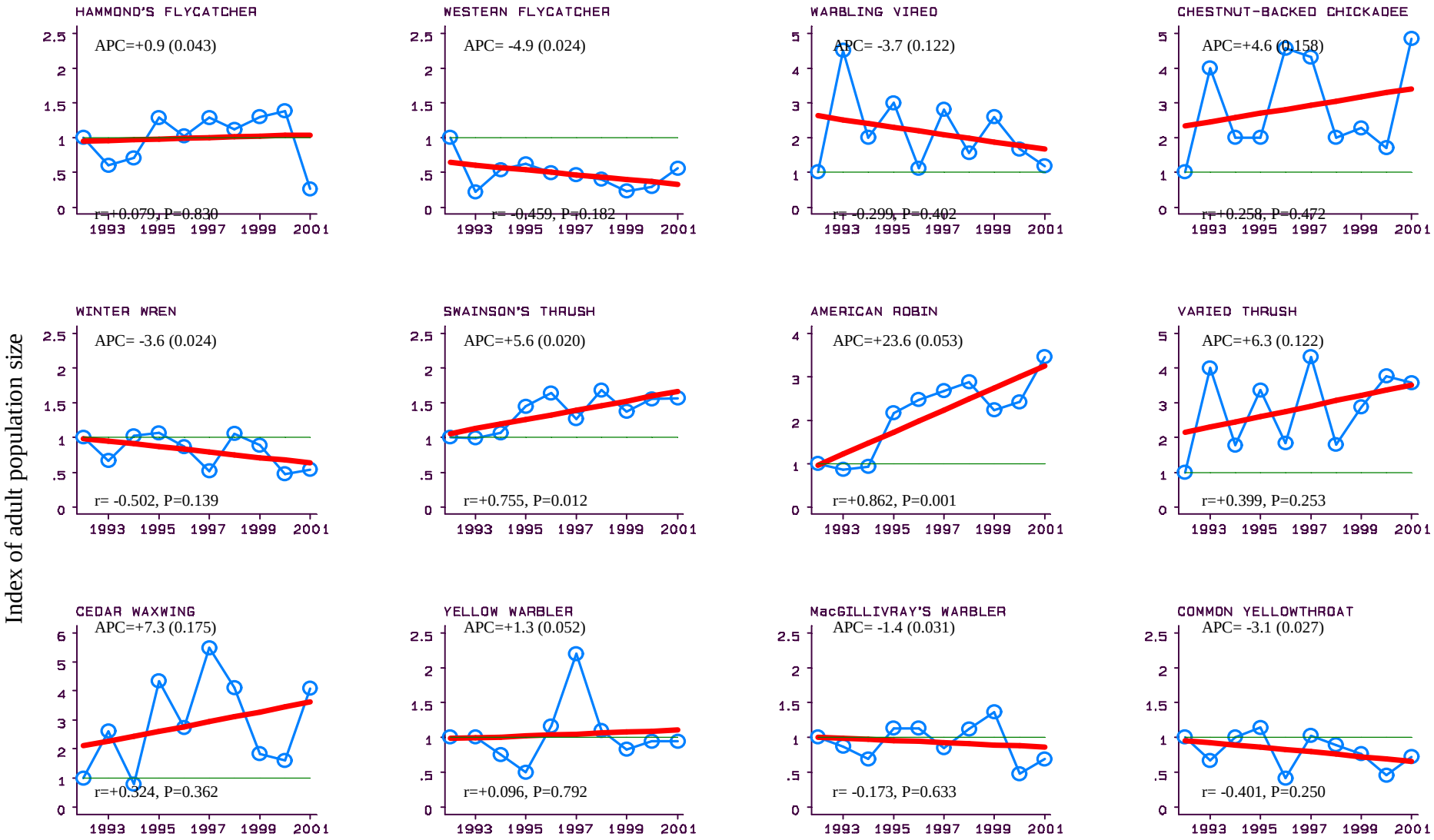


Figure 1. Population trends for 14 species and all species pooled in Mount Baker National Forest over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

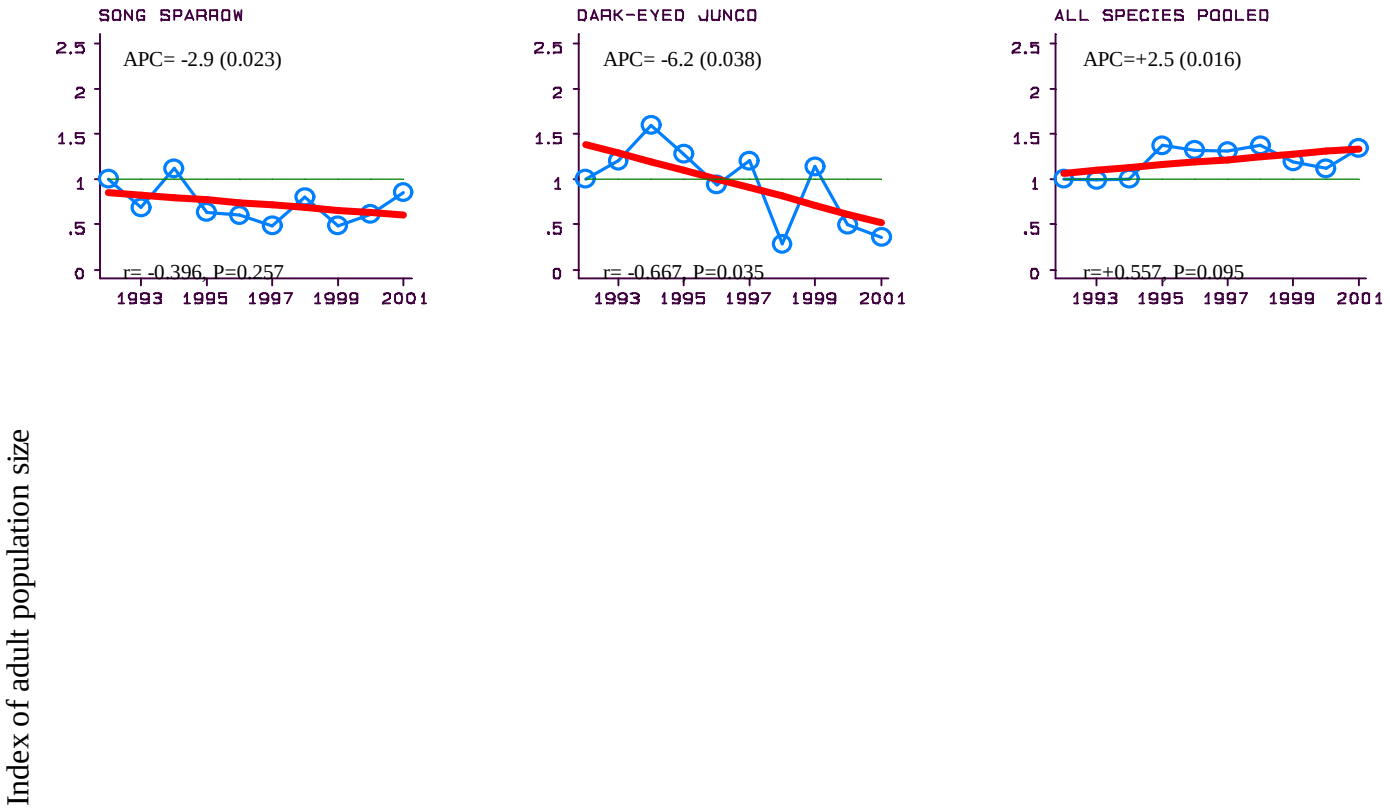


Figure 1. (cont.) Population trends for 14 species and all species pooled in Mount Baker National Forest over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

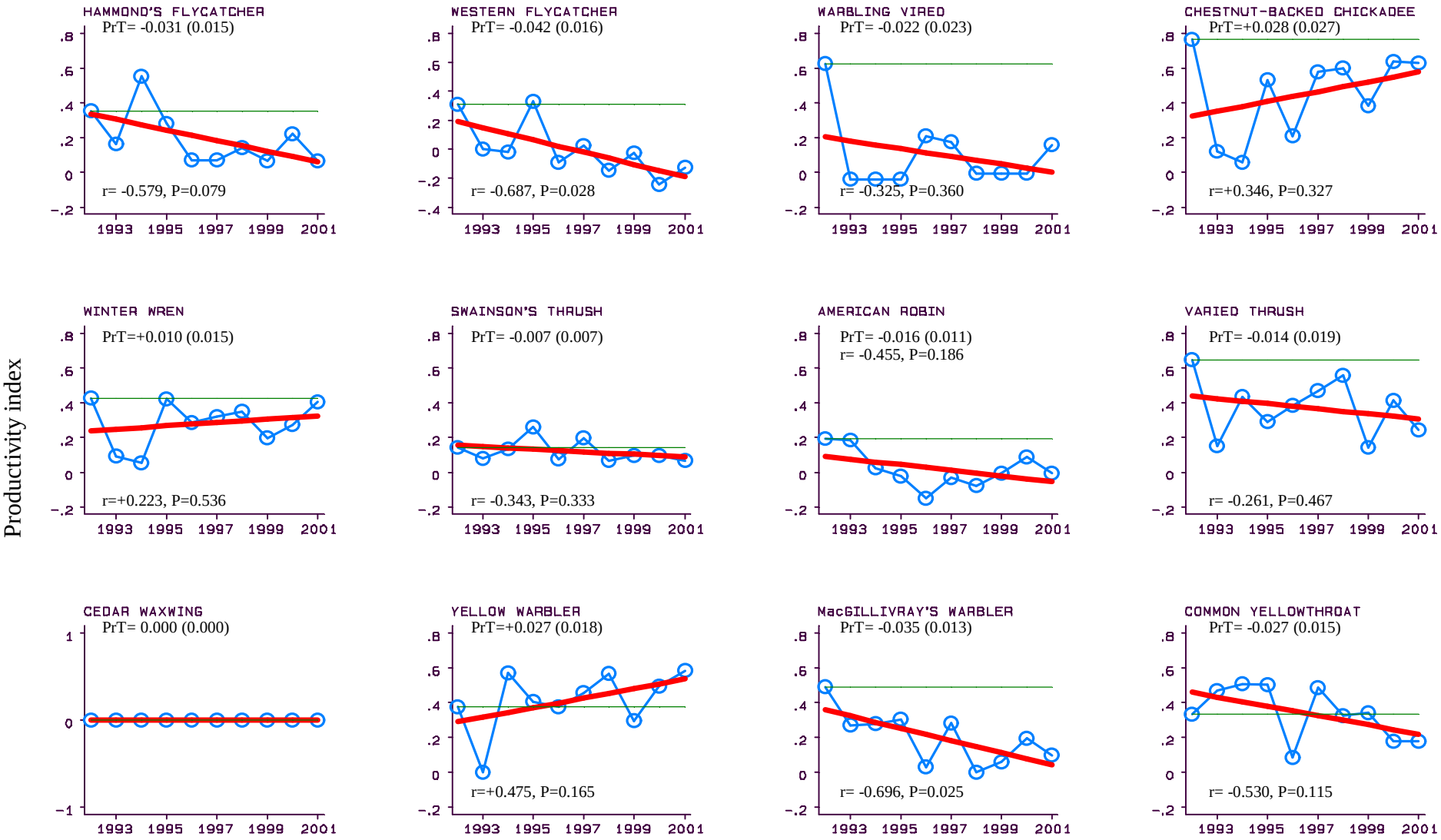
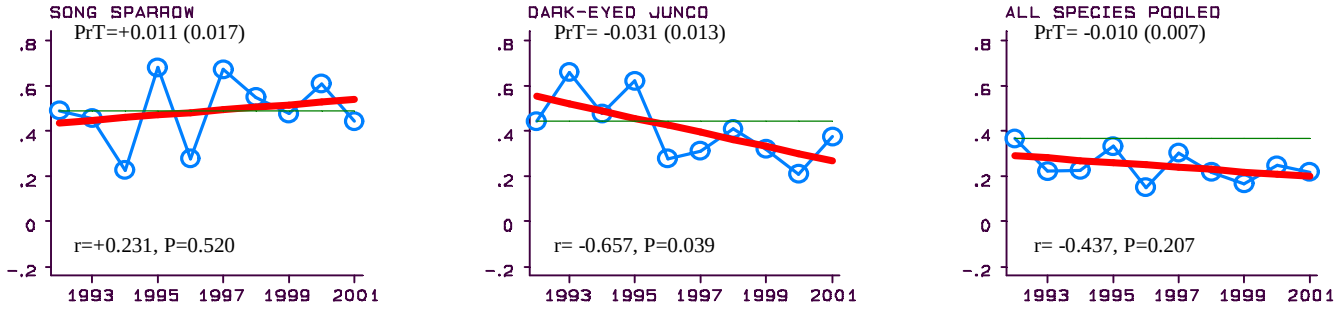


Figure 2. Trend in productivity for 14 species and all species pooled in Mount Baker National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.



Productivity index

Figure 2. (cont.) Trend in productivity for 14 species and all species pooled in Mount Baker National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

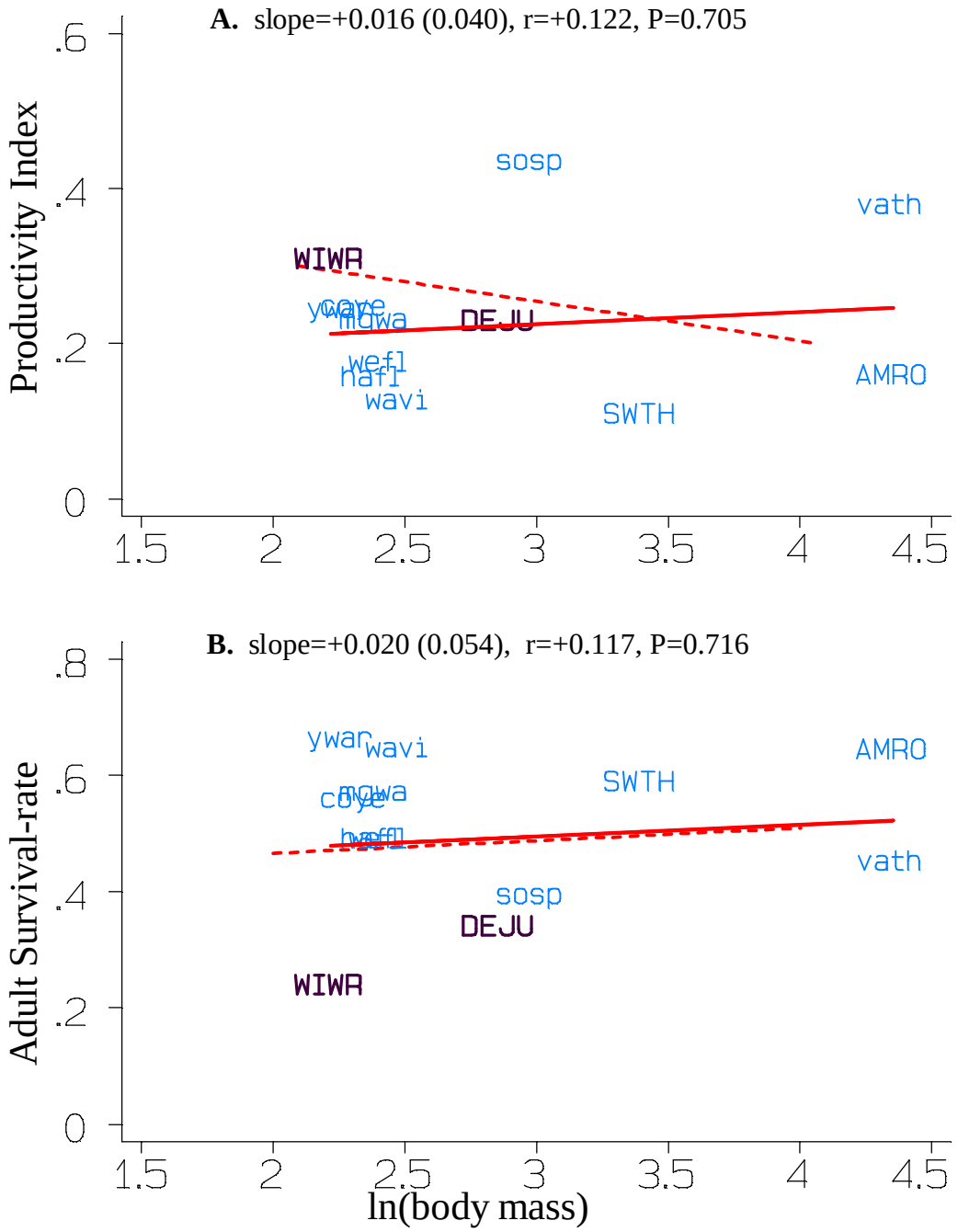


Figure 3. Regressions of productivity index (**A**) and adult survival rates (**B**) at Mount Baker National Forest on the natural log of the body mass for 12 target species with coefficient of variations of the survival estimate less than 30% for the ten years 1992-2001. Species whose four-letter codes (Appendix I) are shown in bold capital letters showed substantially decreasing ($r < -0.5$) population trends, those in regular type capital letters had substantially increasing ($r > +0.5$) population trends, and those in lower-case letters had flat (absolute $r < 0.5$) trends. Regressions are shown for the correlations of the targe species (non-dashed line) and the correlations for all species throughout all of North America (dashed line). The slope, the r-value, and P-value are presented for the targe species line.

