The 2009 Annual Report of the Monitoring Avian Productivity and Survivorship (MAPS) Program in Yosemite National Park

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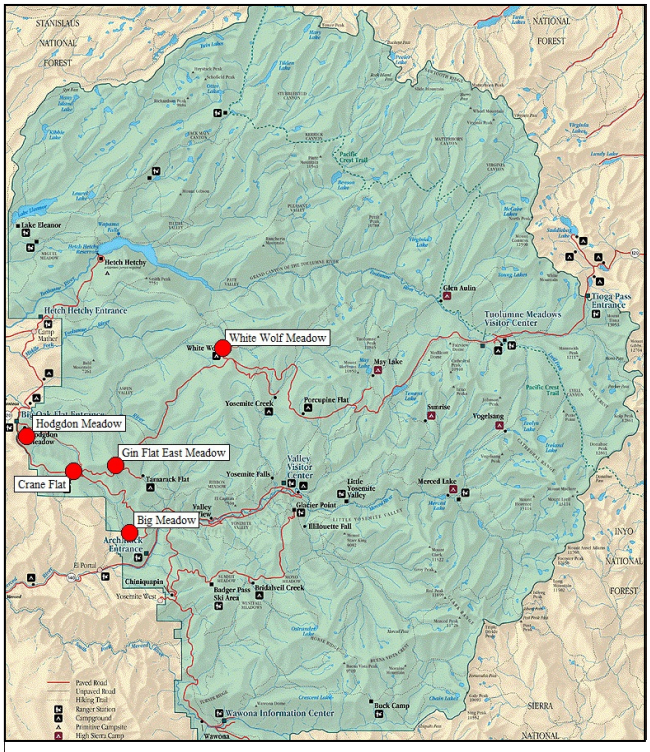
March 16, 2010



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INTRODUCTION

National parks can fulfill vital roles for birds, both as refuges for species dependent on late successional forest conditions, and as reference sites for assessing the effects of land use and land cover changes on populations (Silsbee and Peterson 1991). Such changes may result from local or regional activities such as land conversion and forest management, or from broader-scale processes such as global climate change. Monitoring vital rates and population trends at 'control' sites in national parks can be especially important because parks are among the few sites in the United States where population trends, due to large-scale regional and global change patterns are relatively unconfounded by local changes in land-use practices (Simons et al. 1999).

Landbirds are excellent indicators of environmental change in terrestrial ecosystems, because of their high body temperature, rapid metabolism, and high ecological position on most food webs. 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. An added benefit is that landbird monitoring is often particularly efficient, in the sense that many species can be monitored simultaneously with the same survey protocol, and costs are relatively low. Finally, landbirds hold high and growing public interest (Cordell et al. 1999; Cordell and Herbert 2002) and are perhaps the most visible faunal component of park ecosystems.

Population-trend data on Neotropical migrant birds, while suggesting alarming declines in some species, provide no information on primary demographic parameters (productivity and survivorship). Without demographic information, population-trend data alone provide no means for determining at what point(s) in the life cycles problems are occurring, or to what extent population trends are driven by causal factors that affect birth rates, death rates, or both (DeSante 1995). The lack of such information for migratory birds in particular is an obstacle to effective conservation actions, as it leaves unresolved whether critical problems that drive population declines are occurring primarily on temperate breeding grounds, during migration, or on distant tropical wintering grounds. Lack of data on productivity and survivorship thus impedes the formulation of effective management and conservation strategies to reverse population declines (DeSante 1992); for example, if low survival away from breeding grounds is a primary cause of population decline, managing for improved breeding success in a national park likely will not reverse the decline.

Environmental factors and management actions affect primary demographic parameters directly and these effects can be observed over a short time period (Temple and Wiens 1989). Because of the buffering effects of floater individuals and density-dependent responses of populations, there may be substantial time lags 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 population trend data alone. Perhaps even more importantly, because of the vagility of many bird species, local variation 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). Local abundance can sometimes be a poor indicator of reproductive success, particularly in habitats that have been modified substantially by humans (Bock and Jones 2004).

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. MAPS has since grown into a continent-wide network of over 500 constant-effort mist-netting and banding stations that provide long-term demographic data on landbirds (DeSante et al. 1995). The design of the MAPS program was patterned after the very successful British Constant Effort Sites (CES) Scheme that has been operated by the British Trust for Ornithology since 1981 (Peach et al. 1996). The MAPS program was endorsed in 1991 by both the Monitoring Working Group of PIF and the USDI Bird Banding Laboratory, and subsequently has attracted participation from numerous federal agencies, including the National Park Service, USDA Forest Service, US Fish and Wildlife Service, Department of Defense, Department of the Navy, Department of the Army, and Texas Army National Guard.

The MAPS Program is organized to fulfill three sets of goals and objectives: monitoring, research, and management:

> *Monitoring goals.* For over 100 target species, including Neotropical-wintering migrants, temperate-wintering migrants, and permanent residents, MAPS provides: (a) annual indices of adult population size and post-fledging productivity from data on the numbers and proportions of young and adult birds captured; and (b) annual estimates of adult population size, adult survival rates, proportions of residents, and recruitment into the adult population from modified Cormack- Jolly-Seber analyses of mark-recapture data on adult birds.
>
> *Research goals*. MAPS identifies and describes: (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.
>
> *Management goals*. MAPS uses these patterns and relationships to: (a) identify thresholds and trigger points to notify appropriate agencies and organizations of the need for further research and/or management actions; (b) determine the proximate demographic cause(s) of population change; (c) suggest management actions and conservation strategies to reverse population declines and maintain stable or increasing populations; and (d) evaluate the effectiveness of management actions and conservation strategies that are implemented.

The MAPS program was established in Yosemite National Park in 1990, and Yosemite now hosts some of the longest-running MAPS stations in the country.

In this report we briefly summarize results of the MAPS program at five stations in Yosemite National Park from 1993 (1998 at the Gin Flat East Meadow station) through 2009. Siegel et al. (2007) present a complete report summarizing data and results through 2006, Siegel et al. (2009) update data from the 2008 season, and additional data from the Hodgdon Meadow station from 1990-1992 are presented in previous reports (e.g., Pyle et al. 2006). Here we present indices of adult population size and productivity for each station and for all stations combined through 2009. For selected target species and all species pooled, we present temporal trends in adult population size and productivity. More in-depth analyses, particularly analyses assessing effects of annual weather variation and climate change, will be conducted after the 2010 field season.

METHODS

Establishment and Operation of Stations

Five MAPS stations were re-established and operated in Yosemite National Park in 2009, at the same locations they were operated in previous years (Fig 1). The five stations, located along an elevation gradient from highest to lowest, were:

- White Wolf Meadow (WHWO), set in a wet montane meadow surrounded by mixed red fir and lodgepole pine forest at 2,402 m elevation.

- Gin Flat East Meadow (GFEM), located in a wet montane meadow surrounded by mixed red fir and lodgepole pine forest at 2,073 m elevation.

- Crane Flat Meadow (CRFL), located in a wet montane meadow with willow and aspen thickets, surrounded by mixed conifer forest at 1,875 m elevation.

- Hodgdon Meadow (HODG), located in a wet montane meadow with willow and dogwood thickets, surrounded by mixed conifer forest and a patch of California Black Oak woodland at 1,408 m elevation.

- Big Meadow (BIME), located in riparian willows and mixed conifer forest (largely consumed by a stand-replacing fire in 1990) in an open, dry meadow at 1,311 m elevation.

The Hodgdon Meadow station was established and first operated according to the standardized MAPS protocol in 1990, followed by White Wolf Meadow, Crane Flat, and Big Meadow in 1993, and Gin Flat East Meadow in 1998. See Table 1 for details of habitats and operation of each station in 2009.

Through the efforts of three field biologist interns (Jessica Groetsch and Kenton Buck from IBP, and Alan Monroy-Ojeda from the Park Flight program via Sequoia and Kings Canyon National Parks), trained and supervised by IBP Biologist Jeff Moker and Yosemite Wildlife Biologist Sarah Stock, these five MAPS banding stations were operated during 2009 in accordance with

the standardized banding protocols developed for the MAPS Program throughout North America (DeSante et al. 2009).

Ten net sites (14 sites at the Hodgdon Meadow station) were re-established at each of the stations in 2009, at the exact same locations where they were established and operated in each of the preceding years. One 12-m-long, 30-mm-mesh, nylon mist net was erected at each of the ten net sites at four of the stations on each day of operation. At Hodgdon Meadow, seven of the 14 net sites were operated on one day with the remaining seven net sites operated on a second day. Each of the stations was operated for six morning hours per day (beginning at about local sunrise) during one day (two days for Hodgdon Meadow) in each of eight consecutive 10-day periods between May 21 and August 8 or, for the two higher-elevation stations (White Wolf Meadow and Gin Flat East Meadow), for one day in each of seven periods between May 31 and August 8 (see Table 1). The operation of all stations occurred on schedule in 2009 during each of the ten-day periods.

