THE MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) PROGRAM IN SEQUOIA AND KINGS CANYON AND YOSEMITE NATIONAL PARKS AND DEVIL'S POSTPILE NATIONAL MONUMENT: A COMPARISON BETWEEN TIME PERIODS AND LOCATIONS

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EXECUTIVE SUMMARY

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

A second objective of MAPS is to provide standardized population and demographic data for the landbirds found in local areas or on federally managed public lands, such as national parks and forests and military installations. In this light, MAPS stations were operated for in Sequoia and Kings Canyon National Parks and in Yosemite National Park during the past 15 years with the hope that they will serve as an integral part of the parks' long-term ecological monitoring effort. It is expected that information from MAPS will be capable of aiding research and management efforts within the parks to protect and enhance their avifauna and ecological integrity.

Five MAPS stations were operated at Yosemite National Park for various consecutive-year periods between 1990 and 2004, with three stations (White Wolf, Crane Flat, and Big Meadow) being operated during 1993-2004 and the Hodgdon Meadow station being operated for all 15 years. At Sequoia and Kings Canyon, two MAPS stations (Lion Meadow and Zumwalt Meadow) were operated during 1991-1993 and again during 2001-2004. A single MAPS station was also operated at Devil's Postpile National Monument during 2002-2004. These eight stations are located at latitudes between 37˚52' N and 36˚44' N, and at elevations between 1280 and 2402 m. In this report we synthesize results from these stations on adult population size, reproductive success, and survival of target landbird species. Our primary goal is to compare these demographic parameters between two locations (Yosemite and Sequoia/Kings Canyon), and between two time periods (1991-1993 and 2001-2004), each as related to elevation and latitude. We also assess landbird population demography in the region, and the effectiveness of the MAPS program at understanding the factors driving landbird trends at these national parks.

Capture rates of adults and young, as well as productivity values, were substantially higher at Yosemite National Park MAPS stations than at those operated in Sequoia/Kings Canyon during both the 1991-1993 and the 2001-2004 periods. The Devil's Postpile station recorded an intermediate capture rate of adults during 2002-2004, but showed low productivity, similar to that of Sequoia/Kings Canyon. These differences cannot be explained by between-station differences in elevation or latitude alone, although we have shown that elevation plays an important role in the population demography of Sierra landbirds. We have found, for example, that, while the relationship between species richness and elevation is indeed linear and negative, relationships for capture rates of adults and young and productivity are curvilinear with maxima

at intermediate elevations. Maximum numbers of adults appear to occur at about 1800 m, approximately the elevation of Crane Flat, while maximum numbers of young and productivity appears to occur slightly higher at about 2200 m, approximately the elevation of Gin Flat East Meadow. In this light, adult population levels and, especially, productivity appear to be very much lower than expected at Lion Meadow in Sequoia/Kings Canyon, where each of these parameters tended to be as low as or lower than the lower elevation Zumwalt Meadow, at least during the more recent 2001-2004 time period. These results suggest that local conditions at or near the Lion Meadow station may be influencing landbird population dynamics there and should be investigated. Interestingly, Lion Meadow's location, just above a large escarpment leading to much lower elevations, may influence dispersal characteristics of breeding adults and post-fledging young and thus affect the population and demographic indices. Lion Meadow's location also may make it more susceptible to the effects of air (e.g., ozone) pollution or the effects airborne contaminants (e.g., pesticide residues) than the Zumwalt Meadow station and stations further north in Yosemite. All of these possibilities beg for further study and suggest that demographic monitoring must play a critical role in such investigations.

Although breeding populations at Sequoia/Kings Canyon stations increased between the 1991-1993 and 2001-2004 time periods, productivity within the park showed an equivalent decrease between these two periods. In addition, 11-year (1993-2003) population trends at Yosemite have been negative for the great majority of species with all species pooled showing a highly significant 2.7% per decline. Comparison of these declines with those detected by the long-term BBS trends from the Sierra Nevada physiographic strata suggests that the declines for most landbird species in Yosemite are part of a Sierra-wide pattern. Predictions from global climate models and recent weather data generally suggest that the Sierra Nevada region is becoming increasingly arid and that this drying tendency may be accelerating. It is possible that, because of the more southerly (and drier in the summer) latitudes of the Sequoia/ Kings Canyon stations, the effects of a drying climate are reducing productivity at those stations to a greater degree than at the Yosemite stations. This possibility also underscores the importance of demographic monitoring data in aiding the understanding of the effects of global climate change on Sierra landbird populations.

Constant-effort, between-year comparisons in adult population sizes and productivity generally showed Sierra-wide concordance but with an elevational effect, with low-elevation stations (and Devil's Postpile) often showing between-year dynamics that were opposite to those at mid- or higher-elevation stations. We suggest that elevational differences in population and demographic parameters are correlated with a complex set of variables including effects of local weather, extent and timing of melt of snowpacks, landscape characteristics, and dispersal characteristics of landbirds. Because of the complexity of these variables and interrelationships among them, we suggest that useful demographic monitoring information in the Sierra must employ an elevational component.

We have frequently found, at other locations where we have operated MAPS stations, consistent alternating patterns of adult population size increases and decreases and equally consistent but out-of-phase alternating decreases and increases in productivity. We believe that this pattern relates to density-dependent effects on productivity and recruitment along with lower

productivity of first-time breeders. This two-year cycle of population increases and decreases, alternating with out-of-phase decreases and increases in productivity, tended to be present at Yosemite MAPS stations during 1991-1993 and 1996-2001, but not during 1993-1996 or 2001-2004. Apparently, strong environmental perturbations caused, for example, by severe weather such as major droughts, severe late spring/early summer storms, or extremely heavy late-melting snowpacks, can disrupt these cycles and cause density-independent productivity and/or population size changes. This is presumably what happened during the 2003 breeding season, when precipitation in the Sierra during April and May was at 200-300% of normal levels and the slightly above-average snowpack reached its peak in mid-May and did not melt until well into June. This was followed by July precipitation levels that, while small, were still 200-300% of normal. This series of events may have caused the 10-20% reduction in adult population levels at MAPS stations in both Yosemite and Sequoia/Kings Canyon, as well as the dramatic 70% decrease in numbers of young and a 42% decrease in productivity documented in 2003. Clearly, the large magnitude of the weather perturbations that affect montane environments and their effect on avian population dynamics means that long consistent runs of population monitoring data will be necessary to detect long-term underlying changes in Sierra bird population levels. Because of the complexity of the dynamics driving bird population changes, equally long-term runs of data on avian vital rates will be absolutely necessary to understand the causes of the changes and, for population declines, to formulate possible solutions. Set in the context of current widespread environmental degradation and contamination and on-going climate change, such population and demographic monitoring data on birds from protected ecosystems, such as the national parks, will become increasingly valuable.

It is important to note that productivity alone is not the only driving force for long-term population trends; annual survival of adults must also be considered. We investigated possible effects of location (park) and time period (1991-1993 vs. 2001-2004) on apparent survival rates of adults for 11 target species at the Hodgdon Meadow (Yosemite) and two Sequoia/Kings Canyon MAPS stations. We found strong to moderately strong support for location effects on survival for five species (Dusky Flycatcher, Warbling Vireo, American Robin, MacGillivray's Warbler, and Song Sparrow), with all but Warbling Vireo showing higher survival at Hodgdon Meadow than at Sequoia/Kings Canyon. Overall, apparent survival rates were higher at Hodgdon Meadow than at Sequoia/Kings Canyon for 11 of 17 species-time period comparisons.

We currently have no explanation for these somewhat surprising location-specific differences in survival estimates. For migratory species, we might expect survival to be influenced primarily by events that occur on migration or the wintering grounds. If such were the case, location effects on survival should not be manifest unless the populations at each location migrate to different wintering locations where they could be subject to different environmental stressors. We hypothesize that the differences in apparent survival observed between Yosemite and Sequoia/Kings Canyon may actually relate to local stressors acting on the breeding grounds which can affect annual survival of adults. It is not inconceivable that higher levels of air pollution and airborne contaminants at Sequoia/Kings Canyon than at Yosemite could be driving these differences in annual survival. In this light, continued monitoring of apparent survival rates would be a prudent course of action.

Strong or moderately strong evidence for temporal effects on survival were also found for five species (American Robin, MacGillivray's Warbler, Lincoln's Sparrow, Song Sparrow, and Dark-eyed Junco), with all five showing higher survival during 2001-2004 than during 1991-1993. Overall, apparent survival probabilities were higher during 2001-2004 than during 1991-1993 for 15 of 18 species-location comparisons. Again, we have no explanation for this difference. It does suggest, however, that decreases in adult population sizes between these two time periods (especially at Yosemite) may be more related to changes in productivity than in survival. This accords with longer-term data from Yosemite, where low productivity appeared to be driving the population trends of 13 species and low survival appeared to drive or influence trends in only four species. This may be cause for concern given the declining productivity noted especially at Sequoia/Kings Canyon. It also suggests, however, that the population dynamics of most species are being affected by events or conditions in the Sierra Nevada and possibly in the national parks themselves, and thus could be within the Park Service's ability to correct through appropriate management action. These findings illustrate the importance of long-term avian demographic monitoring, especially as informing managers regarding species with declining populations or productivity, including Red-breasted Sapsucker, Dusky Flycatcher, House Wren, Black-throated Gray Warbler, Hermit Warbler, Wilson's Warbler, Purple Finch, and Cassin's Finch.

This report demonstrates that the indices and estimates of primary demographic parameters obtained by the Yosemite and Sequoia/Kings Canyon MAPS Programs are providing critical information that will be extremely useful for the management and conservation of landbirds in the Sierra Nevada. It has also revealed that the population dynamics of Sierra landbirds are complex, as are the likely causes of the dynamics and, for those trends deemed problematic, their solutions. This complexity underscores the importance of standardized, long-term avian demographic monitoring data in national parks, where avian population and demographic changes may be affected both by global phenomena and local land-use practices.

We conclude that the MAPS protocol is very well-suited to provide a critical component of the National Park Service's long-term ecological monitoring effort in Yosemite and Sequoia/ Kings Canyon National Parks. Based on the above information, our preferred recommendation is that the operation of all of the current MAPS stations (five in Yosemite, two in Sequoia/Kings Canyon, and one in Devil's Postpile) be sustained into the future. Alternatively, with an eye toward reducing costs while maximizing critical information, we recommend that four stations in Yosemite National Park (to provide an elevational transect) and the two stations in Sequoia/ Kings Canyon (to provide comparative data) continue to be operated (perhaps by a single team). Such an arrangement would involve discontinuance of one station in Yosemite (perhaps Gin Flat East Meadow which has only been operated since 1998) and require an alternative strategy for continuing the operation of the Devil's Postpile station (which would be logistically difficult for a Yosemite-Sequoia/Kings Canyon team to run). Discontinuance of the Devil's Postpile station is not recommended, because its vegetation and environment is strongly influenced by east-side of the Sierra climate and no other MAPS station exits in true montane conditions on the east slope of the Sierra. Other scenarios for station operation could also be considered. We also recommend that funding be identified to provide for a comprehensive analysis of all Sierra MAPS data (including stations on national forests and private lands) as a function of station-specific and remote-sensed landscape-scale habitat data and spatially-explicit weather data.

INTRODUCTION

The National Park Service (NPS) has been charged with the responsibility of managing natural resources on lands under its jurisdiction in a manner that conserves them unimpaired for future generations. In order to carry out this charge, the NPS is implementing integrated long-term programs for inventorying and monitoring the natural resources in national parks and other NPS units. A pilot study to develop and evaluate field and analytical techniques to accomplish these objectives was first implemented in four national parks across the United States during the 1990s. The goals of this pilot program were to develop: (1) quantitative sampling and analytical methods that could provide relatively complete inventories and long-term trends for many components of biological diversity; and (2) effective means of monitoring the ecological processes driving the trends (Van Horn et al. 1992). An additional goal was to develop and evaluate methods potentially useful in other national parks across the United States. This program was referred to as the Long-term Ecological Monitoring (LTEM) Program.

The development of an effective long-term ecological monitoring program in the national parks can be of even wider importance than aiding the NPS in managing its resources. Because lands managed by the NPS provide large areas of relatively pristine ecosystems that promise to be maintained in a relatively undisturbed manner indefinitely into the future, studies conducted in national parks can provide invaluable information for monitoring natural ecological processes and for evaluating the effects of large-scale, even global, environmental changes. The national parks and other NPS units can also serve as critical control areas for monitoring the effects of relatively local land-use practices. Thus, long-term monitoring data from the national parks can provide information that is crucial for efforts to preserve natural resources and biodiversity at multiple spatial scales, ranging from the local scale to the continental or even global scale.

Landbirds

Because of their high body temperature, rapid metabolism, and high ecological position on most food webs, landbirds are excellent indicators of the effects of local, regional, and global environmental change on 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 NPS to receive high priority for monitoring. Nor is it surprising that several large-scale monitoring programs that provide annual population estimates and long-term population trends for landbirds are already in place on this continent. They include the North American Breeding Bird Survey (BBS), the Breeding Bird Census, the Winter Bird Population Study, and the Christmas Bird Count.

Analyses of data from several of these programs, particularly the BBS, suggest that populations of many landbirds, including forest-, scrubland-, and grassland-inhabiting species, appear to be in serious decline (Peterjohn et al. 1995). Indeed, populations of most landbird species appear to be declining on a global basis. Nearctic-Neotropical migratory landbirds (species that breed in North America and winter in Central and South America and the West Indies; hereafter, Neotropical migratory birds) constitute one group for which pronounced population declines have been documented (Robbins et al.1989, Terborgh 1989). In response to these declines, the

Neotropical Migratory Bird Conservation Program, "Partners in Flight - Aves de las Americas," was initiated in 1991 (Finch and Stangel 1993). A 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 NPS has defined its role in the program to include the establishment of long-term monitoring programs at NPS units using protocols developed by the Monitoring Working Group of PIF. Clearly, the long-term ecological monitoring goals of the NPS and the monitoring and research goals of PIF share many common elements.

Primary Demographic Parameters

Existing population-trend data on Neotropical migrants, while suggesting severe and sometimes accelerating declines, provide no information on primary demographic parameters (productivity and survivorship) of these birds. Thus, population-trend data alone provide no means for determining at what point(s) in the life cycles problems are occurring, or to what extent the observed population trends are being driven by causal factors that affect birth rates, death rates, or both (DeSante 1995). In particular, large-scale North American avian monitoring programs that provide only population-trend data have been unable to determine to what extent forest fragmentation and deforestation on the temperate breeding grounds, versus that on the tropical wintering grounds, are causes for declining populations of Neotropical migrants. Without critical data on vital rates (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 generally affect primary demographic parameters directly and these effects usually can be observed over a short time period (Temple and Wiens 1989). Because of the buffering effects of floater individuals and density-dependent responses of populations, there may be substantial timelags between changes in primary parameters and resulting changes in population size or density as measured by census or survey methods (DeSante and George 1994). Thus, a population could be in trouble long before this becomes evident from survey data. Moreover, because of the vagility of many animal species, especially birds, local variations in secondary parameters (e.g., population size or density) may be masked by recruitment from a wider region (George et al. 1992) or accentuated by lack of recruitment from a wider area (DeSante 1990). A successful monitoring program should be able to account for these factors.

Finally, a successful monitoring program should be able to detect significant differences in productivity as a function of such local variables as landscape-level habitat characteristics or degree of habitat disturbance. The detection of such differences can lead to immediate management implementation within a national park, especially for species where long-term demographic monitoring suggests that declines are related to local (e.g., productivity) rather than remote (e.g., overwintering survival in Neotropical migrants) factors.

MAPS

In 1989, The Institute for Bird Populations (IBP) established the Monitoring Avian Productivity and Survivorship (MAPS) program, a cooperative effort among public agencies, private organizations, and individual bird banders in North America to operate a continent-wide network of constant-effort mist-netting and banding stations providing long-term demographic data on landbirds (DeSante et al. 1995). The design of the MAPS program was patterned after the very successful British Constant Effort Sites (CES) Scheme that has been operated by the British Trust for Ornithology since 1981 (Peach et al. 1996). The MAPS program was endorsed in 1991 by both the Monitoring Working Group of PIF and the USDI Bird Banding Laboratory, and a four-year pilot project (1992-1995) was approved by the USDI Fish and Wildlife Service and National Biological Service (now the Biological Resources Division [BRD] of the U.S. Geological Survey [USGS]) to evaluate its utility and effectiveness for monitoring demographic parameters of landbirds. A peer review of the program and of the evaluation of the pilot project was completed by a panel assembled by USGS/BRD (Geissler 1996). The review concluded that: (1) MAPS is technically sound and is based on the best available biological and statistical methods; and (2) it complements other landbird monitoring programs such as the BBS by providing useful information on landbird demographics that is not available elsewhere.

Now in its 16th year (13th year of standardized protocol and extensive distribution of stations), the MAPS program has expanded greatly from 178 stations in 1992 to about 500 stations in 2004. The substantial growth of the Program since 1992 was caused by its endorsement by PIF and the subsequent involvement of various federal agencies in PIF, including the NPS, USDA Forest Service, US Fish and Wildlife Service, Department of Defense, Department of the Navy, and Texas Army National Guard. Within the past 13 years, for example, IBP has been contracted to operate over 25 MAPS stations in Yosemite, Sequoia/Kings Canyon, Denali, and Shenandoah National Parks and on Cape Cod National Seashore.

Goals and Objectives of MAPS

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

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

   (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 among newly captured adults, recruitment rates into the adult population, and population growth rates from modified Cormack-Jolly-Seber analyses of mark-recapture data on adult birds.

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

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

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

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

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

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

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

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

The overall objectives of MAPS are to achieve the above-outlined goals by means of long-term monitoring at two major spatial scales. The first is a very large scale, effectively the entire North American continent divided into eight geographic regions. It is envisioned that the national parks, along with national forests, 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 geographic areas (perhaps based on BBS physiographic strata, such as the Sierra Nevada, Cascade Mountains, Central Valley, or California Foothills or the newly described Bird Conservation Regions) or specific locations (such as individual national parks, national forests, or military installations). The objective for MAPS at these smaller scales is to aid research and management efforts within the areas, parks, forests, 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.

Both of these long-term objectives are in agreement with goals laid out for the NPS's Long-Term Ecological Monitoring Program. Accordingly, MAPS stations have been established and operated for various years since 1990 in Yosemite National Park, Kings Canyon National Park, and Devil's Postpile National Monument.

Recent Important Results from MAPS

Recent important results from MAPS reported in the peer-reviewed literature include the following. (1) Age ratios obtained during late summer, population-wide mist netting provided a good index to actual productivity in the Kirtland's Warbler (Bart et al. 1999). (2) Measures of productivity and survival derived from MAPS data were consistent with observed population changes at multiple spatial scales (DeSante et al. 1999). (3) Patterns of productivity from MAPS at two large spatial scales (eastern North America and the Sierra Nevada) not only agreed with those found by direct nest monitoring and those predicted from theoretical considerations, but were in general agreement with current life-history theory and were robust with respect to both time and space (DeSante 2000). (4) Modeling spatial variation in MAPS productivity indices and survival-rate estimates as a function of spatial variation in population trends provides a successful means for identifying the proximate demographic cause(s) of population change at multiple spatial scales (DeSante et al. 2001). (5) Productivity of landbirds breeding in Pacific Northwest national forests is affected by global climate cycles including the El Niño Southern Oscillation and the North Atlantic Oscillation in such a manner that productivity of Neotropical migratory species is determined more by late winter and early spring weather conditions on their wintering grounds than by late spring and summer weather conditions on their breeding grounds (Nott et al. 2002). These results indicate that MAPS is capable of achieving, and in some cases is already achieving, its objectives and goals.

The MAPS Program at Yosemite and Sequoia/Kings Canyon National Parks and Devil's Postpile National Monument

Five MAPS stations have been operated at Yosemite National Park for various consecutive-year periods between 1990 and 2004 (Table 1; a sixth station, operated from 1993-1996 at Tamarack Meadow, is not dealt with in this report). At Sequoia and Kings Canyon National Parks, two MAPS stations were operated in 1991-1993 and again in 2001-2004. A single MAPS station was also established at Devil's Postpile National Monument in 2002 (Gates & Heath 2003) and operated through 2004. These eight stations are located at various latitudes between 37°52' N (White Wolf in Yosemite) and 36°44' N (Lion Meadow in Kings Canyon) and at various elevations between 1280 m (Zumwalt Meadow in Kings Canyon) and 2402 m (White Wolf in Yosemite) (Table 1). In this report we synthesize results on adult population size, reproductive success, and survival of target landbird species at these eight stations. Our primary goals are to compare these parameters between two locations (Yosemite versus Sequoia/Kings Canyon and Devil's Postpile), and between two time periods (1991-1993 versus 2001-2004), each as related to elevation. We assess both landbird population demography in the Sierra region, and the effectiveness of the MAPS program at understanding the factors driving landbird trends, especially at Sequoia/Kings Canyon National Park.

METHODS

Establishment and Operation of Stations

At each of the three locations, stations were established between 1990 and 2002 and, except for the period 1994-2000 at Sequoia/Kings Canyon, all stations were re-established and operated at the same locations for consecutive years through 2004 (Table 1). The Sequoia/Kings Canyon stations were thus operated during two periods, 1991-1993 and 2001-2004. At Sequoia/Kings Canyon, the Lion Meadow station is located at a small montane meadow surrounded by coniferous forest with an area of montane chaparral at 1853 m elevation; the Zumwalt Meadow station is located along a riparian corridor with open meadows and mixed coniferous and oak woodlands at 1280 m elevation. The Devil's Postpile station is located in a montane meadow among lodgepole pines and willow thickets at 2350 m elevation (Gates & Heath 2003). This station was established in 2002 and operated during 2002-2004. At Yosemite, the five stations are located along an elevation gradient from highest to lowest, as follows: (1) White Wolf Meadow, set in a wet montane meadow with red fir/lodgepole pine forest at 2402 m elevation; (2) Gin Flat East Meadow, located in a wet montane meadow with mixed fir and lodgepole pine forest at 2073 m elevation; (3) Crane Flat Meadow, located in a wet montane meadow with mixed coniferous forest and willow/aspen thickets at 1875 m elevation; (4) Hodgdon Meadow, located in a wet montane meadow with mixed coniferous forest, willow/dogwood thickets, and a patch of California Black Oak woodland at 1408 m elevation; and (5) Big Meadow, located in riparian willows and mixed coniferous and oak forest at the edge of an open dry meadow at 1311 m elevation. The Hodgdon Meadow station was established in 1990 and operated through 2004; three of the four remaining Yosemite stations were operated from 1993 through 2004, with the fourth station (Gin Flat East Meadow) being operated from 1998-2004. Only data from the Hodgdon Meadow station during 1991-1993 will be compared with data collected at the two Sequoia/Kings Canyon stations during that period. All five Yosemite stations were operated during 2001-2004 and data from all of them will be compared with data from the Sequoia/Kings Canyon stations during that period.

Through the efforts of intensively trained field biologist interns of The Institute for Bird Populations (from PRBO Conservation Science for the Devil's Postpile station), these eight MAPS banding stations were operated in accordance with the highly standardized banding protocols developed for the MAPS Program throughout North America (DeSante et al. 2004a). A total of 10-14 net sites were operated at each of the stations in the exact same locations where they were operated during each of the preceding years. Each of the stations was operated for six morning hours per day (beginning at local sunrise) during one day in each of eight consecutive 10-day periods between May 21 and August 8 or, for the two higher-elevation stations at Yosemite (White Wolf and Gin Flat East), for one day in each of seven consecutive 10-day periods between May 31 and August 8. The Hodgdon Meadow station during 1990-1992 and both Sequoia/Kings Canyon stations during 1991-1993 were operated for three days during each 10-day period (see below for methods for statistical adjustments to these data). With very few exceptions, the operation of all stations occurred on schedule during each of the ten-day periods during each year of operation. A brief overview of both the field and analytical techniques is presented here.

Data Collection

With few exceptions, all birds captured during the course of the study were identified to species, age, and sex and, if unbanded, were banded with USGS/BRD numbered aluminum bands. Birds were released immediately upon capture and before being banded if situations arose where bird safety would be comprised. Such situations involved exceptionally large numbers of birds being captured at once, or the sudden onset of adverse weather conditions, such as high winds or 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) existence of molt limits and plumage characteristics
(12) fat class;
(13) wing chord and weight;
(14) date and time of capture (net-run time); and
(15) station and net site where captured.

Effort data, the number and timing of net-hours on each day of operation, were collected in a standardized manner. 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 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 station, 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 updated. The pattern and extent of cover of each of four major vertical layers of vegetation (upperstory, midstory, understory, and ground cover) in each major habitat type were classified into one of twelve pattern types and eleven cover categories according to guidelines spelled out in the MAPS Habitat Structure Assessment Protocol, developed by IBP Landscape Ecologist, Philip Nott (Nott et al. 2003).

Computer Data Entry and Verification

The computer entry of all banding data (except 2002 and 2003 Devils's Postpile data, which was entered by PRBO) 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 all numerical data;
(2) Cross-check programs to compare station, date, and net fields from the banding data with those from the summary of mist netting effort data;
(3) Cross-check programs to compare species, age, and sex determinations against degree of skull pneumaticization, breeding condition (extent of cloacal protuberance and brood patch), and extent of body and flight-feather molt, primary-feather wear, and juvenal plumage;
(4) Screening programs which allow identification of unusual or duplicate band numbers or unusual band sizes for each species; and
(5) Verification programs to screen banding and recapture data from all years of operation for inconsistent species, age, or sex determinations for each band number.

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

Data Analysis

To facilitate analyses, we first classified the landbird species captured in mist nets into five groups based upon their breeding or summer residency status at the station. Each species was classified as one of the following: a regular breeder (B) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during all years* that the station was operated; a usual breeder (U) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during more than half but not all of the years* that the station was operated; an occasional breeder (O) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during half or fewer of the years* that the station was operated; a transient (T) if the species was *never* a breeder or summer resident at the station, but the station was within the overall breeding range of the species; an altitudinal disperser (A) if the species breeds only at lower elevation than that of the station but disperses to higher elevations after breeding; and a migrant (M) if the station was not located within the overall breeding range of the species. Data for a given species from a given station were included in productivity analyses if the station was within the breeding range of the species; that is, data were included from stations where the species was a breeder (B, U, or O), transient (T), or altitudinal disperser (A), but not where the species was a migrant (M). Data for a given species from a given station were included in survivorship analyses only if the species was classified as a regular (B) or usual (U) breeder at the station.