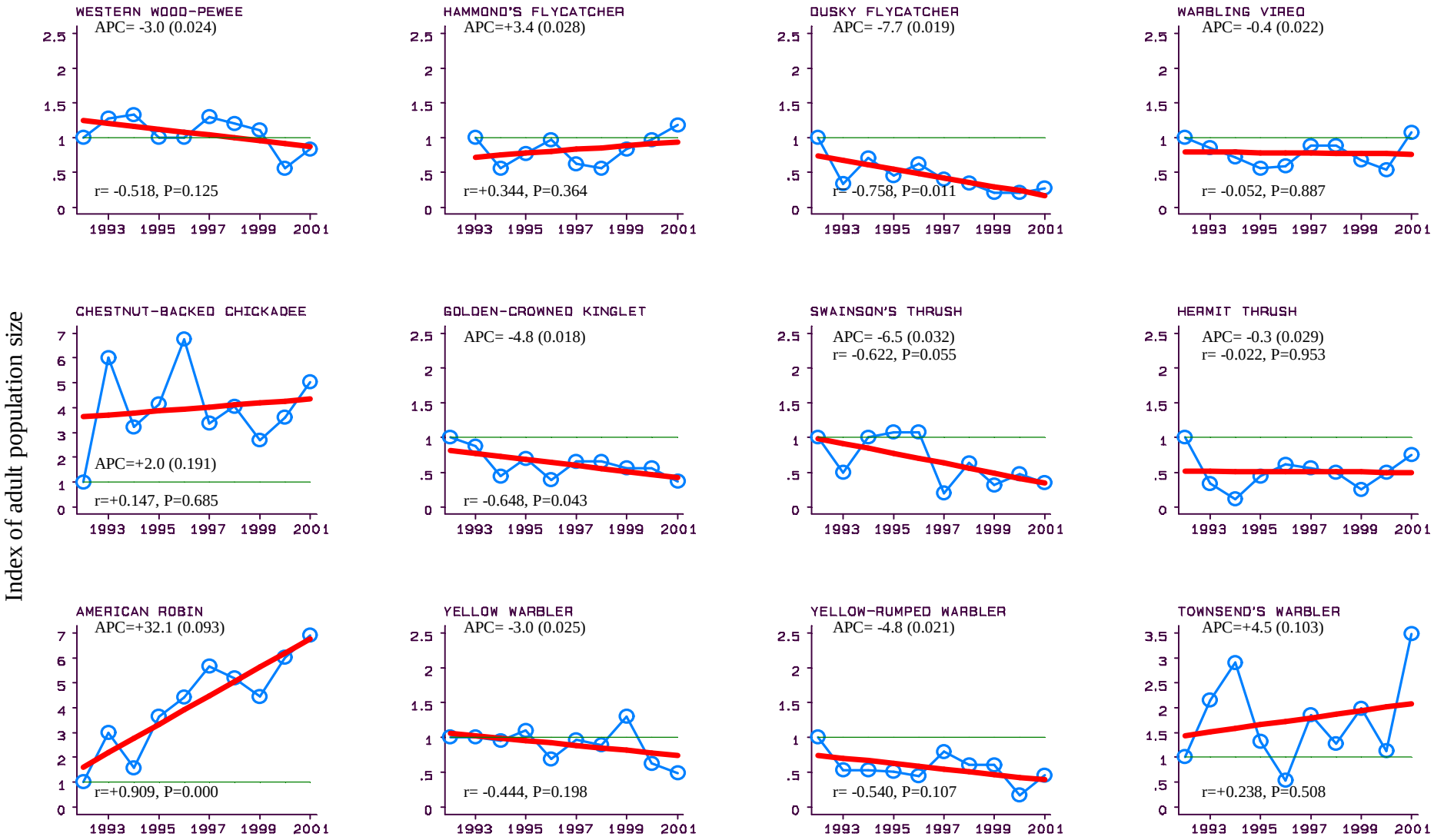


Figure 4. Population trends for 19 species and all species pooled in Wenatchee National Forest over the ten years 1992-2001 (1993-2001 for Hammond's Flycatcher). The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

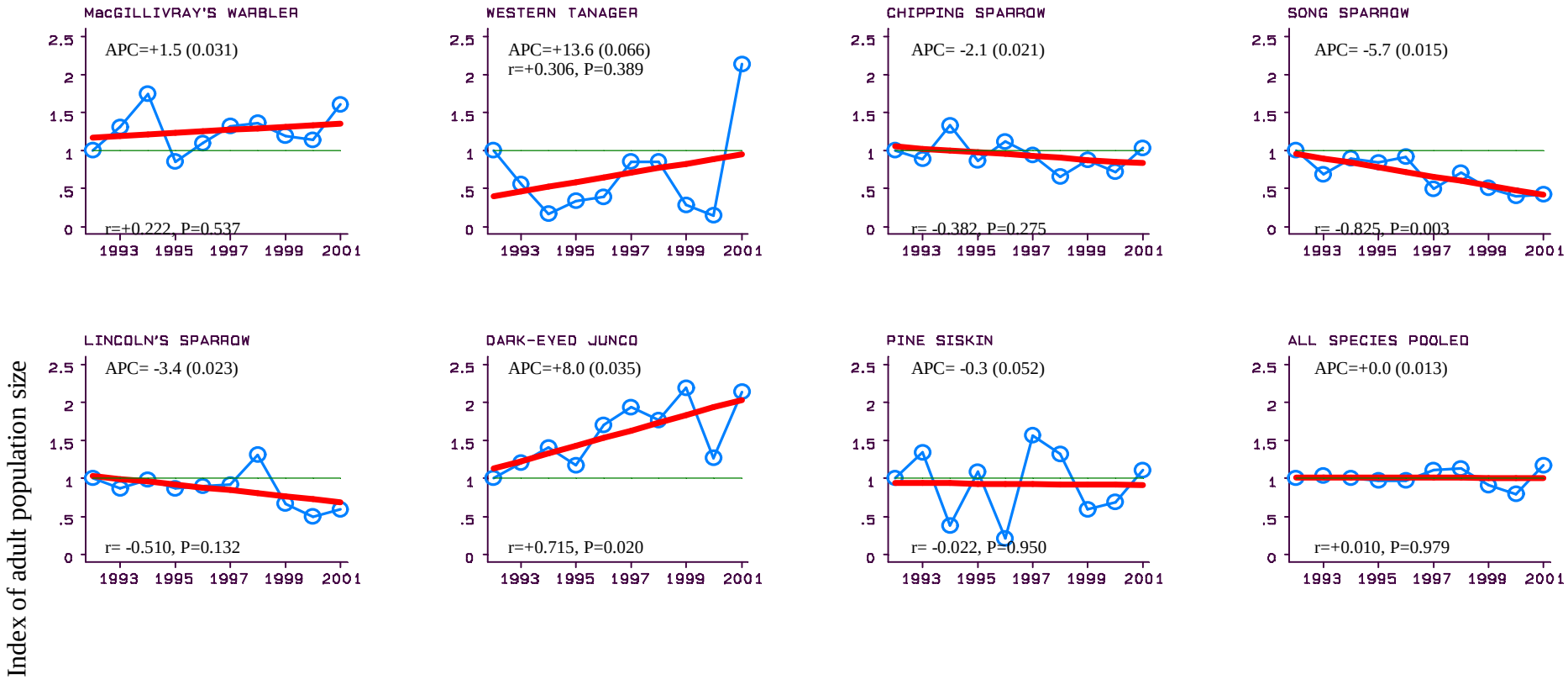


Figure 4. (cont.) Population trends for 19 species and all species pooled in Wenatchee National Forest over the ten years 1992-2001 (1993-2001 for Hammond's Flycatcher). The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-yea changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

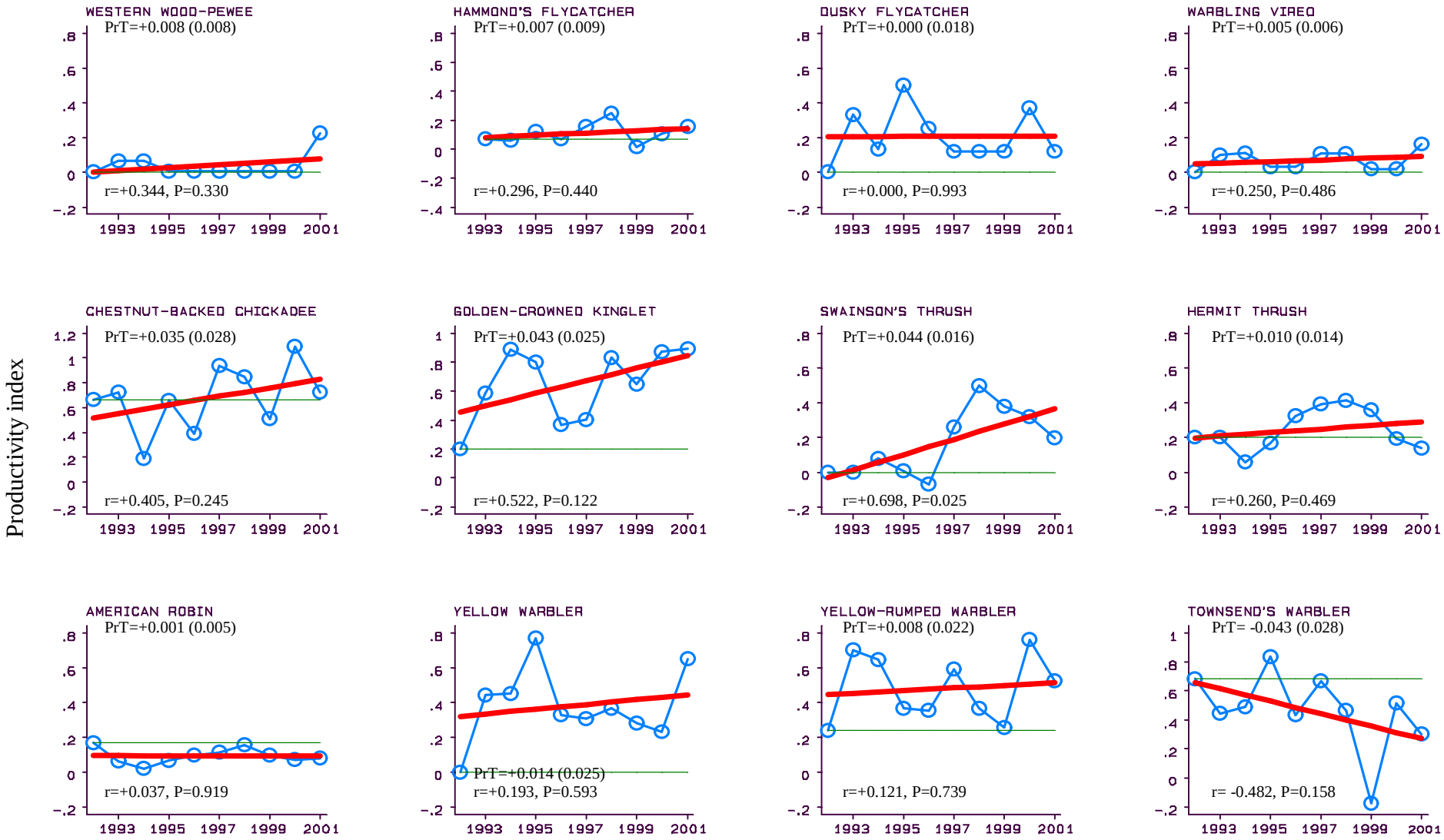


Figure 5. Trend in productivity for 19 species and all species pooled in Wenatchee National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

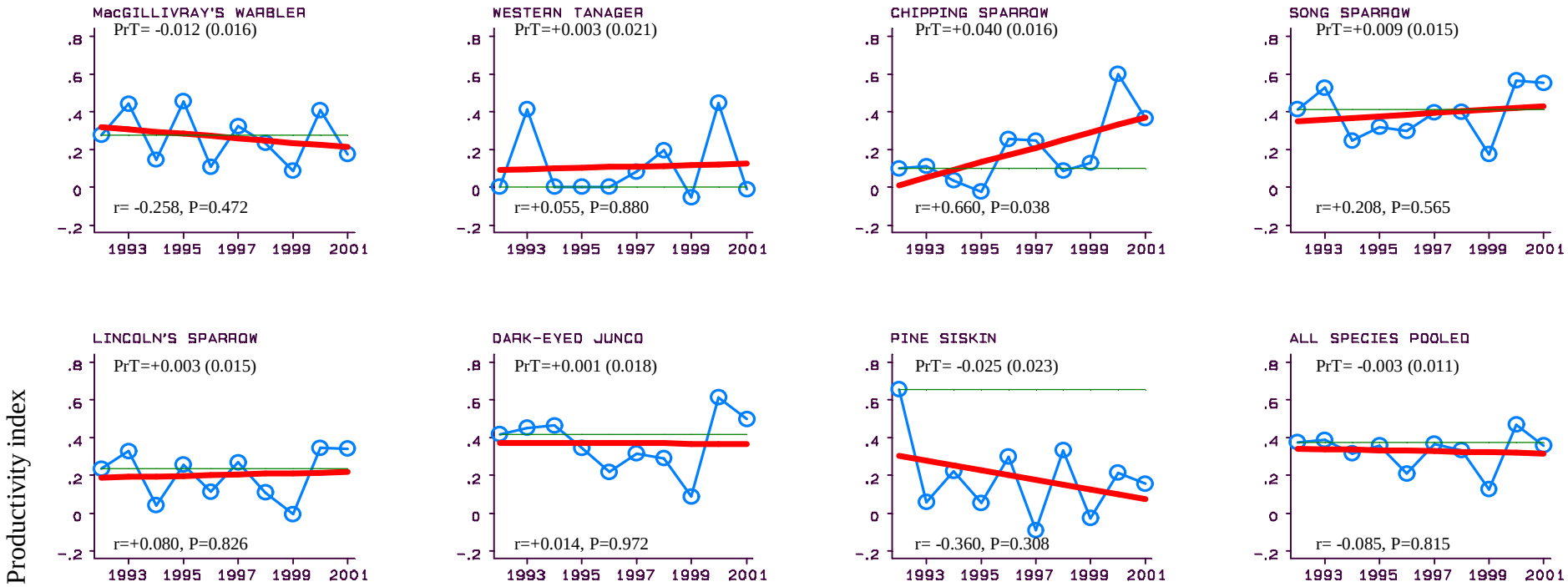


Figure 5. (cont.) Trend in productivity for 19 species and all species pooled in Wenatchee National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

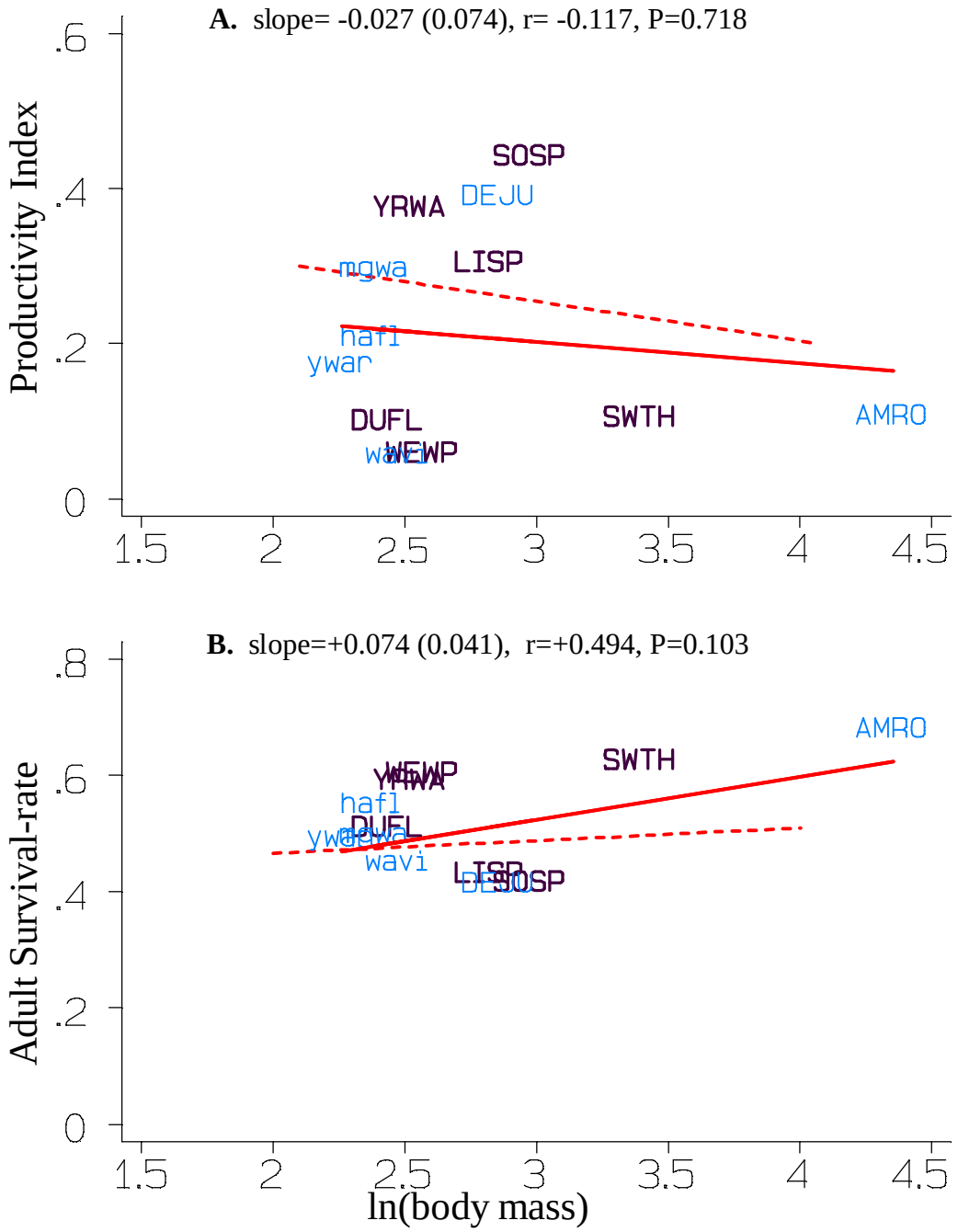


Figure 6. Regressions of productivity index (**A**) and adult survival rates (**B**) at Wenatchee National Forest on the natural log of the body mass for 12 target species for the tenyears 1992-2001. Species whose four-letter codes (Appendix I) are shown in bold capital letters showed substantially decreasing ($r < -0.5$) population trends, those in regular type capital letters had substantially increasing ($r > +0.5$) population trends, and those in lower-case letters had flat (absolute $r < 0.5$) trends. Regressions are shown for the correlations of the target species (non-dashed line) and the correlations for all species throughout all of North America (dashed line). The slope, the r-value, and P-value are presented for the targe species line.