Data Collection

With few exceptions, all birds captured at MAPS stations were identified to species, age, and sex. If unbanded, the birds were banded with USGS/BRD numbered aluminum bands. Birds were released immediately upon capture and before being banded or processed if situations arose where bird safety was compromised. Such situations could involve exceptionally large numbers of birds being captured at once, or the sudden onset of adverse weather conditions such as high winds or rainfall. The following data were collected from all birds captured, including recaptures:

- capture code (newly banded, recaptured, band changed, unbanded);
- band number
- species
- age and how aged
- sex (if possible) and how sexed (if applicable)
- extent of skull pneumaticization
- breeding condition of adults (i.e., extent of cloacal protuberance or brood patch)
- extent of juvenal plumage in young birds
- extent of body and flight-feather molt
- extent of primary-feather wear
- presence of molt limits and plumage characteristics
- wing chord
- fat class and body mass
- date and time of capture (net-run time)
- station and net site where captured
- any pertinent notes

Effort data (i.e., the number and timing of net-hours on each day of operation) were also collected in a standardized manner. In order to allow constant-effort comparisons of data, the

times of opening and closing the array of mist nets and of beginning each net check were recorded to the nearest ten minutes. The breeding (summer residency) status (confirmed breeder, likely breeder, non-breeder) of each species seen, heard, or captured at each MAPS station on each day of operation was recorded using techniques similar to those employed for breeding bird atlas projects.

For each of the five stations, simple habitat maps prepared in previous years (indicating extent and location of major habitats, as well as structures, roads, trails, and streams) were checked and updated where necessary. 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 in the MAPS Habitat Structure Assessment Protocol (Nott et al. 2003).

Computer Data Entry and Verification

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

- Clean-up programs to check the validity of all codes entered and the ranges of all numerical data.
- Cross-check programs to compare station, date, and net fields from the banding data with those from the summary of mist netting effort data.
- 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.
- Screening programs which allow identification of unusual or duplicate band numbers or unusual band sizes for each species.
- 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

We classified the landbird species captured in mist nets into six groups based upon their breeding or summer residency status. Each species was classified as one of the following:

- a regular breeder (B) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during all years* that the station was operated.

- a usual breeder (U) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during more than half but not all of the years* that the station was operated.

- an occasional breeder (O) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station *during half or fewer of the years* that the station was operated.

- a transient (T) if the species was *never* a breeder or summer resident at the station, but the station was within the overall breeding range of the species.

- an altitudinal disperser (A) if the species breeds only at lower elevation than that of the station but disperses to higher elevations after breeding.

- 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), or transient (T), but not where the species was an altitudinal disperser (A) or a migrant (M). Data for a given species from a given station were included in trend analyses only if the species was classified as a regular (B) or usual (U) breeder at the station. Throughout this report we define "target species" for trend and survivorship analyses as those for which an average of 2.5 individual adult birds were captured per year at all stations combined or at each station for station-specific analysis.

Adult population index and productivity analyses

The proofed, verified, and corrected banding data from all sixteen years were run through a series of analysis programs that calculated for each species:

- the numbers of newly banded birds, recaptured birds, and birds released unbanded.

- the numbers and capture rates (per 600 net-hours) of first captures (in a given year) of individual adult and young birds.

- the reproductive index. Following the procedures pioneered by the British Trust for Ornithology (BTO) in their CES Scheme (Peach et al. 1996), we used the number of adult birds captured as an index of adult population size. For each species each year, we calculated a yearly reproductive index as the number of young divided by the number of adults.

Analyses of trends in adult population size and productivity

For each target species and for all species pooled we examined 17-year (1993-2009) trends in adult population size and productivity (reproductive index) using data from all five stations combined. Year-to-year comparisons were made in a "constant-effort" manner by means of an 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. For trends in population size, we first calculated adult population indices for each species for each of the 17 years based on an arbitrary starting index of 1.0 in the first year of station operation or analysis (1993). The constant-effort changes were used to calculate these "chain" indices in each subsequent year by multiplying the proportional change (percent change divided by 100) between the two years times the index of the previous year and adding that figure to the index of the previous year:

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

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

(slope of the regression line / predicted value for the first year)*100

We present the *APC*, the standard error of the slope (*SE*), the correlation coefficient (*r*), and the significance of the correlation (*P*) to describe each trend. For 17-year trends, species for which $r \geq 0.30$ are considered to have a substantially increasing trend, those for which $r \leq -0.30$ are considered to have a substantially decreasing trend, those for which absolute $r < 0.3$ and $SE \leq 0.015$ are considered to have a non-substantial and non-fluctuating trend, and those for which absolute $r < 0.3$ and $SE > 0.015$ are considered to have non-substantial, widely fluctuating trends.

Trends in productivity, *PrT*, for all stations combined were calculated in an analogous manner by starting with actual productivity values in 1993 and calculating each successive year's value based on the actual constant-effort changes in productivity between each pair of consecutive years. For trends in productivity, the slope (*PrT*) and its standard error (*SE*) are presented, along with the correlation coefficient (*r*), and the significance of the correlation (*P*). Productivity trends are characterized in a manner analogous to that for population trends, except that, for non-substantial trends, we do not attempt to distinguish between those that are widely fluctuating and those that are non-fluctuating.

RESULTS

A total of 2,161.3 net-hours was accumulated at the five MAPS stations operated in Yosemite National Park in 2009 (Table 1). Data from 1,927.0 of these net-hours could be compared directly to the previous year's data in a constant-effort manner.

2009 Indices of Adult Population Size and Post-fledging Productivity

We present the 2009 numbers of newly-banded, unbanded, and recaptured birds for each species at each of the five stations individually and for all stations combined in Table 2. A total of 2,397 captures of 70 species was recorded during the summer of 2009. Newly banded birds comprised 73.6% of the total captures. The greatest number of total captures (810) was recorded at the Hodgdon Meadow station and the smallest number of total captures (220) was recorded at the White Wolf Meadow station. The highest species richness occurred at Hodgdon Meadow (42 species) and the lowest species richness occurred at White Wolf Meadow (30 species).

The 2009 capture rates (per 600 net-hours) of individual adult and young birds and the 2009 reproductive index (number of young birds per adult) are presented for each species and for all species pooled at each station and all stations combined in Table 3. We present capture rates (captures per 600 net-hours) rather than absolute numbers of birds in this table so that the data can be compared among stations which, because of the vagaries of weather and other factors, can differ from one another in effort expended (see Table 1). These capture indices suggest that the total adult population size in 2009 was greatest at Crane Flat (252.4 adults/600 net-hours), followed in descending order by Hodgdon Meadow (241.8), Gin Flat East Meadow (211.4), White Wolf Meadow (171.3), and Big Meadow (155.3). The capture rate of young of all species pooled at each station in 2009 was highest at Gin Flat East Meadow (358.9 young/600 net-hours), followed by Crane Flat, Hodgdon Meadow, Big Meadow, and White Wolf Meadow (Table 3). Reproductive index (the number of young per adult) at the five stations in 2009 was greatest at Gin Flat East Meadow (1.70), followed by Crane Flat (0.91), Big Meadow (0.86), Hodgdon Meadow (0.82), and White Wolf Meadow (0.49). The mean adult capture rate for the five stations combined was 209.9 per 600 net hours and the overall reproductive index was 0.93 in 2009. The adult capture rate was similar to that of 2008 (214.3) but the reproductive index was lower in 2009 than in 2008 (1.14).

In 2009 Orange-crowned Warbler was the most frequently captured species, followed by Dark-eyed Junco, MacGillivray's Warbler, Lincoln's Sparrow, Song Sparrow, Golden-crowned Kinglet, Anna's Hummingbird, Nashville Warbler, and Yellow-rumped Warbler (Table 2). Overall, the most abundant breeding species in 2009 (as determined by the number of adults captured per 600 net-hours; Table 3), not including Orange-crowned Warbler (because most if not all of the individuals captured in Yosemite are dispersing upslope from lower-elevation breeding sites outside the park) and Anna's Hummingbird (because hummingbirds were not banded to determine individual adults), in decreasing order, were Dark- eyed Junco, MacGillivray's Warbler, Lincoln's Sparrow, American Robin, Warbling Vireo, Black-headed Grosbeak, Lazuli Bunting, Red-breasted Sapsucker, and Dusky Flycatcher. The following is a

list of such species (captured at a rate of at least 8.0 adults per 600 net-hours), in decreasing order, at each station in 2009 (Table 3):

White Wolf Meadow
Dark-eyed Junco
American Robin
Yellow-rumped Warbler
Lincoln's Sparrow
Pine Siskin
Chipping Sparrow

Gin Flat East Meadow
Lincoln's Sparrow
Dark-eyed Junco
Yellow-rumped Warbler
MacGillivray's Warbler
American Robin
Dusky Flycatcher
Western Tanager
Pine Siskin
Lesser Goldfinch

Crane Flat
Dark-eyed Junco
Lincoln's Sparrow
MacGillivray's Warbler
Lazuli Bunting
Yellow-rumped Warbler
Dusky Flycatcher
Warbling Vireo
Chipping Sparrow
Hermit Warbler

Hodgdon Meadow
MacGillivray's Warbler
Black-headed Grosbeak
Song Sparrow
Warbling Vireo
Red-breasted Sapsucker
Lincoln's Sparrow
Yellow-rumped Warbler
Western Wood-Pewee

Big Meadow
Nashville Warbler
Lazuli Bunting
Purple Finch
Western Wood-Pewee
Warbling Vireo
Wrentit
Spotted Towhee

Multi-year Trends in Adult Population Size and Productivity

"Chain" indices of adult population size for the 17-year period 1993-2009 are presented for 25 target species and for all species pooled in Figure 2. We used annual percent change (*APC*) for each species as an estimate of the mean annual population trend for that species. These estimates of *APC*, along with the standard error of the slope (in parentheses), the correlation coefficient (r), and the significance of the correlation (P), are included for each target species and for all species pooled on each graph.