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

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

Following the procedures pioneered by the British Trust for Ornithology (BTO) in their CES Scheme (Peach et al. 1996), the number of adult birds captured was used as an index of adult population size, and the proportion of young in the catch was used as indices of post-fledging productivity. For each of these three population parameters, data has been summarized by station, location, and temporal-period (pooled into the periods 1991-1993 and 2001-2004), in order to make meaningful comparisons by time, location, and elevation (Tables 2 and 3).

During initial operation of stations in Yosemite and Sequoia/Kings Canyon, before final MAPS protocols were established, stations were operated for three days per 10-day period (Hodgdon Meadow in 1990-1992 and both Sequoia/Kings Canyon stations in 1991-1993). During all subsequent years, stations were only operated during one day per 10-day period. Analyses conducted in preparation for data processing revealed that the best way to compare data between these two different regimes of mist-netting effort was to include data from only the first day of operation for stations that were operated for multiple days per 10-period. We found that including data from all days of operation per 10-day period, or even using the mean of each day of operation per 10-day period, always had the effect of producing a downward bias in the index of numbers of adults captured and a corresponding upward bias in the index of productivity, when compared to data from stations that were operated on only one day per 10-day period. This is because a large proportion of the adults captured at MAPS stations are resident breeding birds and, once captured for the season, are not counted again despite increased effort. Young birds, however, are almost all transient individuals, and the capture rate of newly captured young birds increases nearly continuously with increasing effort. Even so, it is possible that a very slight downward bias in numbers of adults and upward bias in productivity might still exist in stations operated for multiple days per 10-day period compared to stations operated for only one day per 10-day period, even when using only the first day of operation from such multiple-day stations. This could be caused by a small amount of net avoidance induced in adult birds, that could be proportional to the amount of effort expended and that could carry over from one 10-day period to the next. This possibility should be kept in mind when examining comparisons between groups of years with different amounts of effort expended per 10-day period.

For the three stations operated in 1991-1993 (Lion, Zumwalt, and Hodgdon meadows), we calculated changes between 1991 and 1992, and changes between 1992 and 1993, in the numbers of adult and young birds captured and in the indices of post-fledging productivity. The same comparisons were made with data from the seven stations (all except Devil's Postpile) operated between 2001 and 2002, and from all eight stations operated between 2002 and 2003 and between 2003 and 2004. We determined the statistical significance of any changes that occurred

according to methods developed by the BTO in their CES scheme (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. We excluded 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. At Sequoia/Kings Canyon and Yosemite national parks, park-wide annual changes in the numbers of adult and young birds and in the indices of post-fledging productivity were also calculated. These results are presented in Tables 4-7).

B. Survivorship analyses.

We used the computer program MARK (White and Burnham 1999) and modified Cormack-Jolly-Seber mark-recapture models (Pollock et al. 1990) to calculate, for selected target species, maximum-likelihood estimates and standard errors (*SE*s) for annual apparent survival rates (ϕ) and recapture probabilities (p). Apparent survival rate is defined as the probability of a bird marked (banded) at a given station in a given year surviving to the next year and remaining at the same station. Recapture probability is defined as the conditional probability of recapturing a bird at a station in a subsequent year that was banded at the station in a previous year, given that it survived and remained at the station at which it was originally banded.

A minimum of three years of data are required to estimate recapture probability and, because recapture probability must be estimated in order to estimate apparent survival rate, at least three years of data are required in order to estimate apparent survival rate. The presence of transient individuals (dispersing, floating, and late or early migrating individuals) in the sample of newly captured birds tends to bias apparent survival rates and/or recapture probabilities low, because they are only captured once and never recaptured. At the very minimum, at least four years of data are required to utilize a between-period transient model (Pradel et al. 1997). Although we could have calculated apparent survival rates using transient models (using four years of data) for the later time period (2001-2004), we could not compare these with non-transient models (using three years of data) from the earlier time period. We thus present only the results of non-transient models.

We selected 13 target species for which we recorded at least two between-year captures in at least two "strata" (location/time period cells: Hodgdon Meadow in 1991-1993, Hodgdon Meadow in 2001-2004, Sequoia/Kings Canyon in 1991-1993, and Sequoia/Kings Canyon in 2001-2004). For Yosemite, we only used data from Hodgdon Meadow in 2001-2004, so that we could make meaningful comparisons with apparent survival during the earlier time period (1991-1993), during which no other Yosemite stations were operated continuously. Following Burnham et al. (1987) and Burnham and Anderson (1998), *a priori* sets of models were created for which both apparent survival rate (ϕ) and recapture probability (p) were modeled as functions of both location (park) and time period, making a total of four models for each parameter. All combinations of these parameterizations yielded a total of 16 candidate models for each species (see Table 8).

Model selection methods based on Akaike's Information Criterion (AIC) (Burnham & Anderson 1998) were used to assess the evidence for location (park) and time period effects on apparent

annual survival. Models in each candidate set were first ranked by second-order AIC differences (Burnham & Anderson 1998) and adjusted by the "c-hat" obtained from bootstrap goodness-of-fit tests included in Program MARK to insure conservative model selection (Cooch and White 2002). The c-hat was calculated by dividing the observed deviance by the mean deviances of the simulated model. Where c-hat = 1.000, the model fits the data. Where c-hat > 1.000, the c-hat adjustment corrects AICs for over-dispersion of data and creates $QAIC_C$s to be used in model selection.

The relative likelihood of each model in each of the candidate sets was estimated with AIC or $QAIC_C$ weights (w_i; Burnham & Anderson 1998). A model averaging procedure was used to provide the best estimates of survival and recapture probabilities from all models in a candidate set (e.g., the survival estimates for the stratum Sequoia/Kings Canyon for 1991-1993). For species with sufficient data in all four strata, all 16 candidate models were run and averaged. Where comparisons could be made only between two strata (due to insufficient data to make comparisons between other strata), the four appropriate models were run and averaged. Model averaging is based on w_i values for each model and thus includes model selection uncertainty in the estimate of each parameter and its associated variance (Burnham & Anderson 1998). Statistical support for location and period effects in survival and recapture probability was assessed by summing the w_i for all models in which a parameter of interest occurred. This method of multi-model inference enabled us to use the entire set of candidate models to judge the importance of a parameter to survival rate, rather than basing conclusions on a single best-fit model.

The following results are presented for each of the species in each analysis: (a) Table 9 showing the distribution of the individual adults, captures, and returns by location and time period; (b) Table 10 showing model-averaged apparent survival rate estimates, along with SEs and coefficients of variation (CVs), for each stratum (location/time period cell); and (c) Table 11 showing model selection results (AIC/$QAIC_C$ weights) for survival rate and recapture probability (for location and time period effects).

RESULTS

Indices of Adult Population Size and Post-fledging Productivity

A. 1991-1993 indices by location. The capture rates (per 600 net-hours) of individual adult and young birds and the proportion of young in the catch are presented for each of 52 breeding species and all species pooled at Lion Meadow, Zumwalt Meadow, these two Sequoia/Kings Canyon stations combined, and Hodgdon Meadow, for the period 1991-1993 (Table 2). We present capture rates (captures per 600 net-hours) of adults and young so that the data can be compared among stations and locations which, because of the vagaries of weather and accidental net damage, can differ from one another in effort expended.

For all species pooled, the capture rate of adults (per 600 net-hours) at Hodgdon Meadow (Yosemite) was at least twice that of either of the Sequoia/Kings Canyon stations as well as both of these stations combined (Table 2a). Capture rates were higher at Hodgdon than at the Sequoia/Kings Canyon stations (combined) for 34 of 50 ($P = 0.008$, one-sided binomial test) species in which adults were captured (for two breeding species, Hutton's Vireo and White-breasted Nuthatch, young birds but no adults were captured). Species richness was also higher at Hodgdon Meadow (44 species) than at Lion (31 species) or Zumwalt (35 species) meadows, although 44 species were also captured in Sequoia/Kings Canyon when these two stations were combined.

Similarly, over twice the number of young birds were captured (per 600 net-hours) at Hodgdon Meadow than at either of the two Sequoia/Kings Canyon stations (Table 2b). Although much of this difference can be attributed to the substantial numbers of young Orange-crowned Warblers caught at Hodgdon Meadow, overall, 28 of 39 ($P = 0.005$, one-sided binomial test) species (for which young were caught) showed higher values at this station than at the two Sequoia/Kings Canyon stations combined. Species richness of young at Hodgdon Meadow (32 species) was higher than at either of the two Sequoia/Kings Canyon stations (21 species each) but similar to that of both stations combined (31 species).

When all species were pooled, productivity at Hodgdon Meadow (as measured by proportion of young in the catch, 0.429) was also higher than that at Lion Meadow (0.388), Zumwalt Meadow (0.283), and both Sequoia/Kings Canyon stations combined (0.337) (Table 2c), but not by as large a margin as adults and young captured. Again, substantially more species (22 of 33 with values for both locations; $P = 0.040$, one-sided binomial test) showed higher productivity at Hodgdon Meadow than at the two Sequoia/Kings Canyon stations combined.

B. 2001-2004 indices by location. The capture rates (per 600 net-hours) of individual adult and young birds and the proportion of young in the catch are presented for each of 76 breeding species and all species pooled at each of the eight stations operated during 2001-2004 (including Devil's Postpile which was operated during 2002-2004), as well as at all stations combined at each of Sequoia/Kings Canyon and Yosemite (Table 3). For all species pooled and all stations within a location combined, the number of adult birds captured (per 600 net-hours) was highest at Yosemite (196.24), followed by Devil's Postpile (173.35), and Sequoia Kings/Canyon (149.95) (Table 3a). As during 1991-1993, breeding populations at Hodgdon Meadow (215.75

birds/600 net-hours) were substantially higher than at Lion Meadow and Zumwalt Meadow, and at those two Sequoia/Kings Canyon stations combined (149.95). Among all eight stations, breeding populations were highest at Crane Flat, followed in decreasing order by Hodgdon Meadow, Gin Flat East Meadow, Devil's Postpile, Zumwalt Meadow, Big Meadow, Lion Meadow, and White Wolf (Table 3a). Species richness followed a different order, being highest at Big Meadow, followed in decreasing order by Hodgdon Meadow, Zumwalt Meadow, Gin Flat East Meadow, Crane Flat, Lion Meadow, Devil's Postpile, and White Wolf.

For all species pooled and all stations within a location combined, the capture rate of young birds (per 600 net-hours) was much higher at Yosemite (251.16), than at Devil's Postpile (73.93) or Sequoia Kings/Canyon (61.04) (Table 3b). As during 1991-1993, the capture rate of young was very much higher at Hodgdon Meadow (224.10) than at Lion Meadow and Zumwalt Meadow, and at those two Sequoia/Kings Canyon stations combined (61.04). Among stations, the capture rate of young birds was highest at the five Yosemite stations. In descending order, the capture rates were: Gin Flat East Meadow, Crane Flat, Hodgdon Meadow, Big Meadow, and White Wolf, followed by Devil's Postpile, Zumwalt Meadow, and Lion Meadow (Table 3b).

Productivity (proportion of young in the catch) showed similar patterns to numbers of young, being substantially higher at Yosemite (0.540) than at Devil's Postpile (0.298) and Sequoia Kings/Canyon (0.288), and being higher at the five Yosemite stations than at the other stations. In decreasing order: Gin Flat East Meadow, Big Meadow, Crane Flat, Hodgdon Meadow, White Wolf, Devil's Postpile, Zumwalt Meadow and Lion Meadow (Table 3c). Again, as during 1991-1993, productivity at Hodgdon Meadow (0.492) was much higher than at Lion Meadow and Zumwalt Meadow, and at those two Sequoia/Kings Canyon stations combined (0.288).

C. Variation in landbird population parameters with elevation and location. Regressions on station elevation for adult population size, species richness, numbers of young captured, and productivity for all species pooled during 2001-2004 are presented in Figure 1**A**-**D**, respectively. These regressions were calculated in two ways, using data from the five Yosemite stations only and using data from all eight stations (i.e., also including data from the two Sequoia/Kings Canyon and the Devils's Postpile stations). For all four parameters, regression lines that included data from all eight stations were lower than those that included data from only the five Yosemite stations. Moreover, for all four parameters, the indices for Lion and Zumwalt meadows fell below the expected values based on either regression line (i.e., using the Yosemite stations only or using all eight stations). The values for the Devil's Postpile station also fell below the expected values for numbers of young captured and productivity, but fell on or slightly above the expected values for adults captured and species richness.

Strong and highly significant negative relationships were found between species richness and elevation using all eight stations or only the five Yosemite stations (Fig. 1**B**), with substantially more species at lower elevations. Relationships for adult population sizes and productivity also showed negative, but non-significant, relationships with elevation, with a higher negative slope for adult population size than for productivity (Figs. 1**A** and **D** respectively). The relationship between numbers of young and elevation was also non-significant but was slightly positive (Fig. 1**C**). Actually, using data from only the five Yosemite stations, it is clear that all three of these

relationships were curvilinear, with highest values at intermediate elevations. Adult population size, for example, was highest at Crane Flat (about 1800 m) and progressively lower at both lower and higher elevations (Fig. 1**A**). Numbers of young and productivity, however, were highest at Gin Flat East Meadow, thus peaking at yet a higher elevation, about 2200 m (Figs 1**C** and **D**). When values for these parameters for the two Sequoia/Kings Canyon and the Devil's Postpile stations are examined in light of these curvilinear relationships, it is clear that adult population size, numbers of young, and productivity appear to be nearly as expected or only slightly low for both Zumwalt Meadow and Devil's Postpile, the low and high elevation stations, respectively, but are all very low for Lion Meadow, the intermediate elevation station.

D. Comparisons between 1991-1993 and 2001-2004 time periods at Sequoia/Kings Canyon and Yosemite. Comparisons between the numbers in Tables 2a and 3a reveal that adult population sizes at each of the Sequoia/Kings Canyon stations appear to have increased between early years (1991-1993; 131.34 adults per 600 net-hours at both stations combined) and later years (2001-2004; 149.95 at both stations combined), an increase of 14.2%. The increase at Lion Meadow (11.6%) was less than that at Zumwalt Meadow (16.5%). When both Sequoia/Kings Canyon stations were combined, adult populations of 25 species showed increases (10 by 50% or more), 19 showed decreases (8 by 50% or more), and 2 showed no change. In contrast, adult populations at Yosemite appear to have decreased between these two time periods, from 270.22 adults/600 net-hours at Hodgdon Meadow in 1991-1993 to 215.75 there in 2001-2004, a decrease of 20.2%. Populations of 26 species at Hodgdon showed decreases (18 by 50% or more), 21 showed increases (9 by 50% or more), and one remained unchanged. Some small part of the increase between the two time periods in the numbers of adults captured at Sequoia/Kings Canyon could have been caused by adult population indices being biased low during the 1991-1993 time period when the stations were operated with greater effort (three days per 10-day period) than during the 2001-2004 time period (when stations were operated for only one day per 10-day period). However, a similar bias should have affected data collected at Hodgdon Meadow (where the station was also operated for three days per 10-day period during 1991 and 1992, but not 1993). Adult population sizes, however, decreased at Hodgdon Meadow between the two time periods. Thus, we can conclude that changes in adult populations between the two periods actually were more positive at Sequoia/Kings Canyon than at Yosemite.

Examination of the 41 species that exhibited changes in adult population size between the two time periods at both locations reveals that 28 showed changes in the same direction at Yosemite and Sequoia/Kings Canyon (14 positive and 14 negative) whereas only 13 showed changes in the opposite direction. Of the latter, eight involved changes that were positive at Sequoia/Kings Canyon and negative at Yosemite, which would be expected given the overall comparison, while five species showed the opposite pattern. Further examination of the data in Tables 2a and 3a shows that four species (House Wren, Black-throated Gray Warbler, Wilson's Warbler, and Cassin's Finch) showed negative changes between the early and late time periods in adult population size of 50% or more at both locations, and two species (Black Phoebe and Spotted Towhee) showed positive changes of 50% or more at both locations.

Changes in numbers of captures of young between the two time periods (Figures 2b and 3b) showed mixed results at Sequoia/Kings Canyon, decreasing (by 28.6%) between 1991-1993 and

2001-2004 at Lion Meadow and increasing (by 16.1%) at Zumwalt Meadow. At both stations combined, numbers of young captured decreased by 10.4%. At Hodgdon Meadow, number of young captured increased between the two periods, by 9.9%.

Productivity at Sequoia/Kings Canyon dropped from 0.337 in 1991-1993 to 0.288 in 2001-2004 when both stations were combined, a decrease of 14.5% (Tables 2c and 3c). This decrease was driven by a large decrease (of 26.5%) at Lion Meadow; productivity actually increased slightly (by 1.4%) at Zumwalt Meadow. When both stations were combined, productivity of 17 species showed decreases (8 by 50% or more, not including those with productivity of 0.00 during one of the two years), 15 showed increases (2 by 50% or more), and 5 showed no change. Again, in contrast, productivity at Yosemite appeared to increase between these two periods, from 0.429 at Hodgdon Meadow in 1991-1993 to 0.492 there in 2001-2004, an increase of 14.7%. Productivity of 25 species at Hodgdon showed increases (3 by 50% or more), 12 showed decreases (1 by 50% or more), and 3 remained unchanged. Again, as mentioned above, some small part of the decrease between the two time periods in productivity noted at Sequoia/Kings Canyon, especially at Lion Meadow, might be related to downward biases in numbers of adults (and a consequent upward bias in productivity) associated with the higher capture effort during the early first three-year period (see Methods); however, this same small bias should also have occurred at both Zumwalt and Hodgdon meadows, where productivity increased between the two time periods. Thus, we can conclude that changes in productivity between the two periods actually were more positive at Yosemite than at Sequoia/Kings Canyon, and that the large decrease in productivity at Lion Meadow was real and, perhaps, cause for some concern.

Examination of the 31 species that exhibited changes in productivity between the two time periods at both locations reveals that 18 showed changes in the same direction at Yosemite and Sequoia/Kings Canyon (12 positive and 6 negative) and 13 showed changes in the opposite direction. Of the latter, nine involved changes that were negative at Sequoia/Kings Canyon and positive at Yosemite, again to be expected given the overall comparison, while only four species showed the opposite pattern. Further examination of Tables 2c and 3c revealed that four species (Mountain Chickadee, Red-breasted Nuthatch, Hermit Thrush, and Purple Finch) showed negative changes in productivity at both locations with at least one change of 50% or more, and three species (Yellow-rumped Warbler, Black-throated Gray Warbler, and Black-headed Grosbeak) showed positive changes of such a magnitude.

E. Comparisons between years during 1991-1993. Constant-effort comparisons between 1991 and 1992, and between 1992 and 1993, were undertaken at each of the Sequoia/Kings Canyon stations and both stations combined and at Hodgdon Meadow for numbers of adult birds captured, numbers of young birds captured, and proportion of young in the catch (Table 4). Adult population size for all species pooled showed rather comparable decreases at all three stations between 1991 and 1992, with the largest being at Zumwalt Meadow (-30.5%) and the smallest at Hodgdon Meadow (-13.8%) (Table 4a). The overall decrease at Sequoia/Kings Canyon (-26.8%) was approximately twice that at Hodgdon Meadow (-13.8%). Interestingly, adult population sizes showed corresponding, but somewhat smaller, increases between 1992 and 1993 at both Zumwalt (+20.7%) and Hodgdon (+8.2) meadows, but showed another decrease (of -14.3%) at Lion Meadow (Table 4a). The overall increase at Sequoia/Kings Canyon

(+2.8%) was less than half that at Hodgdon Meadow (+8.2%). Despite some of these rather substantial between-year decreases (or increases) in all species pooled, the proportion of decreasing (or increasing) species was not significantly, or even near-significantly, greater than 0.50 at any station in any between-year comparison.

Changes in numbers of young captured tended to be rather similar at all three stations during both between-year comparisons, and showed large increases (43.5-266.7%) between 1991 and 1992, and slight to no increases (0.0-23.8%) between 1992 and 1993 (Table 4b). The increases were larger between 1991 and 1992 at both Sequoia/Kings Canyon stations than at Hodgdon Meadow, but smaller between 1992 and 1993 at both Sequoia/Kings Canyon stations than at Hodgdon Meadow. The proportion of species showing increases in numbers of young captured was significantly or near-significantly greater than 50% at all three stations between 1991 and 1992, but were not significant, or even near-significant, at any station between 1992 and 1993.

As expected from the changes in numbers of adults and young, between-year changes in productivity differed greatly between 1991-1992 and 1992-1993, but tended to be rather similar among the three stations during each pair of years (Table 4c). Thus, changes in productivity between 1991 and 1992 were large and positive (range +0.122 to +0.277) at all three stations, while changes in productivity between 1992 and 1993 were small, varying from -0.028 at Zumwalt Meadow to +0.038 at Lion Meadow. As with numbers of young captured, the increase in productivity was larger at the two Sequoia/Kings Canyon stations than at Hodgdon Meadow between 1991 and 1992, but smaller at the two Sequoia/Kings Canyon stations than at Hodgdon Meadow between 1992 and 1993.

Despite some differences between Sequoia/Kings Canyon and Hodgdon Meadow in the magnitude of the between-year changes in the various parameters, it is clear from the above results that, overall, between-year changes in all three parameters were relatively similar between the two locations. This suggests that the factors driving the 1991-1992 and 1992-1993 year-to-year changes in population and demographic parameters were region-wide, extending at least over the southern half of the Sierra Nevada, and were detectable through MAPS stations at both Yosemite and Sequoia/Kings Canyon national parks.

F. Comparisons between years during 2001-2004. Constant-effort comparisons in numbers of adults and young captured, and productivity were undertaken at all Yosemite and Sequoia/Kings Canyon stations between 2001 and 2002 (Table 5), and at these stations as well as the Devil's Postpile station between 2002 and 2003 (Table 6) and between 2003 and 2004 (Table 7).

Changes in adult population sizes for all species pooled between 2001 and 2002 (Table 5a) showed substantial variation among Sequoia/Kings Canyon and Yosemite stations, being negative at three stations (ranging from -7.7% at Crane Flat to -23.1% at Big Meadow) and positive at four stations (ranging from +1.8% at Hodgdon Meadow to +60.5% at Gin Flat East Meadow). This variation also occurred at Sequoia/Kings Canyon, where Lion Meadow showed a change of +22.3% whereas Zumwalt Meadow showed a change of -21.1%. In general, stations at lower elevations (Zumwalt and Big meadows) showed negative changes while stations at higher elevations (Lion Meadow, White Wolf, and Gin Flat East Meadow) showed positive

changes. Overall, their was a slight increase (+2.9%) in numbers of adults at Yosemite stations and a slight decrease (-2.1%) at the Sequoia/Kings Canyon stations. Changes between 2001 and 2002 in numbers of young captured also showed patterns related to elevation (Table 5b). Among Sequoia/Kings Canyon and Yosemite stations, numbers of young captured decreased at the two low-elevation stations (by -38.3% at Zumwalt Meadow and -11.3% at Big Meadow) but increased substantially at all higher-elevation, especially mid-elevation, stations (ranging from +31.3% at Lion Meadow to +181.8% at Crane Flat). Overall, their was a large increase (+80.5%) in numbers of adults at Yosemite stations but a small decrease (-7.4%), caused by the decrease at Zumwalt Meadow, at the Sequoia/Kings Canyon stations. As expected from changes in adults and young, productivity increased between 2001 and 2002 at all stations except Zumwalt Meadow where a small decrease of -0.050 was recorded. The largest increases were at mid-elevation Yosemite stations (Crane Flat and Hodgdon) which led to an overall increase at Yosemite of +0.137. This can be compared to a slight overall decrease at Sequoia/Kings Canyon of -0.012 which was driven by the small decrease at Zumwalt Meadow.

The patterns of changes between 2002 and 2003 were generally opposite the patterns that occurred between 2001 and 2002. Thus, the numbers of adults captured (Table 6a), increased at the low-elevation Sequoia/Kings Canyon and Yosemite stations (e.g., +2.9% at Zumwalt Meadow and +26.0% at Big Meadow) and decreased at all the high-elevation stations, ranging from -2.2% at White Wolf to -30.7% at Lion Meadow. The Devil's Postpile station, however, did not fit this pattern; it was a high-elevation station that showed increased adult populations (+27.8%) between 2002 and 2003. The changes in numbers of young captured between 2002 and 2003 at the Sequoia/Kings Canyon and Yosemite station were even more consistent than changes in adults at these stations (Table 6b), with all stations showing consistent and substantial decreases in the numbers of young (ranging from -56.6% at Big Meadow to -74.5% at Crane Flat) with the exception of Zumwalt Meadow, which showed an increase in numbers of young of +21.1%. Again, the Devil's Postpile stations differed dramatically from the rest with an increase in the numbers of young of 57.1%. Changes in productivity between 2002 and 2003 paralleled those in numbers of young, being substantially negative (ranging from -0.121 at Lion Meadow to -0.278 at Crane Flat) at all stations except Zumwalt Meadow and Devils's Postpile where productivity increased slightly by 0.033 and 0.047, respectively.

The changes between 2003 and 2004 were even more consistent among all the stations than those between 2002 and 2003 (Table 7a), with seven of eight stations showing increases in numbers of adults captured (ranging from +6.6 at Hodgdon Meadow to +44.1% at Gin Flat East Meadow). Only at Big Meadow did adults decrease slightly (by -5.6%) between 2003 and 2004. Similarly, seven of the eight stations showed substantial positive changes (ranging from +25.0% at Zumwalt Meadow to +590.9% at White Wolf) in numbers of young captured between 2003 and 2004 (Table 7b). Only at the Devil's Postpile station did numbers of young decrease somewhat (by -11.5%) between 2003 and 2004. As expected from the changes in adults and young, productivity also showed generally substantial increases between 2003 and 2004 (ranging from 0.048 at Lion Meadow to 0.342 at White Wolf), and only decreased at Zumwalt Meadow (by -0.018) and Devil's Postpile (by -0.044). It is of considerable interest that Zumwalt Meadow and Devil's postpile stations so often showed opposite patterns from the other stations.