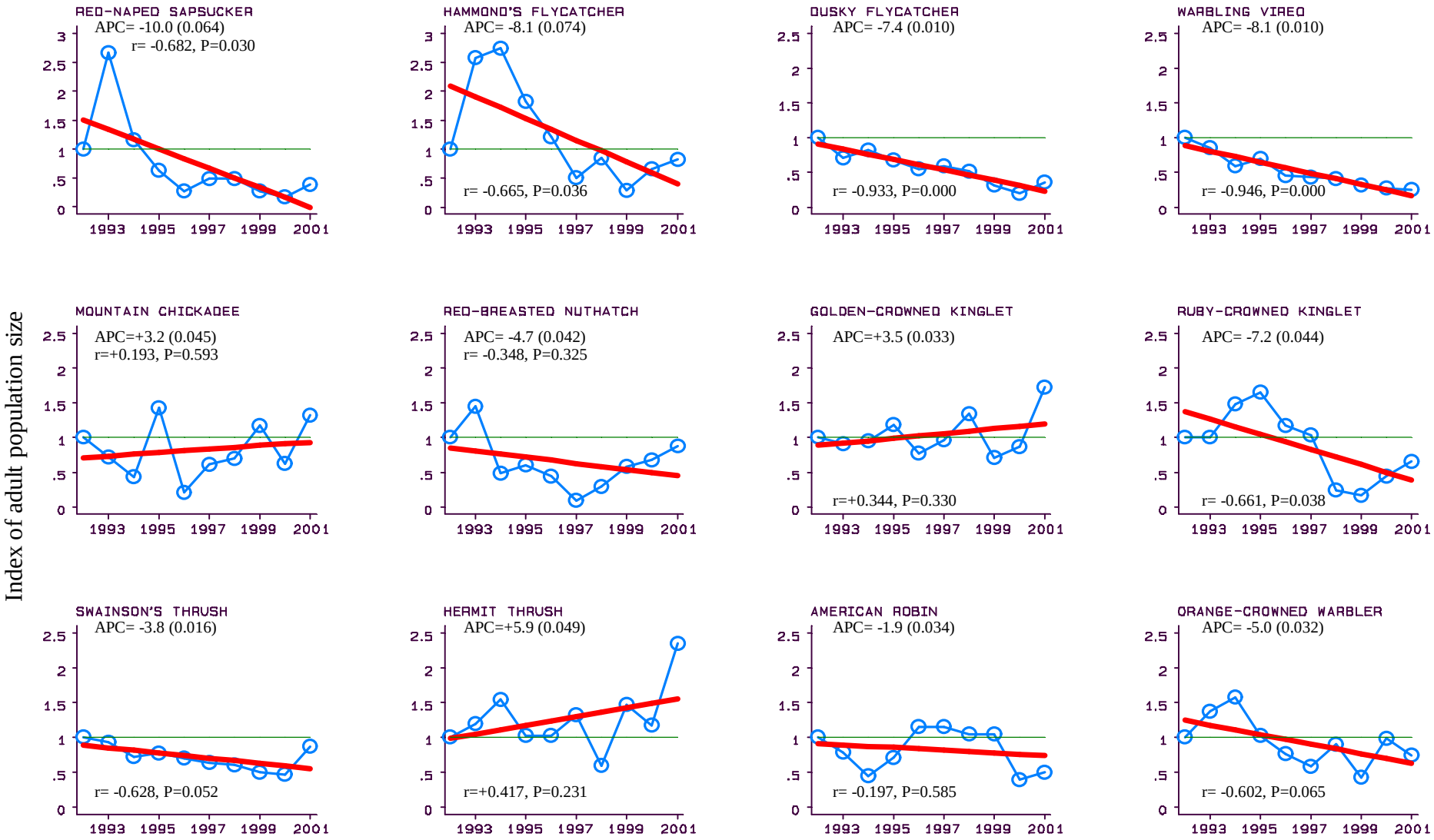


Figure 7. Population trends for 22 species and all species pooled in Umatilla National Forest over the ten years 1992-2001. The index of population size was arbitraril defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

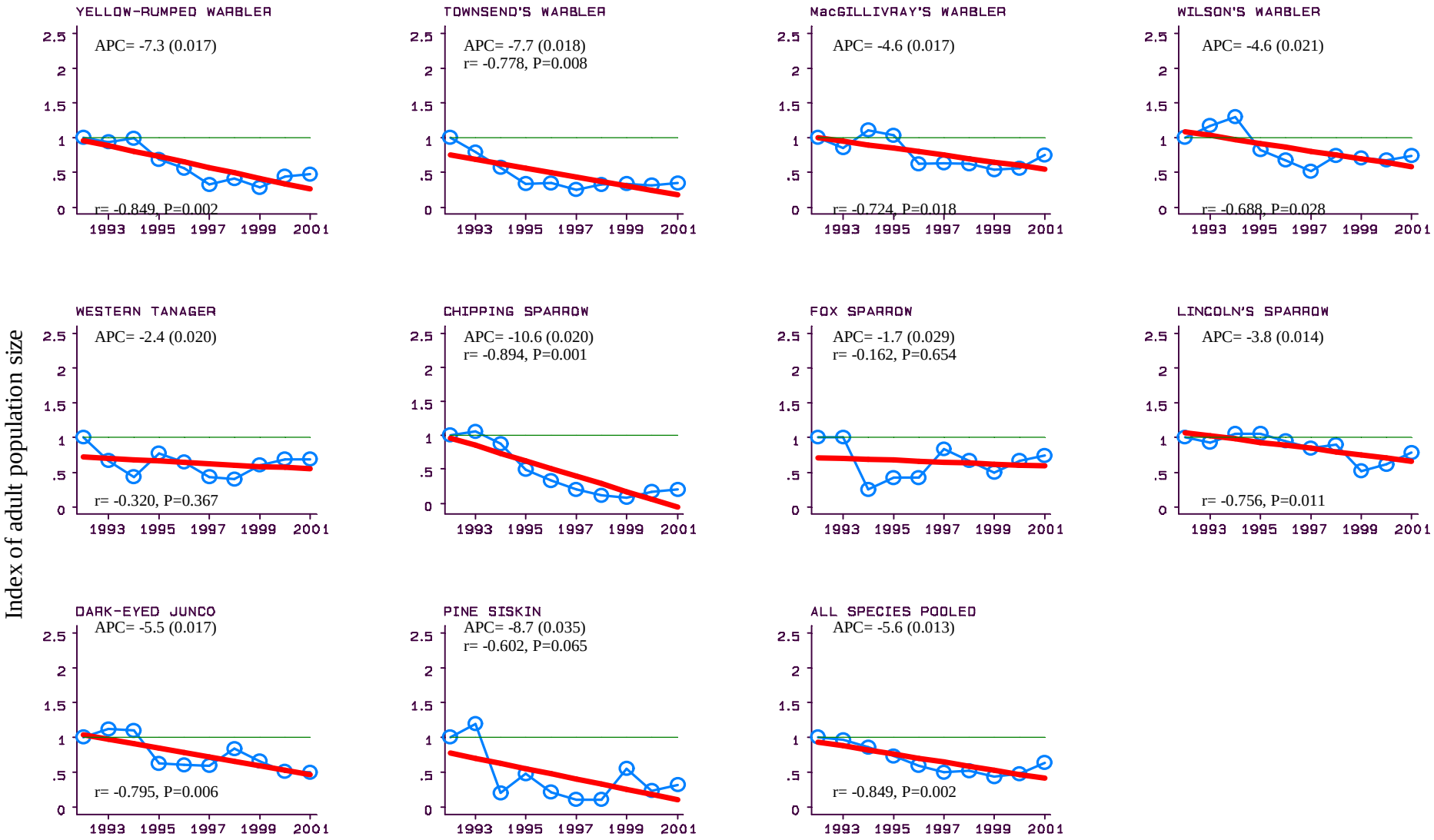


Figure 7. (cont.) Population trends for 22 species and all species pooled in Umatilla National Forest over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

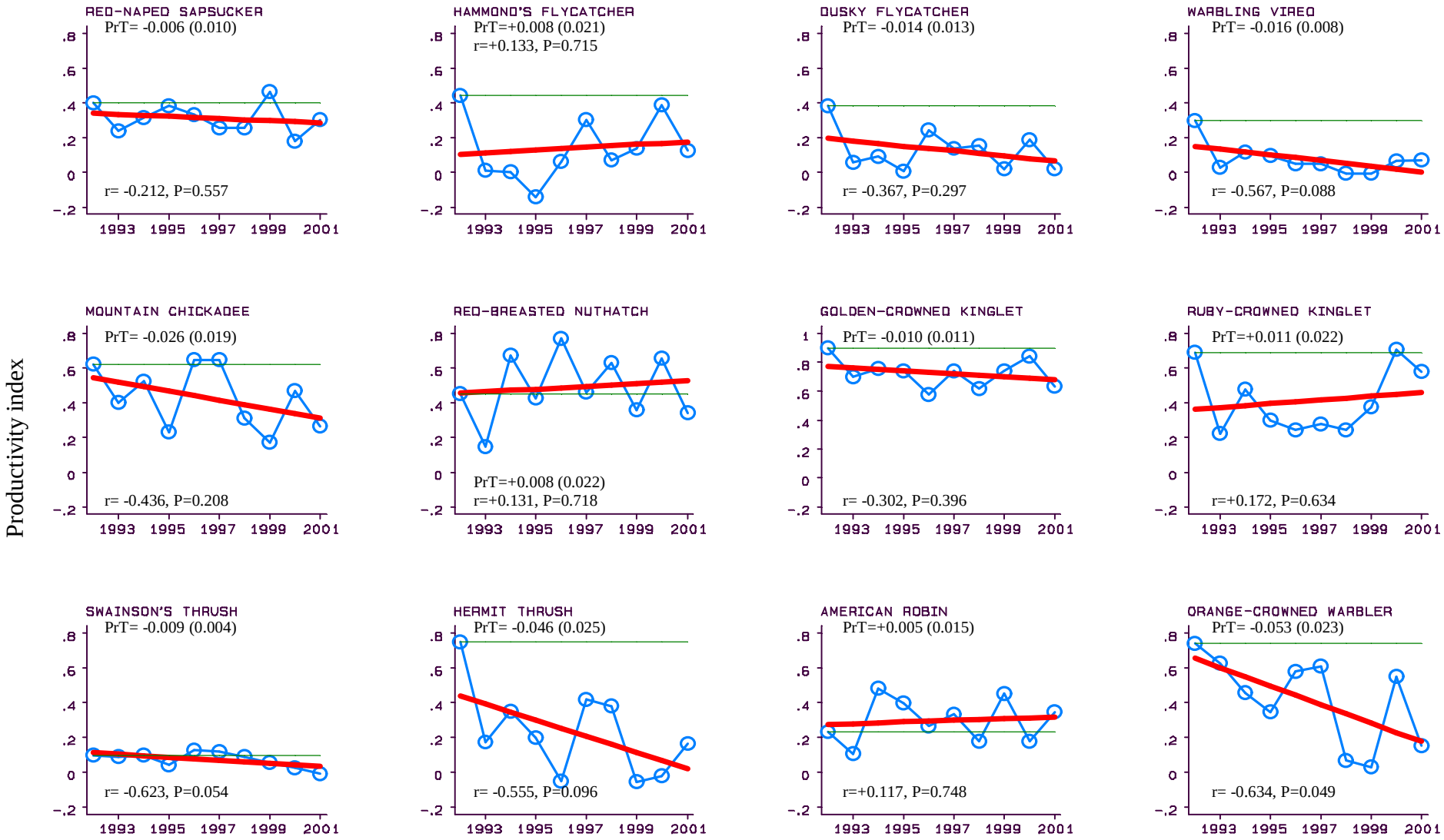


Figure 8. Trend in productivity for 22 species and all species pooled in Umatilla National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

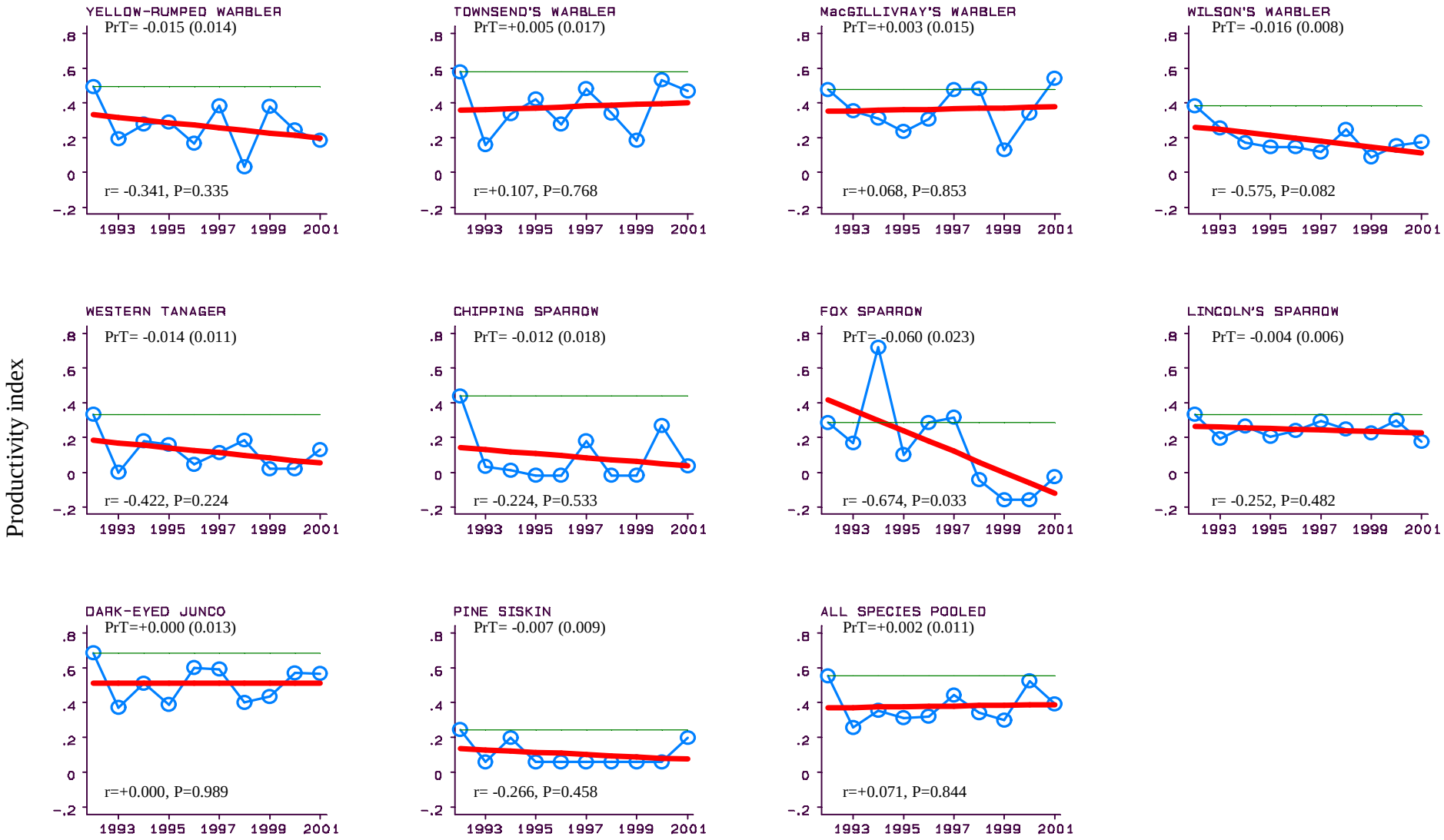


Figure 8. (cont.) Trend in productivity for 22 species and all species pooled in Umatilla National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

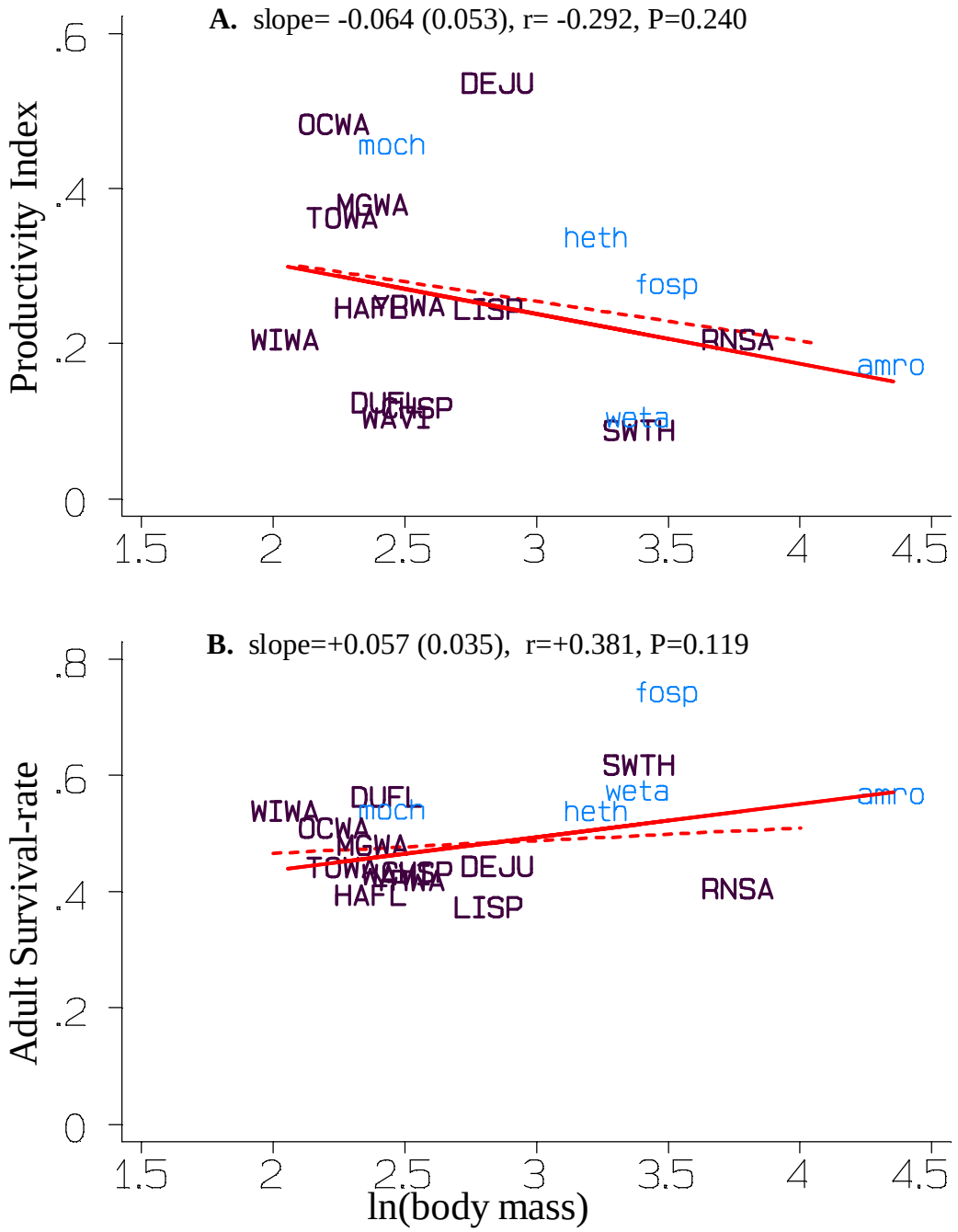


Figure 9. Regressions of productivity index (**A**) and adult survival rates (**B**) at Umatilla National Forest on the natural log of the body mass for 18 target species with coefficient of variations of the survival estimate less than 30% for the ten years 1992-2001. Species whose four-letter codes (Appendix I) are shown in bold capital letters showed substantially decreasing ($r < -0.5$) population trends, those in regular type capital letters had substantially increasing ($r > +0.5$) population trends, and those in lower-case letters had flat (absolute $r < 0.5$) trends. Regressions are shown for the correlations of the targe species (non-dashed line) and the correlations for all species throughout all of North America (dashed line). The slope, the r-value, and P-value are presented for the targe species line.