Populations of 10 species as well as all species pooled showed substantial declining trends ($r \leq -0.3$). The declines for Golden-crowned Kinglet, Hermit Warbler, and Lazuli Bunting were highly significant ($P < 0.01$); those for Western Wood-Pewee, Dusky Flycatcher, Warbling Vireo, Yellow Warbler, Dark-eyed Junco, and Purple Finch were significant ($P < 0.05$); and those of Hermit Thrush and all species pooled were not significant ($P > 0.10$). In contrast, populations of only five species showed substantial increasing trends ($r \geq 0.3$), which were highly significant for Mountain Chickadee, MacGillivray's Warbler, and Western Tanager; significant for Song Sparrow; and not significant for Yellow-rumped Warbler. Populations of the remaining 10 target species (Red-breasted Sapsucker, Hammond's Flycatcher, Cassin's Vireo, Brown Creeper, American Robin, Chipping Sparrow, Lincoln's Sparrow, Black-headed Grosbeak, Pine Siskin, and Lesser Goldfinch) showed non-substantial (absolute $r < 0.3$) trends. Seven of these ten species showed substantially fluctuating (SE of the slope ≥ 0.015) population

trends, whereas three species (Chipping Sparrow, Lincoln's Sparrow, and Lesser Goldfinch) showed non-fluctuating trends. Overall, 14 of the 25 species showed negative trends, one species (Lincoln's Sparrow) showed a flat trend, and 10 species showed positive trends. The substantial negative trend for all species pooled had been highly significant ($P = 0.009$) after 14 years of data had been collected (Siegel et al. 2007) but based on increasing populations in 2006-2009 was no longer significant after 17 years of data had been collected. Nevertheless, the decline continues to be substantial at a decreasing rate of -0.6% per year, suggesting that total populations of landbirds in Yosemite have declined by 9.7% over the 17-year period (1993-2009).

"Chain" indices of productivity for each of the 17 years (1993-2009) are shown in Figure 3 for the same 25 target species and all species pooled, at all five stations combined. Five species showed substantially declining productivity trends ($r \leq -0.30$), which were highly significant for Lesser Goldfinch, significant for Hermit Thrush and MacGillivray's Warbler, marginally significant ($0.05 < P < 0.10$) for Western Wood-Pewee, and not significant for Chipping Sparrow. In contrast, 12 species as well as all species pooled showed substantially increasing productivity trends ($r \geq 0.30$); these were highly significant for Red-breasted Sapsucker, American Robin, Yellow Warbler, Lincoln's Sparrow, Black-headed Grosbeak, Lazuli Bunting, and Purple Finch; significant for Mountain Chickadee, Golden-crowned Kinglet, and Hermit Warbler; and not significant for Dusky Flycatcher, Warbling Vireo, and all species pooled. The remaining eight species (Hammond's Flycatcher, Cassin's Vireo, Brown Creeper, Yellow-rumped Warbler, Western Tanager, Song Sparrow, Dark-eyed Junco, and Pine Siskin) showed non-substantial productivity trends. Overall, 16 of the 25 target species had positive productivity trends and nine had negative productivity trends. The productivity trend for all species pooled indicated an average annual increase of 0.022 per year.

DISCUSSION

The MAPS Program in Yosemite continues to yield station-specific indices of adult population size and post-fledging productivity, park-wide estimates of annual survival rates of adults, and important information on annual changes and longer-term trends in these indices and estimates, for over 25 target species. The results in this and previous reports underscore the complexity of the population dynamics of Yosemite's breeding birds, complexity which can only be unraveled through long-term data collection.

The Yosemite MAPS Program also continues to yield both new findings and new hypotheses about landbird population dynamics in the park. The generation of preliminary findings and new hypotheses that can then be followed up with targeted research is one of the hallmarks of an effective ecological monitoring program. A recent example of this monitoring-research cycle is that MAPS results over the past two decades suggested disturbing declines in the park's Willow Flycatcher population, prompting an intensive research project on Willow Flycatcher in the park (Siegel et al. 2008). The MAPS program at Yosemite is particularly well-suited to studying the effects of annual weather variation and climate change on birds, and this will be an important focus of our next major analytical report for the Yosemite MAPS program, which will be completed after the 2010 field season.

ACKNOWLEDGMENTS

We are grateful to our 2009 field crew: Jessica Groetsch, Kenton Buck, Jeff Moker (crew leader) and Alan Monroy-Ojeda. Additional assistance and supervision in the field was provided by IBP Biologist Bob Wilkerson. Financial support for the MAPS Program in Yosemite National Park during 2009 was provided by the National Park Service through a Cooperative Agreement between Yosemite National Park and The Institute for Bird Populations, with funding provided by the Yosemite Fund. This is Contribution Number 389 of The Institute for Bird Populations.

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Table 1. Summary of the 2009 operation of the five MAPS stations in Yosemite National Park.

Station						2009 operation		
Name	Code	No.	Major Habitat Type	Latitude-longitude	Avg Elev. (m)	Total number of net-hours[1]	No. of periods	Inclusive dates
White Wolf Meadow	WHWO	11904	Wet montane meadow, red fir/ lodgepole pine forest	37°52'10"N,-119°39'08"W	2402	388.8 (335.2)	7	6/09 - 8/04
Gin Flat East Meadow	GFEM	11980	Wet montane meadow, mixed fir forest	37°45'59"N,-119°45'37"W	2073	337.7 (324.2)	7	6/04 - 8/03
Crane Flat	CRFL	11907	Wet montane meadow, willow/ aspen thickets, mixed coniferous forest	37°45'20"N,-119°48'13"W	1875	416.0 (380.3)	8	5/23 - 8/02
Hodgdon Meadow	HODG	11107	Wet montane meadow, willow/ dogwood thickets, mixed oak and coniferous forest	37°47'41"N,-119°51'50"W	1408	605.5 (549.0)	8	5/20 - 7/31
Big Meadow	BIME	11905	Riparian willows, mixed coniferous forest (largely consumed by a stand-replacing fire in 1990), open dry meadow	37°42'16"N,-119°45'07"W	1311	413.3 (338.3)	8	5/22 - 7/30
ALL STATIONS COMBINED						2161.3 (1927.0)	8	5/20 - 8/04

[1] Total net-hours in 2009. Net-hours in 2009 that could be compared in a constant-effort manner to 2008 are shown in parentheses.

Table 2. Capture summary for the five individual MAPS stations operated in Yosemite National Park in 2009. N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

Species	White Wolf Meadow			Gin Flat East Meadow			Crane Flat			Hodgdon Meadow			Big Meadow			All five stations combined		
	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
California Quail														1			1	
Anna's Hummingbird		1			4			5			44			27			81	
Calliope Hummingbird					2			1			4						7	
Rufous Hummingbird		7			4			9			5			1			26	
Allen's Hummingbird								1									1	
Unident. Selasphorus Humm.					1									1			2	
Unidentified Hummingbird														1			1	
Acorn Woodpecker													2			2		
Williamson's Sapsucker	2		1	3												5		1
Red-breasted Sapsucker	1			6	1	1	7		1	23	1	5	6			43	2	7
Downy Woodpecker										1			1			2		
Hairy Woodpecker	1			2			1									4		
White-headed Woodpecker				3						1						4		
Black-backed Woodpecker	1															1		
Northern Flicker							1									1		
Olive-sided Flycatcher										2						2		
Western Wood-Pewee				7						6		3	8		1	21		4
Willow Flycatcher							1									1		
Hammond's Flycatcher	2			7			3			1						13		
Dusky Flycatcher	4	1		12		3	12		7	2			1			31	1	10
Pacific-slope Flycatcher	1			3			3			15			1			23		
Unident. Empidonax Flycat.								1			1						2	
Black Phoebe													8		1	8		1
Western Kingbird													1			1		
Unidentified Flycatcher								1			2						3	
Cassin's Vireo	1			2			1			9			3		1	16		1

Table 2, continued. Capture summary for the five individual MAPS stations operated in Yosemite National Park in 2009. N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

Species	White Wolf Meadow			Gin Flat East Meadow			Crane Flat			Hodgdon Meadow			Big Meadow			All five stations combined		
	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Warbling Vireo	2			2			11		3	25		3	6	1	3	46	1	9
Steller's Jay				1		1	1			2	1					4	1	1
Mountain Chickadee	3		4	6		1	3	1	1	3		2	1		2	16	1	10
Oak Titmouse													3			3		
Bushtit													4	3		4	3	
Red-breasted Nuthatch	7			4			6			8	1	2				25	1	2
White-breasted Nuthatch													1			1		
Brown Creeper	8	1		5			7	1	1	5						25	2	1
Bewick's Wren													1			1		
House Wren		1			1		3		1	4		1	8	1	3	15	3	5
Winter Wren							1									1		
Unidentified Wren								1									1	
Golden-crowned Kinglet	3			50	2		17		1	10	1					80	3	1
Western Bluebird				2												2		
Hermit Thrush	3	1	1				2		1	1			1			7	1	2
American Robin	12		3	12		1	4		2	8	1	2	1			37	1	8
Wrentit													12		1	12		1
Orange-crowned Warbler	5			22	1		99	2	12	173	3	24	88	4	7	387	10	43
Nashville Warbler	9		1	8			22	1		13		1	18		5	70	1	7
Yellow Warbler							2			5		1	6		6	13		7
Yellow-rumped Warbler	8			27		4	16	1	1	18	1		1			70	2	5
Black-throated Gray Warbler										3						3		
Townsend's Warbler							1									1		
Hermit Warbler	3			19			12		1	16	1					50	1	1
American Redstart										1						1		
MacGillivray's Warbler				11	1	7	27		21	57	5	52	7		1	102	6	81