Overall, the major pattern was a pronounced decrease in numbers of young and productivity between 2002 and 2003, and a pronounced recovery in numbers of young and productivity between 2003 and 2004. Of particular interest is the fact that numbers of adults also decreased along with numbers and proportions of young between 2002 and 2003 and recovered along with numbers of proportions of young between 2003 and 2004. For changes between 2001 and 2002, the proportion of species with increasing adult population sizes at Gin Flat East Meadow was the only proportion that was near-significantly greater than 0.50 for any of the three parameters. In contrast, the proportion of species with decreasing numbers of young between 2002 and 2003 was significantly or near-significantly greater than 0.50 for four of the five Yosemite stations (all except Big Meadow), for Lion Meadow, and for the Sequoia/Kings Canyon stations combined, while the proportion of species with decreasing productivity between those years was near-significantly greater than 0.50 for all Yosemite stations combined. Similarly, the proportion of species with increasing numbers of young between 2003 and 2004 was significantly or near-significantly greater than 0.50 for all five Yosemite stations and all Yosemite stations combined, while the proportion of species with increasing productivity between those years was significantly greater than 0.50 for Crane Flat and all Yosemite stations combined.

Estimates of Adult Survivorship

A total of 13 species met the requirement for survivorship analyses (at least two returns in at least two location/time period strata), and were designated as target species. As discussed in the Methods, an *a priori* sets of candidate models were created for which both apparent survival rate (ϕ) and recapture probability (p) were modeled as functions of both location (park) and time period, making a total of 16 models (Table 8).

The number of individuals captured (i.e., the number of capture histories), the total number of captures, and the number of returns (returns are the first capture in each year subsequent to the year the individual was originally banded) for each of the 13 target species are presented in Table 9 for the four strata (Yosemite National Park (Hodgdon Meadow) in 1991-1993, Yosemite National Park (Hodgdon Meadow) in 2001-2004, Sequoia/Kings Canyon in 1991-1993, and Sequoia/Kings Canyon in 2001-2004). We found that we could investigate possible effects of location (park) and/or time period on apparent survival rate and recapture probability for 11 (of the 13) target species (Table 9). Data were insufficient for estimation of apparent survival for two species ("Western" Flycatcher and Mountain Chickadee).

Among these 11 species, 18 between-time period comparisons of survival rate could be made at one or the other (or both) locations, and 17 between-location comparisons of survival rate could be made within one or the other (or both) time periods (Table 10). For one species (Red-breasted Sapsucker), mark-recapture data were insufficient at Sequoia/Kings Canyon, thus allowing a between-time period comparison to be made only at Hodgdon Meadow (by averaging parameter estimates from four models); for three species (Dusky Flycatcher, American Robin, and Yellow Warbler), data were insufficient in one of the four strata, resulting in two overall comparisons (one for location, one for period; again, in each case, by averaging parameter estimates from four models). Because different models were averaged for comparisons of location than for comparisons of time period, two pairs of model-averaged parameter estimates (A and B in Table 10) were calculated for the overlapping stratum for each of these three

species. For the remaining seven species (Warbling Vireo, MacGillivray's Warbler, Song Sparrow, Lincoln's Sparrow, Dark-eyed Junco, Black-headed Grosbeak, and Purple Finch), sufficient data were available from all four strata, and all four comparisons could be made (by averaging parameter estimates for survival and recapture probability from all 16 models).

Model-averaged apparent survival probabilities (Table 10) varied from 0.213 (Song Sparrow at Sequoia/Kings Canyon during 1991-1993) to 0.957 (Black-headed Grosbeak at Hodgdon Meadow during 2001-2004). Model-averaged recapture probabilities varied from 0.035 (Purple Finch at Hodgdon during both periods) to 0.724 (MacGillivray's Warbler at Sequoia/Kings Canyon during 2001-2004). For three of these species (all but MacGillivray's Warbler), however, the occurrence of multiple parameter estimates of 1.000 among the models, or high c-hat values (> 3.0), suggest that survival and recapture probabilities may have been biased high or low. Among the other eight species, apparent survival varied from 0.295 (Red-breasted Sapsucker at Hodgdon during 1991-1993) to 0.714 (American Robin at Sequoia/Kings Canyon during 2001-2004), and recapture probabilities varied from 0.121 (Warbling Vireo at Hodgdon during 2001-2004) to 0.724 (MacGillivray's Warbler at Sequoia/Kings Canyon in 2001-2004).

Overall, Table10 indicates that apparent survival probabilities were higher at Hodgdon Meadow than at Sequoia/Kings Canyon for 11 species comparisons (6 during 1991-1993 and 5 during 2001-2004) and were higher at Sequoia/Kings Canyon than at Hodgdon Meadow for only six comparisons (three during each period). Table 10 also indicates that apparent survival probabilities were higher during 2001-2004 than during 1991-1993 for 15 comparisons (8 at Hodgdon and 7 at Sequoia/Kings Canyon), and were higher during 1991-1993 than during 2001-2004 for only three comparisons (two at Hodgdon and one at Sequoia/Kings Canyon). Only two species (Red-breasted Sapsucker at Hodgdon and Warbling Vireo at both locations) showed lower survival during 2001-2004 than during 1991-1993 (Table 10).

Strong evidence ($w_i > 0.4$) for location effects on apparent survival rate (Table 11) was found for one species (MacGillivray's Warbler), and moderately strong evidence ($0.4 \geq w_i > 0.3$) was found for four species (Dusky Flycatcher, Warbling Vireo, American Robin, and Song Sparrow). Among these five species, four showed higher survival at Hodgdon, whereas only one species (Warbling Vireo) showed higher survival at Sequoia/Kings Canyon (Table 10). Strong evidence ($w_i > 0.4$) for temporal effects on apparent survival (Table 11) was found for two species, MacGillivray's Warbler and Song Sparrow, and moderately strong evidence ($0.4 \geq w_i > 0.3$) was found for three species (American Robin, Lincoln's Sparrow, and Dark-eyed Junco). All five of these species showed higher survival during 2001-2004 than during 1991-1993 (Table 10).

Moderately strong evidence for location effects on recapture probability was found for three species (Dusky Flycatcher, Warbling Vireo, MacGillivray's Warbler), and strong or moderately strong evidence for temporal effects on recapture probability was found for five species (Red-breasted Sapsucker, American Robin, MacGillivray's Warbler, Song Sparrow, and Lincoln's Sparrow). Recapture probabilities were higher at Sequoia/Kings Canyon than at Hodgdon for two of the three species and were higher during 2001-2004 than during 1991-1993 for three of the five species.

DISCUSSION AND CONCLUSIONS

Location-specific Differences in Adult Population Size and Post-fledging Productivity
Capture rates of both adults and young during 1991-1993 were more than twice as high at Hodgdon Meadow (Yosemite) as they were at the either of two Sequoia/Kings Canyon stations. These differences were species-wide, with over 2/3 of the species showing this pattern among both adults and young. Similar patterns were found during 2001-2004, when the capture rates of adults and young at the five Yosemite stations were 31% and 311% higher, respectively, than at the two Sequoia/Kings Canyon stations. Species richness of adults also was higher at the Hodgdon Meadow station than at either of the two Sequoia/Kings Canyon stations during both of the two time periods by at least 23%. In addition, productivity indices were substantially higher at each of the five Yosemite stations than at either Sequoia/Kings Canyon station during both time periods. Productivity at Hodgdon Meadow, for example, was 27% and 71% higher than at the two Sequoia/Kings Canyon stations combined during the 1991-1993 and 2001-2004 time periods, respectively. The Devil's Postpile station, operated during 2002-2004, showed a capture rate of adults that was intermediate between the Yosemite and Sequoia/Kings Canyon stations, but a low productivity index that was similar to that of the Sequoia/Kings Canyon stations and 45% lower than that of the Yosemite stations.

Correlations between elevation and the four population or demographic indices mentioned above indicate that the lower values at Sequoia/Kings Canyon cannot be explained solely by differences in elevation between the stations. For all four parameters (species richness, numbers adults captured, numbers of young captured, and productivity), regression lines that included data from all eight stations were lower than those that included data from only the five Yosemite stations, and the indices for Lion and Zumwalt meadows fell below the expected values from either regression line. The Devil's Postpile station fell slightly above the expected values for species richness and numbers of adults captured, but below the expected values for numbers of young captured and productivity. Because of the negative (or flat) slopes of the four regressions, the lower latitudes of the Sequoia/Kings Canyon stations cannot explain the differences in parameter values between there and Yosemite, because Sequoia/Kings Canyon stations would, if anything, be expected to have slightly higher values for these parameters. Therefore, the lower breeding population densities and reproductive success at Sequoia/Kings Canyon, and the lower productivity values at Devil's Postpile, must be related to either sub-regional (park-specific) or local (station-specific) effects.

Analysis of eleven years (1993-2003) of data from the Yosemite MAPS stations (DeSante et al. 2004b) suggest that the increasingly negative population trends at lower-elevation stations may have been driven by increasingly lower productivity, especially in drought years with meager snowpacks. Predictions from global climate models and recent weather data generally suggest that the Sierra Nevada region is becoming increasingly arid and that this drying tendency may be accelerating. Data from MAPS suggest that, in general, avian populations in the Sierra will be adversely affected by such climate change. It is possible that, because of their more southerly (and drier in the summer) latitudes, the effects of a drying climate are reducing productivity at the Sequoia/Kings Canyon stations to a greater degree than at the Yosemite stations. Alternatively, landscape variables within two kilometers of each station have been shown to

have substantial effects on the landbird dynamics at a station (Nott 2000) and such variables could be affecting the two Sequoia/Kings Canyon stations directly. These hypotheses underscore the importance of long-term avian demographic monitoring data in national parks, where avian population and demographic changes may be affected both by global phenomena and more local, landscape-scale land management practices.

Closer inspection of the relationships between elevation and the four population or demographic parameters at Yosemite shows that, while the relationship between species richness and elevation is indeed linear and negative, the relationships for the other three parameters are curvilinear with maxima at intermediate elevations. Maximum numbers of adults appear to occur at about 1800 m, approximately the elevation of Crane Flat, while maximum numbers of young and productivity appear to occur slightly higher at about 2200 m, approximately the elevation of Gin Flat East Meadow. In this light, adult population levels and, especially, productivity appear to be very much lower than expected at Lion Meadow in Sequoia/Kings Canyon, where each of these parameters tend to be as low as or lower than the lower elevation Zumwalt Meadow, at least during the more recent 2001-2004 time period. These results suggest that local conditions at or near the Lion Meadow station should be investigated. Interestingly, Lion Meadow's location, just above a large escarpment leading to much lower elevations, may influence dispersal characteristics of breeding adults and post-fledging young and thus affect the population and demographic indices. Lion Meadow's location also may make it more susceptible to the effects of air (e.g., ozone) pollution or the effects airborne contaminants (e.g., pesticide residues) than the Zumwalt Meadow station and stations further north in the Sierra in Yosemite and Devil's Postpile. All of these possibilities beg for further study and demographic monitoring must play a critical role in such investigation.

Comparisons of Adult Population size and Productivity Between 1991-1993 and 2001-2004
Populations of adults at both Sequoia/Kings Canyon stations increased between 1991-1993 and 2001-2004, by 14.2%. Populations of 25 of 46 species showed increases, with 10 species increasing by 50% or more. In contrast, populations at Hodgdon Meadow (Yosemite) decreased between these two periods, by 20.2%, with 26 of 47 species showing decreases, 18 by 50% or more. This latter result at Yosemite accords with 11-year (1993-2003) analyses showing a substantial and highly significant decrease of -2.7% per year, a 26% decline over this period (DeSante et al. 2004b). At Hodgdon Meadow, however, populations during 1990-1992 also tended to be lower than during the mid 1990s, suggesting that populations in Yosemite may be undergoing cyclical increases and decreases over decade-long periods and, in the long run, be more stable than the 11-year data suggest. The opposite results from Sequoia/Kings Canyon (increases between the two periods) might support this latter hypothesis. They may also support the occurrence of a sub-regional component to population-trend dynamics within the Sierra Nevada as a whole, as discussed above, with distinct differences between parts of the Sierra.

Aside from these trends in all species pooled, however, certain species (e.g., Red-breasted Sapsucker, Dusky Flycatcher, Hermit Warbler, and Purple Finch) showed pronounced 14-year decreases at Hodgdon Meadow that do not appear to be part of a short-term cycle and are cause both for concern and for management action. Furthermore, comparison of 11-year population trends at Yosemite with long-term BBS trends from the Sierra Nevada physiographic strata (see

http://www.mbr-pwrc.usgs.gov/bbs/trend/tf02.html) suggests that the declines for most landbird species in Yosemite are part of a Sierra-wide decline. Supporting this latter result, a comparison between the 41 species with population-size changes between 1991-1993 and 2001-2004 at both Yosemite and Sequoia/Kings Canyon revealed that 28 showed changes in the same direction at both Yosemite and Sequoia/Kings Canyon and only 13 showed changes in the opposite direction. Four species (House Wren, Black-throated Gray Warbler, Wilson's Warbler, and Cassin's Finch) showed negative changes in breeding population size of 50% or more at both locations. These four species, along with the four species mentioned above, should be considered in future plans for management actions at both national parks.

In contrast to population-size results, productivity (proportion of young in the catch) at Sequoia/ Kings Canyon dropped from 0.337 in 1991-1993 to 0.288 in 2001-2004, a decrease of 14.5%. This decrease was driven by a large decrease (of 26.5%) at Lion Meadow. Seventeen of 32 species showed decreases in productivity, 8 by 50% or more. Again, in contrast, productivity at Hodgdon Meadow increased between these two periods, from 0.429 in 1991-1993 to 0.492 in 2001-2004 (14.7%). A comparison between the 31 species with productivity changes at both locations reveals that 18 showed changes in the same direction and 13 showed changes in the opposite direction. Four species (Mountain Chickadee, Red-breasted Nuthatch, Hermit Thrush, and Purple Finch) showed negative changes in productivity at both locations with at least one change of 50%. These results on productivity further underscore that: (1) sub-regional or local phenomena are causing differences between Sequoia/Kings Canyon and Yosemite in the population dynamics of landbirds, but (2) there are also Sierra-wide phenomena affecting avian population dynamics in both national parks, and (3) there are species with consistent declines in adult population sizes or productivity that warrant management attention.

Between-year Changes in Adult Population Sizes and Productivity

Constant-effort comparisons were made in numbers of adult and young birds captured and productivity (proportion of young in the catch) between 1991 and 1992 and between 1992 and 1993 at Hodgdon Meadow and at both Sequoia/Kings Canyon stations; between 2001 and 2002 at all seven Yosemite and Sequoia/Kings Canyon stations; and between 2002 and 2003 and between 2003 and 2004 for those seven stations as well as the Devil's Postpile station. In general, year-to-year changes in adult population sizes showed Sierra-wide concordance, with decreases at all three stations operated in both Yosemite and Sequoia/Kings Canyon from 1991 to 1992 and increases from 1992 to 1993, although adult population sizes at Lion Meadow decreased during both of these two years. A similar concordance of year-to-year changes was demonstrated during the 2001-2004 time period, but with an elevation effect. At higher-elevation stations (e.g., White Wolf, Gin Flat East Meadow, Crane Flat, Lion Meadow, and Hodgdon Meadow), adult population sizes generally increased between 2001 and 2002, decreased between 2002 and 2003, and increased again between 2003 and 2004. Low-elevation stations (e.g., Zumwalt Meadow, Big Meadow) showed a similar alternating trend in adult population sizes but in the opposite direction; they generally decreased between 2001 and 2002, increased between 2002 and 2003, and decreased again between 2003 and 2004.

Year-to-year changes in productivity were large and positive at all three stations between 1991 and 1992, but were slight and variable between 1992 and 1993. Between year changes in

productivity showed even more Sierra-wide concordance during the 2001-2004 time period, when productivity increased between 2001 and 2002 at all stations but Zumwalt Meadow, decreased dramatically between 2002 and 2003 at all stations except Zumwalt Meadow and Devil's Postpile, and increased equally dramatically between 2003 and 2004 at all stations except, again, Zumwalt Meadow and Devil's Postpile. We currently have no explanation for why these two stations consistently showed year-to-year changes in productivity opposite to those of all other stations, but it worth noting that they, along with the Big Meadow station, often showed differences from the other stations in year-to-year changes in adult population sizes as well. We expect that the explanation is related to bird responses to the effects of local climate and landscape-scale variables, because each of these three stations are located at lower elevations (Zumwalt Meadow and Big Meadow) or nearly on the east-slope of the Sierra (Devil's Postpile) and may to be characterized by more xeric conditions than all the other mid- and higher-elevation west slope stations.

We have frequently found, at other locations where we have operated MAPS stations, consistent alternating patterns of adult population size increases and decreases and equally consistent but out-of-phase alternating decreases and increases in productivity. We believe that this pattern relates to density-dependent effects on productivity and recruitment along with lower productivity of first-time breeders. Accordingly, populations that have shown an increase in a given year, typically show reduced productivity that year, apparently due to stronger intra- and, possibly, inter-specific competition and a greater proportion of inexperienced first-time breeders. This poor productivity then results in decreased recruitment and fewer breeding birds the following year, which in turn have higher productivity due to weaker competition and a higher proportion of experienced (two-year-old or older) breeders.

This alternating cycle of population increases and decreases, with out-of-phase decreases and increases in productivity, tended to be present at Yosemite MAPS stations during 1991-1993 and 1996-2001, but not during 1993-1996 or 2001-2003 (DeSante et al. 2004b). Apparently, strong environmental perturbations caused, for example, by severe weather such as major droughts, severe late spring/early summer storms, or extremely heavy late-melting snowpacks, can disrupt these cycles and cause density-independent productivity and/or population size perturbations. This is presumably what happened during the 2003 breeding season, when precipitation in the Sierra during April and May was at 200-300% of normal levels and the above-average snowpack did not reach its peak until mid-May and did not melt until well into June. This was followed by July precipitation levels that, while small, were still 200-300% of normal. This series of events may have caused the 10-20% reduction in adult population levels at MAPS stations in both Yosemite and Sequoia/Kings Canyon, as well as the dramatic 70% decrease in numbers of young and a 42% decrease in productivity from 0.638 to 0.373. Clearly, the large magnitude of the weather perturbations that affect montane environments and their effect on avian population dynamics means that long, consistent runs of monitoring data will be necessary to detect long-term underlying changes in bird populations. Because of the complexity of the dynamics driving bird population changes, equally long-term runs of data on avian vital rates will be absolutely necessary to understand the causes of the changes and, for population declines, to formulate possible solutions. Set in the context of current widespread environmental degradation and contamination and on-going climate change, such population and demographic monitoring data

on birds from protected ecosystems, such as the national parks, will become increasingly valuable.

Estimates of Adult Survivorship

It is important to note that productivity alone is not necessarily the driving force for long-term population trends, even when annual changes in productivity can be shown to drive annual changes in population size. Rather, it is the overall relation between average productivity and average mortality that determines overall population trends. Indeed, alternating cycles of out-of-phase changes in productivity and population size, such as described earlier, could occur in species variously showing increasing, stable, or decreasing population trends. In order to fully investigate the effects of productivity on long-term population trends and determine the causes of population change, we must also consider annual adult survival rates.

We investigated possible effects of location (park) and time period (1991-1993 vs. 2001-2004) on apparent survival rates for 11 target species breeding at the Hodgdon Meadow (Yosemite) and two Sequoia/Kings Canyon MAPS stations. We found strong to moderately strong support for location effects on survival rate for five species (Dusky Flycatcher, Warbling Vireo, American Robin, MacGillivray's Warbler, and Song Sparrow), with all but Warbling Vireo showing higher survival at Hodgdon Meadow than at Sequoia/Kings Canyon. Overall, apparent survival probabilities were higher at Hodgdon Meadow than at Sequoia/Kings Canyon for 11 of 17 species-time period comparisons.

We currently have no explanation for these location-specific differences in survival estimates. Apparent survival values might be expected to be influenced primarily by events that occur on migration or the wintering grounds, and this would be true for the five species with strong or moderately strong support for location effects on survival, since they are all migratory species. Within the Sierra Nevada, such location effects on survival should not be manifest unless the populations at each location are migrating to different wintering locations where they are subject to different environmental stressors. At the continental scale, populations breeding farther north generally have longer migrations, and we often see lower survival (offset by higher productivity) at higher than at lower latitudes. This pattern, however, cannot explain our results because only one of five species showed higher survival at the lower latitudes of Sequoia/Kings Canyon, and productivity also showed higher values at higher latitudes. We hypothesize that the differences in apparent survival observed between Yosemite and Sequoia/Kings Canyon may actually relate to local stressors acting on the breeding grounds which can affect annual survival of adults. It is not inconceivable that higher levels of air pollution and airborne contaminants at Sequoia/Kings Canyon than at Yosemite could be driving these differences in annual adult apparent survival. In this light, continued monitoring of apparent survival rates would be a prudent course of action.

Strong or moderately strong evidence for temporal effects on apparent survival were also found for five species (American Robin, MacGillivray's Warbler, Lincoln's Sparrow, Song Sparrow, and Dark-eyed Junco), with all five showing higher survival during 2001-2004 than during 1991-1993. Overall, apparent survival probabilities were higher during 2001-2004 than during 1991-1993 for 15 of 18 species-location comparisons. Only two species (Red-breasted Sapsucker at Hodgdon Meadow and Warbling Vireo at both locations) showed lower survival in 2001-2004

than 1991-1993. This suggests a region-wide tendency for apparent survival to have been better during the early 2000s than during the early 1990s. Again, we have as yet no explanation for this difference. It does suggest, however, that decreases in adult population sizes between these two time periods (especially at Yosemite) may be more related to changes in productivity than in survival; in other words, that productivity more than adult survival may be driving the population dynamics of landbirds in the Sierra Nevada. This accords with longer-term data from Yosemite, where productivity appeared to be driving the trends of 13 species whereas survival was only driving or influencing trends in four species (Desante et al. 2004b). This may be cause for considerable concern given the low and declining productivity noted especially at Sequoia/Kings Canyon. It also suggests, however, that the population dynamics of most species are being affected by events or conditions in the Sierra Nevada and probably in the national parks themselves, and, thus, could be within the National Park Service's ability to influence through appropriate management action.

Conclusions

Capture rates of adults and young, as well as productivity indices, were substantially higher at Yosemite National Park MAPS stations than at those operated in Sequoia/Kings Canyon. Survival rates also appeared to be higher, in general, at Yosemite than at Sequoia/Kings Canyon. These differences cannot be explained by differences between the two locations in elevation or latitude (although elevation appears to have a strong affect on the population dynamics of Sierra landbirds, as demonstrated by differences in between-year changes in adult population sizes and productivity). Considering expected elevational effects, adult population sizes and, especially, productivity appeared to be very low at Lion Meadow in Sequoia/Kings Canyon National Park.

We suggest that the lower population and demographic parameter values recorded at Sequoia/ Kings Canyon than at Yosemite result from a complex combination of factors including: (1) global climate change resulting in drier conditions in the Sierra that could negatively affecting productivity at the Sequoia/Kings Canyon stations to a greater degree than at the Yosemite stations because of their inherently warmer and drier local climates; (2) severe weather fluctuations, such as droughts, major late spring/early summer storms, and large late-melting snowpacks, that may be more excessive and be driving larger density-independent population and productivity fluctuations in the inherently warmer and drier southern Sierra than farther north; (3) variations in landscape-scale habitat characteristics within a few km of each station that could have important differential effects on landbird dynamics at the two locations; (4) higher levels of air pollution and airborne contaminants present at the Sequoia/Kings Canyon stations than at the Yosemite stations that could cause greater decreases in productivity and survival at Sequoia/ Kings Canyon which, in turn, could drive steeper population declines there; and (5) differences in the habitat quality at the various stations which, through breeding-site selection based on habitat quality, could produce variations in the quality or life-histories of the individuals comprising the breeding populations at each location, and which, in turn, could affect their productivity and/or survival. These hypotheses underscore the importance of long-term avian demographic monitoring data in national parks, where avian population and demographic changes may be affected both by global climate phenomena and local environment and weather conditions, but where deleterious land-management practices can more easily be minimized.

Although breeding populations at Sequoia/Kings Canyon stations increased between 1991-1993 and 2001-2004 (by 14.2%), productivity within the park dropped between these two periods (by 14.5%). In addition, comparison of 11-year population trends at Yosemite with long-term BBS trends from the Sierra Nevada physiographic strata suggests that the declines for most landbird species in Yosemite are part of a Sierra-wide decline. And although apparent survival increased for most species between 1991-1993 and 2001-2004, MAPS data indicate that productivity more than adult survival is driving the population dynamics in the Sierra Nevada. This is cause for concern (especially given low and declining productivity at Sequoia/Kings Canyon), but also indicates that the landbird population dynamics at national parks in the Sierra could be within the National Park Service's ability to influence through management action. These findings again underscore the importance of long-term avian demographic monitoring as related to local land-use practices, especially as affecting species with declining populations or productivity. For the southern half of the Sierra Nevada and for Yosemite and Sequoia/Kings Canyon taken as a whole, such species include Red-breasted Sapsucker, Dusky Flycatcher, House Wren, Black-throated Gray Warbler, Hermit Warbler, Wilson's Warbler, Purple Finch and Cassin's Finch.

Should data collection at Yosemite and Sequoia/Kings Canyon continue, and future funding permit, we would like to follow several avenues of investigation to further explain landbird population dynamics in the Sierra Nevada with the ultimate goal of recommending generalized management guidelines and specific management actions to reverse populations declines by improving the quality of the environment within or adjacent to the National Parks. First, in future analyses we hope to be able to index first year survival as well as immigration into and emigration out of the populations by using mark-recapture models to estimate annual recruitment of both second-year and after-second-year birds. Once these analyses have been completed, we will be able to examine patterns in adult and first year survival rates according to geographic location, elevation, climate, and habitat considerations, and to identify species for which declines may be driven by low first-year survival.