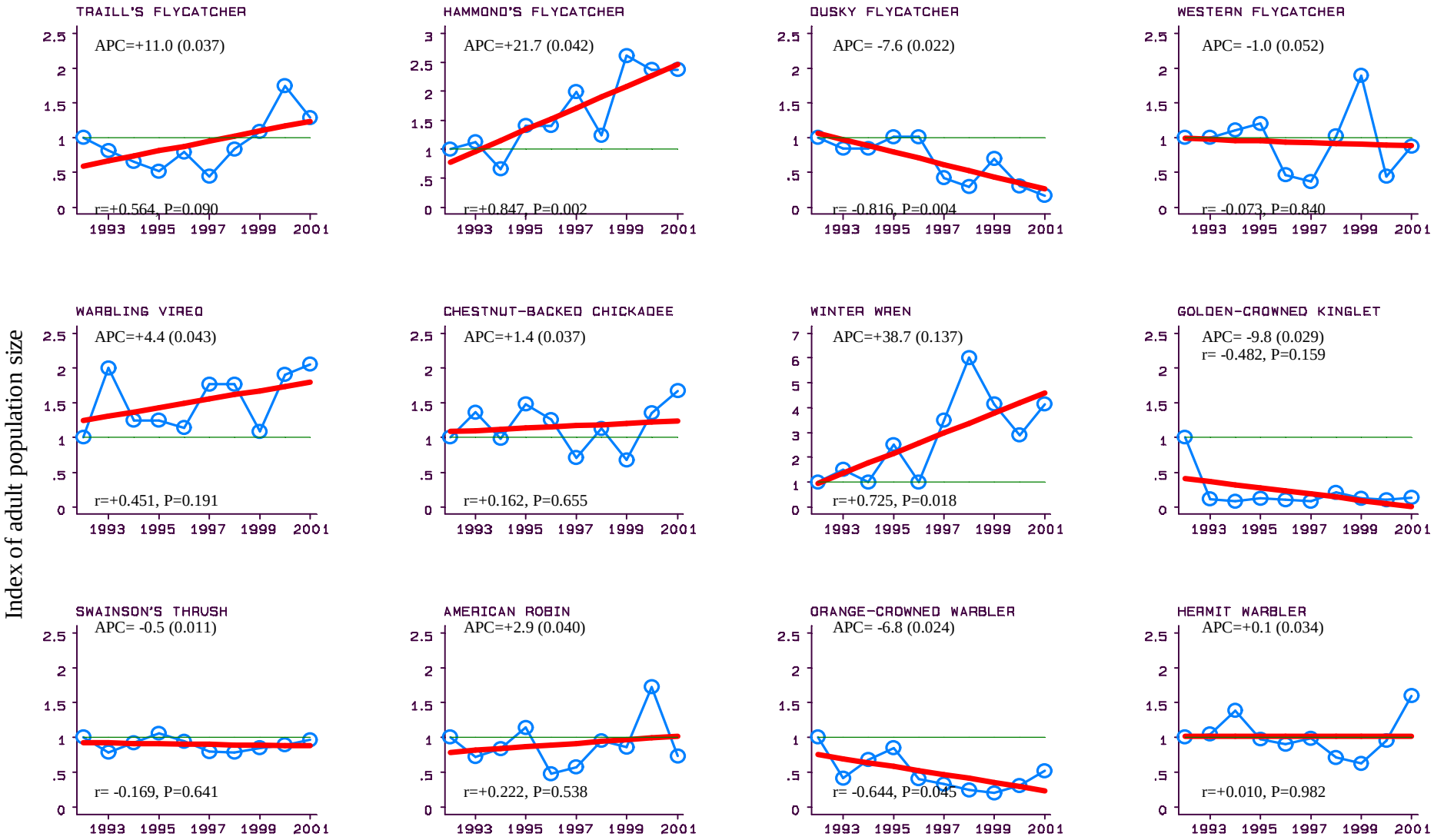


Figure 10. Population trends for 19 species and all species pooled in Willamette National Forest over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

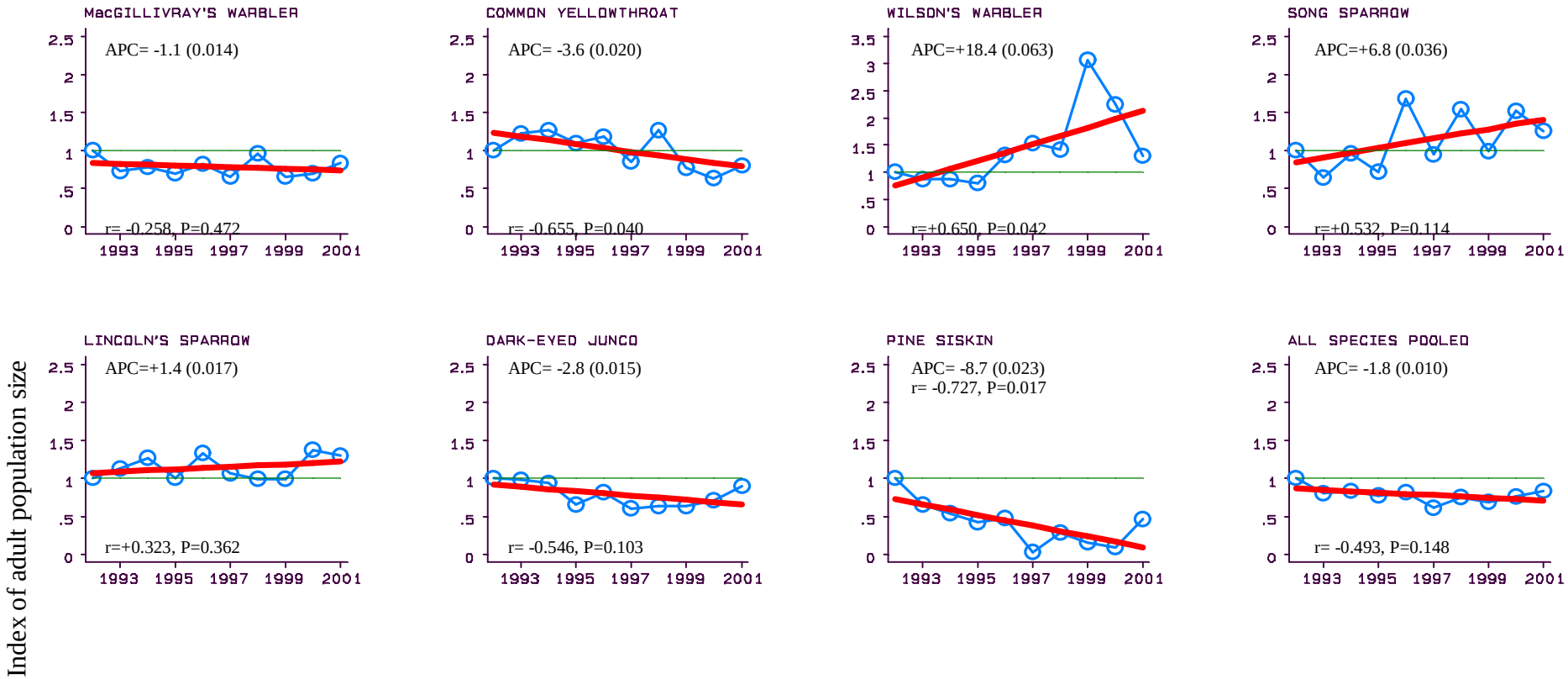


Figure 10. (cont.) Population trends for 19 species and all species pooled in Willamette National Forest over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

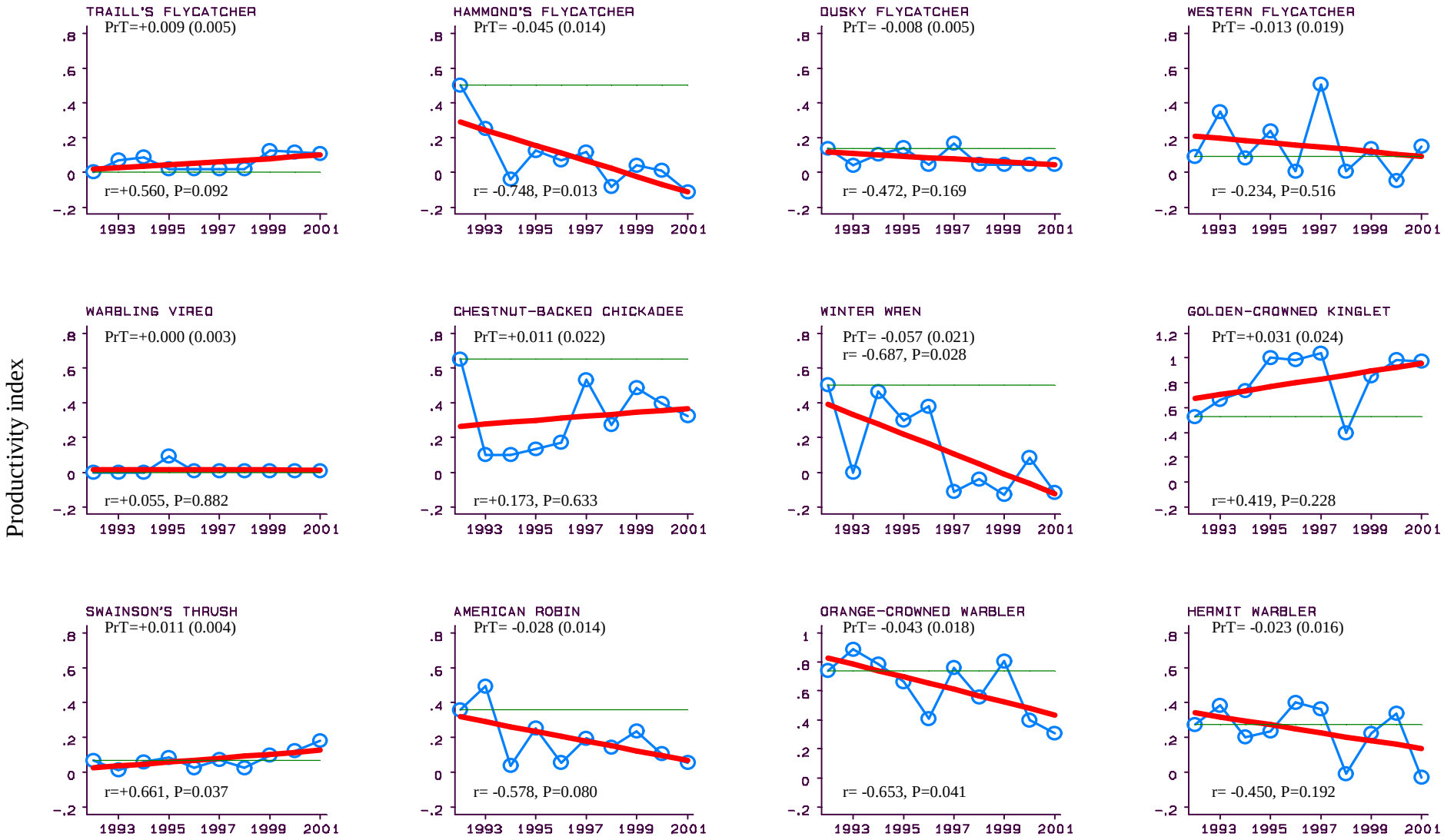


Figure 11. Trend in productivity for 19 species and all species pooled in Willamette National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

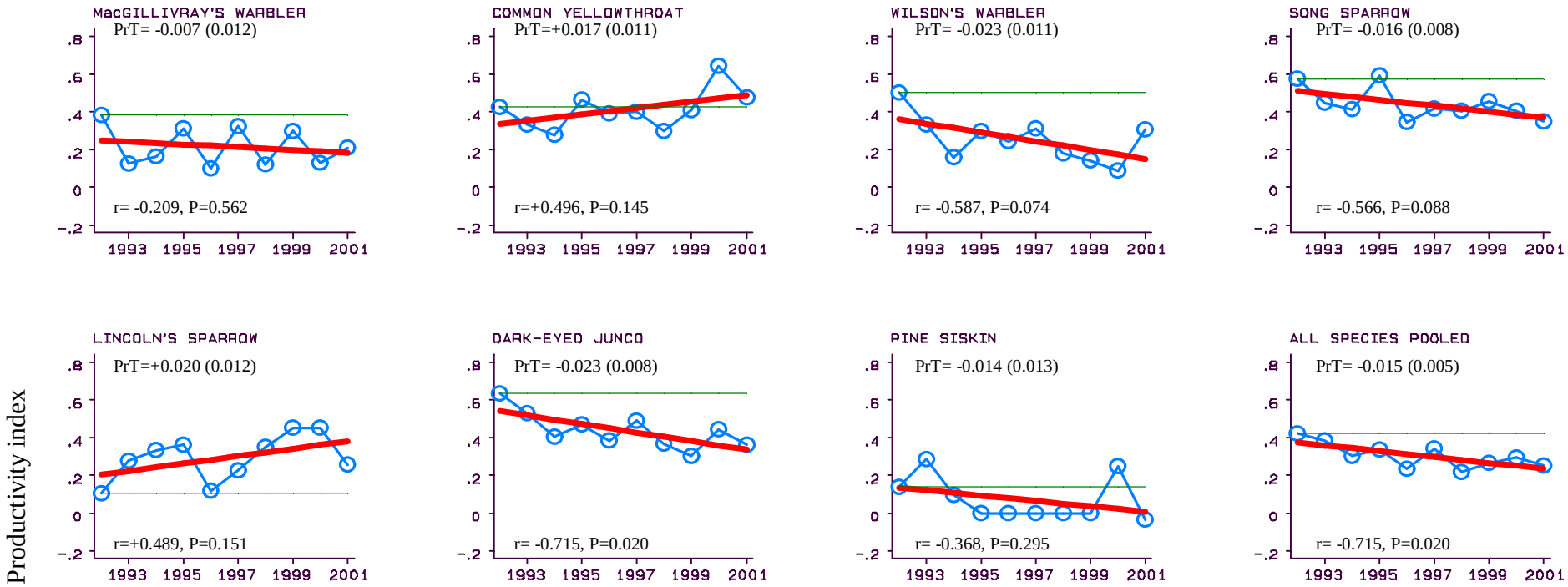


Figure 11. (cont.) Trend in productivity for 19 species and all species pooled in Willamette National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

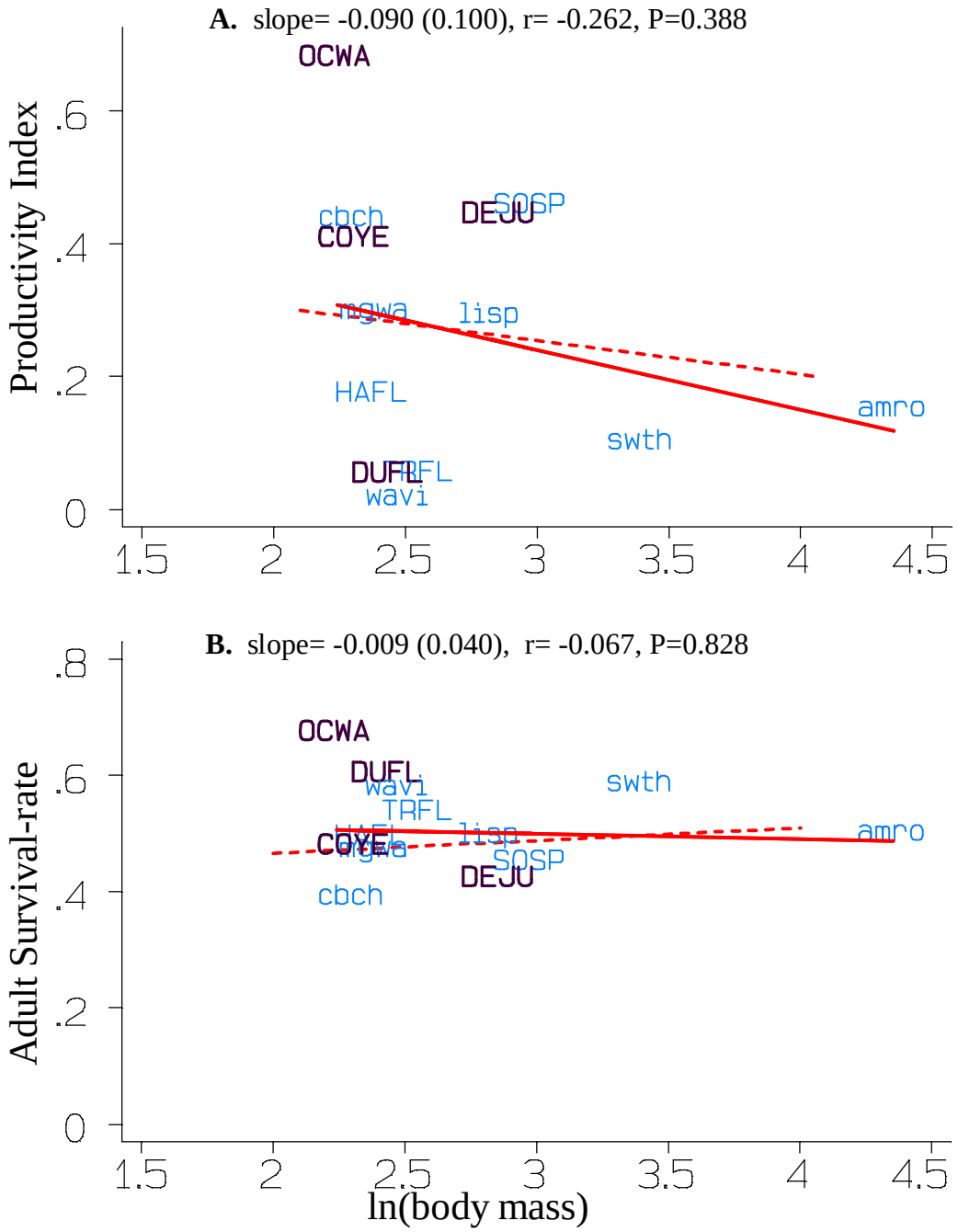


Figure 12. Regressions of productivity index (**A**) and adult survival rates (**B**) at Willamette National Forest on the natural log of the body mass for 13 target species with coefficient of variations of the survival estimate less than 30% for the ten years 1992-2001. Species whose four-letter codes (Appendix I) are shown in bold capital letters showed substantially decreasing ($r < -0.5$) population trends, those in regular type capital letters had substantially increasing ($r > +0.5$) population trends, and those in lower-case letters had flat (absolute $r < 0.5$) trends. Regressions are shown for the correlations of the targe species (non-dashed line) and the correlations for all species throughout all of North America (dashed line). The slope, the r-value, and P-value are presented for the targe species line.