Table 2, continued. Capture summary for the five individual MAPS stations operated in Yosemite National Park in 2009. N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

Species	White Wolf Meadow			Gin Flat East Meadow			Crane Flat			Hodgdon Meadow			Big Meadow			All five stations combined		
	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Hooded Warbler										1						1		
Wilson's Warbler				7		1	7			5		1				19		2
Western Tanager	2			6			2			7		2	3			20		2
Green-tailed Towhee				2									1			3		
Spotted Towhee				1						6			5	1	3	12	1	3
California Towhee													1			1		
Chipping Sparrow	7			2			8	1	1	5			1			23	1	1
Fox Sparrow				5												5		
Song Sparrow							10	1	8	40	2	30	5		1	55	3	39
Lincoln's Sparrow	7	2	4	27	2	31	53	6	32	12	4	11				99	14	78
Dark-eyed Junco	53	3	23	38	5	11	59	3	27	40	2	8	1			191	13	69
Unidentified Sparrow		2			1			2			4						9	
Black-headed Grosbeak										19		10	19		1	38		11
Lazuli Bunting				1			15		6				20		1	36		7
Red-winged Blackbird										2						2		
Brewer's Blackbird													1			1		
Brown-headed Cowbird										1						1		
Bullock's Oriole													2			2		
Pine Grosbeak	6															6		
Purple Finch	1						4			12			24	1		41	1	
Cassin's Finch	3			3	2		1									7	2	
Pine Siskin	8		1	15			1			7						31		1
Lesser Goldfinch				9		1							3		1	12		2
Lawrence's Goldfinch													4			4		
Unidentified Bird														1			1	

Table 2, continued. Capture summary for the five individual MAPS stations operated in Yosemite National Park in 2009. N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

	White Wolf Meadow			Gin Flat East Meadow			Crane Flat			Hodgdon Meadow			Big Meadow			All five stations combined		
Species	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
ALL SPECIES POOLED	163	19	38	330	27	62	423	38	127	569	83	158	279	43	38	1764	210	423
Total Number of Captures		220			419			588			810			360			2397	
Number of Species	27	8	8	34	11	11	35	13	18	39	15	17	38	9	16	65	29	33
Total Number of Species		30			38			39			42			41			70	

Table 3. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the five individual MAPS stations operated in Yosemite National Park in 2009.

	White Wolf Meadow			Gin Flat East Meadow			Crane Flat			Hodgdon Meadow			Big Meadow			All five stations combined		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Acorn Woodpecker													2.9	0.0	0.00	0.6	0.0	0.00
Williamson's Sapsucker	4.6	0.0	0.00	0.0	5.3	und.[1]										0.8	0.8	1.00
Red-breasted Sapsucker	1.5	0.0	0.00	7.1	5.3	0.75	5.8	4.3	0.75	14.9	8.9	0.60	1.5	7.3	5.00	6.9	5.6	0.80
Downy Woodpecker										0.0	1.0	und.[1]	0.0	1.5	und.[1]	0.0	0.6	und.[1]
Hairy Woodpecker	1.5	0.0	0.00	1.8	1.8	1.00	0.0	1.4	und.[1]							0.6	0.6	1.00
White-headed Woodpecker				3.6	1.8	0.50				1.0	0.0	0.00				0.8	0.3	0.33
Black-backed Woodpecker	1.5	0.0	0.00													0.3	0.0	0.00
Northern Flicker							0.0	1.4	und.							0.0	0.3	und.
Olive-sided Flycatcher										2.0	0.0	0.00				0.6	0.0	0.00
Western Wood-Pewee				7.1	5.3	0.75				8.9	0.0	0.00	8.7	2.9	0.33	5.3	1.4	0.26
Willow Flycatcher							1.4	0.0	0.00							0.3	0.0	0.00
Hammond's Flycatcher	0.0	3.1	und.[1]	0.0	12.4	und.	1.4	2.9	2.00	0.0	1.0	und.				0.3	3.3	12.00
Dusky Flycatcher	6.2	0.0	0.00	10.7	14.2	1.33	13.0	7.2	0.56	2.0	0.0	0.00	1.5	0.0	0.00	6.1	3.6	0.59
Pacific-slope Flycatcher	1.5	0.0	0.00	1.8	3.6	2.00	2.9	1.4	0.50	4.0	10.9	2.75	1.5	0.0	0.00	2.5	3.9	1.56
Black Phoebe													1.5	11.6	8.00	0.3	2.2	8.00
Western Kingbird													0.0	1.5	und.	0.0	0.3	und.
Cassin's Vireo	0.0	1.5	und.	1.8	1.8	1.00	0.0	1.4	und.	5.9	3.0	0.50	5.8	0.0	0.00	3.1	1.7	0.54
Warbling Vireo	3.1	0.0	0.00	3.6	0.0	0.00	13.0	5.8	0.44	15.9	8.9	0.56	8.7	0.0	0.00	9.7	3.6	0.37
Steller's Jay				3.6	0.0	0.00	1.4	0.0	0.00	2.0	0.0	0.00				1.4	0.0	0.00
Mountain Chickadee	7.7	0.0	0.00	5.3	7.1	1.33	1.4	4.3	3.00	3.0	2.0	0.67	1.5	0.0	0.00	3.6	2.5	0.69
Oak Titmouse													1.5	2.9	2.00	0.3	0.6	2.00
Bushtit													0.0	4.4	und.	0.0	0.8	und.
Red-breasted Nuthatch	4.6	6.2	1.33	3.6	3.6	1.00	4.3	4.3	1.00	5.9	4.0	0.67				3.9	3.6	0.93
White-breasted Nuthatch													1.5	0.0	0.00	0.3	0.0	0.00
Brown Creeper	6.2	6.2	1.00	1.8	5.3	3.00	2.9	8.7	3.00	1.0	4.0	4.00				2.2	4.7	2.13
Bewick's Wren													0.0	1.5	und.	0.0	0.3	und.

Table 3, continued. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the five individual MAPS stations operated in Yosemite National Park in 2009.

	White Wolf Meadow			Gin Flat East Meadow			Crane Flat			Hodgdon Meadow			Big Meadow			All five stations combined		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
House Wren													4.4	7.3	1.67	0.8	1.4	1.67
Winter Wren							1.4	0.0	0.00							0.3	0.0	0.00
Golden-crowned Kinglet	1.5	3.1	2.00	1.8	87.1	49.00	7.2	17.3	2.40	2.0	7.9	4.00				2.5	19.7	7.89
Western Bluebird				0.0	3.6	und.										0.0	0.6	und.
Hermit Thrush	4.6	0.0	0.00				4.3	0.0	0.00	0.0	1.0	und.	1.5	0.0	0.00	1.9	0.3	0.14
American Robin	20.1	1.5	0.08	16.0	5.3	0.33	7.2	0.0	0.00	7.9	2.0	0.25	1.5	0.0	0.00	10.0	1.7	0.17
Wrentit													8.7	10.2	1.17	1.7	1.9	1.17
Nashville Warbler										2.0	10.9	5.50	20.3	7.3	0.36	4.4	4.4	1.00
Yellow Warbler							1.4	1.4	1.00	4.0	1.0	0.25	7.3	4.4	0.60	2.8	1.4	0.50
Yellow-rumped Warbler	10.8	1.5	0.14	17.8	33.8	1.90	18.8	5.8	0.31	10.9	6.9	0.64	1.5	0.0	0.00	11.7	8.6	0.74
Black-throated Gray Warbler										0.0	3.0	und.				0.0	0.8	und.
Hermit Warbler	0.0	4.6	und.	0.0	33.8	und.	11.5	7.2	0.63	5.9	9.9	1.67				3.9	10.3	2.64
MacGillivray's Warbler				17.8	1.8	0.10	26.0	21.6	0.83	51.5	24.8	0.48	1.5	8.7	6.00	22.5	13.0	0.58
Wilson's Warbler				5.3	7.1	1.33	4.3	5.8	1.33	3.0	1.0	0.33				2.5	2.5	1.00
Western Tanager	3.1	0.0	0.00	10.7	0.0	0.00	2.9	0.0	0.00	5.0	4.0	0.80	4.4	0.0	0.00	5.0	1.1	0.22
Green-tailed Towhee				3.6	0.0	0.00							1.5	0.0	0.00	0.8	0.0	0.00
Spotted Towhee				0.0	1.8	und.				2.0	4.0	2.00	8.7	0.0	0.00	2.2	1.4	0.63
California Towhee													1.5	0.0	0.00	0.3	0.0	0.00
Chipping Sparrow	9.3	1.5	0.17	0.0	3.6	und.	13.0	0.0	0.00	3.0	2.0	0.67	1.5	0.0	0.00	5.3	1.4	0.26
Fox Sparrow				5.3	3.6	0.67										0.8	0.6	0.67
Song Sparrow							2.9	13.0	4.50	19.8	28.7	1.45	4.4	2.9	0.67	6.9	11.1	1.60
Lincoln's Sparrow	10.8	4.6	0.43	33.8	30.2	0.90	33.2	54.8	1.65	11.9	4.0	0.33				16.9	17.2	1.02
Dark-eyed Junco	47.8	46.3	0.97	24.9	53.3	2.14	43.3	56.3	1.30	5.9	35.7	6.00	1.5	0.0	0.00	22.8	37.5	1.65
Black-headed Grosbeak										25.8	0.0	0.00	5.8	21.8	3.75	8.3	4.2	0.50
Lazuli Bunting				0.0	1.8	und.	20.2	1.4	0.07				20.3	10.2	0.50	7.8	2.5	0.32

Table 3, continued. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the five individual MAPS stations operated in Yosemite National Park in 2009.