Through analysis of MAPS data at other locations we have also found that patterns of landscape structure detected within a two- to four-kilometer radius area surrounding each station are good predictors not only of the numbers of birds of each species captured but, more importantly, of their productivity levels as well (Nott 2000). We have been able to estimate threshold values of woodland/forest patch size above which productivity levels were high and below which productivity dropped off rapidly. These types of analyses provide extremely powerful tools to identify and formulate management actions aimed at reversing declining populations and maintaining stable or increasing populations of landbirds, because they can address the particular vital rate responsible for the decline. We plan to conduct similar analyses for the target species in the Sierra, by modeling productivity as a function of various landscape characteristics that vary along a gradient from the pristine landscapes found in Yosemite National Park to the much more heavily managed landscapes on Sierra national forests where we also have MAPS stations.

Because of the pronounced elevation factor in the Sierra Nevada and the complex effects of weather on population size and productivity, we will need to incorporate elevation-specific habitat analyses and account for weather on an annual basis. For example, elevation effects on adult population size also reflect the effects of dry years (greater population sizes at higher

elevations due to lack of snow pack and warmer temperatures) versus wet years (greater population sizes at lower elevations due to higher food productivity and cooler temperatures) (DeSante et al. 2004b). Thus, landscape-level analyses from Sierra MAPS stations will necessarily involve interactions between elevation and weather as well as habitat characteristics. It is the complexity of these interactions that create the need for truly long-term data with high station continuity from year to year.

This report demonstrates that the indices and estimates of primary demographic parameters obtained by the Yosemite and Sequoia/Kings Canyon MAPS Programs are providing critical information that will be extremely useful for the management and conservation of landbirds in the Sierra Nevada and, in combination with data collected at the continental scale, across the whole of North America. The results highlighted above have also revealed that the population dynamics of the breeding birds in the Sierra Nevada are complex, as are the likely causes of the dynamics and, for those trends deemed problematic, their solutions. This complexity, in turn, underscores the importance of standardized, long-term demographic data without which landbird population monitoring will be primarily an historical exercise with limited power to determine causes of landbird population declines or to formulate strategies and identify actions to reverse the declines.

We conclude that the MAPS protocol is very well-suited to provide a critical component of the National Park Service's long-term ecological monitoring effort in Yosemite and Sequoia/ Kings Canyon National Parks. Based on the above information, our preferred recommendation is that the operation of all of the current MAPS stations (five in Yosemite, two in Sequoia/Kings Canyon, and one in Devil's Postpile) be sustained into the future. Alternatively, with an eye toward reducing costs while maximizing critical information, we recommend that four stations in Yosemite National Park (to provide an elevational transect) and the two stations in Sequoia/ Kings Canyon (to provide comparative data) continue to be operated (perhaps by a single team). Such an arrangement would involve discontinuance of one station in Yosemite (perhaps Gin Flat East Meadow which has only been operated since 1998) and require an alternative strategy for continuing the operation of the Devil's Postpile station (which would be logistically difficult for a Yosemite-Sequoia/Kings Canyon team to run). Discontinuance of the Devil's Postpile station is not recommended, because its vegetation and environment is strongly influenced by east-side of the Sierra climate and no other MAPS station exits in true montane conditions on the east slope of the Sierra. Other scenarios for station operation could also be considered. We also recommend that funding be identified to provide for a comprehensive analysis of all Sierra MAPS data (including stations on national forests and private lands) as a function of station-specific and remote-sensed landscape-scale habitat data and spatially-explicit weather data.

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Table 1. Summary of the eight MAPS stations in Yosemite National Park, and Kings Canyon and Sequoia National Parks, and Devil's Postpile National Monument that were operated in 2004 and various prior years.

Station Name	Code	No.	Major Habitat Type	Latitude-longitude	Avg Elev. (m)	Years of Operation
Yosemite National Park						
White Wolf Meadow	WHWO	11904	Wet montane meadow, red fir/ lodgepole pine forest	37˚52'10"N,-119˚39'10"W	2402	1993-2004
Gin Flat East Meadow	GFEM	11980	Wet montane meadow, mixed fir forest	37˚46'00"N,-119˚45'30"W	2073	1998-2004
Crane Flat Meadow	CRFL	11907	Wet montane meadow, mixed coniferous forest, willow/aspen thickets	37˚45'20"N,-119˚48'10"W	1875	1993-2004
Hodgdon Meadow	HODG	11107	Wet montane meadow, mixed coniferous forest, black oak woodland, willow/ dogwood thickets	37˚47'50"N,-119˚52'00"W	1408	1990-2004
Big Meadow	BIME	11905	Open dry meadow, riparian willows, mixed coniferous and oak forest	37˚42'20"N,-119˚45'10"W	1311	1993-2004
Sequoia/Kings Canyon National Park						
Lion Meadow	LIME	11109	Coniferous forest, montane meadow, montane chaparral	36˚44'45"N,-118˚58'57"W	1853	1991-1993, 2001-2004
Zumwalt Meadow	ZUME	11110	Riparian corridor, conifer forest, oak woodland	36˚47'00"N,-118˚35'00"W	1280	1991-1993, 2001-2004
Devil's Postpile National Monument						
Devil's Postpile NM	DEPO	11224	Montane meadow, lodgepole pine forest, willow thickets	37˚37'45"N,-119˚05'04"W	2350	2002-2004

Table 2a. Mean numbers of individual ADULT birds captured per 600 net-hours at the three MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks averaged over the three years 1991-1993[1]. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Red-breasted Sapsucker	1.33		0.65	7.14
Downy Woodpecker		0.84	0.42	0.61
Hairy Woodpecker	0.42	0.42	0.42	0.75
White-headed Woodpecker	2.13	0.85	1.50	0.43
Northern Flicker				0.98
Olive-sided Flycatcher		0.42	0.22	0.81
Western Wood-Pewee		0.42	0.22	3.08
"Traill's" Flycatcher				4.46
Hammond's Flycatcher	1.71	0.42	1.06	2.70
Dusky Flycatcher	6.38	0.84	3.59	26.21
"Western" Flycatcher	8.34	1.27	4.74	3.75
Black Phoebe		0.42	0.21	
Cassin's Vireo		1.69	0.86	3.70
Hutton's Vireo				
Warbling Vireo	1.25	15.60	8.52	33.38
Mountain Chickadee	5.63	0.84	3.21	2.09
Chestnut-backed Chickadee				0.61
Red-breasted Nuthatch	1.29	0.42	0.85	0.38
White-breasted Nuthatch				
Brown Creeper	6.84	0.84	3.82	2.63
House Wren	0.88		0.43	2.85
Winter Wren	0.42		0.21	0.38
Golden-crowned Kinglet	3.92		1.93	0.81
Western Bluebird				0.43
Swainson's Thrush		2.11	1.07	
Hermit Thrush	1.25	1.69	1.48	2.03
American Robin	2.21	11.36	6.78	4.17
Orange-crowned Warbler		2.96	1.51	5.77
Nashville Warbler	6.46	4.63	5.52	9.21
Yellow Warbler	0.42	2.52	1.47	8.30
Yellow-rumped Warbler	9.67		4.84	5.67
Black-throated Gray Warbler		3.80	1.93	2.10
Hermit Warbler	3.00	0.84	1.91	13.06
MacGillivray's Warbler	15.50	21.09	18.33	34.47
Wilson's Warbler	2.13	14.33	8.23	3.85
Western Tanager	2.54	2.52	2.52	3.27
Spotted Towhee	1.25		0.63	

Table 2a. (cont.) Mean numbers of individual ADULT birds captured per 600 net-hours at the three MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks averaged over the three years 1991-1993[1]. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Chipping Sparrow				3.79
Fox Sparrow	3.83		1.91	
Song Sparrow		10.52	5.30	9.47
Lincoln's Sparrow	11.59	0.84	6.16	10.56
Dark-eyed Junco	19.88	0.42	10.02	14.51
Black-headed Grosbeak	1.25	8.85	5.09	8.82
Lazuli Bunting		0.84	0.42	1.28
Red-winged Blackbird		2.11	1.07	0.61
Brewer's Blackbird		0.84	0.42	
Brown-headed Cowbird	0.42	0.85	0.64	
Bullock's Oriole				0.38
Purple Finch	1.75	16.01	8.92	26.06
Cassin's Finch		2.10	1.05	1.61
Pine Siskin	1.75		0.86	2.77
Evening Grosbeak	0.92		0.44	0.30
ALL SPECIES POOLED	126.30	136.55	131.34	270.22
Number of Species	31	35	44	44

[1] Data were only included from a single day of operation each year in each of the years, 1991-1993, at all three stations.

Table 2b. Mean numbers of individual YOUNG birds captured per 600 net-hours at the three MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks averaged over the three years 1991-1993[1]. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Red-breasted Sapsucker	0.92		0.44	2.36
Downy Woodpecker				
Hairy Woodpecker		0.42	0.21	0.68
White-headed Woodpecker				
Northern Flicker		0.42	0.21	
Olive-sided Flycatcher				
Western Wood-Pewee				0.61
"Traill's" Flycatcher				0.68
Hammond's Flycatcher				
Dusky Flycatcher	2.17		1.07	1.67
"Western" Flycatcher	4.84	1.69	3.23	0.75
Black Phoebe		0.84	0.43	
Cassin's Vireo				2.91
Hutton's Vireo		0.42	0.21	
Warbling Vireo	0.42	0.84	0.63	10.02
Mountain Chickadee	3.09	1.26	2.15	0.81
Chestnut-backed Chickadee				
Red-breasted Nuthatch	1.29	0.42	0.85	1.71
White-breasted Nuthatch	0.42		0.21	
Brown Creeper	8.13	1.27	4.69	1.93
House Wren	7.29	4.24	5.79	4.48
Winter Wren				0.68
Golden-crowned Kinglet	0.88		0.43	1.59
Western Bluebird				
Swainson's Thrush				
Hermit Thrush		0.42	0.22	0.43
American Robin		2.94	1.48	
Orange-crowned Warbler	7.08	11.36	9.28	80.96
Nashville Warbler	6.33	0.84	3.58	16.21
Yellow Warbler		0.42	0.21	5.50
Yellow-rumped Warbler				0.61
Black-throated Gray Warbler		0.42	0.22	2.74
Hermit Warbler				5.63
MacGillivray's Warbler	7.88	10.56	9.25	17.90
Wilson's Warbler	2.67	3.39	3.04	3.66
Western Tanager	0.83		0.42	2.18
Spotted Towhee	0.88		0.43	

Table 2b. (cont.) Mean numbers of individual YOUNG birds captured per 600 net-hours at the three MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks averaged over the three years 1991-1993[1]. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Chipping Sparrow				0.98
Fox Sparrow	1.25		0.63	
Song Sparrow		12.20	6.15	8.80
Lincoln's Sparrow	9.92		4.90	8.87
Dark-eyed Junco	14.13		6.91	12.00
Black-headed Grosbeak	0.46		0.22	0.30
Lazuli Bunting				0.30
Red-winged Blackbird				
Brewer's Blackbird				
Brown-headed Cowbird				
Bullock's Oriole				
Purple Finch	0.46	0.42	0.44	5.57
Cassin's Finch		0.42	0.22	0.38
Pine Siskin				
Evening Grosbeak				
ALL SPECIES POOLED	81.32	55.25	68.14	203.90
Number of Species	21	21	31	32

[1] Data were only included from a single day of operation each year in each of the years, 1991-1993, at all three stations.

Table 2c. Mean PROPORTION OF YOUNG in the catch at the three MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks averaged over the three years 1991-1993[1]. Data for each species are included only from stations that lie within the breeding range of the species. If no young or adult birds were captured in a year the year is not included in the average.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Red-breasted Sapsucker	0.250		0.250	0.222
Downy Woodpecker		0.000	0.000	0.000
Hairy Woodpecker	0.000	0.500	0.250	0.667
White-headed Woodpecker	0.000	0.000	0.000	0.000
Northern Flicker		1.000	1.000	0.000
Olive-sided Flycatcher		0.000	0.000	0.000
Western Wood-Pewee		0.000	0.000	0.167
"Traill's" Flycatcher				0.148
Hammond's Flycatcher	0.000	0.000	0.000	0.000
Dusky Flycatcher	0.264	0.000	0.254	0.055
"Western" Flycatcher	0.438	0.584	0.447	0.111
Black Phoebe		0.750	0.750	
Cassin's Vireo		0.000	0.000	0.402
Hutton's Vireo		1.000	1.000	
Warbling Vireo	0.250	0.048	0.065	0.218
Mountain Chickadee	0.326	0.584	0.388	0.278
Chestnut-backed Chickadee				0.000
Red-breasted Nuthatch	0.500	0.500	0.500	0.833
White-breasted Nuthatch	1.000		1.000	
Brown Creeper	0.542	0.375	0.549	0.682
House Wren	0.914	1.000	0.949	0.635
Winter Wren	0.000		0.000	0.750
Golden-crowned Kinglet	0.178		0.178	0.500
Western Bluebird				0.000
Swainson's Thrush		0.000	0.000	
Hermit Thrush	0.000	0.167	0.167	0.333
American Robin	0.000	0.181	0.154	0.000
Orange-crowned Warbler	1.000	0.831	0.851	0.930
Nashville Warbler	0.477	0.095	0.364	0.595
Yellow Warbler	0.000	0.250	0.250	0.403
Yellow-rumped Warbler	0.000		0.000	0.111
Black-throated Gray Warbler		0.067	0.067	0.583
Hermit Warbler	0.000	0.000	0.000	0.287
MacGillivray's Warbler	0.328	0.315	0.321	0.336
Wilson's Warbler	0.600	0.277	0.386	0.485
Western Tanager	0.222	0.000	0.167	0.269
Spotted Towhee	0.667		0.667	

Table 2c. (cont.) Mean PROPORTION OF YOUNG in the catch at the three MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks averaged over the three years 1991-1993[1]. Data for each species are included only from stations that lie within the breeding range of the species. If no young or adult birds were captured in a year the year is not included in the average.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Chipping Sparrow				0.444
Fox Sparrow	0.143		0.143	
Song Sparrow		0.440	0.440	0.449
Lincoln's Sparrow	0.456	0.000	0.445	0.440
Dark-eyed Junco	0.375	0.000	0.370	0.439
Black-headed Grosbeak	0.500	0.000	0.048	0.024
Lazuli Bunting		0.000	0.000	0.125
Red-winged Blackbird		0.000	0.000	0.000
Brewer's Blackbird		0.000	0.000	
Brown-headed Cowbird	0.000	0.000	0.000	
Bullock's Oriole				0.000
Purple Finch	0.111	0.030	0.048	0.157
Cassin's Finch		0.500	0.500	0.167
Pine Siskin	0.000		0.000	0.000
Evening Grosbeak	0.000		0.000	0.000
ALL SPECIES POOLED	0.388	0.283	0.337	0.429

[1] Data were only included from a single day of operation each year in each of the years, 1991-1993, at all three stations.

Table 3a. Mean numbers of individual ADULT birds captured per 600 net-hours at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Sharp-shinned Hawk	0.31		0.16							
Spotted Sandpiper		0.32	0.16							
Acorn Woodpecker								1.01	0.20	
Williamson's Sapsucker				4.07					0.60	
Red-breasted Sapsucker	1.28		0.65	1.32	7.12	2.15	10.43	3.10	5.34	6.61
Downy Woodpecker		2.59	1.29				0.71	1.11	0.41	
Hairy Woodpecker	0.33	0.64	0.48		0.77	1.32	0.27	1.62	0.82	
White-headed Woodpecker	1.92	0.33	1.12		1.60	2.13	0.54	1.81	1.23	
Northern Flicker	0.63	0.64	0.64	0.41	0.77	0.61	0.98	3.52	1.28	
Olive-sided Flycatcher		0.32	0.16		0.81		0.54		0.28	
Western Wood-Pewee		4.54	2.26	0.49	2.01		3.14	4.16	2.08	
"Traill's" Flycatcher						0.32	0.70	1.83	0.60	0.51
Hammond's Flycatcher	1.91		0.96		1.98	3.57	0.47		1.24	
Dusky Flycatcher	5.69	0.31	3.01	2.18	4.19	13.39	4.72	0.70	5.32	1.96
"Western" Flycatcher	5.16	6.17	5.64	0.84	0.40	4.89	4.71		2.52	
Black Phoebe		0.96	0.48			0.28	0.27	4.35	0.96	
Cassin's Vireo	0.65	4.22	2.42		1.17	1.52	3.91	0.32	1.67	0.98
Hutton's Vireo	0.32		0.16							
Warbling Vireo	1.25	8.74	4.98	1.45	2.66	18.22	17.18	4.52	10.11	13.99
Steller's Jay	0.63	1.27	0.96	0.42		0.28	1.01	0.37	0.47	1.17
Western Scrub-Jay								0.38	0.06	
Violet-green Swallow		0.33	0.16							
Mountain Chickadee	2.54	0.33	1.45	4.37	11.90	6.49	1.23		4.47	2.22
Chestnut-backed Chickadee							1.19		0.34	

Table 3a. (cont.) Mean numbers of individual ADULT birds captured per 600 net-hours at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Oak Titmouse								0.32	0.06	
Bushtit							0.47	7.32	1.45	
Red-breasted Nuthatch	1.30		0.65		1.89	1.47	1.20		0.99	0.47
White-breasted Nuthatch					0.40			2.24	0.49	
Brown Creeper	3.85	1.31	2.59	2.25	4.64	2.51	1.02	1.07	2.16	0.47
Canyon Wren										
Bewick's Wren								2.07	0.40	
House Wren				0.41	0.75	1.55	0.73	3.42	1.39	
Winter Wren	1.28		0.64					0.35	0.07	
Marsh Wren										
American Dipper		0.31	0.16					0.35	0.07	
Golden-crowned Kinglet	4.45		2.25	3.21	5.88	9.51	1.44		3.88	0.51
Western Bluebird								0.37	0.07	
Townsend's Solitaire	0.33		0.16				0.47		0.13	
Swainson's Thrush		2.90	1.45				0.46		0.13	0.47
Hermit Thrush	0.63		0.31	2.32	0.40	2.83	1.27	0.38	1.42	
American Robin	7.04	10.34	8.68	6.83	5.49	2.63	3.19	2.12	3.79	12.98
Wrentit								3.59	0.67	
European Starling										
Orange-crowned Warbler		0.33	0.16	0.41	4.80	19.66	12.94	14.92	11.51	11.53
Nashville Warbler	4.13	5.56	4.84	0.41	1.13	1.83	3.60	6.66	2.87	2.04
Yellow Warbler		6.14	3.04				2.90	7.17	2.14	6.14
Yellow-rumped Warbler	15.31	0.33	7.86	16.65	31.98	35.82	6.72	2.19	17.82	24.99
Black-throated Gray Warbler		1.93	0.96					0.38	0.06	

Table 3a. (cont.) Mean numbers of individual ADULT birds captured per 600 net-hours at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Hermit Warbler	3.50	0.33	1.93	1.33	3.78	18.37	10.03		7.44	0.47
MacGillivray's Warbler	25.23	14.87	20.07		8.47	18.09	34.95	2.89	15.44	7.63
Wilson's Warbler	0.63	5.47	3.03			0.98	0.46	0.35	0.40	17.40
Western Tanager	1.28	5.78	3.51	0.42	14.60	2.95	4.68	2.20	4.84	1.75
Green-tailed Towhee					1.57	0.84		0.37	0.54	
Spotted Towhee	2.87	0.64	1.76				1.83	9.94	2.38	
Chipping Sparrow				1.47	0.40	4.80	0.96	0.70	1.72	
Savannah Sparrow										0.47
Fox Sparrow	4.44		2.24		0.81	0.98	0.23	0.32	0.47	
Song Sparrow	1.95	11.56	6.73	0.46		0.95	22.23	3.52	7.02	16.22
Lincoln's Sparrow	16.88		8.50	5.96	30.71	25.28	12.14		14.98	0.47
White-crowned Sparrow										4.54
Dark-eyed Junco	19.41	6.49	12.99	43.64	31.16	46.35	15.56	1.11	26.49	17.84
Black-headed Grosbeak	0.33	8.98	4.65		0.78	0.65	7.82	5.39	3.39	
Lazuli Bunting	0.32	0.98	0.64		0.40	6.76		13.31	4.07	1.56
Red-winged Blackbird		1.62	0.80				3.03		0.86	
Brewer's Blackbird							1.47	2.51	0.89	3.63
Brown-headed Cowbird		1.29	0.64		0.40		0.50	0.38	0.27	1.56
Bullock's Oriole								1.40	0.26	
Pine Grosbeak				2.27					0.34	2.00
Purple Finch	3.21	35.40	19.18	0.42	0.40	2.53	7.47	9.54	4.61	
Cassin's Finch		0.33	0.16	2.81	3.51	2.86	0.73		1.80	6.71
House Finch										
Red Crossbill							1.82	0.64	0.65	

Table 3a. (cont.) Mean numbers of individual ADULT birds captured per 600 net-hours at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Pine Siskin				0.89	8.39	4.21	1.46		2.87	4.04
Lesser Goldfinch		3.84	1.92		2.32	0.33		8.38	2.10	
Lawrence's Goldfinch		0.63	0.31		0.40			3.87	0.80	
Evening Grosbeak								0.37	0.07	
ALL SPECIES POOLED	141.00	159.05	149.95	107.73	200.89	269.91	215.75	150.89	196.24	173.35
Number of Species	34	39	50	27	38	38	48	50	66	31

[1] Devil's Postpile National Monument only operated three years, 2002-2004, therefore the means for this station reflect only three years of data.

Table 3b. Mean numbers of individual YOUNG birds captured per 600 net-hours at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Sharp-shinned Hawk										
Spotted Sandpiper										
Acorn Woodpecker										
Williamson's Sapsucker				0.41	0.40				0.13	0.47
Red-breasted Sapsucker	0.64		0.32		4.33	1.59	5.01	2.16	2.85	7.24
Downy Woodpecker		0.98	0.48				0.50	0.69	0.27	
Hairy Woodpecker		0.32	0.16	0.41	0.72		0.46	0.69	0.46	
White-headed Woodpecker		0.31	0.16		0.79	0.56		0.38	0.33	
Northern Flicker		0.32	0.16			0.33	0.92	0.38	0.39	0.94
Olive-sided Flycatcher										
Western Wood-Pewee		0.33	0.16	0.46	0.40	0.28	0.75	0.99	0.59	
"Traill's" Flycatcher										
Hammond's Flycatcher	1.59		0.80	2.21	6.72	1.84	0.98		2.17	
Dusky Flycatcher	1.61		0.81		0.75	1.95	0.54	0.35	0.74	
"Western" Flycatcher	0.63	1.62	1.12	0.42	1.55	2.04	6.85	0.32	2.70	
Black Phoebe		6.17	3.05		0.72		0.46	7.56	1.71	
Cassin's Vireo		0.65	0.32			0.56	2.45		0.80	
Hutton's Vireo						0.28			0.06	
Warbling Vireo		0.64	0.32		0.39	2.75	11.20	0.37	3.84	0.94
Steller's Jay		0.64	0.32		0.40		0.50		0.21	0.51
Western Scrub-Jay										
Violet-green Swallow										
Mountain Chickadee	0.64		0.32	3.00	14.06	3.57	0.71		3.85	
Chestnut-backed Chickadee							0.52		0.14	

Table 3b. (cont.) Mean numbers of individual YOUNG birds captured per 600 net-hours at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Oak Titmouse										
Bushtit	0.32		0.16				4.59	8.31	2.84	
Red-breasted Nuthatch		0.33	0.16	1.25	14.28	7.75	1.48		4.72	
White-breasted Nuthatch							0.23		0.07	
Brown Creeper	3.84	5.22	4.53	4.64	4.64	5.34	4.91	1.83	4.36	0.51
Canyon Wren		0.31	0.16							
Bewick's Wren								2.10	0.39	
House Wren	1.93	1.94	1.93	2.52	4.68	5.94	2.99	3.43	3.94	0.98
Winter Wren	0.98		0.49	0.42			0.50		0.20	
Marsh Wren										0.47
American Dipper										
Golden-crowned Kinglet	0.64		0.32	4.02	27.07	16.10	5.05		10.01	
Western Bluebird								0.95	0.19	
Townsend's Solitaire		0.63	0.31		0.40		0.23		0.14	
Swainson's Thrush		0.64	0.32							
Hermit Thrush						0.65	0.27		0.20	
American Robin		1.26	0.63		2.75	0.28	2.16		1.13	
Wrentit								2.49	0.47	
European Starling										
Orange-crowned Warbler	2.56	5.81	4.18	6.93	44.03	90.28	75.52	56.23	58.60	26.27
Nashville Warbler	6.66	1.29	4.00	9.54	42.32	31.94	7.91	6.90	18.93	0.58
Yellow Warbler		2.23	1.11			0.33	1.96	7.84	2.14	0.47
Yellow-rumped Warbler	0.63		0.32	11.97	185.87	23.09	3.67		39.35	2.92
Black-throated Gray Warbler		0.97	0.48	0.46	1.55	2.05	1.20	0.70	1.24	

Table 3b. (cont.) Mean numbers of individual YOUNG birds captured per 600 net-hours at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Hermit Warbler				2.54	19.22	31.92	5.26		12.03	
MacGillivray's Warbler	13.98	8.32	11.17	0.42	4.24	15.29	21.75	7.11	11.38	3.05
Wilson's Warbler	0.33	4.78	2.54	0.41	3.73	4.27	1.03	1.42	2.17	6.70
Western Tanager		1.62	0.81		9.12	1.77	2.40		2.60	
Green-tailed Towhee										
Spotted Towhee	0.96	0.64	0.80				0.27	5.33	1.06	0.51
Chipping Sparrow						0.61		0.32	0.20	
Savannah Sparrow										
Fox Sparrow	1.59		0.80	0.41	0.72	0.32			0.26	0.47
Song Sparrow	2.58	9.73	6.13		1.19	2.26	23.34	1.43	7.27	10.59
Lincoln's Sparrow	5.12		2.57	3.88	16.13	21.75	6.44		9.96	0.47
White-crowned Sparrow										4.47
Dark-eyed Junco	10.84	2.28	6.56	17.39	22.26	31.20	12.70	0.67	16.87	3.96
Black-headed Grosbeak		1.58	0.79		0.79	0.99	2.39	17.23	4.17	
Lazuli Bunting		0.96	0.48			0.87		11.59	2.44	0.94
Red-winged Blackbird							0.49		0.13	
Brewer's Blackbird		0.66	0.33			0.28			0.06	
Brown-headed Cowbird										
Bullock's Oriole								0.32	0.06	
Pine Grosbeak				0.41					0.06	
Purple Finch		0.64	0.32			0.33	1.87	20.09	4.31	
Cassin's Finch					1.21	0.33		0.76	0.40	
House Finch							0.27		0.07	
Red Crossbill							0.46		0.13	

Table 3b. (cont.) Mean numbers of individual YOUNG birds captured per 600 net-hours at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Pine Siskin					24.15	0.33	0.97		4.38	
Lesser Goldfinch		0.33	0.16		2.72			1.40	0.72	0.47
Lawrence's Goldfinch					0.40				0.07	
Evening Grosbeak								1.01	0.20	
ALL SPECIES POOLED	58.07	64.16	61.04	74.15	464.74	312.00	224.10	173.32	251.16	73.93
Number of Species	20	32	42	22	35	37	43	33	59	22

[1] Devil's Postpile National Monument only operated three years, 2002-2004, therefore the means for this station reflect only three years of data.