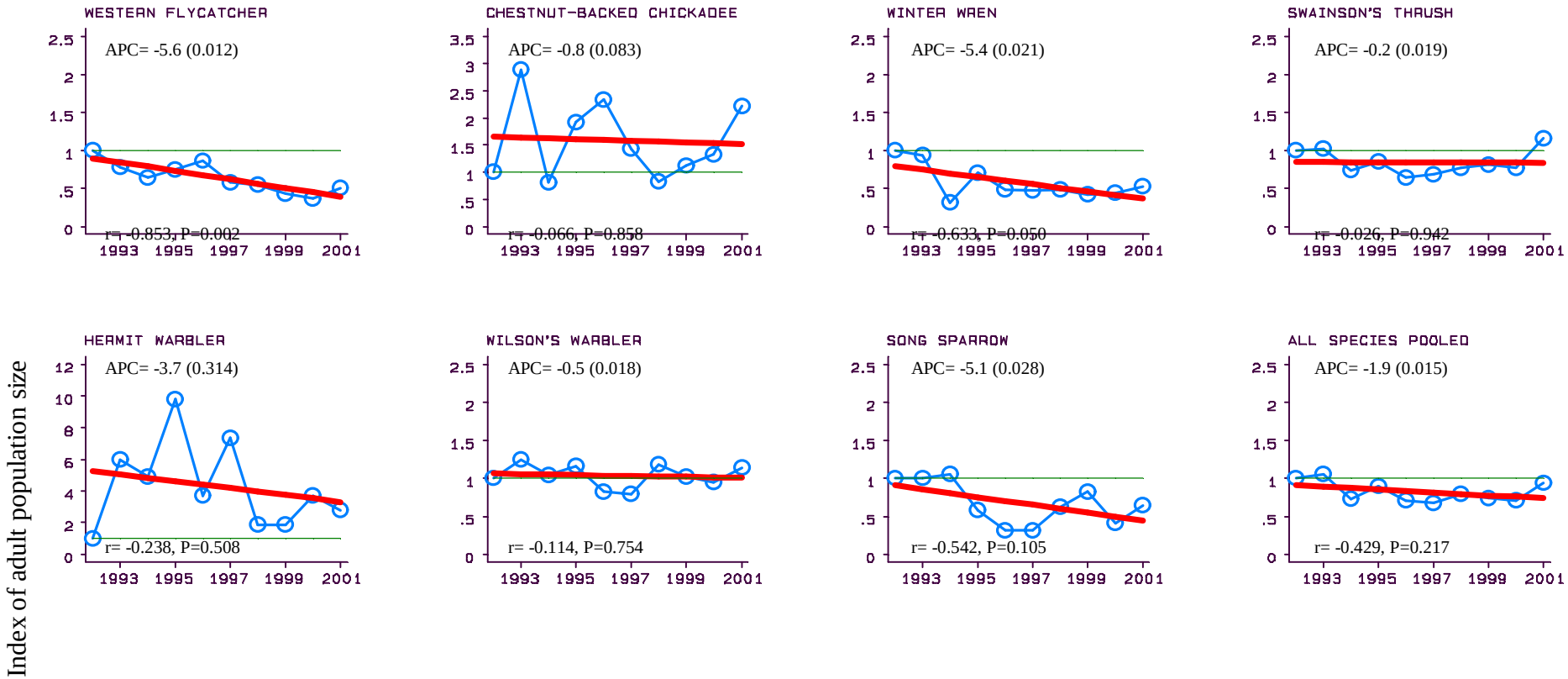


Figure 13. Population trends for seven species and all species pooled in Siuslaw National Forest over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

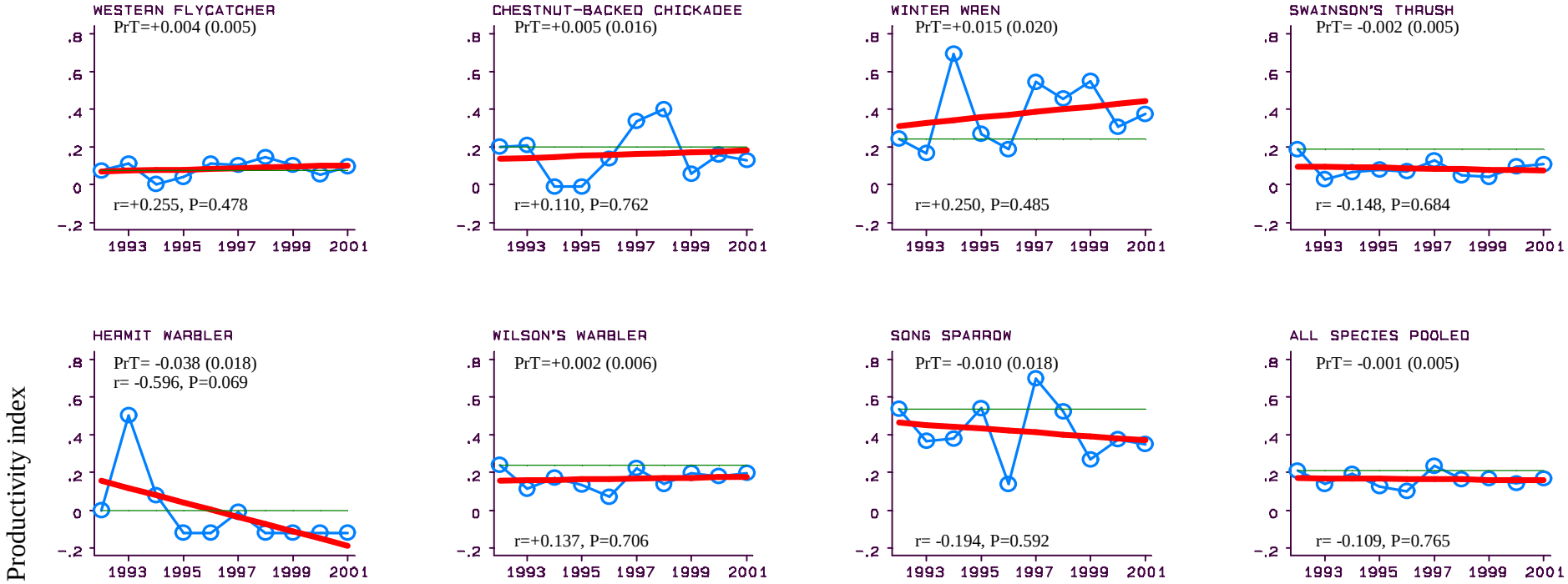


Figure 14. Trend in productivity for seven species and all species pooled in Siuslaw National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

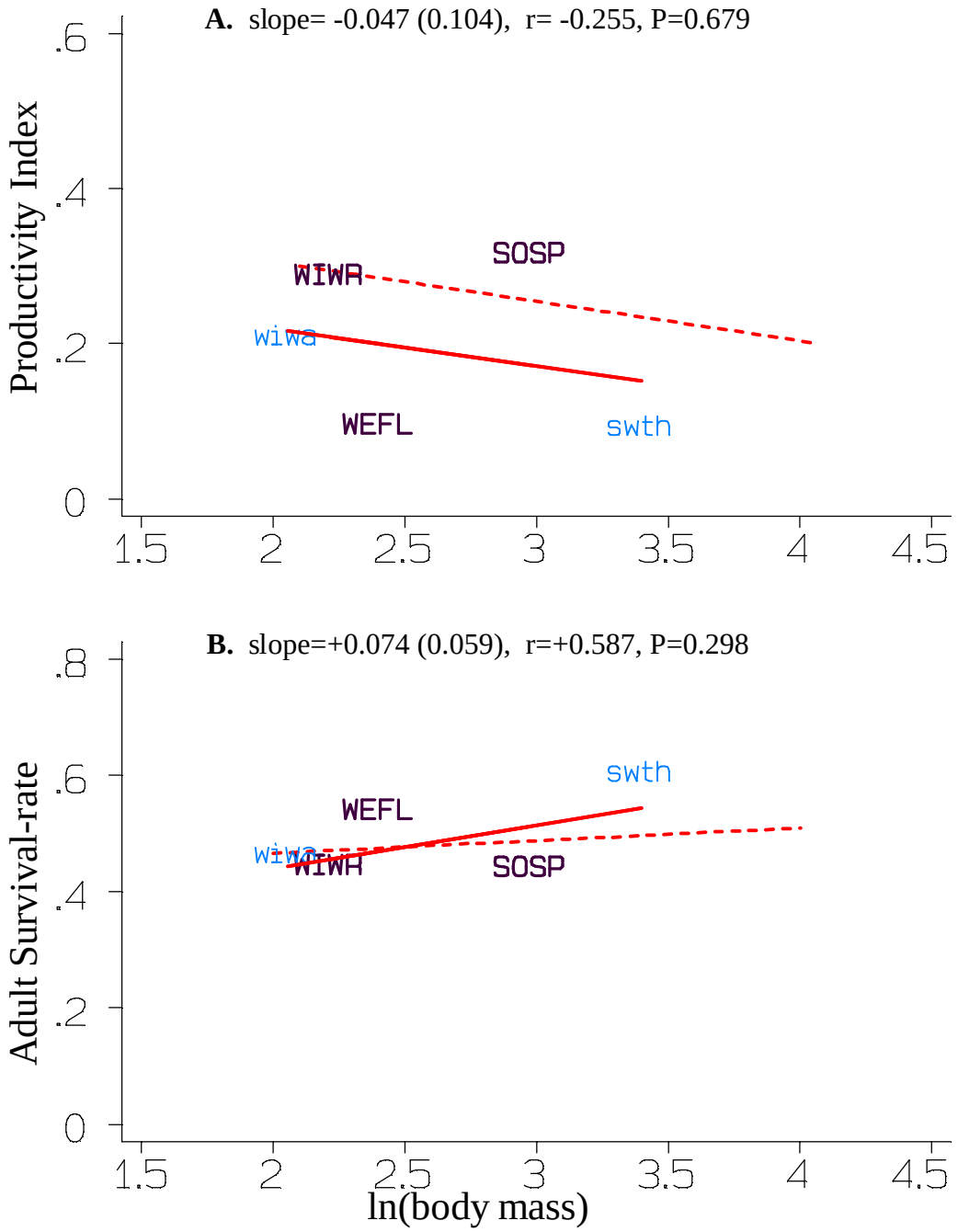


Figure 15. Regressions of productivity index (**A**) and adult survival rates (**B**) at Siuslaw National Forest on the natural log of the body mass for five target species with coefficient of variations of the survival estimate less than 30% for the ten years 1992-2001. Species whose four-letter codes (Appendix I) are shown in bold capital letters showed substantially decreasing ($r < -0.5$) population trends, those in regular type capital letters had substantially increasing ($r > +0.5$) population trends, and those in lower-case letters had flat (absolute $r < 0.5$) trends. Regressions are shown for the correlations of the targe species (non-dashed line) and the correlations for all species throughout all of North America (dashed line). The slope, the r-value, and P-value are presented for the targe species line.

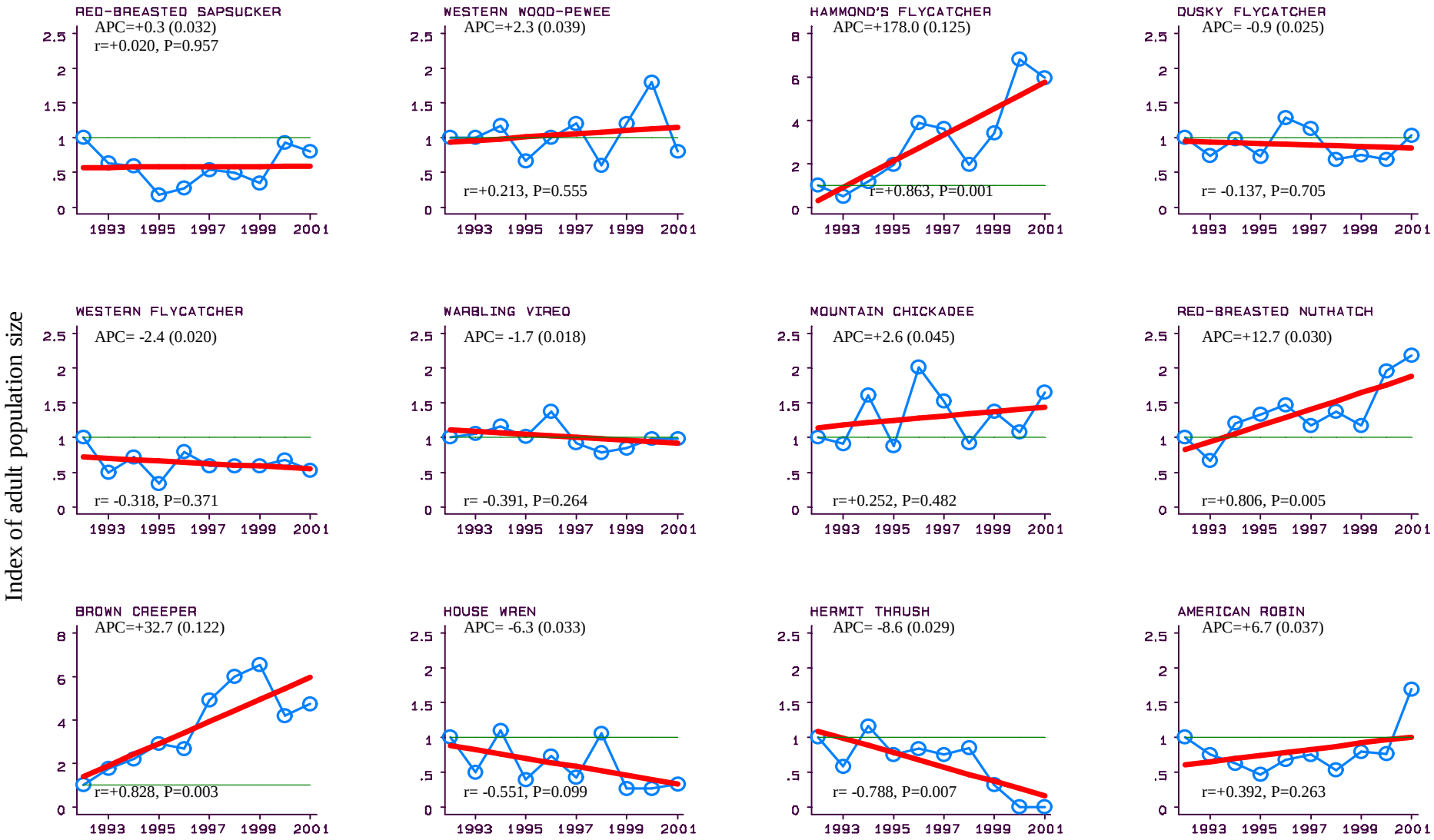


Figure 16. Population trends for 19 species and all species pooled in Fremont National Forest over the ten years 1992-2001. The index of population size was arbitraril defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

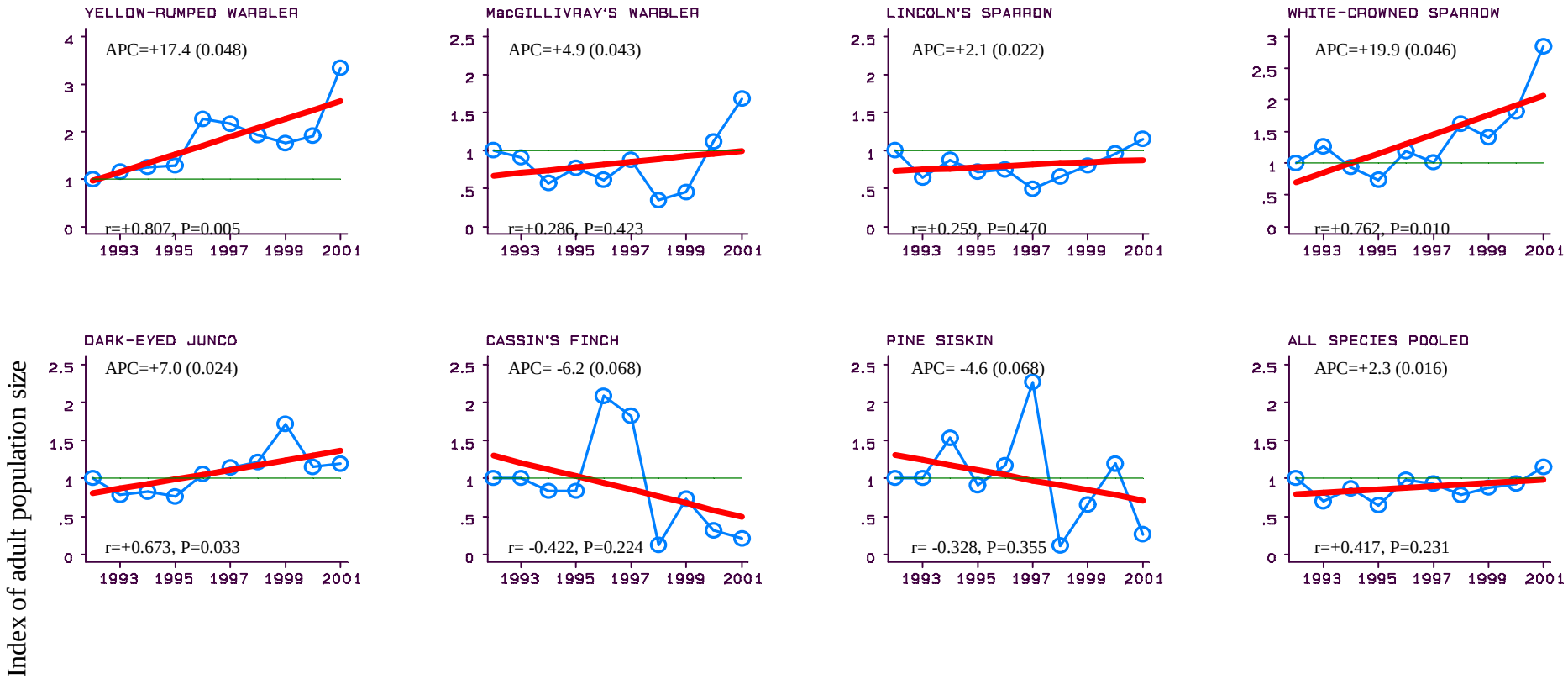


Figure 16. (cont.) Population trends for 19 species and all species pooled in Fremont National Forest over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

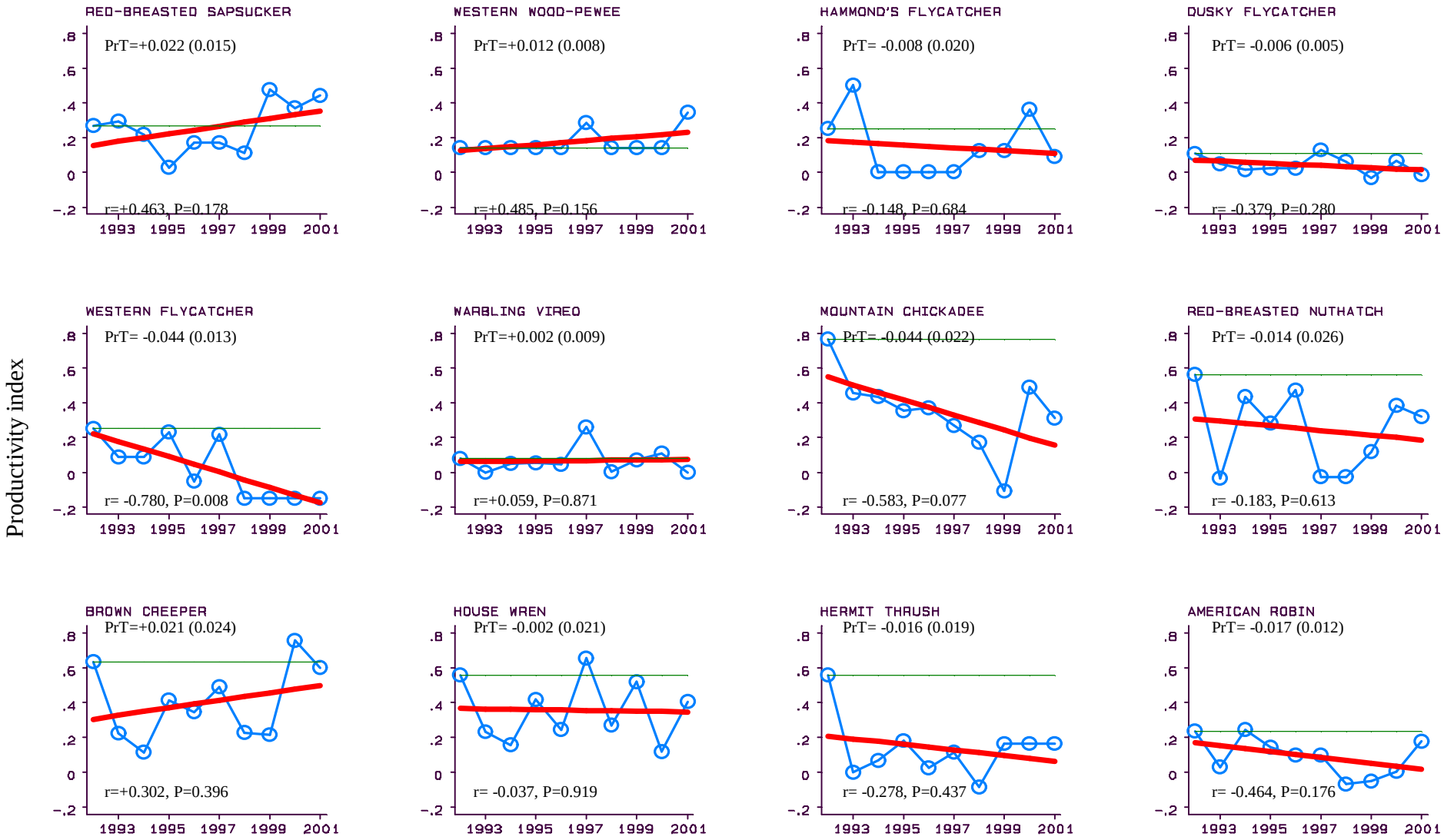


Figure 17. Trend in productivity for 19 species and all species pooled in Fremont National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