	White Wolf Meadow			Gin Flat East Meadow			Crane Flat			Hodgdon Meadow			Big Meadow			All five stations combined		
Species	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Red-winged Blackbird										2.0	0.0	0.00				0.6	0.0	0.00
Brewer's Blackbird													1.5	0.0	0.00	0.3	0.0	0.00
Brown-headed Cowbird										1.0	0.0	0.00				0.3	0.0	0.00
Bullock's Oriole													1.5	1.5	1.00	0.3	0.3	1.00
Pine Grosbeak	7.7	1.5	0.20													1.4	0.3	0.20
Purple Finch	1.5	0.0	0.00				4.3	1.4	0.33	5.9	5.9	1.00	13.1	21.8	1.67	5.3	6.1	1.16
Cassin's Finch	4.6	0.0	0.00	1.8	3.6	2.00	1.4	0.0	0.00							1.4	0.6	0.40
Pine Siskin	10.8	1.5	0.14	10.7	16.0	1.50	1.4	0.0	0.00	5.9	1.0	0.17				5.6	3.1	0.55
Lesser Goldfinch				10.7	5.3	0.50							5.8	0.0	0.00	2.8	0.8	0.30
Lawrence's Goldfinch													1.5	4.4	3.00	0.3	0.8	3.00
ALL SPECIES POOLED	171.3	83.3	0.49	211.4	358.9	1.70	252.4	229.3	0.91	241.8	197.2	0.82	155.3	133.5	0.86	209.9	196.0	0.93
Number of Species	22.0	13.0		25.0	28.0		28.0	22.0		31.0	27.0		33.0	19.0		54.0	49.0	
Total Number of Species		25.0			32.0			31.0			35.0			37.0			61.0	

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

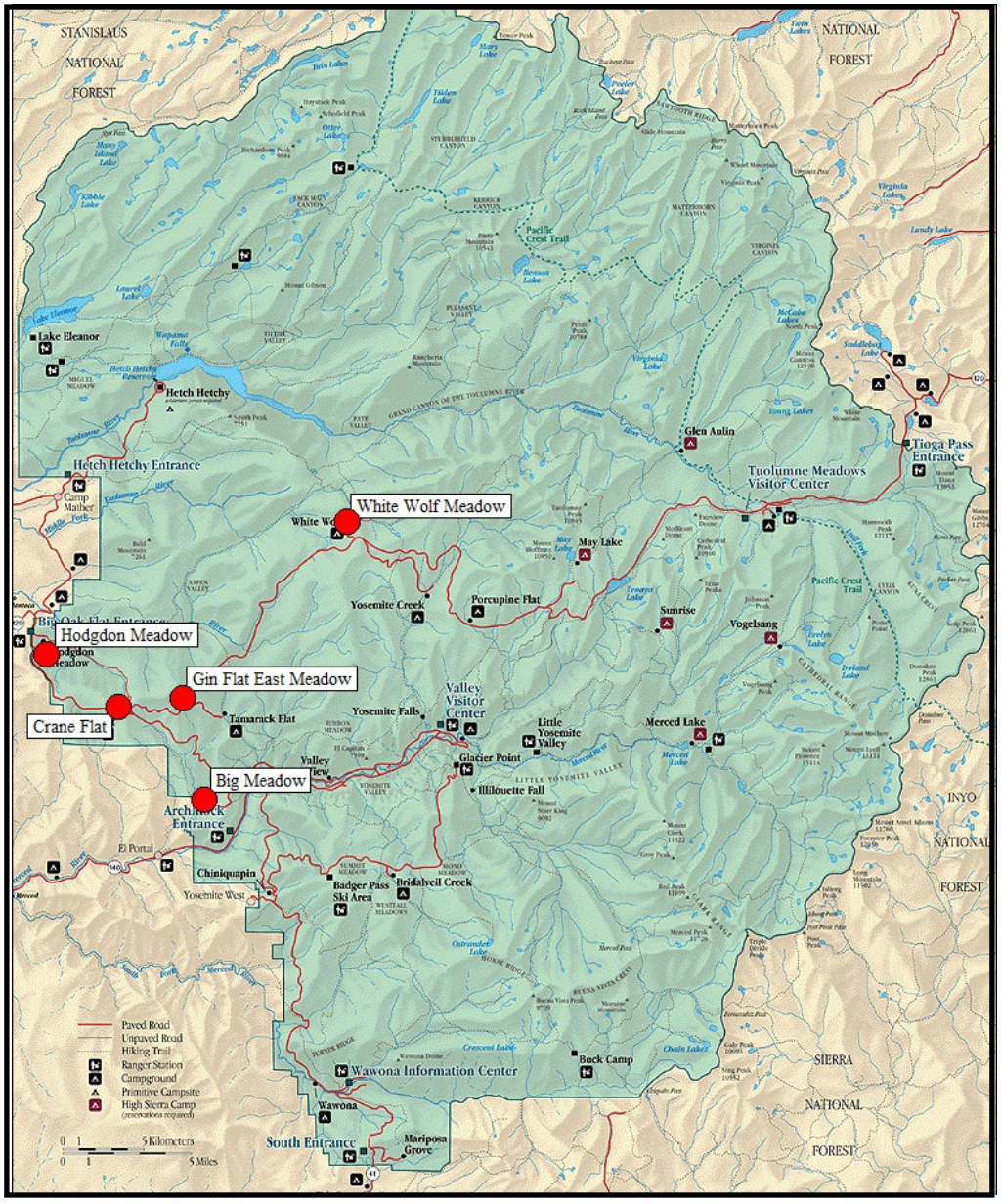

Figure 1. Locations of ongoing Monitoring Avian Productivity and Survivorship (MAPS) bird banding stations at Yosemite National Park.

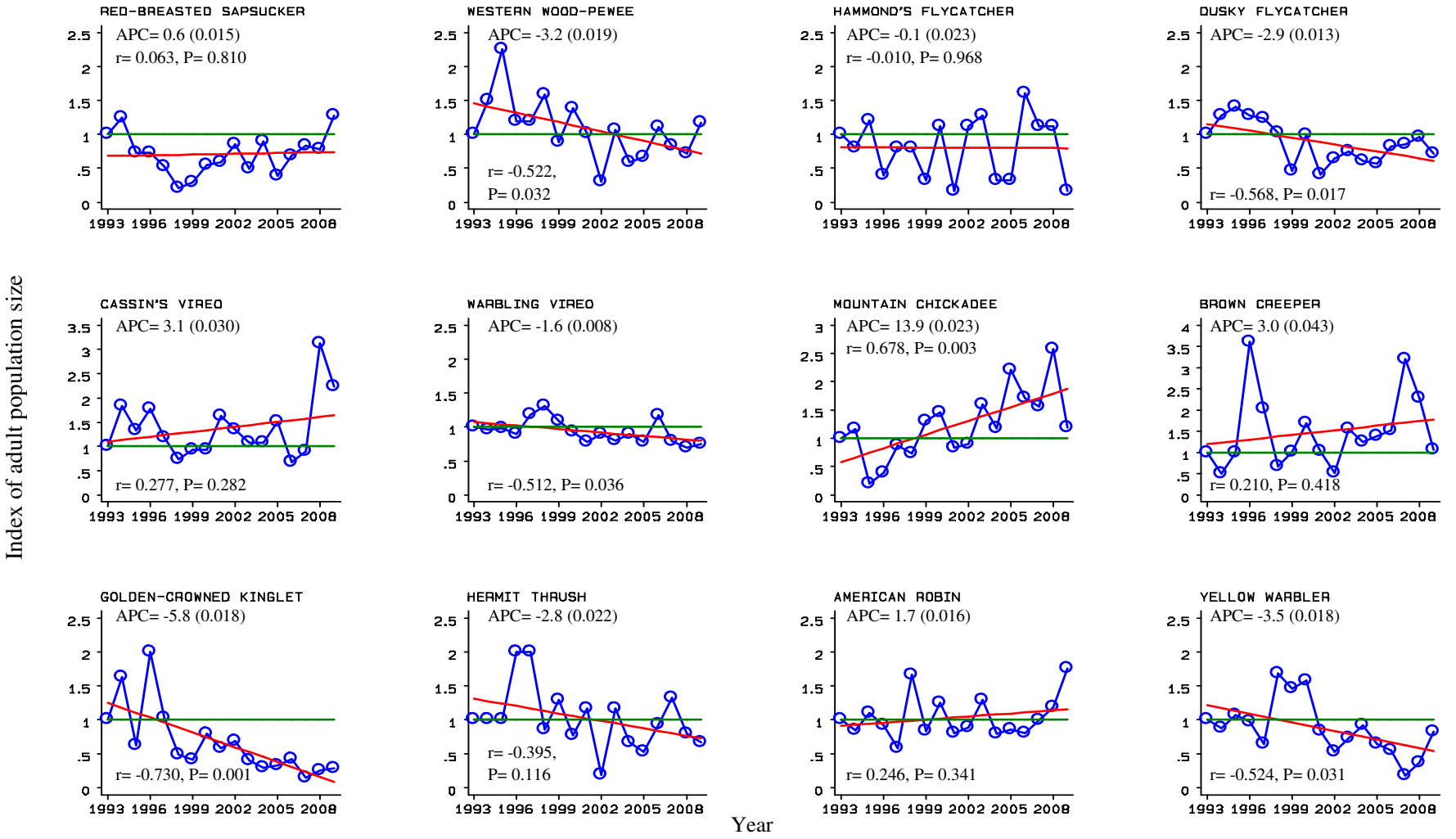

Figure 2. Population trends for 25 species and all species pooled at the **five currently operating MAPS stations** in Yosemite National Park over the 17 years 1993-2009. The index of population size was arbitrarily defined as 1.0 in 1993. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (APC), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (r) and significance of the correlation coefficient (P) are also shown on each graph.