Table 3c. Mean PROPORTION OF YOUNG in the catch at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species. If no young or adult birds were captured in a year the year is not included in the average.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Sharp-shinned Hawk	0.000		0.000							
Spotted Sandpiper		0.000	0.000							
Acorn Woodpecker								0.000	0.000	
Williamson's Sapsucker				0.083	1.000				0.313	1.000
Red-breasted Sapsucker	0.167		0.167	0.000	0.360	0.438	0.302	0.363	0.312	0.527
Downy Woodpecker		0.229	0.229				0.500	0.625	0.433	
Hairy Woodpecker	0.000	0.333	0.250	1.000	0.334	0.000	0.667	0.400	0.396	
White-headed Woodpecker	0.000	0.500	0.125		0.333	0.100	0.000	0.167	0.241	
Northern Flicker	0.000	0.333	0.167	0.000	0.000	0.250	0.313	0.125	0.232	1.000
Olive-sided Flycatcher		0.000	0.000		0.000		0.000		0.000	
Western Wood-Pewee		0.063	0.063	0.500	0.333	1.000	0.217	0.313	0.242	
"Traill's" Flycatcher						0.000	0.000	0.000	0.000	0.000
Hammond's Flycatcher	0.467		0.467	1.000	0.833	0.404	0.750		0.586	
Dusky Flycatcher	0.221	0.000	0.219	0.000	0.286	0.111	0.056	0.333	0.122	0.000
"Western" Flycatcher	0.188	0.221	0.187	0.250	0.750	0.217	0.544	1.000	0.472	
Black Phoebe		0.842	0.842		1.000	0.000	0.667	0.589	0.625	
Cassin's Vireo	0.000	0.092	0.092		0.000	0.167	0.374	0.000	0.310	0.000
Hutton's Vireo	0.000		0.000			1.000			1.000	
Warbling Vireo	0.000	0.064	0.051	0.000	0.250	0.134	0.362	0.083	0.260	0.044
Steller's Jay	0.000	0.333	0.194	0.000	1.000	0.000	0.333	0.000	0.278	0.500
Western Scrub-Jay								0.000	0.000	
Violet-green Swallow		0.000	0.000							
Mountain Chickadee	0.167	0.000	0.146	0.479	0.531	0.438	0.250		0.459	0.000
Chestnut-backed Chickadee							0.375		0.375	

Table 3c. (cont.) Mean PROPORTION OF YOUNG in the catch at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species. If no young or adult birds were captured in a year the year is not included in the average.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Oak Titmouse								0.000	0.000	
Bushtit	1.000		1.000				0.923	0.599	0.684	
Red-breasted Nuthatch	0.000	1.000	0.125	1.000	0.821	0.794	0.450		0.782	0.000
White-breasted Nuthatch					0.000		1.000	0.000	0.333	
Brown Creeper	0.525	0.863	0.637	0.498	0.432	0.754	0.850	0.583	0.666	0.500
Canyon Wren		1.000	1.000							
Bewick's Wren								0.522	0.522	
House Wren	1.000	1.000	1.000	0.917	0.875	0.830	0.861	0.486	0.744	1.000
Winter Wren	0.500		0.500	1.000			1.000	0.000	0.750	
Marsh Wren										1.000
American Dipper		0.000	0.000					0.000	0.000	
Golden-crowned Kinglet	0.072		0.072	0.450	0.742	0.575	0.677		0.719	0.000
Western Bluebird								0.500	0.500	
Townsend's Solitaire	0.000	1.000	0.500		1.000		0.500		0.667	
Swainson's Thrush		0.100	0.100				0.000		0.000	0.000
Hermit Thrush	0.000		0.000	0.000	0.000	0.188	0.111	0.000	0.189	
American Robin	0.000	0.113	0.067	0.000	0.329	0.250	0.441	0.000	0.241	0.000
Wrentit								0.408	0.408	
European Starling										
Orange-crowned Warbler	1.000	0.964	0.969	0.972	0.935	0.763	0.794	0.775	0.804	0.654
Nashville Warbler	0.597	0.408	0.497	0.985	0.981	0.895	0.588	0.586	0.810	0.167
Yellow Warbler		0.222	0.222			1.000	0.408	0.518	0.489	0.056
Yellow-rumped Warbler	0.036	0.000	0.036	0.388	0.805	0.387	0.358	0.000	0.642	0.062
Black-throated Gray Warbler		0.458	0.458	1.000	1.000	1.000	1.000	0.750	0.967	

Table 3c. (cont.) Mean PROPORTION OF YOUNG in the catch at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species. If no young or adult birds were captured in a year the year is not included in the average.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Hermit Warbler	0.000	0.000	0.000	0.444	0.621	0.478	0.365		0.510	0.000
MacGillivray's Warbler	0.359	0.331	0.355	1.000	0.348	0.448	0.384	0.686	0.418	0.286
Wilson's Warbler	0.500	0.369	0.393	1.000	1.000	0.822	0.500	0.875	0.844	0.277
Western Tanager	0.000	0.220	0.181	0.000	0.339	0.411	0.314	0.000	0.336	0.000
Green-tailed Towhee					0.000	0.000		0.000	0.000	
Spotted Towhee	0.250	0.500	0.308				0.100	0.356	0.330	1.000
Chipping Sparrow				0.000	0.000	0.125	0.000	0.500	0.208	
Savannah Sparrow										0.000
Fox Sparrow	0.431		0.431	1.000	0.500	0.250	0.000	0.000	0.333	1.000
Song Sparrow	0.625	0.450	0.450	0.000	1.000	0.785	0.502	0.225	0.501	0.373
Lincoln's Sparrow	0.232		0.232	0.420	0.350	0.458	0.328		0.396	0.500
White-crowned Sparrow										0.375
Dark-eyed Junco	0.301	0.234	0.307	0.280	0.396	0.392	0.448	0.500	0.382	0.170
Black-headed Grosbeak	0.000	0.133	0.133		0.667	0.556	0.268	0.687	0.531	
Lazuli Bunting	0.000	0.556	0.500		0.000	0.190		0.487	0.418	0.222
Red-winged Blackbird		0.000	0.000				0.292		0.292	
Brewer's Blackbird		1.000	1.000			1.000	0.000	0.000	0.125	0.000
Brown-headed Cowbird		0.000	0.000		0.000		0.000	0.000	0.000	0.000
Bullock's Oriole								0.167	0.167	
Pine Grosbeak				0.250					0.250	0.000
Purple Finch	0.000	0.016	0.014	0.000	0.000	0.111	0.140	0.408	0.399	
Cassin's Finch		0.000	0.000	0.000	0.225	0.083	0.000	1.000	0.202	0.000
House Finch							1.000		1.000	
Red Crossbill							0.200	0.000	0.167	

Table 3c. (cont.) Mean PROPORTION OF YOUNG in the catch at the eight MAPS stations operated in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument averaged over the four years 2001-2004. Data for each species are included only from stations that lie within the breeding range of the species. If no young or adult birds were captured in a year the year is not included in the average.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite stations combined	Devil's Postpile NM[1]
Pine Siskin				0.000	0.618	0.033	0.350		0.517	0.000
Lesser Goldfinch		0.250	0.250		0.512	0.000		0.171	0.255	1.000
Lawrence's Goldfinch		0.000	0.000		0.500			0.000	0.077	
Evening Grosbeak								0.750	0.750	
ALL SPECIES POOLED	0.285	0.287	0.288	0.381	0.679	0.504	0.492	0.519	0.540	0.298

[1] Devil's Postpile National Monument only operated three years, 2002-2004, therefore the means for this station reflect only three years of data.

Table 4a. Percentage changes between 1991-1992 and 1992-1993 in the numbers of individual ADULT birds captured at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

Species	Percent Change 1991-1992				Percent Change 1992-1993			
	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Red-breasted Sapsucker	++++[1]		++++[1]	75.0	-50.0		-50.0	0.0
Downy Woodpecker		-100.0	-100.0					++++[1]
Hairy Woodpecker		-100.0	-100.0	++++[1]	++++[1]		++++[1]	-100.0
White-headed Woodpecker	-66.7	++++[1]	0.0	-100.0	0.0	-100.0	-66.7	
Northern Flicker				++++				100.0
Olive-sided Flycatcher		++++	++++	0.0		-100.0	-100.0	-100.0
Western Wood-Pewee		++++	++++	-50.0		-100.0	-100.0	0.0
"Traill's" Flycatcher				-33.3				150.0
Hammond's Flycatcher	0.0	-100.0	-50.0	-100.0	100.0		100.0	++++
Dusky Flycatcher	-50.0	-100.0	-62.5	9.5	100.0		100.0	-8.3
"Western" Flycatcher	900.0	100.0	500.0	100.0	-20.0	-100.0	-33.3	150.0
Black Phoebe						++++[1]	++++	
Cassin's Vireo		++++	++++	33.3		-50.0	-50.0	-25.0
Hutton's Vireo								
Warbling Vireo	-100.0	8.3	-7.1	-37.5	++++	-7.7	0.0	75.0
Mountain Chickadee	25.0	++++	50.0	100.0	-20.0	0.0	-16.7	0.0
Chestnut-backed Chickadee								++++
Red-breasted Nuthatch	-50.0	-100.0	-66.7	++++	-100.0		-100.0	-100.0
White-breasted Nuthatch								
Brown Creeper	-33.3	++++	-16.7	++++	50.0	0.0	40.0	-100.0
House Wren	++++		++++	-25.0	0.0		0.0	-100.0
Winter Wren					++++		++++	
Golden-crowned Kinglet	33.3		33.3	0.0	-50.0		-50.0	-100.0

Table 4a. (cont.) Percentage changes between 1991-1992 and 1992-1993 in the numbers of individual ADULT birds captured at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

Species	Percent Change 1991-1992				Percent Change 1992-1993			
	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Western Bluebird				-100.0				
Swainson's Thrush		-33.3	-33.3			-100.0	-100.0	
Hermit Thrush	-100.0	-50.0	-66.7	++++	++++	0.0	200.0	-100.0
American Robin	50.0	-28.6	-11.1	-83.3	-100.0	200.0	87.5	200.0
Orange-crowned Warbler		++++	++++	-20.0		-25.0	-25.0	50.0
Nashville Warbler	-28.6	-50.0	-36.4	-50.0	-40.0	150.0	14.3	60.0
Yellow Warbler	-100.0	-100.0	-100.0	-50.0		++++	++++	40.0
Yellow-rumped Warbler	-86.7		-86.7	-16.7	150.0		150.0	-20.0
Black-throated Gray Warbler		33.3	33.3	-75.0		-33.3	-33.3	-100.0
Hermit Warbler	-60.0	-100.0	-71.4	-46.2	-100.0		-100.0	85.7
MacGillivray's Warbler	-14.3	5.9	-3.2	-20.0	-25.0	-11.8	-17.2	8.3
Wilson's Warbler	-75.0	-80.8	-80.0	66.7	-100.0	-40.0	-50.0	-83.3
Western Tanager	-75.0	-100.0	-88.9	100.0	0.0	++++	100.0	-75.0
Spotted Towhee	-100.0		-100.0					
Chipping Sparrow				-100.0				++++
Fox Sparrow	-50.0		-50.0		50.0		50.0	
Song Sparrow		0.0	0.0	-12.5		116.7	116.7	14.3
Lincoln's Sparrow	-27.3	-100.0	-38.5	-30.0	-25.0		-25.0	14.3
Dark-eyed Junco	21.4		21.4	-16.7	-29.4	++++	-23.5	18.2
Black-headed Grosbeak	-100.0	-25.0	-45.5	-28.6		16.7	16.7	120.0
Lazuli Bunting		-100.0	-100.0	++++		++++	++++	0.0
Red-winged Blackbird		0.0	0.0			-50.0	-50.0	++++
Brewer's Blackbird						++++	++++	

Table 4a. (cont.) Percentage changes between 1991-1992 and 1992-1993 in the numbers of individual ADULT birds captured at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

Species	Percent Change 1991-1992				Percent Change 1992-1993			
	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Brown-headed Cowbird	-100.0	0.0	-50.0			-100.0	-100.0	
Bullock's Oriole				++++				-100.0
Purple Finch	100.0	-28.6	-20.0	60.0	-50.0	30.0	16.7	-41.9
Cassin's Finch				0.0		++++	++++	-100.0
Pine Siskin	++++		++++	-50.0	0.0		0.0	-50.0
Evening Grosbeak	++++		++++		-100.0		-100.0	++++
ALL SPECIES POOLED	-22.9	-30.5	-26.8	-13.8	-14.3	20.7	2.8	8.2
No. species that increased[2]	10(4)	11(7)	13(8)	15(7)	9(4)	12(7)	19(7)	20(6)
No. species that decreased[3]	18(6)	17(10)	24(5)	21(4)	14(5)	13(6)	20(7)	17(10)
No. species remained same	1	3	3	3	4	3	3	4
Total Number of Species	29	31	40	39	27	28	42	41
Proportion of increasing (decreasing) species	(0.621)	(0.548)	(0.600)	(0.538)	(0.519)	0.429	0.452	0.488
Sig. of increase (decrease)[4]	(0.132)	(0.360)	(0.134)	(0.375)	(0.500)	0.828	0.780	0.622

[1] Increase indeterminate (infinite) because no adult was captured in the first year of the comparison.
[2] No. of species for which adults were captured in the second but not in the first year of the comparison are in parentheses.
[3] No. of species for which adults were captured in the first but not in the second year of the comparison are in parentheses.
[4] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 4b. Percentage changes between 1991-1992 and 1992-1993 in the numbers of individual YOUNG birds captured at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

Species	Percent Change 1991-1992				Percent Change 1992-1993			
	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Red-breasted Sapsucker	++++[1]		++++[1]	100.0	-100.0		-100.0	-100.0
Downy Woodpecker								
Hairy Woodpecker				++++[1]		++++[1]	++++[1]	0.0
White-headed Woodpecker								
Northern Flicker		-100.0	-100.0					
Olive-sided Flycatcher								
Western Wood-Pewee								++++[1]
"Traill's" Flycatcher				++++				0.0
Hammond's Flycatcher								
Dusky Flycatcher	100.0		100.0	-66.7	0.0		0.0	-100.0
"Western" Flycatcher	200.0	0.0	100.0	++++	-66.7	-100.0	-75.0	-100.0
Black Phoebe		++++[1]	++++			0.0	0.0	
Cassin's Vireo				400.0				-100.0
Hutton's Vireo						++++	++++	
Warbling Vireo		-100.0	-100.0	950.0	++++[1]		++++	-90.5
Mountain Chickadee	100.0	++++	150.0	0.0	-75.0	100.0	-40.0	-100.0
Chestnut-backed Chickadee								
Red-breasted Nuthatch	++++		++++	0.0	100.0	++++	200.0	200.0
White-breasted Nuthatch					++++		++++	
Brown Creeper	-37.5	++++	0.0	100.0	0.0	-100.0	-37.5	-100.0
House Wren	150.0	700.0	333.3	100.0	80.0	-87.5	-23.1	50.0
Winter Wren				++++				-100.0
Golden-crowned Kinglet	++++		++++	++++	0.0		0.0	300.0

Table 4b. (cont.) Percentage changes between 1991-1992 and 1992-1993 in the numbers of individual YOUNG birds captured at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

Species	Percent Change 1991-1992				Percent Change 1992-1993			
	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Western Bluebird								
Swainson's Thrush								
Hermit Thrush		++++	++++	-100.0		-100.0	-100.0	
American Robin		0.0	0.0			400.0	400.0	
Orange-crowned Warbler	-100.0	250.0	75.0	26.1	++++	157.1	357.1	76.2
Nashville Warbler	-60.0		-60.0	-83.3	300.0	++++	400.0	400.0
Yellow Warbler				166.7		++++	++++	-50.0
Yellow-rumped Warbler								++++
Black-throated Gray Warbler		++++	++++	100.0		-100.0	-100.0	-100.0
Hermit Warbler				-60.0				250.0
MacGillivray's Warbler	125.0	250.0	187.5	200.0	-44.4	-57.1	-52.2	-41.7
Wilson's Warbler	++++	500.0	900.0	500.0	-50.0	-83.3	-70.0	-71.4
Western Tanager				++++	++++		++++	-100.0
Spotted Towhee	++++		++++		0.0		0.0	
Chipping Sparrow				++++				100.0
Fox Sparrow	-100.0		-100.0					
Song Sparrow		700.0	700.0	-20.0		137.5	137.5	275.0
Lincoln's Sparrow	60.0		60.0	0.0	0.0		0.0	180.0
Dark-eyed Junco	375.0		375.0	-40.0	-63.2		-63.2	166.7
Black-headed Grosbeak	++++		++++		-100.0		-100.0	++++
Lazuli Bunting								++++
Red-winged Blackbird								
Brewer's Blackbird								

Table 4b. (cont.) Percentage changes between 1991-1992 and 1992-1993 in the numbers of individual YOUNG birds captured at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

Species	Percent Change 1991-1992				Percent Change 1992-1993			
	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Brown-headed Cowbird								
Bullock's Oriole								
Purple Finch	++++	++++	++++	-14.3	-100.0	-100.0	-100.0	-83.3
Cassin's Finch		++++	++++	++++		-100.0	-100.0	-100.0
Pine Siskin								
Evening Grosbeak								
ALL SPECIES POOLED	86.8	266.7	137.7	43.5	0.0	7.3	3.2	23.8
No. species that increased[2]	14(7)	12(7)	20(10)	18(8)	7(4)	9(5)	11(6)	14(4)
No. species that decreased[3]	4(2)	2(2)	4(3)	7(1)	8(3)	9(6)	13(6)	15(10)
No. species remained same	0	2	2	3	5	1	5	2
Total Number of Species	18	16	26	28	20	19	29	31
Proportion of increasing (decreasing) species	0.778	0.750	0.769	0.643	0.350	0.474	0.379	0.452
Sig. of increase (decrease)[4]	0.015 ***	0.038 **	0.005 ***	0.092 *	0.942	0.676	0.932	0.763

[1] Increase indeterminate (infinite) because no young bird was captured in the first year of the comparison.
[2] No. of species for which young were captured in the second but not in the first year of the comparison are in parentheses.
[3] No. of species for which young were captured in the first but not in the second year of the comparison are in parentheses.
[4] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 4c. Changes between 1991-1992 and 1992-1993 in the PROPORTION OF YOUNG in the catch at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

	Change 1991-1992				Change 1992-1993			
Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Red-breasted Sapsucker	+-+-+[1]		+-+-+[1]	0.030	-0.500		-0.500	-0.364
Downy Woodpecker		+-+-+[1]	+-+-+					+-+-+[1]
Hairy Woodpecker		+-+-+	+-+-+	+-+-+[1]	+-+-+[1]	+-+-+[1]	+-+-+[1]	0.667
White-headed Woodpecker	0.000	+-+-+	0.000	+-+-+	0.000	+-+-+	0.000	
Northern Flicker		+-+-+	+-+-+	+-+-+				0.000
Olive-sided Flycatcher		+-+-+	+-+-+	0.000		+-+-+	+-+-+	+-+-+
Western Wood-Pewee		+-+-+	+-+-+	0.000		+-+-+	+-+-+	0.500
"Traill's" Flycatcher				0.333				-0.167
Hammond's Flycatcher	0.000	+-+-+	0.000	+-+-+	0.000		0.000	+-+-+
Dusky Flycatcher	0.257	+-+-+	0.289	-0.083	-0.150		-0.150	-0.040
"Western" Flycatcher	-0.292	-0.167	-0.267	0.500	-0.175	+-+-+	-0.200	-0.500
Black Phoebe		+-+-+	+-+-+			-0.500	-0.500	
Cassin's Vireo		+-+-+	+-+-+	0.306		0.000	0.000	-0.556
Hutton's Vireo						+-+-+	+-+-+	
Warbling Vireo	+-+-+	-0.143	-0.125	0.453	+-+-+	0.000	0.071	-0.458
Mountain Chickadee					-0.244	0.167	-0.079	-0.333
Mountain Chickadee	0.111	+-+-+	0.121	-0.167				+-+-+
Red-breasted Nuthatch	0.500	+-+-+	0.500	-0.500	0.500	+-+-+	0.500	0.500
White-breasted Nuthatch					+-+-+		+-+-+	
Brown Creeper	-0.016	+-+-+	0.044	-0.714	-0.101	-0.750	-0.199	+-+-+
House Wren	-0.167	0.000	-0.071	0.238	0.067	0.000	-0.020	0.429
Winter Wren				+-+-+	+-+-+		+-+-+	+-+-+
Golden-crowned Kinglet	0.200		0.200	0.500	0.133		0.133	0.500

Table 4c. (cont.) Changes between 1991-1992 and 1992-1993 in the PROPORTION OF YOUNG in the catch at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

Species	Change 1991-1992				Change 1992-1993			
	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Western Bluebird				+-+-+				
Swainson's Thrush		0.000	0.000			+-+-+	+-+-+	
Hermit Thrush	+-+-+	0.500	0.500	-1.000	+-+-+	-0.500	-0.500	+-+-+
American Robin	0.000	0.042	0.011	0.000	+-+-+	0.083	0.139	0.000
Orange-crowned Warbler	+-+-+	-0.364	-0.364	0.034	+-+-+	0.221	0.278	0.008
Nashville Warbler	-0.131	0.000	-0.090	-0.268	0.442	0.286	0.333	0.270
Yellow Warbler	+-+-+	+-+-+	+-+-+	0.385		+-+-+	+-+-+	-0.252
Yellow-rumped Warbler	0.000		0.000	0.000	0.000		0.000	0.333
Black-throated Gray Warbler		0.200	0.200	0.467		-0.250	-0.250	+-+-+
Hermit Warbler	0.000	+-+-+	0.000	-0.056	+-+-+		+-+-+	0.128
MacGillivray's Warbler	0.206	0.247	0.229	0.290	-0.072	-0.166	-0.128	-0.150
Wilson's Warbler	0.800	0.509	0.593	0.296	0.200	-0.296	-0.125	0.128
Western Tanager	0.000	+-+-+	0.000	0.556	0.667	+-+-+	0.500	-0.556
Spotted Towhee	1.000		1.000		0.000		0.000	
Chipping Sparrow				1.000				-0.667
Fox Sparrow	-0.429		-0.429		0.000		0.000	
Song Sparrow		0.429	0.429	-0.021		0.022	0.022	0.289
Lincoln's Sparrow	0.188	+-+-+	0.222	0.083	0.071		0.071	0.220
Dark-eyed Junco	0.306		0.306	-0.079	-0.159	+-+-+	-0.178	0.199
Black-headed Grosbeak	1.000	0.000	0.143	0.000	+-+-+	0.000	-0.143	0.083
Lazuli Bunting		+-+-+	+-+-+	+-+-+		+-+-+	+-+-+	0.500
Red-winged Blackbird		0.000	0.000			0.000	0.000	+-+-+
Brewer's Blackbird						+-+-+	+-+-+	

Table 4c. (cont.) Changes between 1991-1992 and 1992-1993 in the PROPORTION OF YOUNG in the catch at three constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks using only the first day of operation in each period.