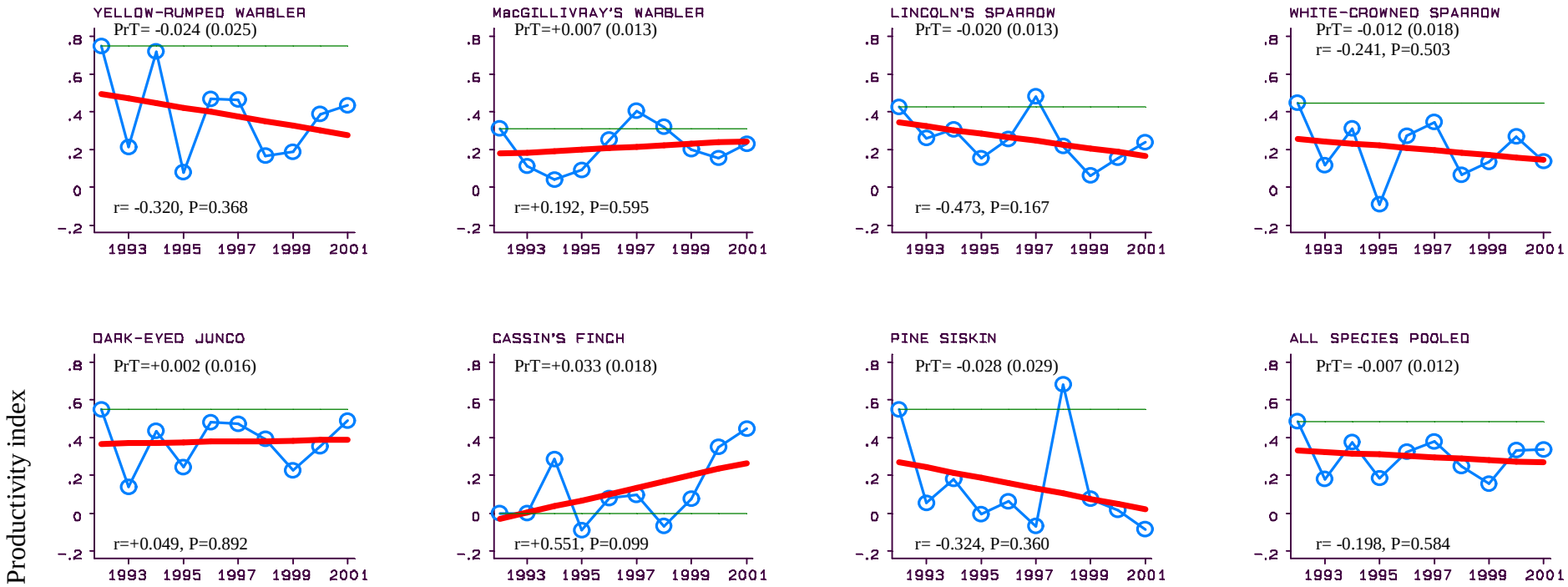


Figure 17. (cont.) Trend in productivity for 19 species and all species pooled in Fremont National Forest over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

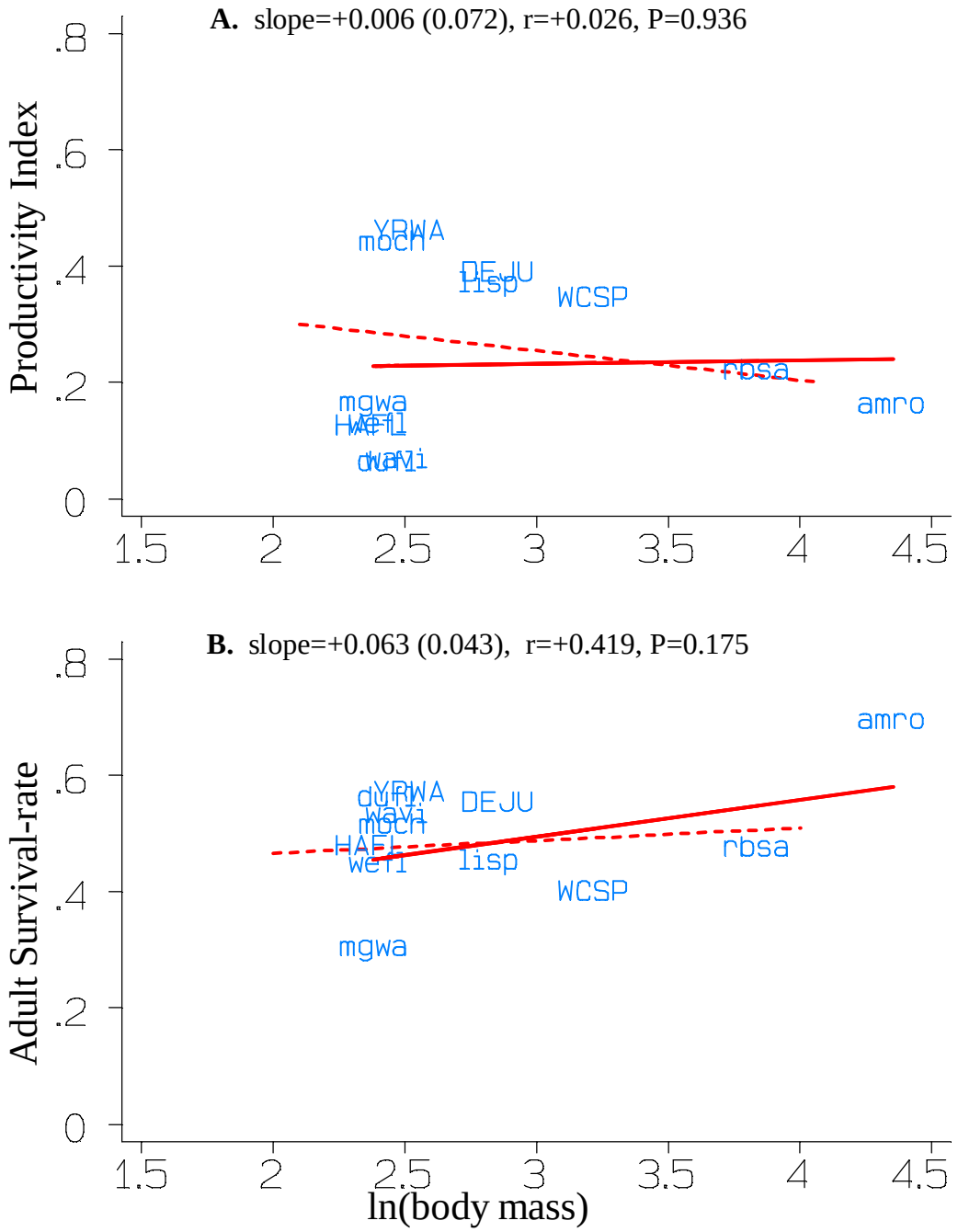


Figure 18. Regressions of productivity index (**A**) and adult survival rates (**B**) at Fremont National Forest on the natural log of the body mass for 12 target species with coefficient of variations of the survival estimate less than 30% for the ten years 1992-2001. Species whose four-letter codes (Appendix I) are shown in bold capital letters showed substantially decreasing ($r < -0.5$) population trends, those in regular type capital letters had substantially increasing ($r > +0.5$) population trends, and those in lower-case letters had flat (absolute $r < 0.5$) trends. Regressions are shown for the correlations of the targe species (non-dashed line) and the correlations for all species throughout all of North America (dashed line). The slope, the r-value, and P-value are presented for the targe species line.

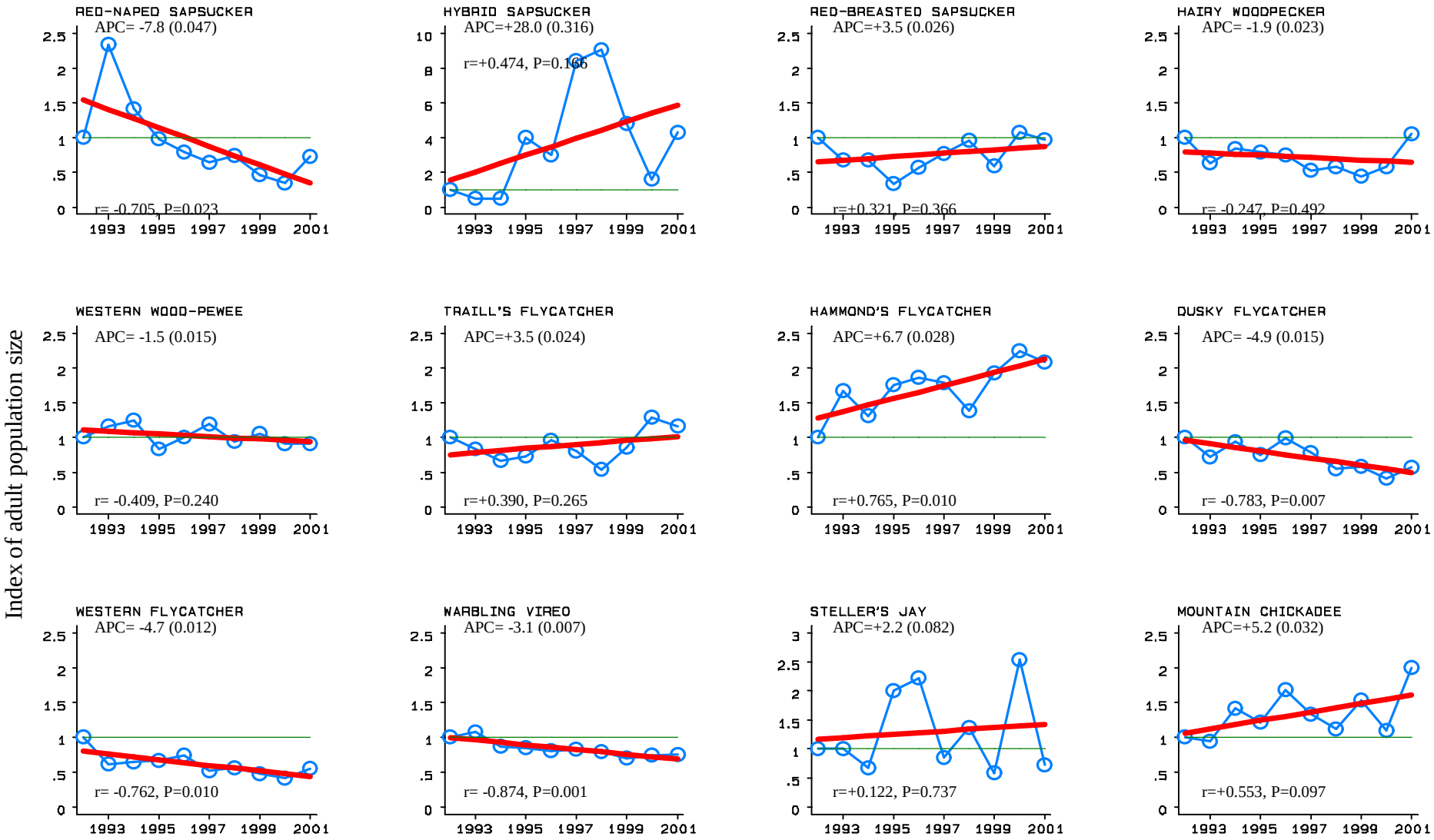


Figure 19. Population trends for 43 species and all species pooled in Forest Service Region 6 over the ten years 1992-2001. The index of population size was arbitraril defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

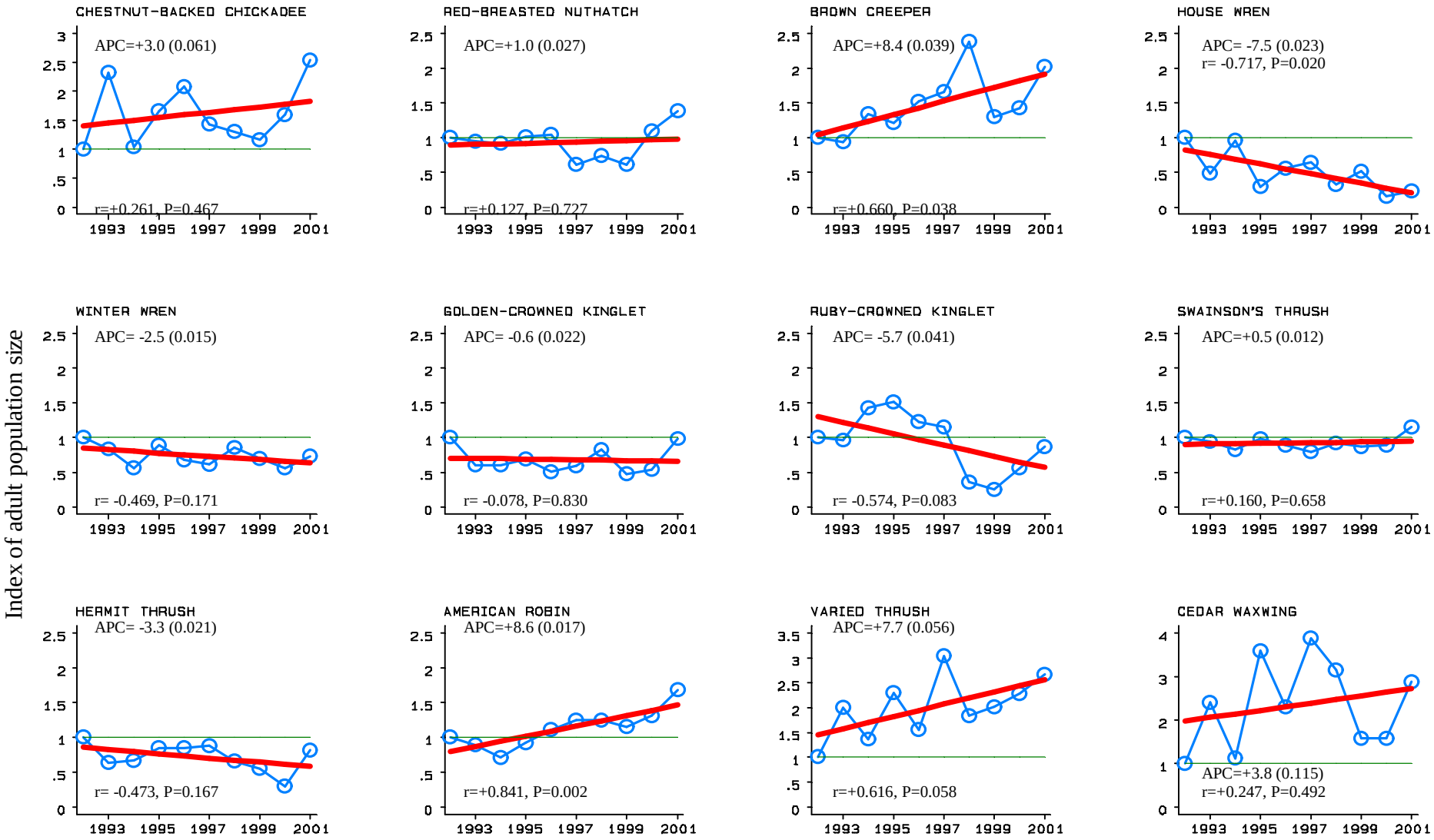


Figure 19. (cont.) Population trends for 43 species and all species pooled in Forest Service Region 6 over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

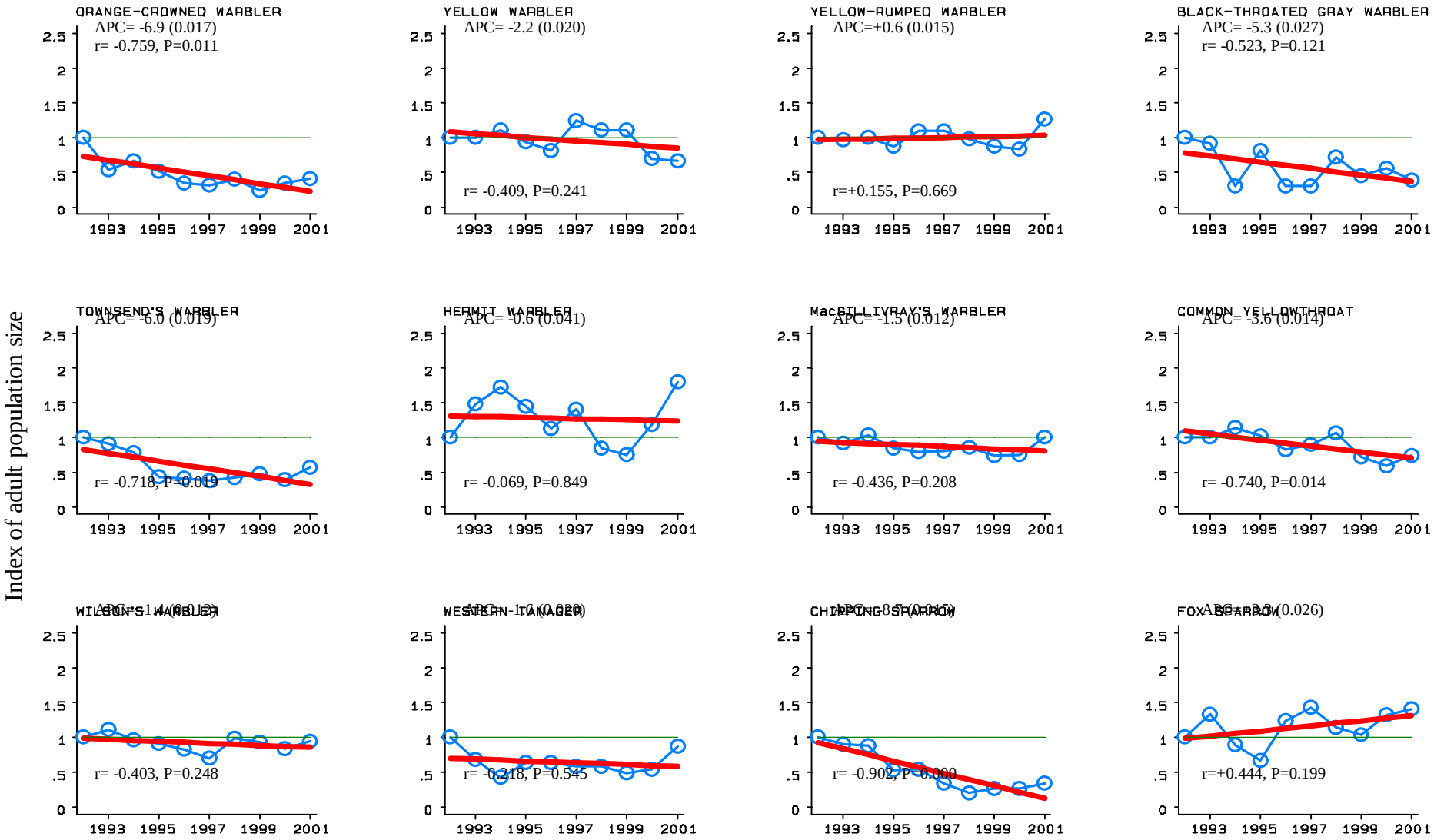


Figure 19. (cont.) Population trends for 43 species and all species pooled in Forest Service Region 6 over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