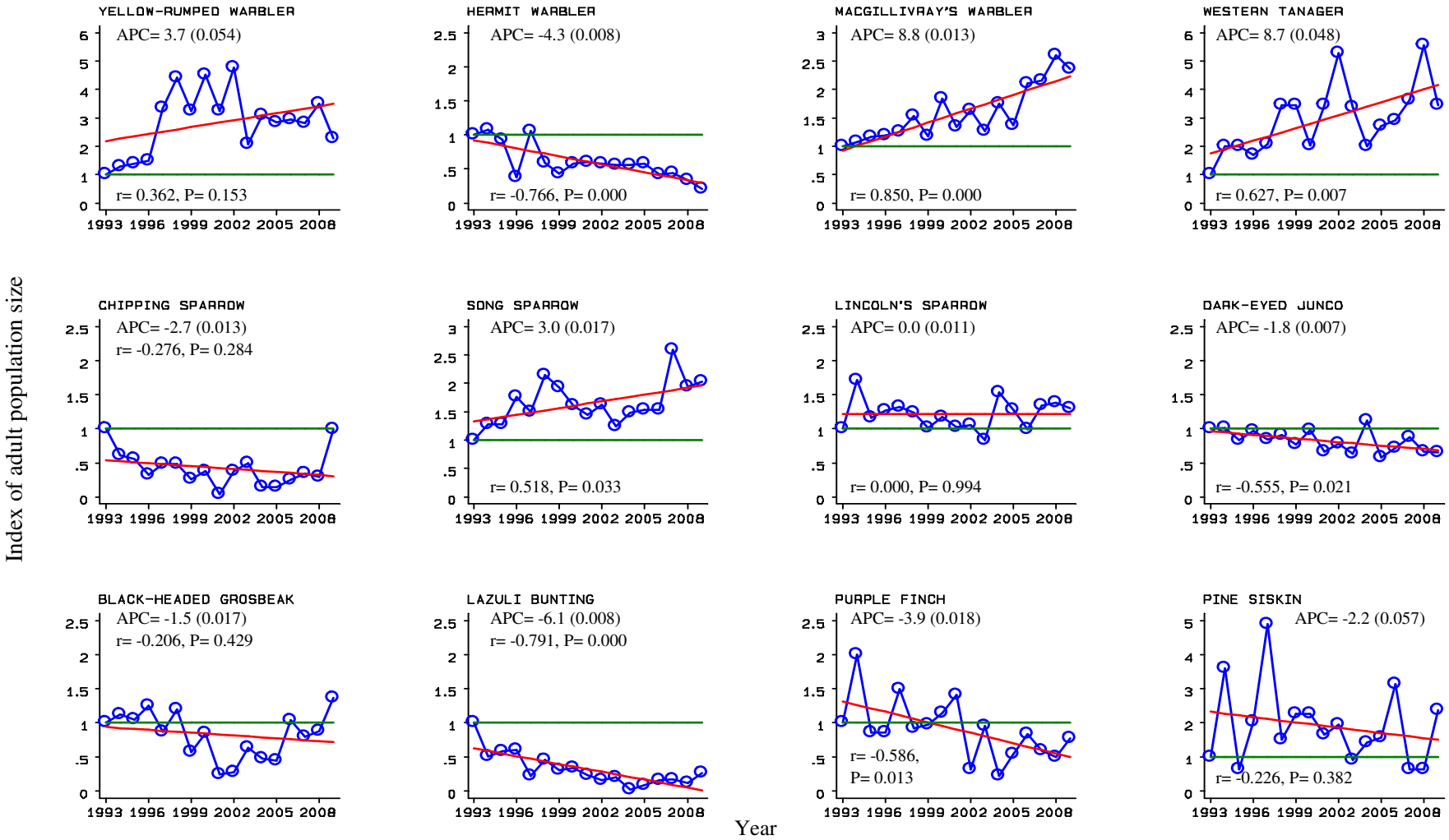

Figure 2, continued. Population trends for 25 species and all species pooled at the **five currently operating MAPS stations** in Yosemite National Park over the 17 years 1993-2009. The index of population size was arbitrarily defined as 1.0 in 1993. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (APC), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (r) and significance of the correlation coefficient (P) are also shown on each graph.

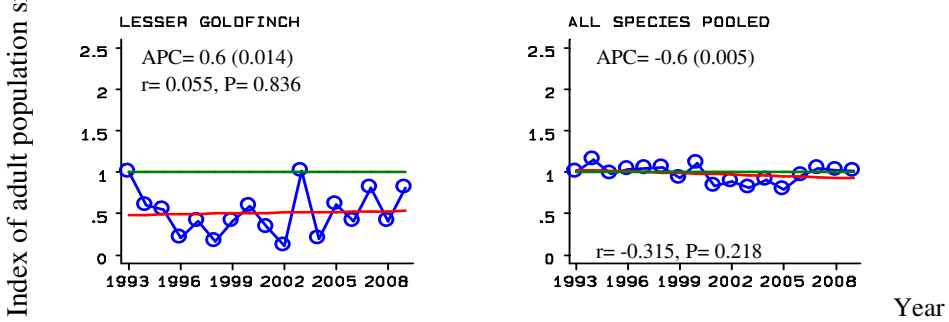

Figure 2, continued. Population trends for 25 species and all species pooled at the **five currently operating MAPS stations** in Yosemite National Park over the 17 years 1993-2009. The index of population size was arbitrarily defined as 1.0 in 1993. Indices for subsequent years were determined from constant-effort between-year changes in the number of adult birds captured from stations where the species was a regular or usual breeder and summer resident. The annual percentage change in the index of adult population size was used as the measure of the population trend (APC), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (r) and significance of the correlation coefficient (P) are also shown on each graph.