	Change 1991-1992				Change 1992-1993			
Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	Hodgdon Meadow
Brown-headed Cowbird	+-+-+	0.000	0.000			+-+-+	+-+-+	
Bullock's Oriole				+-+-+				+-+-+
Purple Finch	0.333	0.091	0.143	-0.101	-0.333	-0.091	-0.143	-0.110
Cassin's Finch		+-+-+	+-+-+	0.333		-1.000	-1.000	+-+-+
Pine Siskin	+-+-+		+-+-+	0.000	0.000		0.000	0.000
Evening Grosbeak	+-+-+		+-+-+		+-+-+		+-+-+	+-+-+
ALL SPECIES POOLED	0.195	0.277	0.235	0.122	0.038	-0.028	0.001	0.034
No. species that increased[2]	11	7	16	16	7	5	9	15
No. species that decreased[2]	5	3	6	10	8	8	15	12
No. species remained same[2]	6	6	8	6	6	5	8	3
Total Number of Species[2]	22	16	30	32	21	18	32	30
Proportion of increasing (decreasing) species	0.500	0.438	0.533	0.500	0.333	0.444	0.281	0.500
Sig. of increase (decrease)[3]	0.584	0.773	0.428	0.570	0.961	0.760	0.997	0.572

[1] The change in the proportion of young is undefined at this station because no aged individual of the species was captured in one of the two years.
[2] Species for which the change in the proportion of young is undefined are not included.
[3] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 5a. Percentage changes between 2001 and 2002 in the numbers of individual ADULT birds captured at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Sharp-shinned Hawk	-100.0		-100.0						
Spotted Sandpiper		++++[1]	++++[1]						
Acorn Woodpecker								-100.0	-100.0
Williamson's Sapsucker				-100.0					-100.0
Red-breasted Sapsucker	++++[1]		++++		150.0	100.0	20.0	-66.7	25.0
Downy Woodpecker		200.0	200.0				-100.0		-100.0
Hairy Woodpecker		-100.0	-100.0			++++[1]		-66.7	-33.3
White-headed Woodpecker	300.0		300.0		0.0	-50.0		-100.0	-50.0
Northern Flicker	++++	-100.0	0.0			++++	0.0	-66.7	-25.0
Olive-sided Flycatcher		++++	++++		++++[1]				++++[1]
Western Wood-Pewee		50.0	50.0		-100.0		-25.0	-100.0	-70.0
"Traill's" Flycatcher						-100.0	++++[1]	++++[1]	300.0
Hammond's Flycatcher	0.0		0.0			400.0	++++		600.0
Dusky Flycatcher	-72.7	-100.0	-75.0	-50.0	++++	22.2	100.0	-100.0	46.7
"Western" Flycatcher	200.0	0.0	50.0	++++[1]		33.3	-100.0		-44.4
Black Phoebe		0.0	0.0					-50.0	-50.0
Cassin's Vireo		400.0	400.0		++++	-100.0	25.0		0.0
Hutton's Vireo	++++		++++						
Warbling Vireo	-100.0	20.0	-25.0	-100.0	++++	-27.8	90.9	-25.0	14.7
Steller's Jay	++++	0.0	50.0	++++			++++		++++
Mountain Chickadee	-50.0		-50.0	++++	-40.0	-80.0	0.0		9.1
Chestnut-backed Chickadee							0.0		0.0
Oak Titmouse								-100.0	-100.0
Bushtit							++++	150.0	250.0
Red-breasted Nuthatch	++++		++++			-100.0	-100.0		-100.0
White-breasted Nuthatch									
Brown Creeper	-50.0	++++	0.0	-50.0	-33.3	-100.0	++++	-100.0	-50.0

Table 5a. (cont.) Percentage changes between 2001 and 2002 in the numbers of individual ADULT birds captured at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Canyon Wren									
Bewick's Wren								50.0	50.0
House Wren					-100.0	++++	-100.0	-50.0	-50.0
Winter Wren	-100.0		-100.0					++++	++++
American Dipper		-100.0	-100.0					++++	++++
Golden-crowned Kinglet	400.0		400.0		25.0	-25.0	++++		18.8
Western Bluebird									
Townsend's Solitaire							++++		++++
Swainson's Thrush		200.0	200.0				-100.0		-100.0
Hermit Thrush	-100.0		-100.0	-100.0		-66.7	-100.0		-83.3
American Robin	0.0	-55.6	-35.7	200.0	0.0	200.0	-66.7	-50.0	10.0
Wrentit								0.0	0.0
Orange-crowned Warbler					-50.0	15.4	-76.9	-64.3	-50.9
Nashville Warbler	-25.0	-100.0	-40.0		++++		-57.1	++++	28.6
Yellow Warbler		25.0	25.0				0.0	-60.0	-37.5
Yellow-rumped Warbler	175.0		175.0	75.0	200.0	2.8	25.0	++++	50.0
Black-throated Gray Warbler		200.0	200.0						
Hermit Warbler	100.0		100.0	++++	++++	-22.7	-12.5		-6.7
MacGillivray's Warbler	22.2	-9.1	10.3		33.3	-7.1	41.9	-100.0	22.0
Wilson's Warbler	-100.0	-50.0	-62.5			100.0	-100.0	++++	50.0
Western Tanager	++++	-42.9	14.3	++++	11.1	200.0	133.3	-100.0	60.0
Green-tailed Towhee					++++				++++
Spotted Towhee	-50.0	++++	0.0					33.3	33.3
Chipping Sparrow					++++	++++	100.0	++++	900.0
Fox Sparrow	250.0		250.0		++++	-100.0	++++	-100.0	50.0
Song Sparrow		-33.3	-33.3			-100.0	30.0	0.0	11.5
Lincoln's Sparrow	88.9		88.9	-66.7	100.0	-39.3	41.7		3.8

Table 5a. (cont.) Percentage changes between 2001 and 2002 in the numbers of individual ADULT birds captured at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Dark-eyed Junco	-21.1	66.7	-9.1	28.6	37.5	20.7	-15.8	++++	19.5
Black-headed Grosbeak		0.0	0.0		-100.0	0.0	66.7	-33.3	0.0
Lazuli Bunting	++++	++++	++++			-80.0		10.0	-35.0
Red-winged Blackbird		0.0	0.0				-16.7		-16.7
Brewer's Blackbird							++++	100.0	500.0
Brown-headed Cowbird		0.0	0.0		++++		-100.0		0.0
Bullock's Oriole								-100.0	-100.0
Pine Grosbeak				-50.0					-50.0
Purple Finch	-100.0	-60.0	-63.6	++++	++++	-60.0	-73.3	-90.9	-71.0
Cassin's Finch				-100.0	0.0	-60.0	0.0		-50.0
Red Crossbill							-100.0	-100.0	-100.0
Pine Siskin				-100.0	-83.3	200.0	200.0		18.2
Lesser Goldfinch		-20.0	-20.0		-100.0	++++		-66.7	-63.6
Lawrence's Goldfinch		-100.0	-100.0		++++			++++	++++
Evening Grosbeak									
ALL SPECIES POOLED	22.3	-21.1	-2.1	21.4	60.5	-7.7	1.8	-23.1	2.9
No. species that increased[2]	15(7)	13(5)	22(6)	9(6)	19(12)	16(5)	21(9)	14(9)	30(7)
No. species that decreased[3]	12(6)	13(6)	16(6)	9(5)	8(4)	17(6)	17(9)	23(11)	26(8)
No. species remained same	2	6	8	0	3	1	5	2	5
Total Number of Species	29	32	46	18	30	34	43	39	61
Proportion of increasing (decreasing) species	0.517	(0.406)	(0.348)	0.500	0.633	(0.500)	0.488	(0.590)	0.492
Sig. of increase (decrease)[4]	0.500	(0.892)	(0.987)	0.593	0.100 *	(0.568)	0.620	(0.168)	0.601

Table 5a. (cont.) Percentage changes between 2001 and 2002 in the numbers of individual ADULT birds captured at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

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[1] Increase indeterminate (infinite) because no adult was captured in the first year of the comparison.
[2] No. of species for which adults were captured in the second but not in the first year of the comparison are in parentheses.
[3] No. of species for which adults were captured in the first but not in the second year of the comparison are in parentheses.
[4] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 5b. Percentage changes between 2001 and 2002 in the numbers of individual YOUNG birds captured at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Sharp-shinned Hawk									
Spotted Sandpiper									
Acorn Woodpecker									
Williamson's Sapsucker					++++[1]				++++[1]
Red-breasted Sapsucker	++++[1]		++++[1]		600.0	100.0	80.0	++++[1]	185.7
Downy Woodpecker		++++[1]	++++					-100.0	-100.0
Hairy Woodpecker		++++	++++				0.0	-100.0	-50.0
White-headed Woodpecker		-100.0	-100.0		0.0				0.0
Northern Flicker		++++	++++			++++[1]	-66.7		-33.3
Olive-sided Flycatcher									
Western Wood-Pewee				-100.0	++++			-50.0	-33.3
"Traill's" Flycatcher									
Hammond's Flycatcher	0.0		0.0	-100.0	-100.0	-100.0	-100.0		-100.0
Dusky Flycatcher	100.0		100.0			0.0		++++	33.3
"Western" Flycatcher	-100.0	0.0	-50.0	++++[1]	0.0	0.0	450.0	-100.0	180.0
Black Phoebe		100.0	100.0				0.0	-90.0	-81.8
Cassin's Vireo		++++	++++				-75.0		-75.0
Hutton's Vireo									
Warbling Vireo		-100.0	-100.0		-100.0	0.0	-78.3		-76.0
Steller's Jay		0.0	0.0		++++		++++[1]		++++
Mountain Chickadee	-100.0		-100.0	300.0	200.0	-50.0	-100.0		100.0
Chestnut-backed Chickadee									
Oak Titmouse									
Bushtit	++++		++++				++++	-11.1	111.1
Red-breasted Nuthatch				++++	171.4	++++	++++		300.0
White-breasted Nuthatch							++++		++++
Brown Creeper	50.0	100.0	66.7	300.0	++++	-66.7	200.0	-100.0	100.0

Table 5b. (cont.) Percentage changes between 2001 and 2002 in the numbers of individual YOUNG birds captured at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Canyon Wren		-100.0	-100.0						
Bewick's Wren								++++	++++
House Wren	200.0	-100.0	0.0	-100.0	0.0	200.0	-50.0	0.0	18.2
Winter Wren	++++		++++	++++					++++
American Dipper									
Golden-crowned Kinglet	++++		++++	300.0	-55.0	25.0	1100.0		18.4
Western Bluebird								-100.0	-100.0
Townsend's Solitaire		-100.0	-100.0						
Swainson's Thrush		++++	++++						
Hermit Thrush						0.0			0.0
American Robin		-66.7	-66.7		0.0		200.0		66.7
Wrentit								0.0	0.0
Orange-crowned Warbler	++++	25.0	175.0	-100.0	38.1	419.4	227.8	326.7	257.7
Nashville Warbler	33.3	0.0	28.6	0.0	12.9	381.8	240.0	33.3	113.7
Yellow Warbler		-75.0	-75.0				0.0	-42.9	-33.3
Yellow-rumped Warbler	0.0		0.0	0.0	231.5	122.2	200.0		195.7
Black-throated Gray Warbler		-100.0	-100.0	-100.0	-50.0	++++	100.0	-100.0	0.0
Hermit Warbler				++++	-66.7	1125.0	100.0		159.3
MacGillivray's Warbler	-7.7	-92.9	-51.9	++++	-33.3	-56.3	-40.0	-84.6	-52.6
Wilson's Warbler		-88.9	-88.9		-100.0	0.0		0.0	-44.4
Western Tanager		++++	++++		100.0	++++	++++		216.7
Green-tailed Towhee									
Spotted Towhee	++++	-100.0	0.0					0.0	0.0
Chipping Sparrow								-100.0	-100.0
Fox Sparrow	100.0		100.0			-100.0			-100.0
Song Sparrow		-33.3	-33.3		-100.0	-100.0	-44.4	0.0	-52.9
Lincoln's Sparrow	75.0		75.0	++++	-57.1	0.0	100.0		12.5

Table 5b. (cont.) Percentage changes between 2001 and 2002 in the numbers of individual YOUNG birds captured at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Dark-eyed Junco	-33.3	++++	-20.0	0.0	200.0	130.8	9.1	0.0	67.6
Black-headed Grosbeak		-33.3	-33.3		++++	++++	++++	-75.0	-12.5
Lazuli Bunting		100.0	100.0					0.0	0.0
Red-winged Blackbird							++++		++++
Brewer's Blackbird									
Brown-headed Cowbird									
Bullock's Oriole								-100.0	-100.0
Pine Grosbeak									
Purple Finch		-100.0	-100.0			++++	-80.0	-100.0	-93.1
Cassin's Finch					++++	++++			++++
Red Crossbill							-100.0		-100.0
Pine Siskin					88.9	++++	++++		105.6
Lesser Goldfinch					-80.0			-100.0	-85.7
Lawrence's Goldfinch					++++				++++
Evening Grosbeak								-100.0	-100.0
ALL SPECIES POOLED	31.3	-38.3	-7.4	41.4	88.5	181.8	63.1	-11.3	80.5
No. species that increased[2]	12(6)	11(7)	18(10)	9(6)	16(7)	16(8)	20(8)	5(3)	26(8)
No. species that decreased[3]	4(2)	14(8)	15(7)	5(5)	10(4)	6(3)	10(3)	17(11)	21(8)
No. species remained same	2	3	5	3	4	6	3	7	6
Total Number of Species	18	28	38	17	30	28	33	29	53
Proportion of increasing (decreasing) species	0.667	(0.500)	(0.395)	0.529	0.533	0.571	0.606	(0.586)	0.491
Sig. of increase (decrease)[4]	0.119	(0.575)	(0.928)	0.500	0.428	0.286	0.148	(0.229)	0.608

Table 5b. (cont.) Percentage changes between 2001 and 2002 in the numbers of individual YOUNG birds captured at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

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[1] Increase indeterminate (infinite) because no young bird was captured in the first year of the comparison.
[2] No. of species for which young were captured in the second but not in the first year of the comparison are in parentheses.
[3] No. of species for which young were captured in the first but not in the second year of the comparison are in parentheses.
[4] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 5c. Changes between 2001 and 2002 in the PROPORTION OF YOUNG in the catch at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Sharp-shinned Hawk	+-+-+[1]		+-+-+[1]						
Spotted Sandpiper		+-+-+[1]	+-+-+						
Acorn Woodpecker								+-+-+[1]	+-+-+[1]
Williamson's Sapsucker				+-+-+[1]	+-+-+[1]				1.000
Red-breasted Sapsucker	+-+-+		+-+-+		0.250	0.000	0.095	0.667	0.196
Downy Woodpecker		0.250	0.250				+-+-+[1]	+-+-+	+-+-+
Hairy Woodpecker		1.000	1.000			+-+-+[1]	0.000	-0.250	-0.067
White-headed Woodpecker	0.000	+-+-+	-0.500		0.000	0.000		+-+-+	0.133
Northern Flicker	+-+-+	1.000	0.500			+-+-+	-0.250	0.000	-0.029
Olive-sided Flycatcher		+-+-+	+-+-+		+-+-+				+-+-+
Western Wood-Pewee		0.000	0.000	+-+-+	1.000		0.000	0.714	0.169
"Traill's" Flycatcher						+-+-+	+-+-+	+-+-+	0.000
Hammond's Flycatcher	0.000		0.000	+-+-+	+-+-+	-0.750	-1.000		-0.900
Dusky Flycatcher	0.317	+-+-+	0.323	0.000	+-+-+	-0.036	0.000	1.000	-0.013
"Western" Flycatcher	-0.500	0.000	-0.190	+-+-+	0.000	-0.050	0.750	+-+-+	0.380
Black Phoebe		0.133	0.133				0.000	-0.333	-0.180
Cassin's Vireo		0.167	0.167		+-+-+	+-+-+	-0.333		-0.257
Hutton's Vireo	+-+-+		+-+-+						
Warbling Vireo	+-+-+	-0.167	-0.111	+-+-+	-1.000	0.019	-0.484	0.000	-0.290
Steller's Jay	+-+-+	0.000	-0.083	+-+-+	+-+-+		+-+-+		+-+-+
Mountain Chickadee	-0.333		-0.333	-0.636	0.333	0.214	-0.667		0.149
Chestnut-backed Chickadee							0.000		0.000
Oak Titmouse								+-+-+	+-+-+
Bushtit	+-+-+		+-+-+				+-+-+	-0.203	-0.087
Red-breasted Nuthatch	+-+-+		+-+-+	+-+-+	0.000	1.000	1.000		0.417
White-breasted Nuthatch							+-+-+		+-+-+
Brown Creeper	0.250	-0.333	0.114	0.467	0.600	0.400	-0.143	+-+-+	0.311

Table 5c. (cont.) Changes between 2001 and 2002 in the PROPORTION OF YOUNG in the catch at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Canyon Wren		+-+-+	+-+-+						
Bewick's Wren								0.400	0.400
House Wren	0.000	+-+-+	0.000	+-+-+	0.333	-0.143	0.333	0.167	0.165
Winter Wren	1.000		1.000	+-+-+				+-+-+	+-+-+
American Dipper		+-+-+	+-+-+					+-+-+	+-+-+
Golden-crowned Kinglet	0.286		0.286	0.000	-0.190	0.118	-0.294		0.001
Western Bluebird								+-+-+	+-+-+
Townsend's Solitaire		+-+-+	+-+-+				+-+-+		+-+-+
Swainson's Thrush		0.400	0.400				+-+-+		+-+-+
Hermit Thrush	+-+-+		+-+-+	+-+-+		0.250	+-+-+		0.357
American Robin	0.000	-0.050	-0.077	0.000	0.000	0.000	0.500	0.000	0.082
Wrentit								0.000	0.000
Orange-crowned Warbler	+-+-+	0.000	0.000	+-+-+	0.054	0.210	0.371	0.410	0.278
Nashville Warbler	0.127	0.500	0.167	0.000	-0.028	0.000	0.433	-0.556	0.044
Yellow Warbler		-0.333	-0.333				0.000	0.083	0.016
Yellow-rumped Warbler	-0.068		-0.068	-0.139	0.010	0.151	0.175	+-+-+	0.147
Black-throated Gray Warbler		-0.500	-0.500	+-+-+	0.000	+-+-+	0.000	+-+-+	0.000
Hermit Warbler	0.000		0.000	+-+-+	-0.333	0.589	0.204		0.241
MacGillivray's Warbler	-0.067	-0.469	-0.193	+-+-+	-0.167	-0.183	-0.192	0.133	-0.226
Wilson's Warbler	+-+-+	-0.350	-0.279		+-+-+	-0.133	+-+-+	-0.500	-0.193
Western Tanager	+-+-+	0.429	0.273	+-+-+	0.146	0.143	0.462	+-+-+	0.156
Green-tailed Towhee					+-+-+				+-+-+
Spotted Towhee	0.500	-1.000	0.000					-0.067	-0.067
Chipping Sparrow					+-+-+	+-+-+	0.000	-1.000	-0.500
Fox Sparrow	-0.111		-0.111		+-+-+	+-+-+	+-+-+	+-+-+	-0.333
Song Sparrow		0.000	0.000		+-+-+	+-+-+	-0.209	0.000	-0.211
Lincoln's Sparrow	-0.016		-0.016	0.500	-0.281	0.111	0.080		0.018

Table 5c. (cont.) Changes between 2001 and 2002 in the PROPORTION OF YOUNG in the catch at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined
Dark-eyed Junco	-0.041	0.286	-0.030	-0.056	0.153	0.152	0.062	-0.500	0.078
Black-headed Grosbeak		-0.064	-0.064		1.000	0.667	0.286	-0.227	-0.033
Lazuli Bunting	+-+-+	-0.333	-0.500			0.000		-0.023	0.091
Red-winged Blackbird		0.000	0.000				0.167		0.167
Brewer's Blackbird							+-+-+	0.000	0.000
Brown-headed Cowbird		0.000	0.000		+-+-+		+-+-+		0.000
Bullock's Oriole								+-+-+	+-+-+
Pine Grosbeak				0.000					0.000
Purple Finch	+-+-+	-0.024	-0.022	+-+-+	+-+-+	0.333	-0.050	-0.686	-0.302
Cassin's Finch				+-+-+	0.500	0.333	0.000		0.375
Red Crossbill							+-+-+	+-+-+	+-+-+
Pine Siskin				+-+-+	0.221	0.100	0.400		0.119
Lesser Goldfinch		0.000	0.000		0.286	+-+-+		-0.182	-0.189
Lawrence's Goldfinch		+-+-+	+-+-+		+-+-+			+-+-+	+-+-+
Evening Grosbeak								+-+-+	+-+-+
ALL SPECIES POOLED	0.015	-0.050	-0.012	0.037	0.029	0.272	0.117	0.035	0.137
No. species that increased[2]	6	9	12	2	13	16	15	8	25
No. species that decreased[2]	7	11	17	3	6	6	10	12	17
No. species remained same[2]	5	8	10	5	5	5	9	6	7
Total Number of Species[2]	18	28	39	10	24	27	34	26	49
Proportion of increasing (decreasing) species	0.333	(0.393)	(0.436)	0.200	0.542	0.593	0.382	0.308	0.510
Sig. of increase (decrease)[3]	0.952	(0.908)	(0.832)	0.989	0.419	0.221	0.939	0.986	0.500

Table 5c. (cont.) Changes between 2001 and 2002 in the PROPORTION OF YOUNG in the catch at seven constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks.

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[1] The change in the proportion of young is undefined at this station because no aged individual of the species was captured in one of the two years.
[2] Species for which the change in the proportion of young is undefined are not included.
[3] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 6a. Percentage changes between 2002 and 2003 in the numbers of individual ADULT birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Spotted Sandpiper		-100.0	-100.0							
Williamson's Sapsucker				++++[1]					++++[1]	
Red-breasted Sapsucker	-50.0		-50.0	++++	16.7	-50.0	-69.2	0.0	-34.8	-25.0
Downy Woodpecker		-33.3	-33.3					++++[1]	++++	
Hairy Woodpecker		++++[1]	++++[1]		++++[1]	200.0	++++[1]		400.0	
White-headed Woodpecker	-100.0	++++	-75.0		100.0	0.0	++++	++++	300.0	
Northern Flicker	0.0	++++	100.0		++++	-100.0	0.0	100.0	50.0	
Olive-sided Flycatcher		-100.0	-100.0		-100.0		++++		0.0	
Western Wood-Pewee		0.0	0.0	++++	++++		-50.0	++++	250.0	
"Traill's" Flycatcher							-100.0	++++	++++	-100.0
Hammond's Flycatcher	-100.0		-100.0		++++	-20.0	-100.0		14.3	
Dusky Flycatcher	-66.7		-66.7	-100.0	-66.7	55.6	16.7		15.8	-100.0
"Western" Flycatcher	0.0	200.0	100.0	-100.0	++++	-100.0	++++		-20.0	
Black Phoebe		0.0	0.0				++++	400.0	500.0	
Cassin's Vireo		-20.0	-20.0		0.0	++++[1]	-40.0		-16.7	-100.0
Hutton's Vireo	-100.0		-100.0							
Warbling Vireo	++++[1]	20.0	40.0	++++	-50.0	0.0	-20.0	-33.3	-13.2	-80.0
Steller's Jay	0.0	-100.0	-66.7	-100.0			0.0	++++	0.0	++++[1]
Mountain Chickadee	200.0		200.0	-71.4	166.7	500.0	0.0		76.9	++++
Chestnut-backed Chickadee							-50.0		-50.0	
Bushtit							-100.0	-80.0	-85.7	
Red-breasted Nuthatch	-100.0		-100.0		++++		++++		++++	
White-breasted Nuthatch					++++			++++	++++	
Brown Creeper	200.0	-100.0	50.0	++++	50.0	++++	100.0		200.0	
Bewick's Wren								-100.0	-100.0	
House Wren						100.0		-50.0	0.0	

Table 6a. (cont.) Percentage changes between 2002 and 2003 in the numbers of individual ADULT birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Winter Wren								-100.0	-100.0	
American Dipper								-100.0	-100.0	
Golden-crowned Kinglet	20.0		20.0	++++	-40.0	-66.7	-80.0		-42.1	-100.0
Western Bluebird								++++	++++	
Townsend's Solitaire							-100.0		-100.0	
Swainson's Thrush		-66.7	-66.7							
Hermit Thrush				++++	++++	200.0	++++		600.0	
American Robin	-40.0	0.0	-22.2	66.7	66.7	33.3	0.0	0.0	45.5	60.0
Wrentit								50.0	50.0	
Orange-crowned Warbler					-100.0	-66.7	-33.3	-60.0	-59.3	166.7
Nashville Warbler	-33.3	++++	66.7		-100.0	++++	0.0	-40.0	-11.1	++++
Yellow Warbler		40.0	40.0				-33.3	150.0	40.0	200.0
Yellow-rumped Warbler	-59.1		-59.1	-66.7	-53.1	-56.4	-55.6	50.0	-54.3	175.0
Black-throated Gray Warbler		-33.3	-33.3							
Hermit Warbler	-25.0		-25.0	0.0	-66.7	-52.9	142.9		-3.6	
MacGillivray's Warbler	-28.6	-10.0	-22.6		-20.0	-7.7	-34.1	++++	-22.0	++++
Wilson's Warbler		0.0	0.0			-100.0		-100.0	-100.0	-28.6
Western Tanager	-100.0	0.0	-50.0	-100.0	-46.2	-83.3	0.0	++++	-38.5	++++
Green-tailed Towhee					-50.0			++++	0.0	
Spotted Towhee	200.0	-100.0	50.0				++++	28.6	85.7	
Chipping Sparrow				++++	-100.0	40.0	-50.0	-100.0	10.0	
Fox Sparrow	-28.6		-28.6		-100.0	++++			0.0	
Song Sparrow	++++	-12.5	0.0				-20.8	-50.0	-23.1	-9.1
Lincoln's Sparrow	-5.9		-5.9	-100.0	-16.7	-6.7	-37.5		-23.5	
White-crowned Sparrow										100.0
Dark-eyed Junco	-31.3	-40.0	-33.3	-6.7	-26.3	-11.4	-31.3	-100.0	-18.6	12.5

Table 6a. (cont.) Percentage changes between 2002 and 2003 in the numbers of individual ADULT birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Black-headed Grosbeak		-100.0	-100.0			-100.0	200.0	100.0	128.6	
Lazuli Bunting	-100.0	100.0	0.0		++++	133.3		0.0	35.7	++++
Red-winged Blackbird		0.0	0.0				-80.0		-80.0	
Brewer's Blackbird							-33.3	50.0	0.0	++++
Brown-headed Cowbird		0.0	0.0		-100.0		++++		0.0	0.0
Pine Grosbeak				0.0					0.0	++++
Purple Finch		87.5	87.5	-100.0	-100.0	-100.0	350.0	500.0	114.3	
Cassin's Finch		++++	++++	++++	-66.7	-50.0	0.0		0.0	-100.0
House Finch										
Pine Siskin					300.0	-100.0	-33.3		-53.8	-100.0
Lesser Goldfinch		-100.0	-100.0		++++	-100.0		800.0	400.0	
Lawrence's Goldfinch					-100.0			-100.0	-100.0	
Evening Grosbeak								++++	++++	
ALL SPECIES POOLED	-30.7	2.9	-15.7	-2.2	-17.4	-20.3	-13.4	26.0	-11.3	27.8
No. species that increased[2]	6(2)	10(5)	12(2)	10(9)	16(10)	12(4)	14(9)	21(11)	26(7)	14(8)
No. species that decreased[3]	16(6)	14(7)	23(7)	9(6)	19(8)	18(7)	21(4)	13(7)	24(6)	10(6)
No. species remained same	3	7	7	2	1	2	7	3	9	1
Total Number of Species	25	31	42	21	36	32	42	37	59	25
Proportion of increasing (decreasing) species	(0.640)	0.323	(0.548)	(0.429)	(0.528)	(0.563)	(0.500)	0.568	(0.407)	0.560
Sig. of increase (decrease)[4]	(0.115)	0.985	(0.322)	(0.808)	(0.434)	(0.298)	(0.561)	0.256	(0.941)	0.345

Table 6a. (cont.) Percentage changes between 2002 and 2003 in the numbers of individual ADULT birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