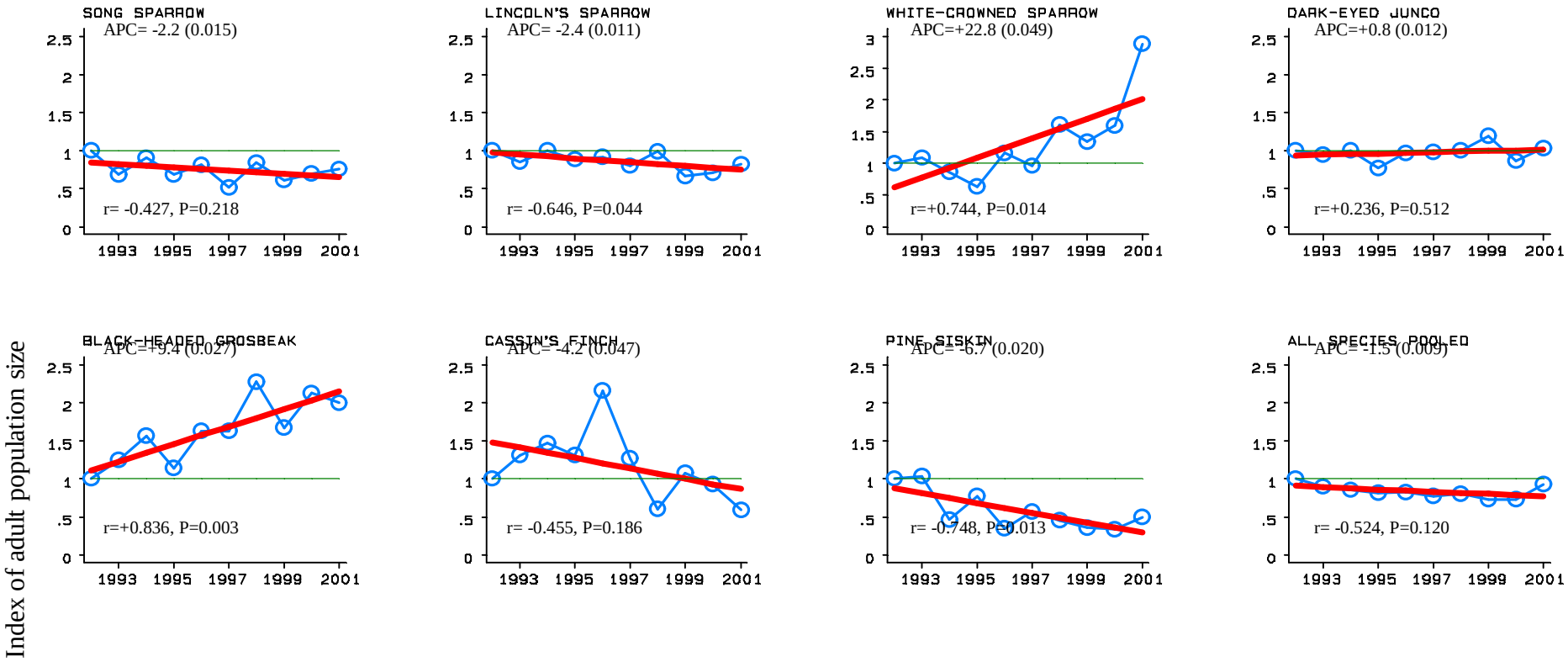


Figure 19. (cont.) Population trends for 43 species and all species pooled in Forest Service Region 6 over the ten years 1992-2001. The index of population size was arbitrarily defined as 1.0 in 1992. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (*APC*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

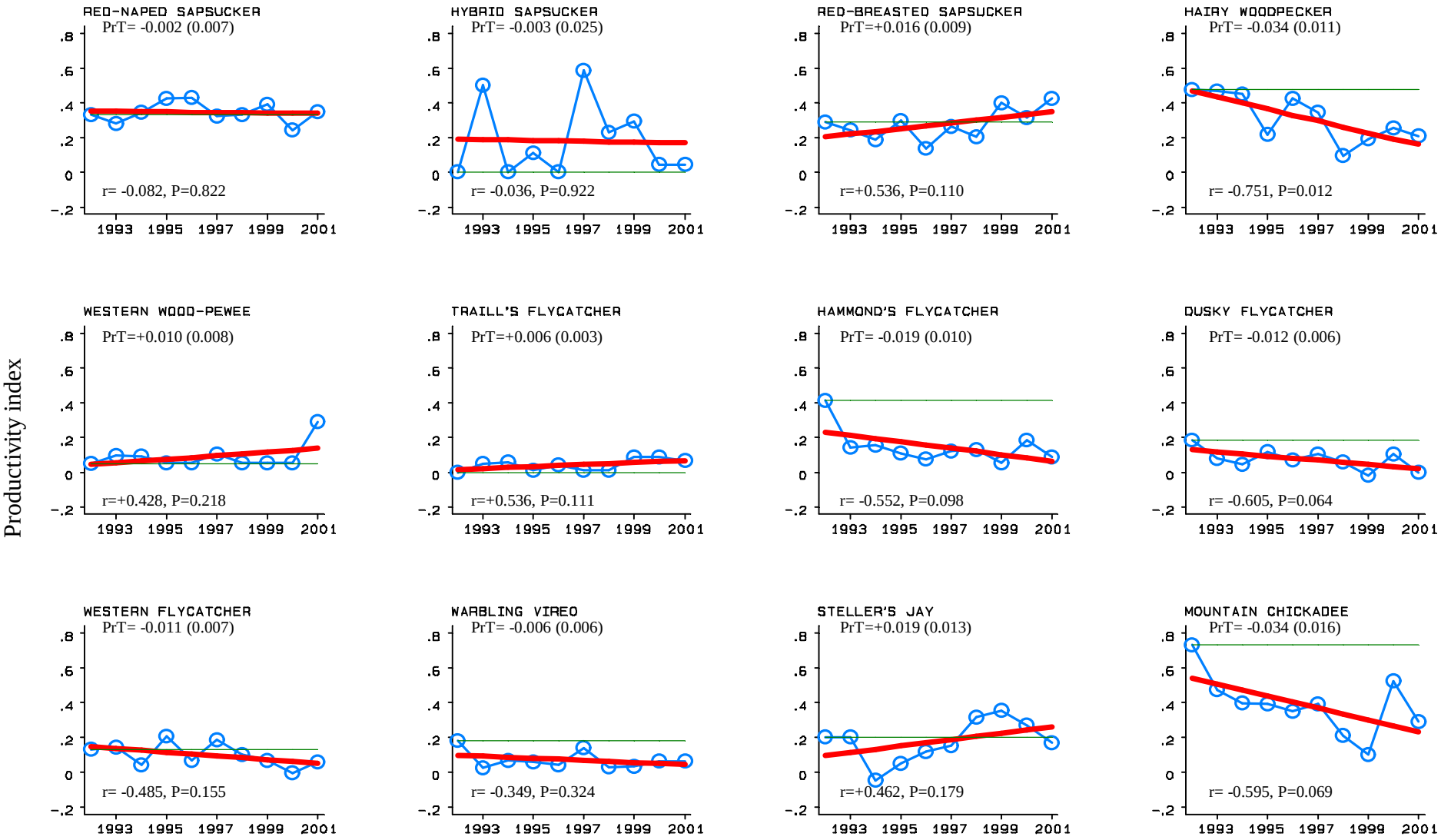


Figure 20. Trend in productivity for 43 species and all species pooled in Forest Service Region 6 over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

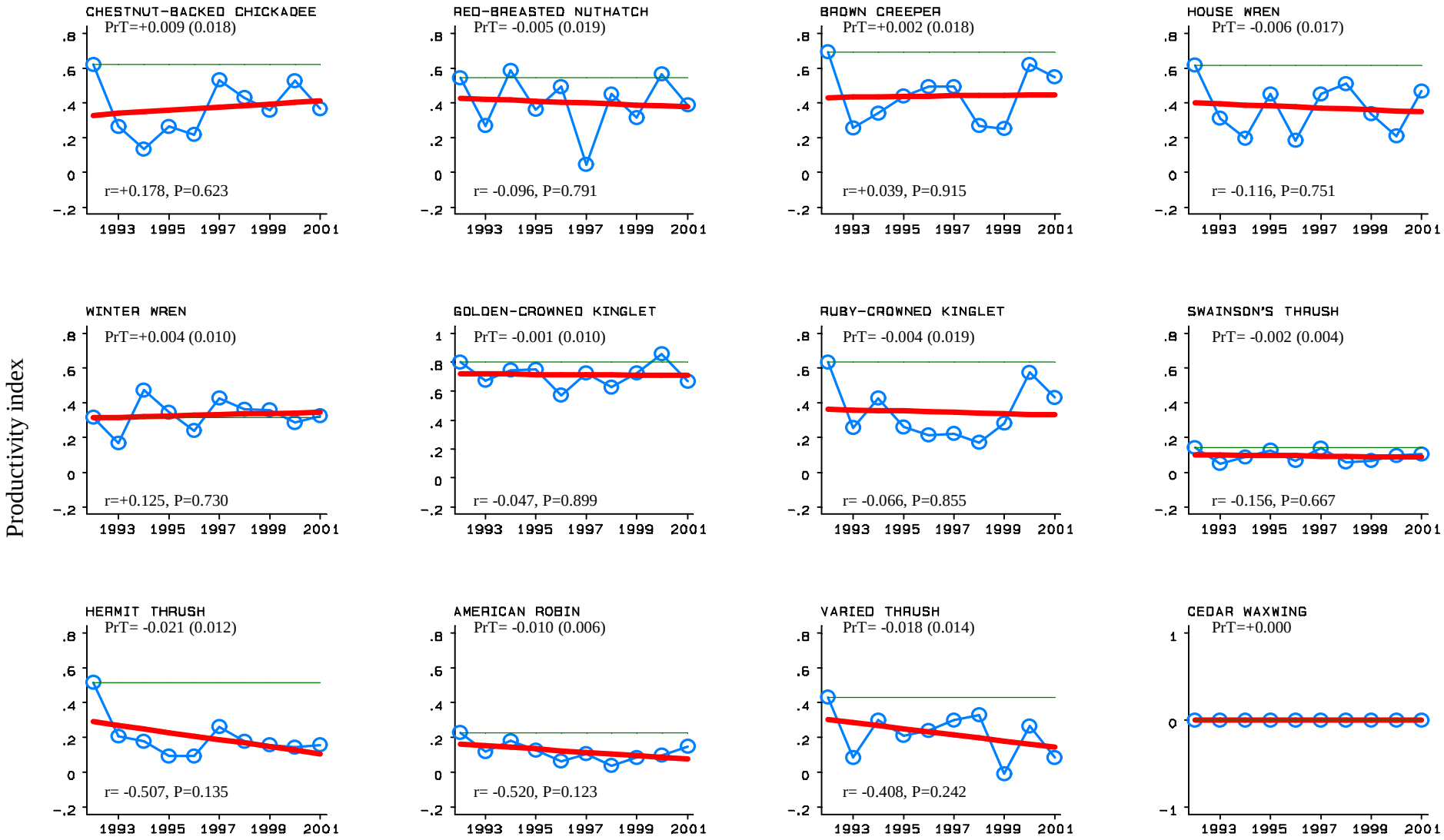


Figure 20. (cont.) Trend in productivity for 43 species and all species pooled in Forest Service Region 6 over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

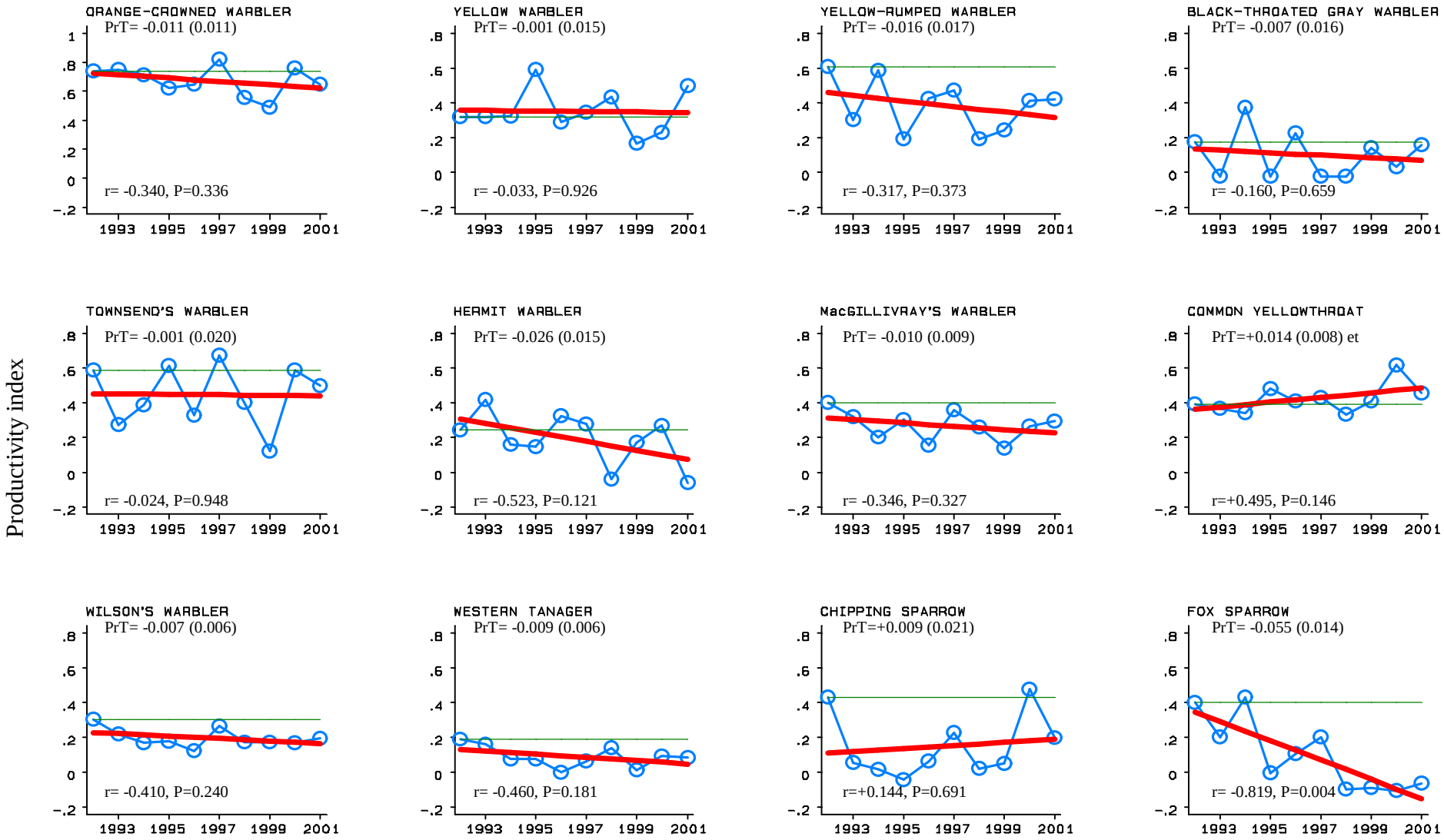


Figure 20. (cont.) Trend in productivity for 43 species and all species pooled in Forest Service Region 6 over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

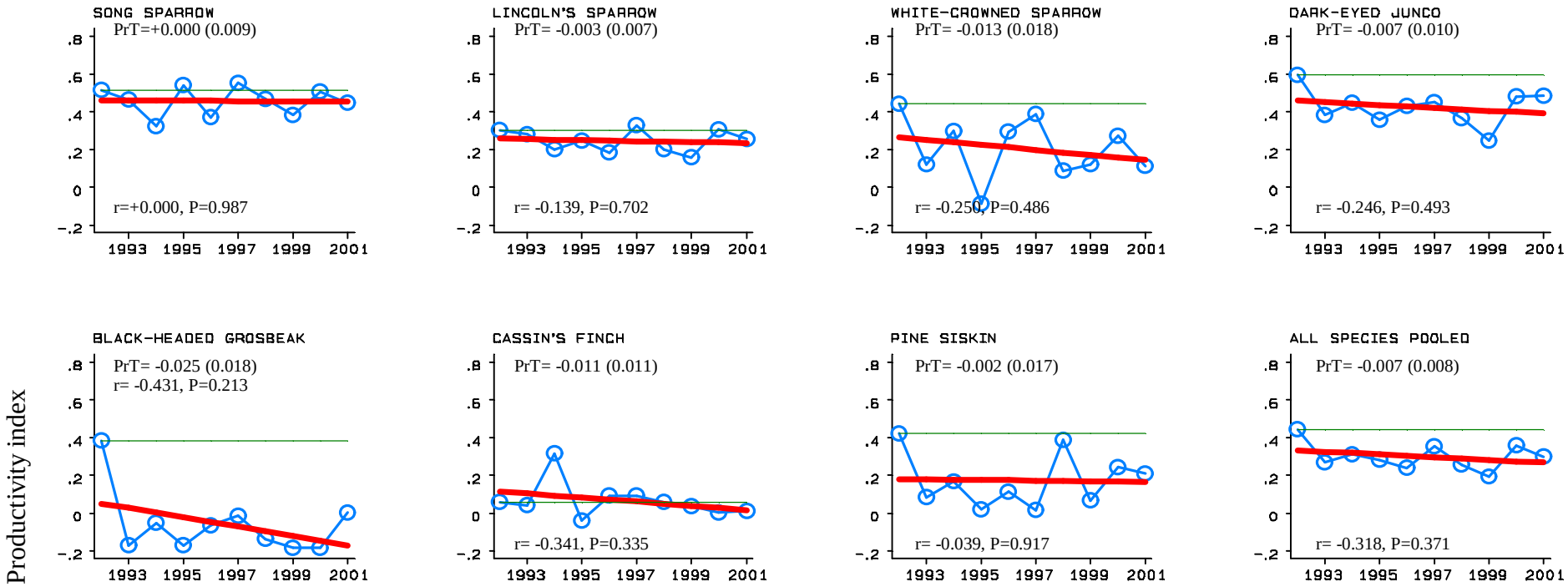


Figure 20. (cont.) Trend in productivity for 43 species and all species pooled in Forest Service Region 6 over the ten years 1992-2001. The productivity index was defined as the actual productivity value in 1992. Indices for subsequent years were determined from constant-effort between-year changes in proportion of young in the catch from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (*PrT*), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are also shown on each graph.