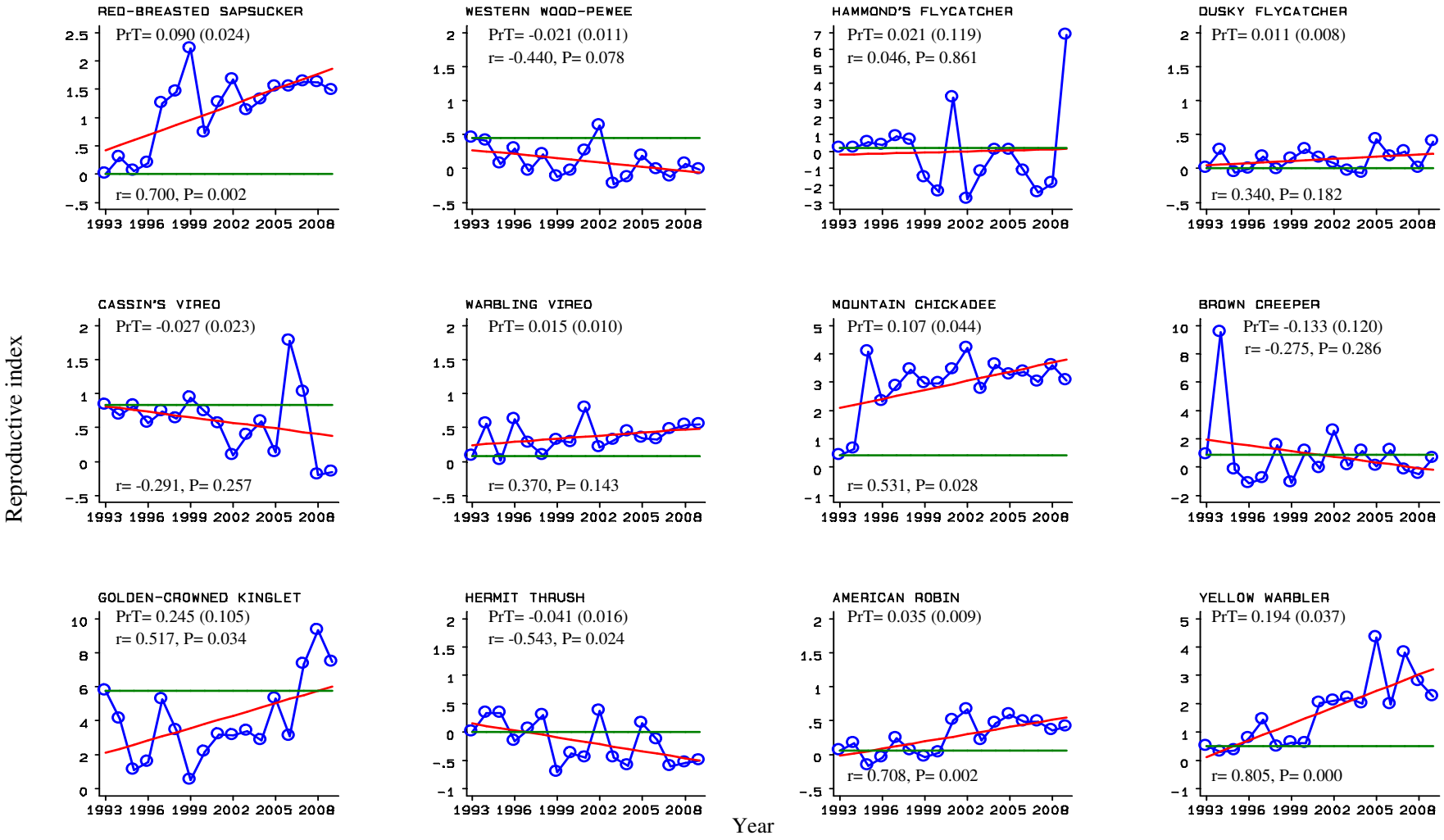

Figure 3. Trend in productivity for 25 species and all species pooled at the **five currently operating MAPS stations** in Yosemite National Park over the 17 years 1993-2009. The 1993 reproductive index was defined as the actual reproductive index; indices for subsequent years were determined from constant-effort between-year changes in the reproductive index. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (PrT), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (r) and significance of the correlation coefficient (P) are also shown on each graph.

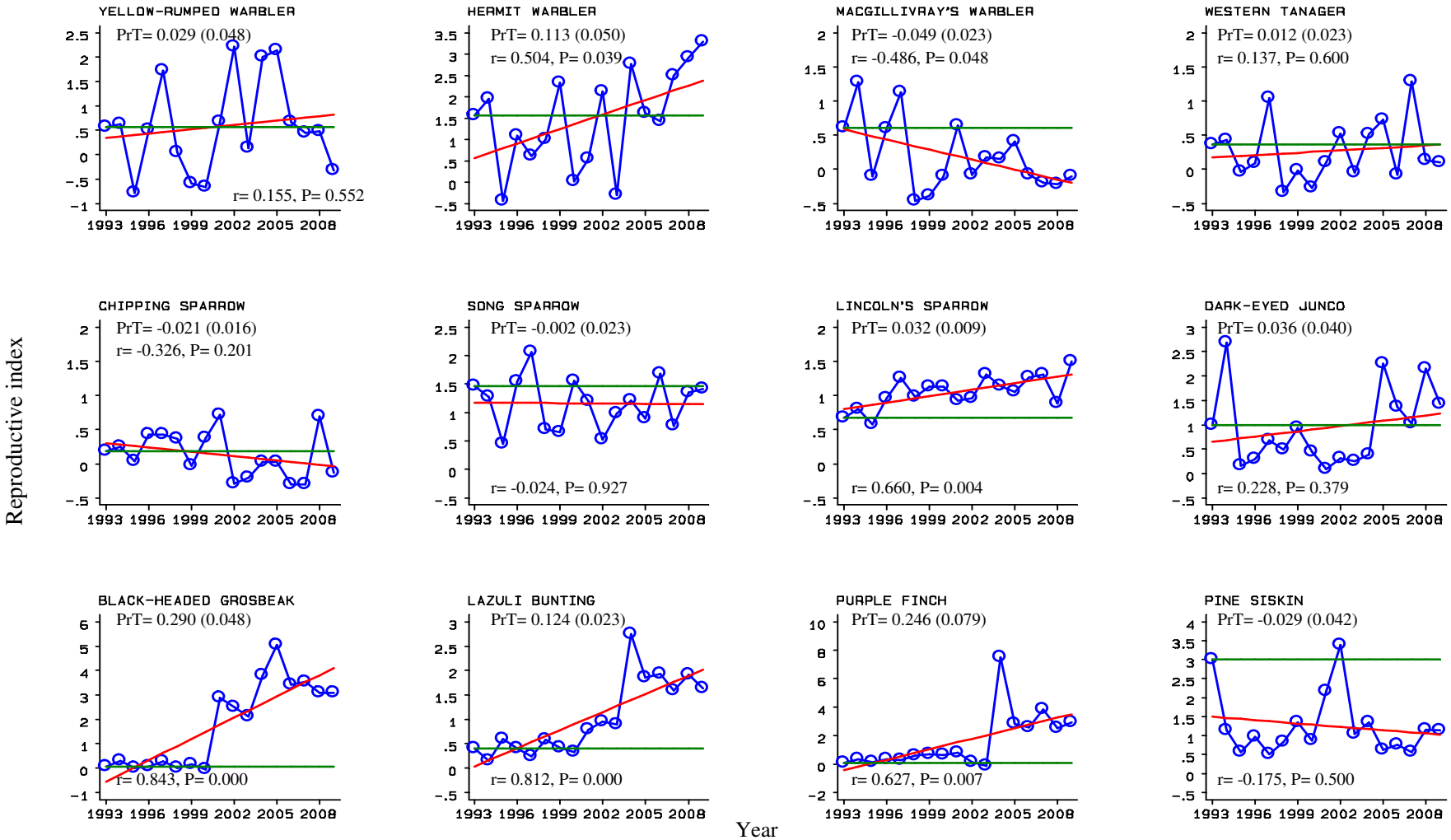

Figure 3, continued. Trend in productivity for 25 species and all species pooled at the **five currently operating MAPS stations** in Yosemite National Park over the 17 years 1993-2009. The 1993 reproductive index was defined as the actual reproductive index; indices for subsequent years were determined from constant-effort between-year changes in the reproductive index. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (PrT), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (r) and significance of the correlation coefficient (P) are also shown on each graph.

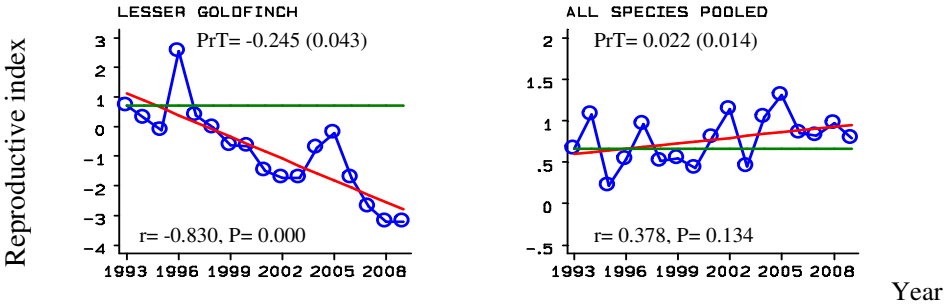

Figure 3, continued. Trend in productivity for 25 species and all species pooled at the **five currently operating MAPS stations** in Yosemite National Park over the 17 years 1993-2009. The 1993 reproductive index was defined as the actual reproductive index; indices for subsequent years were determined from constant-effort between-year changes in the reproductive index. The slope of the regression line for annual change in the index of productivity was used as the measure of the productivity trend (PrT), and it and the standard error of the slope (in parentheses) are presented on each graph. The correlation coefficient (r) and significance of the correlation coefficient (P) are also shown on each graph.

Appendix I. Numerical listing (in AOU checklist order) of all the species sequence numbers, species alpha codes, and species names for all species banded or encountered during the 20 years, 1990-2009, of the MAPS Program on the six stations ever operated on **Yosemite National Park.**

Cumulative breeding status for all years in which each station was operated are also included (**B** = Regular Breeder (all years); **U** = Usual Breeder (>½, not all, years); **O** = Occasional Breeder (<½ years); **T** = Transient; **M** = Migrant; **A**= Altitudinal Disperser; **?** = Uncertain Species ID

NUMB	SPEC	SPECIES NAME	White Wolf (WHWO)	Gin Flat East Meadow (GFEM)	Crane Flat (CRFL)	Hodgdon Meadow (HODG)	Big Meadow (BIME)	Tamarack Meadow (TAME)
01010	GBHE	Great Blue Heron					T	
01300	TUVU	Turkey Vulture	T	T	T	T	T	
01630	MALL	Mallard		O		O	O	
01980	COME	Common Merganser					T	
02020	OSPR	Osprey					T	
02170	NOHA	Northern Harrier					T	
02200	SSHA	Sharp-shinned Hawk		T		T		
02210	COHA	Cooper's Hawk	T		T	O	T	
02240	NOGO	Northern Goshawk	T	T		T		
02245	UAHA	Unidentified Accipiter Hawk				?	?	
02380	RSHA	Red-shouldered Hawk	T		T	T		
02460	RTHA	Red-tailed Hawk	T	T	T	U	O	
02510	GOEA	Golden Eagle					T	
02545	UNHA	Unidentified Hawk				?	?	
02630	AMKE	American Kestrel					U	
02700	PEFA	Peregrine Falcon					M	
03000	DUGR	Dusky Grouse	T	T	O	O		
03040	WITU	Wild Turkey				T	T	
03100	MOUQ	Mountain Quail	O	U	O	U	B	
03130	CAQU	California Quail				T	O	
03370	VIRA	Virginia Rail				T		T
05440	BTPI	Band-tailed Pigeon	T	T	T	O	T	
05570	MODO	Mourning Dove		T	T	O	O	
06670	WESO	Western Screech-Owl				T		
06800	GHOW	Great Horned Owl	T		T	O	T	
06830	NOPO	Northern Pygmy-Owl				T	T	
06940	SPOW	Spotted Owl				O		
06970	GGOW	Great Gray Owl	T	O	O	O		
07040	NSWO	Northern Saw-whet Owl				T		
07330	BLSW	Black Swift					T	

Appendix I, continued.