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[1] Increase indeterminate (infinite) because no adult was captured in the first year of the comparison.
[2] No. of species for which adults were captured in the second but not in the first year of the comparison are in parentheses.
[3] No. of species for which adults were captured in the first but not in the second year of the comparison are in parentheses.
[4] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 6b. Percentage changes between 2002 and 2003 in the numbers of individual YOUNG birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Spotted Sandpiper										
Williamson's Sapsucker					-100.0				-100.0	
Red-breasted Sapsucker	-100.0		-100.0		-100.0	-50.0	-87.5	-100.0	-88.2	-20.0
Downy Woodpecker		0.0	0.0					++++[1]	++++[1]	
Hairy Woodpecker		-100.0	-100.0				-100.0	++++	0.0	
White-headed Woodpecker					-100.0				-100.0	
Northern Flicker		-100.0	-100.0			-100.0	-100.0		-100.0	
Olive-sided Flycatcher										
Western Wood-Pewee		++++[1]	++++[1]		-100.0		++++[1]	-100.0	-50.0	
"Traill's" Flycatcher										
Hammond's Flycatcher	-100.0		-100.0		++++[1]	++++[1]	++++		++++	
Dusky Flycatcher	-100.0		-100.0			-100.0	++++	-100.0	-75.0	
"Western" Flycatcher	++++[1]	100.0	200.0	-100.0	-100.0	-100.0	-88.9		-91.7	
Black Phoebe		125.0	125.0				-100.0	++++	200.0	
Cassin's Vireo		0.0	0.0				100.0		100.0	
Hutton's Vireo										
Warbling Vireo						++++	-25.0	++++	75.0	
Steller's Jay		-100.0	-100.0		-100.0		++++		0.0	-100.0
Mountain Chickadee				-100.0	-71.4	-100.0			-81.0	
Chestnut-backed Chickadee							++++		++++	
Bushtit	-100.0		-100.0				-100.0	-100.0	-100.0	
Red-breasted Nuthatch				-100.0	-75.0	-66.7	-100.0		-75.9	
White-breasted Nuthatch							-100.0		-100.0	
Brown Creeper	-50.0	0.0	-33.3	-100.0	100.0	400.0	-42.9	++++	16.7	-100.0
Bewick's Wren								-100.0	-100.0	
House Wren	-100.0	++++	-66.7		50.0	-16.7	100.0	-66.7	-8.3	-100.0

Table 6b. (cont.) Percentage changes between 2002 and 2003 in the numbers of individual YOUNG birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Winter Wren	-100.0		-100.0	-100.0					-100.0	
American Dipper										
Golden-crowned Kinglet	-100.0		-100.0	-100.0	271.4	-90.5	-100.0		-36.4	
Western Bluebird										
Townsend's Solitaire					++++				++++	
Swainson's Thrush		-100.0	-100.0							
Hermit Thrush						-100.0	++++		0.0	
American Robin		-100.0	-100.0		-100.0		-100.0		-100.0	
Wrentit								100.0	100.0	
Orange-crowned Warbler	-83.3	-40.0	-63.6	++++[1]	-82.8	-92.5	-86.9	-78.9	-87.2	271.4
Nashville Warbler	-37.5	-100.0	-44.4	-100.0	-90.9	-88.7	-93.8	-50.0	-88.7	++++[1]
Yellow Warbler		100.0	100.0			++++	0.0	100.0	100.0	
Yellow-rumped Warbler	-100.0		-100.0	-80.0	-90.5	-55.0	-40.0		-86.6	++++
Black-throated Gray Warbler		++++	++++		-100.0	-100.0	-100.0		-100.0	
Hermit Warbler				-100.0	-100.0	-98.0	-88.9		-97.1	
MacGillivray's Warbler	-25.0	150.0	0.0	-100.0	-50.0	42.9	33.3	-50.0	18.5	++++
Wilson's Warbler		400.0	400.0			-100.0		-100.0	-100.0	800.0
Western Tanager		-66.7	-66.7		-91.7	0.0	-83.3		-84.2	
Green-tailed Towhee										
Spotted Towhee	0.0	++++	100.0					-100.0	-100.0	-100.0
Chipping Sparrow						++++			++++	
Fox Sparrow	-50.0		-50.0							
Song Sparrow	++++	100.0	175.0		++++	++++	38.5	-100.0	57.1	-30.0
Lincoln's Sparrow	-85.7		-85.7	100.0	300.0	63.6	-75.0		29.6	
White-crowned Sparrow										-100.0
Dark-eyed Junco	-100.0	0.0	-83.3	-20.0	16.7	-44.8	-18.2	-100.0	-24.6	-50.0

Table 6b. (cont.) Percentage changes between 2002 and 2003 in the numbers of individual YOUNG birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Black-headed Grosbeak		-100.0	-100.0		-100.0	-50.0	-100.0	100.0	-16.7	
Lazuli Bunting		-100.0	-100.0					14.3	14.3	
Red-winged Blackbird							-100.0		-100.0	
Brewer's Blackbird										
Brown-headed Cowbird										
Pine Grosbeak										
Purple Finch						-100.0	0.0	++++	0.0	
Cassin's Finch					-50.0	-100.0			-66.7	
House Finch							++++		++++	
Pine Siskin					-91.2	-100.0	-100.0		-91.9	
Lesser Goldfinch		++++	++++		-100.0				-100.0	
Lawrence's Goldfinch					-100.0				-100.0	
Evening Grosbeak								++++	++++	
ALL SPECIES POOLED	-62.5	21.1	-31.4	-73.0	-72.9	-74.5	-64.1	-56.6	-70.2	57.1
No. species that increased[2]	2(2)	11(5)	9(3)	2(1)	8(3)	8(5)	11(7)	11(7)	17(7)	5(3)
No. species that decreased[3]	15(9)	10(8)	22(14)	11(9)	21(12)	20(10)	23(12)	13(9)	31(14)	8(5)
No. species remained same	1	4	3	0	0	1	2	0	4	0
Total Number of Species	18	25	34	13	29	29	36	24	52	13
Proportion of increasing (decreasing) species	(0.833)	0.440	(0.647)	(0.846)	(0.724)	(0.690)	(0.639)	(0.542)	(0.596)	0.385
Sig. of increase (decrease)[4]	(0.004) ***	0.788	(0.061) *	(0.011) **	(0.012) **	(0.031) **	(0.066) *	(0.419)	(0.106)	0.867

Table 6b. (cont.) Percentage changes between 2002 and 2003 in the numbers of individual YOUNG birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

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[1] Increase indeterminate (infinite) because no young bird was captured in the first year of the comparison.
[2] No. of species for which young were captured in the second but not in the first year of the comparison are in parentheses.
[3] No. of species for which young were captured in the first but not in the second year of the comparison are in parentheses.
[4] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 6c. Changes between 2002 and 2003 in the PROPORTION OF YOUNG in the catch at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Spotted Sandpiper		+-+-+[1]	+-+-+[1]							
Williamson's Sapsucker				+-+-+[1]	+-+-+[1]				-1.000	
Red-breasted Sapsucker	-0.500		-0.500	+-+-+	-0.455	0.000	-0.181	-0.500	-0.307	0.016
Downy Woodpecker		0.083	0.083					+-+-+[1]	+-+-+[1]	
Hairy Woodpecker		-1.000	-1.000		+-+-+	0.000	-1.000	+-+-+	-0.333	
White-headed Woodpecker	+-+-+[1]	+-+-+	0.000		-0.500	0.000	+-+-+[1]	+-+-+	-0.333	
Northern Flicker	0.000	-1.000	-0.500		+-+-+	+-+-+[1]	-0.500	0.000	-0.333	
Olive-sided Flycatcher		+-+-+	+-+-+		+-+-+		+-+-+		0.000	
Western Wood-Pewee		0.250	0.250	+-+-+	-1.000		0.500	-1.000	-0.375	
"Traill's" Flycatcher							+-+-+	+-+-+	+-+-+	+-+-+[1]
Hammond's Flycatcher	+-+-+		+-+-+		+-+-+	0.200	1.000		0.619	
Dusky Flycatcher	-0.400		-0.400	+-+-+	0.000	-0.250	0.125	+-+-+	-0.130	+-+-+
"Western" Flycatcher	0.250	-0.068	0.057	+-+-+	-1.000	+-+-+	-0.750		-0.506	
Black Phoebe		0.100	0.100				-1.000	0.375	-0.167	
Cassin's Vireo		0.033	0.033		0.000	+-+-+	0.233		0.143	+-+-+
Hutton's Vireo	+-+-+		+-+-+							
Warbling Vireo	+-+-+	0.000	0.000	+-+-+	0.000	0.188	-0.009	0.333	0.080	0.000
Steller's Jay	0.000	+-+-+	-0.250	+-+-+	+-+-+		0.500	+-+-+	0.000	-1.000
Mountain Chickadee	0.000		0.000	-0.417	-0.490	-0.500	0.000		-0.470	+-+-+
Chestnut-backed Chickadee							0.500		0.500	
Bushtit	+-+-+		+-+-+				+-+-+	-0.615	-0.682	
Red-breasted Nuthatch	+-+-+		+-+-+	+-+-+	-0.286	0.000	-1.000		-0.300	
White-breasted Nuthatch					+-+-+		+-+-+	+-+-+	-1.000	
Brown Creeper	-0.400	0.333	-0.179	-1.000	0.071	-0.375	-0.208	+-+-+	-0.191	+-+-+
Bewick's Wren								+-+-+	+-+-+	
House Wren	+-+-+	+-+-+	0.000		0.000	-0.143	0.000	-0.100	-0.014	+-+-+

Table 6c. (cont.) Changes between 2002 and 2003 in the PROPORTION OF YOUNG in the catch at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Winter Wren	+-+-+		+-+-+	+-+-+				+-+-+	+-+-+	
American Dipper								+-+-+	+-+-+	
Golden-crowned Kinglet	-0.286		-0.286	-1.000	0.313	-0.300	-0.706		0.020	+-+-+
Western Bluebird								+-+-+	+-+-+	
Townsend's Solitaire					+-+-+		+-+-+		1.000	
Swainson's Thrush		-0.400	-0.400							
Hermit Thrush				+-+-+	+-+-+	-0.500	+-+-+		-0.375	
American Robin	0.000	-0.200	-0.100	0.000	-0.400	0.000	-0.750	0.000	-0.313	0.000
Wrentit								0.067	0.067	
Orange-crowned Warbler	0.000	0.000	0.000	+-+-+	0.033	-0.208	-0.169	-0.062	-0.125	0.065
Nashville Warbler	-0.013	-1.000	-0.250	+-+-+	0.029	-0.250	-0.592	-0.044	-0.322	+-+-+
Yellow Warbler		0.056	0.056			+-+-+	0.083	-0.056	0.087	0.000
Yellow-rumped Warbler	-0.044		-0.044	-0.121	-0.278	0.007	0.072	0.000	-0.283	0.185
Black-throated Gray Warbler		0.333	0.333		+-+-+	+-+-+	+-+-+		+-+-+	
Hermit Warbler	0.000		0.000	-0.833	-0.667	-0.635	-0.507		-0.645	
MacGillivray's Warbler	0.011	0.190	0.057	+-+-+	-0.086	0.105	0.158	-0.750	0.096	+-+-+
Wilson's Warbler		0.375	0.375			+-+-+		+-+-+	+-+-+	0.518
Western Tanager	+-+-+	-0.229	-0.073	+-+-+	-0.355	0.357	-0.357	+-+-+	-0.264	+-+-+
Green-tailed Towhee					0.000			+-+-+	0.000	
Spotted Towhee	-0.250	1.000	0.067				+-+-+	-0.364	-0.364	+-+-+
Chipping Sparrow				+-+-+	+-+-+	0.125	0.000	+-+-+	0.083	
Fox Sparrow	-0.056		-0.056		+-+-+	+-+-+			0.000	
Song Sparrow	+-+-+	0.200	0.246		+-+-+	+-+-+	0.135	-0.333	0.174	-0.064
Lincoln's Sparrow	-0.233		-0.233	0.667	0.302	0.139	-0.198		0.127	
White-crowned Sparrow										-0.857
Dark-eyed Junco	-0.385	0.114	-0.239	-0.028	0.113	-0.113	0.043	+-+-+	-0.018	-0.100

Table 6c. (cont.) Changes between 2002 and 2003 in the PROPORTION OF YOUNG in the catch at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Black-headed Grosbeak		+-+-+	+-+-+		+-+-+	0.333	-0.200	0.000	-0.223	
Lazuli Bunting	+-+-+	-0.667	-0.500		+-+-+	0.000		0.032	-0.037	+-+-+
Red-winged Blackbird		0.000	0.000				-0.167		-0.167	
Brewer's Blackbird							0.000	0.000	0.000	+-+-+
Brown-headed Cowbird		0.000	0.000		+-+-+		+-+-+		0.000	0.000
Pine Grosbeak				0.000					0.000	+-+-+
Purple Finch		0.000	0.000	+-+-+	+-+-+	+-+-+	-0.233	0.143	-0.105	
Cassin's Finch		+-+-+	+-+-+	+-+-+	0.100	-0.333	0.000		-0.190	+-+-+
House Finch							+-+-+		+-+-+	
Pine Siskin					-0.543	+-+-+	-0.400		-0.407	+-+-+
Lesser Goldfinch		1.000	1.000		-1.000	+-+-+		0.000	-0.333	
Lawrence's Goldfinch					+-+-+			+-+-+	+-+-+	
Evening Grosbeak								+-+-+	+-+-+	
ALL SPECIES POOLED	-0.121	0.033	-0.042	-0.264	-0.247	-0.278	-0.213	-0.255	-0.266	0.047
No. species that increased[2]	2	13	12	1	7	8	11	5	12	4
No. species that decreased[2]	10	8	16	6	13	11	19	10	31	4
No. species remained same[2]	6	5	9	2	5	6	5	6	7	4
Total Number of Species[2]	18	26	37	9	25	25	35	21	50	12
Proportion of increasing (decreasing) species	(0.556)	0.500	(0.432)	(0.667)	(0.520)	(0.440)	(0.543)	(0.476)	(0.620)	0.333
Sig. of increase (decrease)[3]	(0.407)	0.577	(0.838)	(0.254)	(0.500)	(0.788)	(0.368)	(0.668)	(0.059) *	0.927

Table 6c. (cont.) Changes between 2002 and 2003 in the PROPORTION OF YOUNG in the catch at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

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[1] The change in the proportion of young is undefined at this station because no aged individual of the species was captured in one of the two years.
[2] Species for which the change in the proportion of young is undefined are not included.
[3] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 7a. Percentage changes between 2003 and 2004 in the numbers of individual ADULT birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Acorn Woodpecker								-100.0	-100.0	
Williamson's Sapsucker				50.0					50.0	
Red-breasted Sapsucker	0.0		0.0	100.0	-57.1	200.0	300.0	-50.0	66.7	100.0
Downy Woodpecker		0.0	0.0				++++[1]	-100.0	-66.7	
Hairy Woodpecker	++++[1]	-100.0	0.0		0.0	-100.0	-100.0		-66.7	
White-headed Woodpecker	++++	-100.0	0.0		-100.0	200.0	-100.0	-66.7	-50.0	
Northern Flicker	-100.0	-100.0	-100.0	++++[1]	0.0	++++[1]	0.0	-66.7	0.0	
Olive-sided Flycatcher							-100.0		-100.0	
Western Wood-Pewee		100.0	100.0	-100.0	-100.0		200.0	-33.3	-44.4	
"Traill's" Flycatcher								-100.0	-100.0	
Hammond's Flycatcher	++++		++++[1]		-75.0	-75.0			-75.0	
Dusky Flycatcher	200.0		200.0	++++	500.0	-50.0	-66.7		-19.0	++++[1]
"Western" Flycatcher	-100.0	-100.0	-100.0	++++	-100.0	++++	166.7		300.0	
Black Phoebe		-100.0	-100.0			++++	-100.0	-66.7	-57.1	
Cassin's Vireo	++++	-25.0	25.0		0.0	100.0	-25.0		0.0	++++
Hutton's Vireo										
Warbling Vireo	-100.0	66.7	42.9	-100.0	300.0	7.7	12.5	50.0	18.2	200.0
Steller's Jay	-100.0		-100.0			++++	100.0	-100.0	50.0	-100.0
Western Scrub-Jay								++++[1]	++++[1]	
Violet-green Swallow		++++[1]	++++							
Mountain Chickadee	-33.3	++++	0.0	-50.0	44.4	-90.9	100.0		-26.1	-66.7
Chestnut-backed Chickadee							-100.0		-100.0	
Bushtit								1000.0	1000.0	
Red-breasted Nuthatch	++++		++++		50.0	++++	0.0		133.3	++++
White-breasted Nuthatch					-100.0			-50.0	-60.0	
Brown Creeper	100.0	++++	200.0	-100.0	33.3	-50.0	0.0	0.0	-20.0	++++

Table 7a. (cont.) Percentage changes between 2003 and 2004 in the numbers of individual ADULT birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Bewick's Wren								++++	++++	
House Wren				++++	++++[1]	0.0	++++	++++	300.0	
Winter Wren	++++		++++							
Marsh Wren										
Golden-crowned Kinglet	-66.7		-66.7	-75.0	0.0	25.0	-100.0		-25.0	
Townsend's Solitaire	++++		++++							
Swainson's Thrush		200.0	200.0							++++
Hermit Thrush				-50.0	-100.0	-33.3	-50.0	++++	-37.5	
American Robin	166.7	275.0	228.6	-85.7	-40.0	-100.0	150.0	100.0	-38.9	-37.5
Wrentit								0.0	0.0	
Orange-crowned Warbler		++++	++++	++++	++++	520.0	133.3	850.0	476.9	-42.9
Nashville Warbler	50.0	333.3	220.0	++++	++++	0.0	0.0	233.3	125.0	0.0
Yellow Warbler		-57.1	-57.1				50.0	16.7	25.0	-66.7
Yellow-rumped Warbler	0.0	++++	12.5	60.0	60.0	31.3	66.7	-66.7	40.5	-63.6
Black-throated Gray Warbler		-100.0	-100.0					++++	++++	
Hermit Warbler	-33.3	++++	0.0	0.0	500.0	42.9	-50.0		0.0	++++
MacGillivray's Warbler	53.3	77.8	62.5		125.0	60.0	17.9	0.0	35.6	20.0
Wilson's Warbler		66.7	66.7							220.0
Western Tanager		-25.0	-25.0		-37.5	-100.0	-66.7	50.0	-41.2	-100.0
Green-tailed Towhee					0.0	++++		-100.0	50.0	
Spotted Towhee	0.0		0.0				50.0	-60.0	-41.7	
Chipping Sparrow				-100.0		-50.0	-100.0		-70.0	
Savannah Sparrow										++++
Fox Sparrow	-100.0		-100.0			-100.0			-100.0	
Song Sparrow	400.0	0.0	50.0				10.0	200.0	19.0	-60.0
Lincoln's Sparrow	-31.3		-31.3	++++	126.7	57.1	11.1		89.5	++++

Table 7a. (cont.) Percentage changes between 2003 and 2004 in the numbers of individual ADULT birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
White-crowned Sparrow										150.0
Dark-eyed Junco	27.3	200.0	64.3	129.4	16.7	83.3	54.5	++++	76.3	77.8
Black-headed Grosbeak	++++	++++	++++				-10.0	-50.0	-25.0	
Lazuli Bunting		-100.0	-100.0		-100.0	-85.7		-92.3	-90.5	0.0
Red-winged Blackbird		100.0	100.0				-100.0		-100.0	
Brewer's Blackbird							-100.0	-66.7	-75.0	0.0
Brown-headed Cowbird		0.0	0.0				-100.0	++++	0.0	-100.0
Bullock's Oriole								++++	++++	
Pine Grosbeak				-100.0					-100.0	200.0
Purple Finch	++++	-20.0	0.0			++++	-88.9	-75.0	-76.5	
Cassin's Finch		-100.0	-100.0	-66.7	100.0	0.0	-100.0		-33.3	++++
House Finch										
Pine Siskin					100.0	++++	-100.0		57.1	
Lesser Goldfinch		++++	++++		0.0			-80.0	-66.7	
Evening Grosbeak								-100.0	-100.0	
ALL SPECIES POOLED	35.6	36.8	36.3	36.5	44.1	35.2	6.6	-5.6	21.6	7.6
No. species that increased[2]	16(9)	17(8)	22(8)	11(7)	15(3)	19(8)	17(2)	16(8)	22(4)	16(9)
No. species that decreased[3]	9(5)	12(8)	12(8)	10(5)	10(6)	11(4)	19(12)	19(6)	30(8)	9(3)
No. species remained same	3	3	9	1	6	3	4	3	5	3
Total Number of Species	28	32	43	22	31	33	40	38	57	28
Proportion of increasing (decreasing) species	0.571	0.531	0.512	0.500	0.419	0.576	0.425	(0.500)	0.386	0.571
Sig. of increase (decrease)[4]	0.286	0.430	0.500	0.584	0.859	0.243	0.866	(0.564)	0.969	0.286

Table 7a. (cont.) Percentage changes between 2003 and 2004 in the numbers of individual ADULT birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

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[1] Increase indeterminate (infinite) because no adult was captured in the first year of the comparison.
[2] No. of species for which adults were captured in the second but not in the first year of the comparison are in parentheses.
[3] No. of species for which adults were captured in the first but not in the second year of the comparison are in parentheses.
[4] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 7b. Percentage changes between 2003 and 2004 in the numbers of individual YOUNG birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Acorn Woodpecker										
Williamson's Sapsucker				++++[1]					++++[1]	++++[1]
Red-breasted Sapsucker					++++[1]	0.0	400.0	++++[1]	450.0	25.0
Downy Woodpecker		0.0	0.0				-100.0		-100.0	
Hairy Woodpecker				++++	++++			-100.0	200.0	
White-headed Woodpecker						++++[1]		++++	++++	
Northern Flicker								++++	++++	++++
Olive-sided Flycatcher										
Western Wood-Pewee		-100.0	-100.0			++++	0.0		100.0	
"Traill's" Flycatcher										
Hammond's Flycatcher	++++[1]		++++[1]	++++	-75.0	100.0	0.0		-42.9	
Dusky Flycatcher	++++		++++		++++		-100.0		-50.0	
"Western" Flycatcher	-100.0	-100.0	-100.0		++++	++++	1200.0		1800.0	
Black Phoebe		-50.0	-50.0		++++			100.0	166.7	
Cassin's Vireo		-100.0	-100.0			++++	-33.3		33.3	
Hutton's Vireo						++++			++++	
Warbling Vireo		++++[1]	++++			0.0	120.0	-100.0	55.6	++++
Steller's Jay							-100.0		-100.0	
Western Scrub-Jay										
Violet-green Swallow										
Mountain Chickadee	++++		++++	++++	66.7	++++	++++[1]		216.7	
Chestnut-backed Chickadee							0.0		0.0	
Bushtit							++++	50.0	450.0	
Red-breasted Nuthatch		++++	++++	++++	-20.0	433.3	++++		225.0	
White-breasted Nuthatch										
Brown Creeper	100.0	450.0	275.0	++++	25.0	-42.9	25.0	100.0	31.3	

Table 7b. (cont.) Percentage changes between 2003 and 2004 in the numbers of individual YOUNG birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Bewick's Wren								++++	++++	
House Wren	++++	200.0	400.0	++++	-25.0	20.0	250.0	0.0	66.7	++++
Winter Wren	++++		++++				++++		++++	
Marsh Wren										++++
Golden-crowned Kinglet					-88.6	450.0	++++		-37.8	
Townsend's Solitaire					-100.0				-100.0	
Swainson's Thrush										
Hermit Thrush							-100.0		-100.0	
American Robin					0.0	++++	100.0		100.0	
Wrentit								0.0	0.0	
Orange-crowned Warbler	0.0	100.0	75.0	266.7	1100.0	558.3	733.3	253.3	556.0	-57.7
Nashville Warbler	-60.0	++++	-20.0	++++	1200.0	433.3	700.0	400.0	808.3	-100.0
Yellow Warbler		-100.0	-100.0			-100.0	0.0	-33.3	-33.3	++++
Yellow-rumped Warbler				100.0	421.7	260.0	33.3		331.6	-100.0
Black-throated Gray Warbler		0.0	0.0		++++	++++	++++	++++	++++	
Hermit Warbler				++++	++++	4500.0	500.0		3900.0	
MacGillivray's Warbler	-20.0	25.0	-7.1		100.0	30.0	15.0	400.0	36.4	100.0
Wilson's Warbler	++++	-100.0	-80.0	++++	++++	++++	200.0	0.0	750.0	-71.4
Western Tanager		0.0	0.0		0.0	300.0	100.0		100.0	
Green-tailed Towhee										
Spotted Towhee	0.0	-100.0	-50.0				-100.0	500.0	200.0	
Chipping Sparrow						0.0			0.0	
Savannah Sparrow										
Fox Sparrow	0.0		0.0	++++	++++				++++	++++
Song Sparrow	66.7	50.0	54.5		-100.0	-100.0	50.0	++++	33.3	-50.0
Lincoln's Sparrow	300.0		300.0	50.0	25.0	66.7	33.3		48.6	++++

Table 7b. (cont.) Percentage changes between 2003 and 2004 in the numbers of individual YOUNG birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
White-crowned Sparrow										++++
Dark-eyed Junco	++++	50.0	500.0	375.0	78.6	94.7	112.5		117.8	400.0
Black-headed Grosbeak						-100.0	++++	187.5	200.0	
Lazuli Bunting						++++		-76.9	-61.5	++++
Red-winged Blackbird							++++		++++	
Brewer's Blackbird		++++	++++			++++			++++	
Brown-headed Cowbird										
Bullock's Oriole										
Pine Grosbeak				++++					++++	
Purple Finch		++++	++++				-100.0	3000.0	1450.0	
Cassin's Finch					-100.0			++++	100.0	
House Finch							-100.0		-100.0	
Pine Siskin					100.0		++++		166.7	
Lesser Goldfinch		-100.0	-100.0		++++			++++	++++	++++
Evening Grosbeak								-100.0	-100.0	
ALL SPECIES POOLED	76.0	25.0	43.5	590.9	158.2	237.1	192.3	182.5	201.9	-11.5
No. species that increased[2]	10(7)	11(5)	14(8)	16(12)	19(10)	23(11)	25(9)	17(8)	40(12)	14(11)
No. species that decreased[3]	3(1)	8(7)	10(5)	0(0)	7(3)	4(3)	8(7)	5(3)	11(6)	5(2)
No. species remained same	3	3	4	0	2	3	4	3	3	0
Total Number of Species	16	22	28	16	28	30	37	25	54	19
Proportion of increasing (decreasing) species	0.625	0.500	0.500	1.000	0.679	0.767	0.676	0.680	0.741	(0.263)
Sig. of increase (decrease)[4]	0.227	0.584	0.575	0.000 ***	0.044 **	0.003 ***	0.024 **	0.054 *	0.000 ***	(0.990)