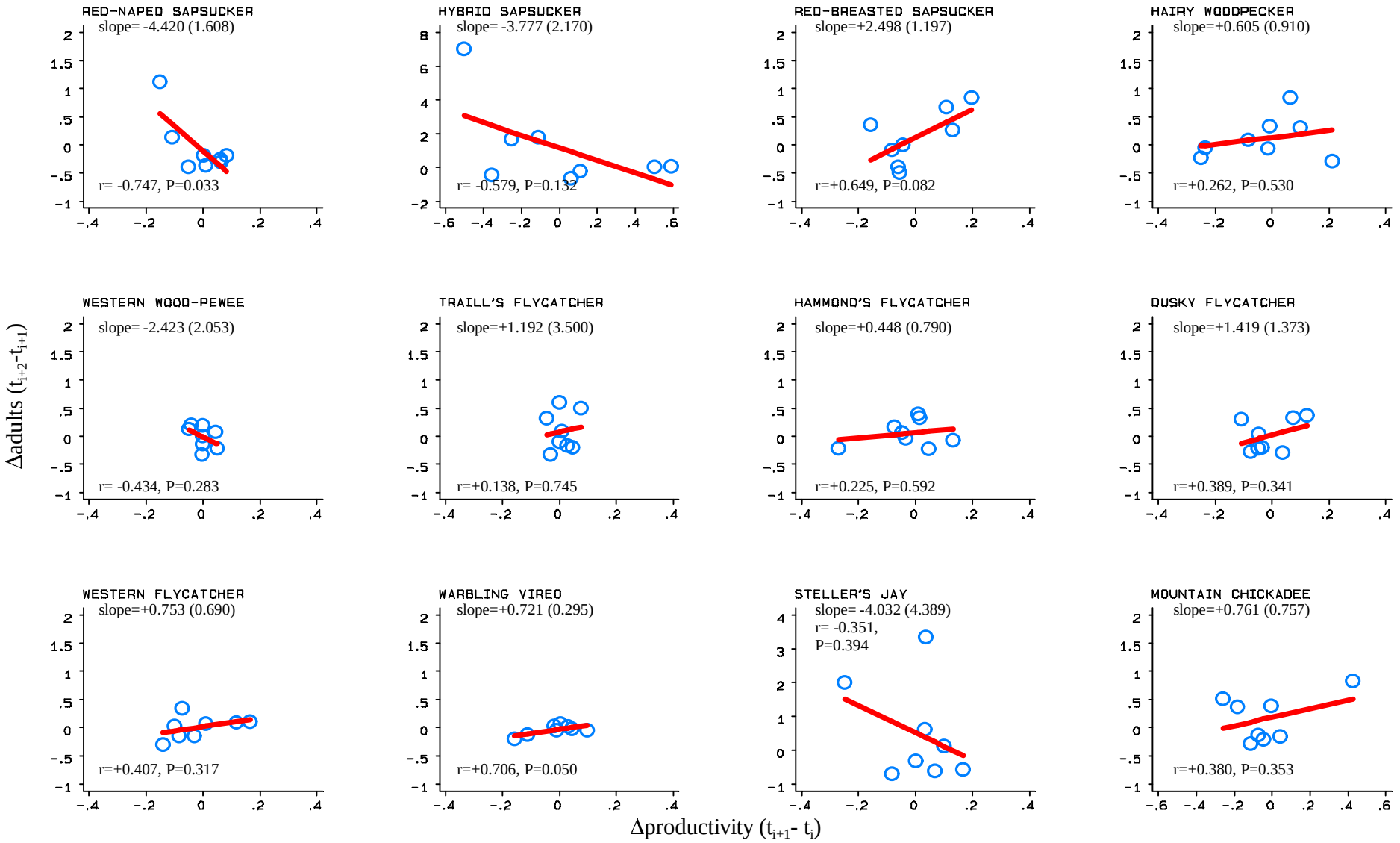


Figure 21. The regression of the proportional change in the number of adults between year i+2 and year i+1 on the absolute change in productivity between year i+1 and year i ("productivity/population correlation") for 43 species and all species pooled in Forest Service Region 6 over the years 1992-2001. The constant-effort between-year changes were obtained from data pooled from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line, the standard error of the slope (in parentheses), the correlation coefficient (*r*), and significance of the correlation coefficient (*P*) are presented on each graph.

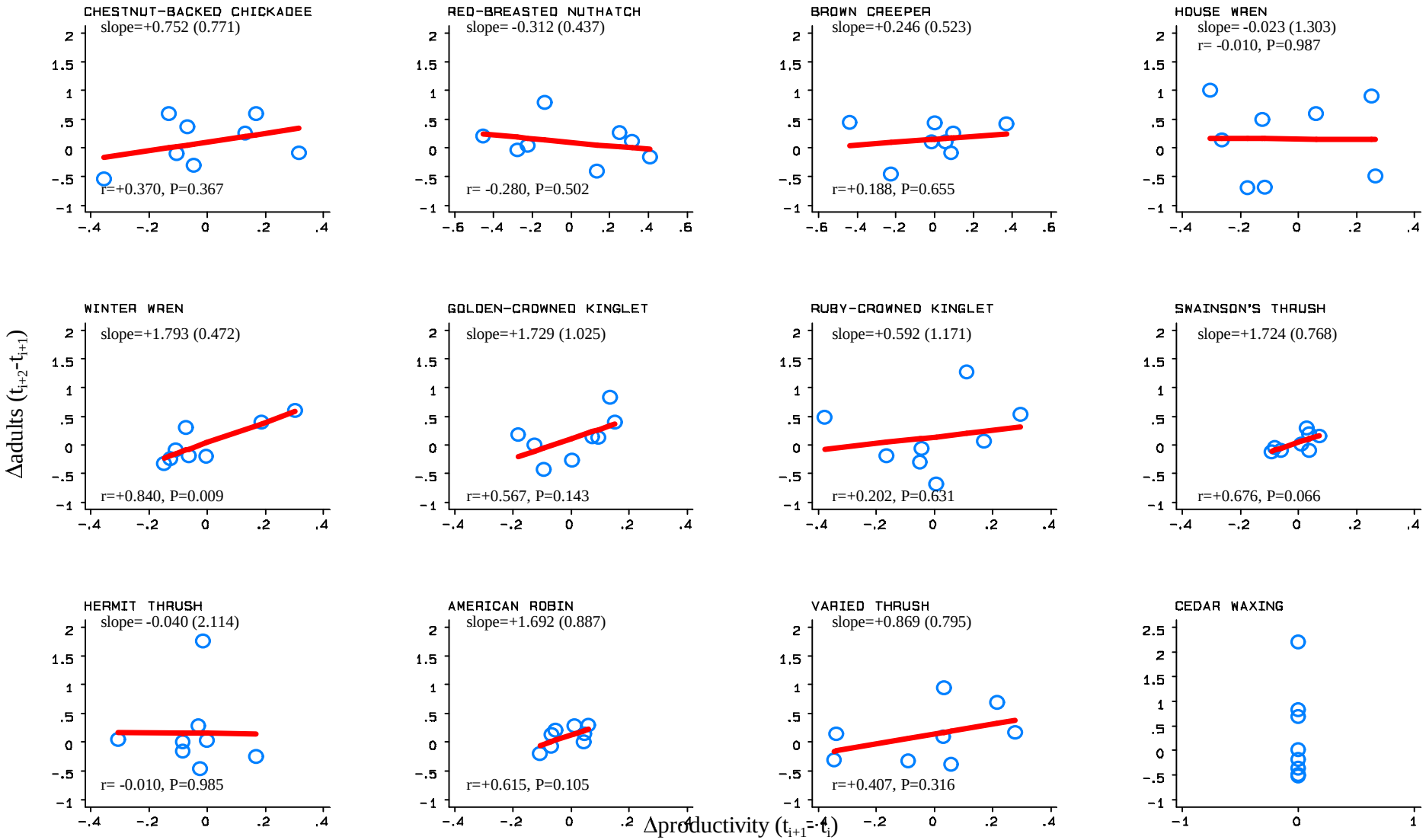


Figure 21. (cont.) The regression of the proportional change in the number of adults between year i+2 and year i+1 on the absolute change in productivity between yea i+1 and year i ("productivity/population correlation") for 43 species and all species pooled in Forest Service Region 6 over the years 1992-2001. The constant-effort between-year changes were obtained from data pooled from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line, the standard error of the slope (in parentheses), the correlation coefficient (*r*), and significance of the correlation coefficient (*P*) are presented on each graph.

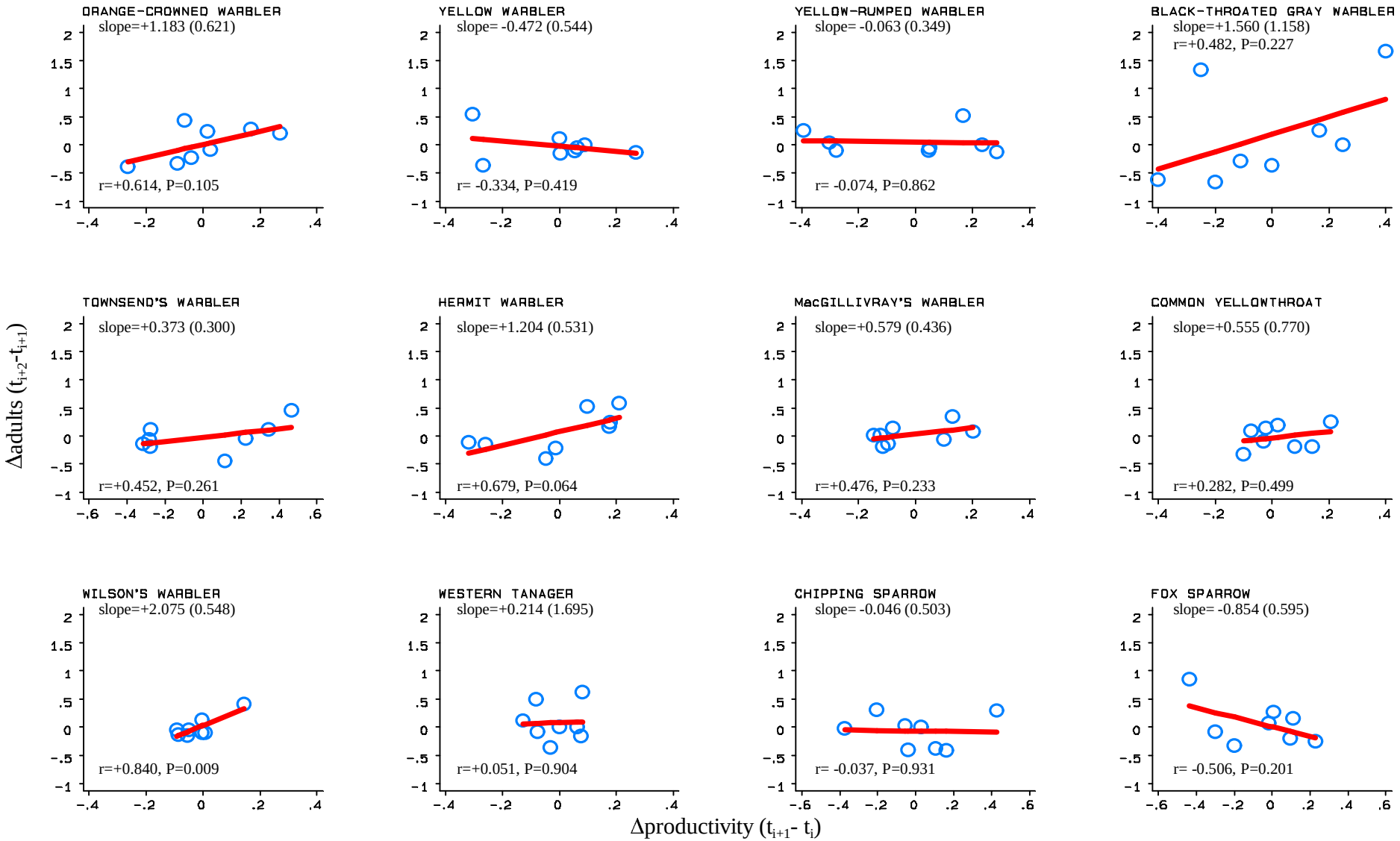


Figure 21. (cont.) The regression of the proportional change in the number of adults between year i+2 and year i+1 on the absolute change in productivity between yea i+1 and year i ("productivity/population correlation") for 43 species and all species pooled in Forest Service Region 6 over the years 1992-2001. The constant-effort between-year changes were obtained from data pooled from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line, the standard error of the slope (in parentheses), the correlation coefficient (*r*), and significance of the correlation coefficient (*P*) are presented on each graph.

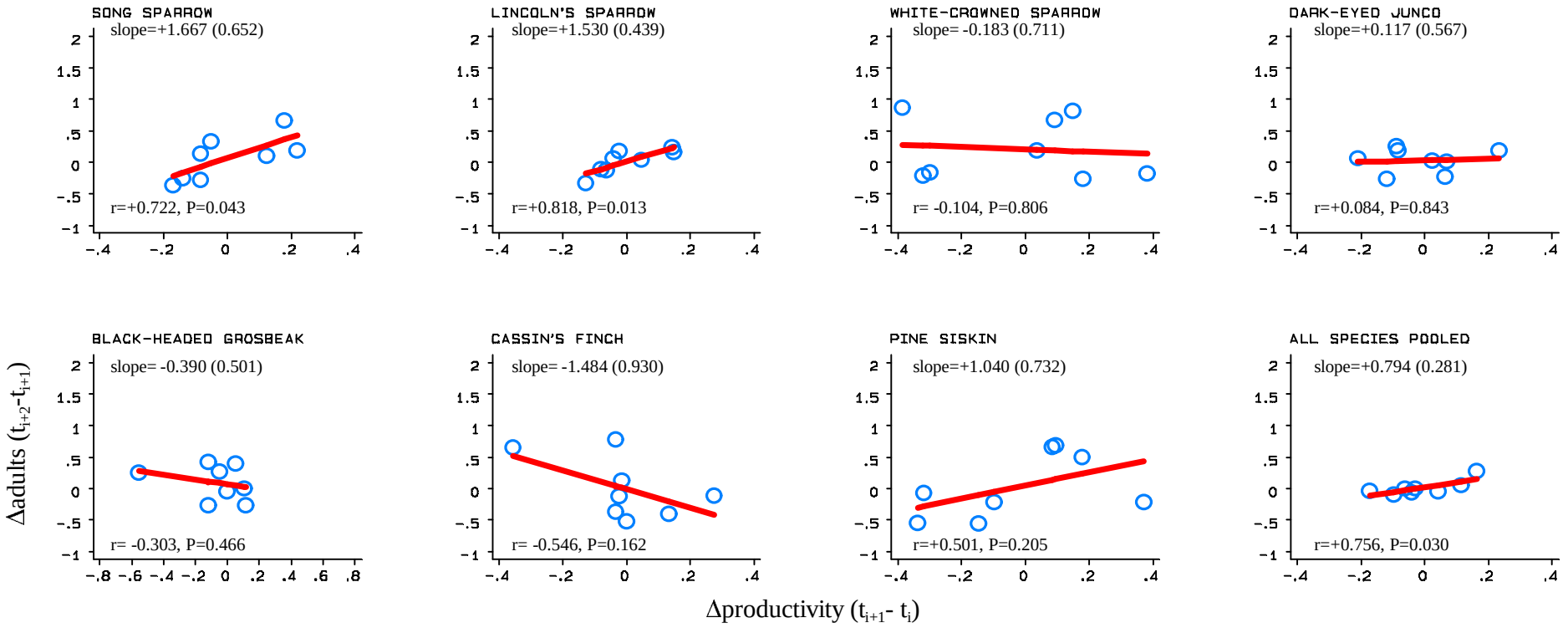


Figure 21. (cont.) The regression of the proportional change in the number of adults between year i+2 and year i+1 on the absolute change in productivity between yea i+1 and year i ("productivity/population correlation") for 43 species and all species pooled in Forest Service Region 6 over the years 1992-2001. The constant-effort between-year changes were obtained from data pooled from stations where the species was a regular or usual breeder and summer resident. The slope of the regression line, the standard error of the slope (in parentheses), the correlation coefficient (*r*), and significance of the correlation coefficient (*P*) are presented on each graph.

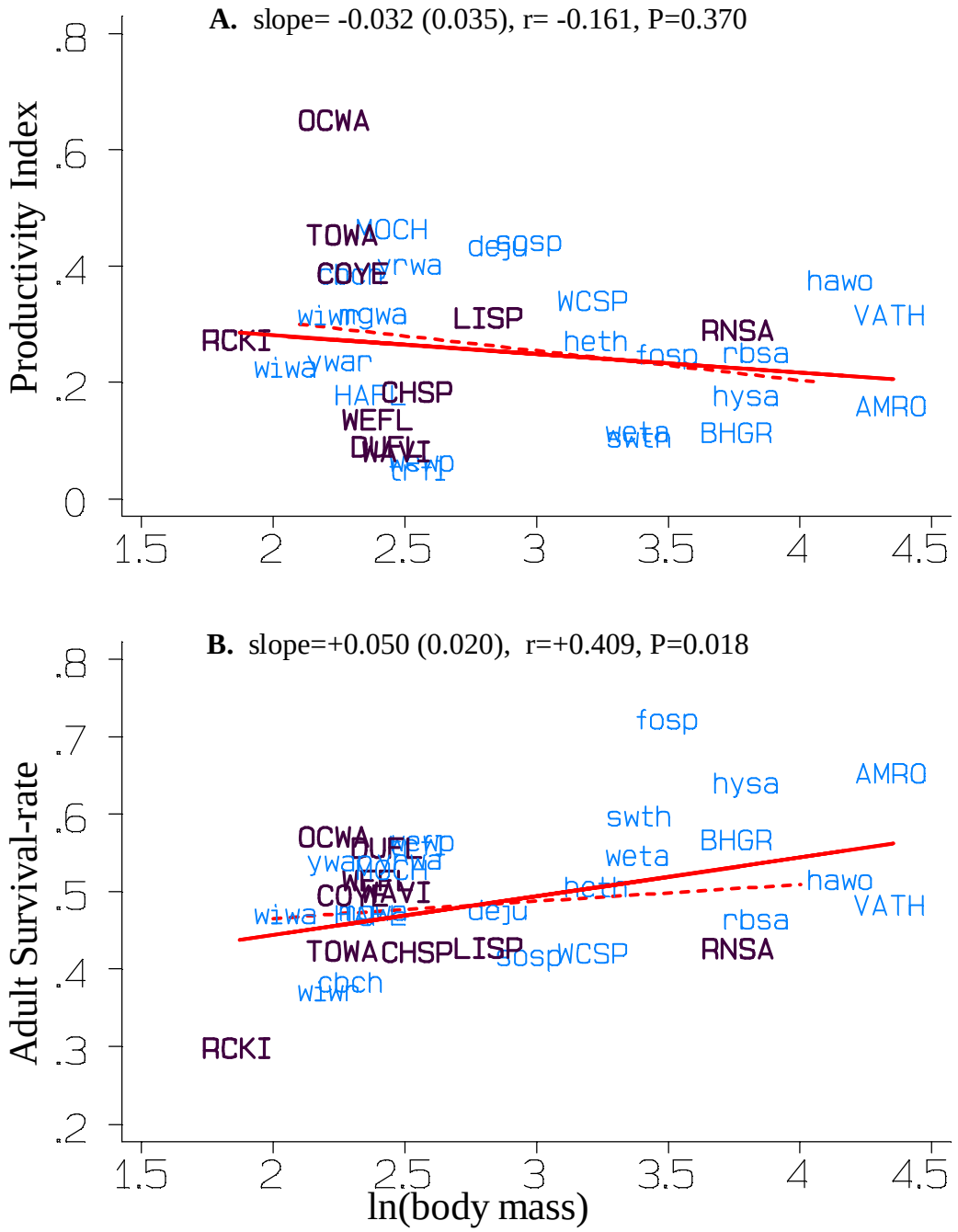


Figure 22. Regressions of productivity index (**A**) and adult survival rates (**B**) in Forest Service Region 6 on the natural log of the body mass for 33 target species with coefficient of variations of the survival estimate less than 30% for the ten years 1992-2001. Species whose four-letter codes (Appendix I) are shown in bold capital letters showed substantially decreasing ($r < -0.5$) population trends, those in regular type capital letters had substantially increasing ($r > +0.5$) population trends, and those in lower-case letters had flat (absolute $r < 0.5$) trends. Regressions are shown for the correlations of the targe species (non-dashed line) and the correlations for all species throughout all of North America (dashed line). The slope, the r-value, and P-value are presented for the targe species line.