NUMB	SPEC	SPECIES NAME	WHWO	GFEM	CRFL	HODG	BIME	TAME
07410	VASW	Vaux's Swift				T	T	
07530	WTSW	White-throated Swift		T		T		
08640	BCHU	Black-chinned Hummingbird			T	T	T	
08670	ANHU	Anna's Hummingbird	T	O	O	U	U	T
08690	CAHU	Calliope Hummingbird	T	O	O	O	O	T
08730	RUHU	Rufous Hummingbird	M	M	M	M	M	M
08740	ALHU	Allen's Hummingbird	M	M	M	M	M	
08774	USHU	Unidentified Selasphorus Hummingbird	?	?	?	?	?	
08775	UNHU	Unidentified Hummingbird	?	?	?	?	?	
09110	BEKI	Belted Kingfisher			T	T	U	
09390	LEWO	Lewis's Woodpecker					M	
09430	ACWO	Acorn Woodpecker	T		T	T	U	
09570	WISA	Williamson's Sapsucker	U	O	T	T		
09600	RBSA	Red-breasted Sapsucker	O	B	B	B	O	O
09640	NUWO	Nuttall's Woodpecker				T	T	
09650	DOWO	Downy Woodpecker	T	T	T	O	U	T
09660	HAWO	Hairy Woodpecker	U	U	U	U	U	B
09690	WHWO	White-headed Woodpecker	O	B	B	B	O	B
09710	BBWO	Black-backed Woodpecker	T	T				U
09800	RSFL	Red-shafted Flicker	U	B	U	B	B	U
09860	PIWO	Pileated Woodpecker	T	U	U	U	T	O
09915	UNWO	Unidentified Woodpecker	?					
11340	OSFL	Olive-sided Flycatcher	T	U	O	B	O	B
11380	WEWP	Western Wood-Pewee	U	U	O	B	B	B
11475	WIFL	Willow Flycatcher		T	T	U	O	T
11510	HAFL	Hammond's Flycatcher	O	U	U	U	T	O
11515	HDFL	Hammond's/Dusky Flycatcher		?	?	?		
11520	GRFL	Gray Flycatcher	M		M	M	M	
11530	DUFL	Dusky Flycatcher	B	B	B	U	T	B
11555	PSFL	Pacific-slope Flycatcher	T	O	U	U	O	T
11595	UEFL	Unidentified Empidonax Flycatcher	?	?	?	?	?	
11600	BLPH	Black Phoebe	T	T	T	O	B	
11620	SAPH	Say's Phoebe		T				
11740	ATFL	Ash-throated Flycatcher					O	T
12020	WEKI	Western Kingbird	T			T	T	
12085	UNFL	Unidentified Flycatcher	?	?	?	?	?	
12710	CAVI	Cassin's Vireo	T	O	B	B	U	U
12740	HUVI	Hutton's Vireo		T	O	O		
12760	WAVI	Warbling Vireo	U	U	B	B	B	B
12790	REVI	Red-eyed Vireo			M	M		
12920	STJA	Steller's Jay	B	B	B	B	U	B

Appendix I, continued.

NUMB	SPEC	SPECIES NAME	WHWO	GFEM	CRFL	HODG	BIME	TAME
13110	WESJ	Western Scrub-Jay	T			T	O	
13150	CLNU	Clark's Nutcracker	T	T		T		
13190	AMCR	American Crow		M		M		
13300	CORA	Common Raven	U	U	U	B	U	O
13410	TRES	Tree Swallow		T		T	T	T
13440	VGSW	Violet-green Swallow		T		T	O	T
13490	NRWS	Northern Rough-winged Swallow				T	O	
13540	BARS	Barn Swallow					O	
13555	UNSW	Unidentified Swallow					?	
13580	MOCH	Mountain Chickadee	B	B	B	U	U	B
13600	CBCH	Chestnut-backed Chickadee	T	T	T	O		T
13640	OATI	Oak Titmouse					O	
13680	BUSH	Bushtit			T	O	U	T
13690	RBNU	Red-breasted Nuthatch	B	B	B	B	O	B
13700	WBNU	White-breasted Nuthatch	T	O	O	O	O	O
13710	PYNU	Pygmy Nuthatch		T				
13730	BRCR	Brown Creeper	B	B	B	B	U	B
14040	BEWR	Bewick's Wren	T	T		T	O	
14070	HOWR	House Wren	A	A	A	A	U	A
14110	WIWR	Winter Wren	T	T	O	O	O	T
14205	UNWR	Unidentified Wren			?	?	?	
14210	AMDI	American Dipper					O	
14240	GCKI	Golden-crowned Kinglet	B	B	B	B	T	U
14250	RCKI	Ruby-crowned Kinglet	O			T		
14570	WEBL	Western Bluebird		T		O	U	
14590	TOSO	Townsend's Solitaire	T	O	O	O	T	
14810	SWTH	Swainson's Thrush	T	T		O		
14820	HETH	Hermit Thrush	B	O	B	U	T	T
15000	AMRO	American Robin	B	B	B	B	B	B
15110	WREN	Wrentit					O	
15370	EUST	European Starling				O	O	
15550	CEDW	Cedar Waxwing				M	M	
15660	OCWA	Orange-crowned Warbler	A	A	A	A	A	A
15670	NAWA	Nashville Warbler	A	A	A	B	U	A
15750	YWAR	Yellow Warbler	O	T	O	U	B	T
15800	AUWA	Audubon's Warbler	B	B	B	B	O	B
15800	YRWA	Yellow-rumped Warbler		T				
15810	BTYW	Black-throated Gray Warbler	T	T	T	O	O	T
15840	TOWA	Townsend's Warbler	M	M	M	M		M
15850	HEWA	Hermit Warbler	U	B	B	B	T	U
16040	AMRE	American Redstart				M		

Appendix I, continued.

NUMB	SPEC	SPECIES NAME	WHWO	GFEM	CRFL	HODG	BIME	TAME
16090	NOWA	Northern Waterthrush					M	
16140	MGWA	MacGillivray's Warbler	T	B	B	B	U	B
16150	COYE	Common Yellowthroat				M		
16280	HOWA	Hooded Warbler				M		
16290	WIWA	Wilson's Warbler	T	O	O	U	T	B
16460	YBCH	Yellow-breasted Chat				T	T	
16495	UNWA	Unidentified Warbler			?	?	?	
16840	WETA	Western Tanager	O	B	B	B	U	B
17790	GTTO	Green-tailed Towhee		O	T	T	T	
17810	SPTO	Spotted Towhee		T	T	O	U	
17850	CALT	California Towhee					T	
18020	CHSP	Chipping Sparrow	U	T	U	U	U	B
18110	SAGS	Sage Sparrow					T	
18130	SAVS	Savannah Sparrow					M	
18140	GRSP	Grasshopper Sparrow					M	
18220	FOSP	Fox Sparrow	T	O	T	T	T	O
18230	SOSP	Song Sparrow	O	O	U	B	B	O
18240	LISP	Lincoln's Sparrow	B	B	B	B	O	B
18290	MWCS	Mountain White-crowned Sparrow	T			T		
18320	ORJU	Oregon Junco	B	B	B	B	U	B
18335	UNSP	Unidentified Sparrow	?	?	?	?	?	
18600	RBGR	Rose-breasted Grosbeak				M		
18610	BHGR	Black-headed Grosbeak	O	O	U	B	B	O
18660	LAZB	Lazuli Bunting	T	T	U	O	B	T
18670	INBU	Indigo Bunting			M	M		
18730	RWBL	Red-winged Blackbird	T	T	T	B	O	O
18810	WEME	Western Meadowlark					O	
18820	YHBL	Yellow-headed Blackbird					M	
18860	BRBL	Brewer's Blackbird	U	O	O	B	B	
18960	BHCO	Brown-headed Cowbird	O	T	O	U	U	
19105	BUOR	Bullock's Oriole		T		T	U	T
19330	PIGR	Pine Grosbeak	U	T	T			
19350	PUFI	Purple Finch	O	O	U	U	U	O
19360	CAFI	Cassin's Finch	U	O	O	O	O	O
19370	HOFI	House Finch			T	T	T	
19375	UCFI	Unidentified Carpodacus Finch			?	?	?	
19380	RECR	Red Crossbill	O	T	T	T	O	
19430	PISI	Pine Siskin	B	B	U	U	O	U
19490	LEGO	Lesser Goldfinch	T	O	T	O	B	T
19500	LAGO	Lawrence's Goldfinch		T	T	T	O	T
19510	AMGO	American Goldfinch				M	M	M

Appendix I, continued.

NUMB	SPEC	SPECIES NAME	WHWO	GFEM	CRFL	HODG	BIME	TAME
19580	EVGR	Evening Grosbeak	O	T	T	T	O	T
19920	HOSP	House Sparrow					T	
20085	UNBI	Unidentified Bird	?		?	?	?	?