Table 7b. (cont.) Percentage changes between 2003 and 2004 in the numbers of individual YOUNG birds captured at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

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[1] Increase indeterminate (infinite) because no young bird was captured in the first year of the comparison.
[2] No. of species for which young were captured in the second but not in the first year of the comparison are in parentheses.
[3] No. of species for which young were captured in the first but not in the second year of the comparison are in parentheses.
[4] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 7c. Changes between 2003 and 2004 in the PROPORTION OF YOUNG in the catch at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Acorn Woodpecker								+-+-+[1]	+-+-+[1]	
Williamson's Sapsucker				0.250					0.250	+-+-+[1]
Red-breasted Sapsucker	0.000		0.000	0.000	0.400	-0.250	0.038	0.750	0.188	-0.117
Downy Woodpecker		0.000	0.000				-1.000	+-+-+	-0.250	
Hairy Woodpecker	+-+-+[1]	+-+-+[1]	0.000	+-+-+[1]	0.667	+-+-+[1]	+-+-+[1]	+-+-+	0.500	
White-headed Woodpecker	+-+-+	+-+-+	0.000		+-+-+[1]	0.400	+-+-+	0.500	0.429	
Northern Flicker	+-+-+	+-+-+	+-+-+[1]	+-+-+	0.000	+-+-+	0.000	0.500	0.167	+-+-+
Olive-sided Flycatcher							+-+-+		+-+-+	
Western Wood-Pewee		-0.250	-0.250	+-+-+	+-+-+	+-+-+	-0.250	0.000	0.186	
"Traill's" Flycatcher								+-+-+	+-+-+	
Hammond's Flycatcher	+-+-+		+-+-+	+-+-+	0.000	0.467	0.000		0.164	
Dusky Flycatcher	0.400		0.400	+-+-+	0.143	0.000	-0.250		-0.031	+-+-+
"Western" Flycatcher	+-+-+	+-+-+	+-+-+	+-+-+	1.000	+-+-+	0.369		0.343	
Black Phoebe		0.111	0.111		+-+-+	+-+-+	+-+-+	0.417	0.427	
Cassin's Vireo	+-+-+	-0.200	-0.200		0.000	0.500	-0.029		0.067	+-+-+
Hutton's Vireo						+-+-+			+-+-+	
Warbling Vireo	+-+-+	0.091	0.091	+-+-+	0.000	-0.011	0.141	-0.333	0.050	0.182
Steller's Jay	+-+-+		+-+-+			+-+-+	-0.500	+-+-+	-0.333	+-+-+
Western Scrub-Jay								+-+-+	+-+-+	
Violet-green Swallow		+-+-+	+-+-+							
Mountain Chickadee	0.333	+-+-+	0.250	0.500	0.035	0.875	0.333		0.321	0.000
Chestnut-backed Chickadee							0.500		0.500	
Bushtit							+-+-+	-0.452	-0.167	
Red-breasted Nuthatch	+-+-+	+-+-+	+-+-+	+-+-+	-0.143	-0.158	0.800		0.061	+-+-+
White-breasted Nuthatch					+-+-+			0.000	0.000	
Brown Creeper	0.000	-0.214	0.054	1.000	-0.016	0.030	0.033	0.167	0.109	+-+-+

Table 7c. (cont.) Changes between 2003 and 2004 in the PROPORTION OF YOUNG in the catch at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
Bewick's Wren								+-+-+	+-+-+	
House Wren	+-+-+	0.000	0.000	+-+-+	-0.250	0.036	-0.222	-0.667	-0.143	+-+-+
Winter Wren	+-+-+		+-+-+				+-+-+		+-+-+	
Marsh Wren										+-+-+
Golden-crowned Kinglet	0.000		0.000	0.000	-0.350	0.354	1.000		-0.036	
Townsend's Solitaire	+-+-+		+-+-+		+-+-+				+-+-+	
Swainson's Thrush		0.000	0.000							+-+-+
Hermit Thrush				0.000	+-+-+	0.000	-0.333	+-+-+	-0.111	
American Robin	0.000	0.000	0.000	0.000	0.083	1.000	-0.048	0.000	0.167	0.000
Wrentit								0.000	0.000	
Orange-crowned Warbler	0.000	-0.143	-0.125	-0.083	-0.143	0.012	0.185	-0.146	0.020	-0.055
Nashville Warbler	-0.314	0.133	-0.300	+-+-+	-0.049	0.248	0.467	0.100	0.258	-0.500
Yellow Warbler		-0.222	-0.222			+-+-+	-0.100	-0.111	-0.143	0.500
Yellow-rumped Warbler	0.000	+-+-+	0.000	0.048	0.228	0.247	-0.056	0.000	0.260	-0.185
Black-throated Gray Warbler		0.667	0.667		+-+-+	+-+-+	+-+-+	+-+-+	+-+-+	
Hermit Warbler	0.000	+-+-+	0.000	0.500	0.818	0.696	0.370		0.688	+-+-+
MacGillivray's Warbler	-0.142	-0.070	-0.118		-0.026	-0.052	-0.006	0.375	0.001	0.114
Wilson's Warbler	+-+-+	-0.625	-0.458	+-+-+	+-+-+	+-+-+	0.000	0.000	0.000	-0.472
Western Tanager		0.050	0.050		0.086	0.500	0.357	0.000	0.254	+-+-+
Green-tailed Towhee					0.000	+-+-+		+-+-+	0.000	
Spotted Towhee	0.000	+-+-+	-0.150				-0.333	0.509	0.319	
Chipping Sparrow				+-+-+		0.107	+-+-+		0.159	
Savannah Sparrow										+-+-+
Fox Sparrow	0.833		0.833	+-+-+	+-+-+	+-+-+			1.000	+-+-+
Song Sparrow	-0.250	0.098	0.007		+-+-+	+-+-+	0.077	0.400	0.028	0.054
Lincoln's Sparrow	0.208		0.208	-0.667	-0.138	0.014	0.036		-0.060	+-+-+

Table 7c. (cont.) Changes between 2003 and 2004 in the PROPORTION OF YOUNG in the catch at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

Species	Lion Meadow	Zumwalt Meadow	Sequoia/ Kings Canyon Stations Combined	White Wolf	Gin Flat East Meadow	Crane Flat	Hodgdon Meadow	Big Meadow	All five Yosemite Stations Combined	Devil's Postpile NM
White-crowned Sparrow										0.375
Dark-eyed Junco	0.391	-0.150	0.218	0.137	0.106	0.014	0.079	+-+-+	0.051	0.138
Black-headed Grosbeak	+-+-+	+-+-+	+-+-+			+-+-+	0.308	0.313	0.332	
Lazuli Bunting		+-+-+	+-+-+		+-+-+	0.667		0.250	0.332	0.667
Red-winged Blackbird		0.000	0.000				1.000		1.000	
Brewer's Blackbird		+-+-+	+-+-+			+-+-+	+-+-+	0.000	0.500	0.000
Brown-headed Cowbird		0.000	0.000				+-+-+	+-+-+	0.000	+-+-+
Bullock's Oriole								+-+-+	+-+-+	
Pine Grosbeak				1.000					1.000	0.000
Purple Finch	+-+-+	0.040	0.032			+-+-+	-0.100	0.828	0.780	
Cassin's Finch		+-+-+	+-+-+	0.000	-0.500	0.000	+-+-+	+-+-+	0.190	+-+-+
House Finch							+-+-+		+-+-+	
Pine Siskin					0.000	+-+-+	1.000		0.121	
Lesser Goldfinch		-1.000	-1.000		0.333			0.500	0.429	+-+-+
Evening Grosbeak								+-+-+	+-+-+	
ALL SPECIES POOLED	0.048	-0.018	0.010	0.342	0.139	0.225	0.247	0.267	0.223	-0.044
No. species that increased[2]	5	7	12	7	11	17	18	13	36	7
No. species that decreased[2]	3	9	9	2	9	4	13	5	9	5
No. species remained same[2]	8	6	12	5	6	3	3	8	5	4
Total Number of Species[2]	16	22	33	14	26	24	34	26	50	16
Proportion of increasing (decreasing) species	0.313	(0.391)	0.353	0.500	0.423	0.708	0.529	0.500	0.720	(0.313)
Sig. of increase (decrease)[3]	0.962	(0.895)	0.971	0.605	0.837	0.032 **	0.432	0.577	0.001 ***	(0.962)

Table 7c. (cont.) Changes between 2003 and 2004 in the PROPORTION OF YOUNG in the catch at eight constant-effort MAPS stations in Sequoia/Kings Canyon and Yosemite National Parks and Devil's Postpile National Monument.

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[1] The change in the proportion of young is undefined at this station because no aged individual of the species was captured in one of the two years.
[2] Species for which the change in the proportion of young is undefined are not included.
[3] Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.
*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 8. Model parameterization of annual survival (ϕ) and recapture (p) probabilities used in the candidate models for breeding species at the Yosemite National Park (Hodgdon Meadow) and two Sequoia/Kings Canyon National Park MAPS stations, 1991-1993 and 2001-2004. Combinations of these parameterizations provide 16 candidate models for each species[1]. See Methods for descriptions of parameters.

Model Parameterization of ϕ	Definition
ϕ.	ϕ is the same at both locations and in both time periods
ϕ_{loc}	ϕ varies by location, but is constant in both time periods
$\phi_{time\ period}$	ϕ varies between the time periods, but is constant between the locations
$\phi_{loc*time\ period}$	ϕ varies by both time period and location

Model Parameterization of p	Definition
p.	p is the same at both locations and in both time periods
p_{loc}	p varies by location, but is constant in both time periods
$p_{time\ period}$	p varies between the time periods, but is constant between the locations
$p_{loc*time\ period}$	p varies by both time period and location

[1] Only four candidate models are possible if only two, rather than four, strata are included in the comparisons.

Table 9. Capture summaries for 13 species breeding at the Hodgdon Meadow (Yosemite National Park) and two Sequoia/Kings Canyon National Park MAPS stations obtained from seven years (1991-1993; 2001-2004) of mark-recapture data. Only species that met the minimum requirement of at least two returns in at least two of the four location/time period strata are included.[1]

		Yosemite National Park (Hodgdon Meadow)				Sequoia/Kings Canyon NP (Lion and Zumwalt Mdws.)			
Species	Per.[2]	Num. sta.[3]	Num. ind.[4]	Num. caps.[5]	Num. ret.[6]	Num. sta2.[3]	Num. ind.[4]	Num. caps.[5]	Num. ret.[6]
Red-breasted Sapsucker	91-93	**1**	**29**	**41**	**6**	1	3	6	0
	01-04	**1**	**39**	**51**	**4**	1	4	5	0
Dusky Flycatcher	91-93	**1**	**122**	**195**	**17**	**2**	**33**	**44**	**2**
	01-04	**1**	**17**	**23**	**2**	2	19	30	0
"Western" Flycatcher[7]	91-93	1	18	18	0	*2*	*53*	*65*	*2*
	01-04	1	19	19	0	*2*	*32*	*37*	*3*
Warbling Vireo	91-93	1	**129**	**158**	**7**	**2**	**82**	**110**	**8**
	01-04	1	**67**	**83**	**3**	**2**	**29**	**36**	**2**
Mountain Chickadee[7]	91-93	*1*	*11*	*15*	*2*	*2*	*19*	*32*	*5*
	01-04	1	5	5	0	2	9	9	0
American Robin	91-93	**1**	**15**	**23**	**5**	**2**	**43**	**70**	**6**
	01-04	1	12	13	1	**2**	**46**	**62**	**8**
Yellow Warbler	91-93	**1**	**22**	**54**	**10**	1	13	27	1
	01-04	**1**	**10**	**19**	**2**	**1**	**16**	**24**	**3**
MacGillivray's Warbler	91-93	**1**	**115**	**245**	**35**	**2**	**134**	**310**	**17**
	01-04	**1**	**104**	**233**	**39**	**2**	**95**	**249**	**30**
Song Sparrow	91-93	**1**	**43**	**66**	**4**	**2**	**39**	**88**	**2**
	01-04	**1**	**71**	**130**	**20**	**2**	**37**	**77**	**5**
Lincoln's Sparrow	91-93	**1**	**31**	**91**	**6**	**1**	**26**	**143**	**5**
	01-04	**1**	**37**	**77**	**13**	**1**	**38**	**133**	**15**
Dark-eyed Junco	91-93	**1**	**48**	**76**	**5**	**2**	**74**	**143**	**9**
	01-04	**1**	**53**	**87**	**11**	**2**	**67**	**118**	**14**
Black-headed Grosbeak	91-93	**1**	**43**	**54**	**5**	**2**	**46**	**63**	**7**
	01-04	**1**	**27**	**34**	**4**	**2**	**23**	**34**	**3**
Purple Finch	91-93	**1**	**128**	**139**	**2**	**2**	**104**	**114**	**4**
	01-04	**1**	**29**	**31**	**2**	**2**	**115**	**125**	**5**

[1] Strata that did not meet the minimum requirement are in normal font. Strata that met the minimum requirement but for which estimates of survival or recapture probability could not be calculated are in italics. Strata that met the minimum requirement and for which comparisons could be made are in bold font.

Table 9. (cont.) Capture summaries for 13 species breeding at the Hodgdon Meadow (Yosemite National Park) and two Sequoia/Kings Canyon National Park MAPS stations obtained from seven years (1991-1993; 2001-2004) of mark-recapture data. Only species that met the minimum requirement of at least two returns in at least two of the four location/time period strata are included.[1]

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[2] Time period of the survival and recapture probability: 91-93 = 1991-1993; 01-04 = 2001-2004.

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

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

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

[6] 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.

[7] The species met the minimum data requirement but the data was too sparse to allow estimation of survival and recapture probabilities.

Table 10. Comparison between model-averaged parameter estimates for annual adult apparent survival and recapture probabilities by time period and location for 11 species breeding at Hodgdon Meadow (Yosemite National Park) and two Sequoia/Kings Canyon National Park MAPS stations obtained from seven years (1991-1993;2001-2004) of mark-recapture data.

Species	Number Models Avg'd[1]	c-hat[2]	Per.[3]	Hodgdon Meadow (Yosemite National Park)		Sequoia/Kings Canyon National Park		Hodgdon Mead. (Yosemite NP)	Sequoia/Kings Canyon NP
				Survival Prob.[4]	CV[5]	Survival Prob.[4]	CV[5]	Recapture Prob.[6]	Recapture Prob.[6]
Red-breasted Sapsucker	4	1.000	91-93	0.295 (0.147)	49.8			0.704 (0.455)	
			01-04	0.305 (0.163)	53.4			0.479 (0.300)	
A. Dusky Flycatcher [7]	4	2.317	91-93	0.570 (0.406)	71.2	0.442 (0.388)	87.8	0.219 (0.196)	0.271 (0.257)
B. Dusky Flycatcher [7]	4	1.938	91-93	0.566 (0.357)	63.1			0.227 (0.180)	
			01-04	0.479 (0.357)	74.5			0.290 (0.250)	
Warbling Vireo	16	1.279	91-93	0.521 (0.276)	53.0	0.610 (0.298)	48.9	0.124 (0.086)	0.151 (0.103)
			01-04	0.454 (0.251)	55.3	0.542 (0.283)	52.2	0.121 (0.093)	0.143 (0.108)
A. American Robin [7]	4	2.384	91-93	0.415 (0.285)	68.7	0.337 (0.224)	66.5	0.589 (0.441)	0.619 (0.452)
B. American Robin [7]	4	1.659	91-93			0.545 (0.311)	57.1		0.392 (0.297)
			01-04			0.714 (0.302)	42.3		0.232 (0.166)
A. Yellow Warbler [7]	4	1.000	01-04	0.579 (0.383)	66.1	0.484 (0.322)	66.5	0.324 (0.288)	0.395 (0.326)
B. Yellow Warbler [7]	4	1.928	91-93	0.618 (0.286)	46.3			0.526 (0.333)	
			01-04	0.622 (0.361)	58.0			0.421 (0.328)	
MacGillivray's Warbler	16	1.890	91-93	0.391 (0.086)	22.0	0.325 (0.096)	29.5	0.706 (0.138)	0.653 (0.166)
			01-04	0.456 (0.073)	16.0	0.430 (0.083)	19.3	0.724 (0.114)	0.693 (0.132)
Song Sparrow [8]	16	1.039	91-93	0.254 (0.137)	23.9	0.213 (0.116)	54.5	0.561 (0.248)	0.585 (0.286)
			01-04	0.390 (0.092)	23.6	0.318 (0.115)	36.2	0.594 (0.163)	0.610 (0.206)

Table 10. (cont) Comparison between model-averaged parameter estimates for annual adult apparent survival and recapture probabilities by time period and location for 11 species breeding at Hodgdon Meadow (Yosemite National Park) and two Sequoia/Kings Canyon National Park MAPS stations obtained from seven years (1991-1993;2001-2004) of mark-recapture data.

Species	Number Models Avg'd[1]	c-hat[2]	Per.[3]	Hodgdon Meadow (Yosemite National Park) Survival Prob.[4]	CV[5]	Sequoia/Kings Canyon National Park Survival Prob.[4]	CV[5]	Hodgdon Mead. (Yosemite NP) Recapture Prob.[6]	Sequoia/Kings Canyon NP Recapture Prob.[6]
Lincoln's Sparrow	16	1.000	91-93	0.442 (0.128)	29.0	0.449 (0.130)	29.0	0.472 (0.168)	0.510 (0.185)
			01-04	0.497 (0.097)	19.5	0.507 (0.099)	19.5	0.550 (0.145)	0.578 (0.145)
Dark-eyed Junco	16	1.290	91-93	0.416 (0.141)	33.9	0.404 (0.131)	32.4	0.368 (0.153)	0.398 (0.165)
			01-04	0.466 (0.120)	25.8	0.454 (0.113)	24.9	0.387 (0.139)	0.411 (0.144)
Black-headed Grosbeak [8]	16	1.558	91-93	0.938 (0.319)	34.0	0.871 (0.382)	43.9	0.120 (0.074)	0.129 (0.090)
			01-04	0.957 (0.265)	27.7	0.883 (0.351)	39.8	0.113 (0.068)	0.118 (0.081)
Purple Finch	16	3.385	91-93	0.704 (0.671)	95.3	0.792 (0.669)	84.5	0.035 (0.052)	0.037 (0.052)
			01-04	0.778 (0.657)	84.4	0.851 (0.639)	75.1	0.035 (0.051)	0.036 (0.048)

[1] See text.

[2] Variance inflation factor (calculated from the global model) as measure of overdispersion of the data. C-hat equal to 1 indicates the model fits the data exactly.

[3] Time period of the survival and recapture probability: 91-93 = 1991-1993; 01-04 = 2001-2004.

[4] Survival probability presented as the maximum likelihood estimate (standard error of the estimate). The survival probability was set to zero for the interval 1993-2001.

[5] The coefficient of variation for survival probability.

[6] Recapture probability is presented as the maximum likelihood estimate (standard error of the estimate). The recapture probability for 2001 was set to zero.

[7] Parameter estimates for comparisons between locations are based on different data than for comparisons between time periods.

[8] Parameters estimates for the species are not well-estimated because of the multiple occurrence of survival or recapture probability estimates of 1.000 that are included in the model-averaged survival and recapture probability estimates presented.

Table 11. QAICc (or AICc) weights for the effects of time period and location on survival and recapture probabilities for 11 species breeding at the Hodgdon Meadow (Yosemite National Park) and two Sequoia/Kings Canyon National Park MAPS stations obtained from seven years (1991-1993; 2001-2004) of mark-recapture data. QAICc (or AICc) weights greater than 0.4 indicate strong support for the effect and are shown in bold face, while weights between 0.3 and 0.4 indicate moderate support and are underlined.

	Effects on ϕ				Effects on p			
Species	Time period effect	No time period effect	Location effect	No location effect	Time period effect	No time period effect	Location effect	No location effect
Red-breasted Sapsucker	0.288	0.712			**0.400**	0.600		
A. Dusky Flycatcher [1]			0.331	0.669			0.301	0.699
B. Dusky Flycatcher [1]	0.296	0.704			0.278	0.722		
Warbling Vireo	0.286	0.714	0.355	0.645	0.254	0.746	0.344	0.656
A. American Robin [1]			0.302	0.698			0.257	0.743
B. American Robin [1]	0.391	0.609			0.348	0.652		
A. Yellow Warbler [1]			0.250	0.750			0.297	0.703
B. Yellow Warbler [1]	0.261	0.739			0.236	0.764		
MacGillivray's Warbler	**0.581**	0.419	**0.429**	0.571	0.326	0.674	0.326	0.674
Song Sparrow	**0.565**	0.435	0.371	0.629	**0.414**	0.586	0.267	0.733
Lincoln's Sparrow	0.375	0.625	0.221	0.779	0.373	0.627	0.250	0.750
Dark-eyed Junco	0.338	0.662	0.225	0.775	0.281	0.719	0.252	0.748
Black-headed Grosbeak	0.225	0.775	0.280	0.720	0.244	0.756	0.245	0.755
Purple Finch	0.244	0.756	0.255	0.745	0.237	0.763	0.248	0.752

[1] Parameter estimates for comparisons between locations are based on different data than for comparisons between time periods.

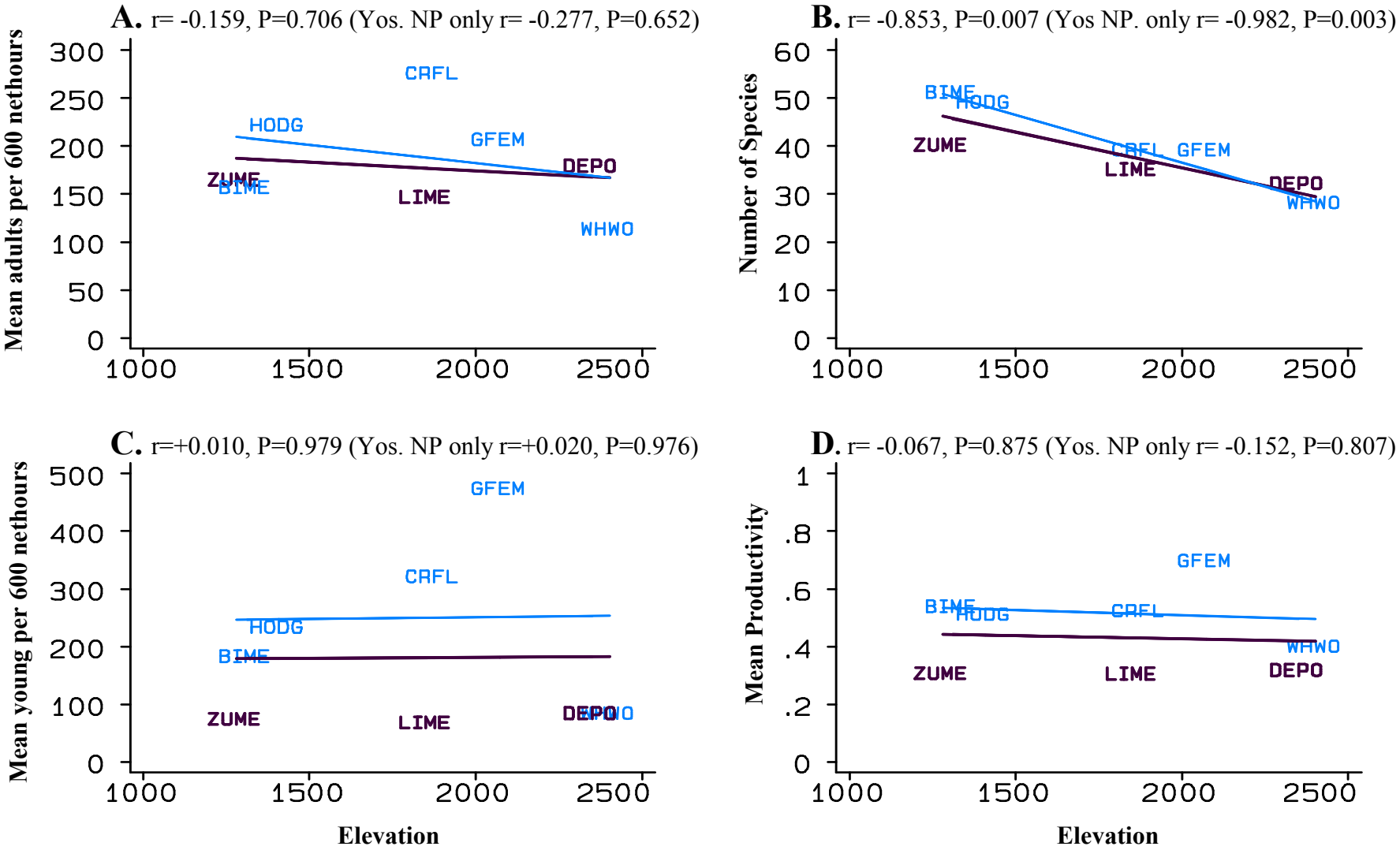

Figure 1. Correlations of population indices for all species pooled at the two Sequoia/Kings Canyon, five Yosemite National Park, and one Devil's Postpile National Mounment MAPS stations over the four years 2001-2004 (the Devil's Postpile station was only operated 2002-2004) with elevation. Regression lines are plotted using values from all eight stations (bold line) and using values from the five Yosemite stations only (grayer line). The correlation coefficient (*r*) and significance of the correlation coefficient (*P*) are shown on each graph. LION - Lion Meadow, ZUME - Zumwalt Meadow, WHWO - White Wolf Meadow, GFEM - Gin Flat East Meadow, HODG - Hodgdon Meadow, BIME - Big Meadow, DEPO - Devil's Postpile NM.