

**THE MONITORING AVIAN PRODUCTIVITY AND
SURVIVORSHIP (MAPS) PROGRAM IN
SEQUOIA AND KINGS CANYON NATIONAL PARKS:**

A REPORT TO ACCOMPANY THE 2005 DATA VERIFICATION

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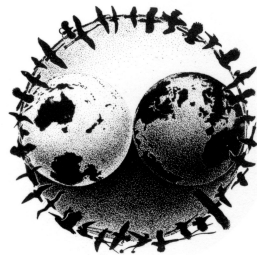
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INTRODUCTION

In 2005 The Institute for Bird Populations (IBP) worked under a cooperative agreement with Sequoia and Kings Canyon National Parks to provide technical assistance for the parks' Monitoring Avian Productivity and Survivorship (MAPS) program at Lion and Zumwalt Meadows. Although we did not staff or operate either of the two MAPS stations, we trained the field crew in bird banding techniques and data collection, and at the end of the field season, after receiving an electronic copy of the banding, data we proofed the data entry for errors, and then verified and made corrections to the final data set. We provide the verified data on the accompanying CD. Additionally, to facilitate interpretation of the data, we provide summary analysis of the data in this brief report.

METHODS

Training

IBP Staff Biologist Victor Sepulveda trained the field crew, along with our Yosemite field biologist interns, during an intensive course at Starr Ranch Sanctuary between May 15-22.

Data Collection

All data were collected at Lion Meadow and Zumwalt Meadow (Table 1) by NPS personnel or interns, rather than IBP staff or IBP interns. Nevertheless, crews followed standard MAPS protocols (DeSante et al. 2005a). 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 compromised. 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.

Computer Data Entry and Verification

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

- (1) Clean-up programs to check the validity of all codes entered and the ranges of all numerical data;
- (2) Cross-check programs to compare station, date, and net fields from the banding data with those from the 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.

Summary 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).

The proofed, verified, and corrected banding data for each year were run through a series of analysis programs that calculated the following for each species and for all species combined at each station as well as for both 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 reproductive index (young/adult).

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

We calculated changes between 2004 and 2005 in the numbers of adult and young birds captured and in the indices of post-fledging productivity, for each station and both stations pooled. 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.

RESULTS AND DISCUSSION

The 2005 MAPS field season at Sequoia and Kings Canyon National Parks garnered 341 total captures of 35 bird species (Table 2), with a higher number of both species and individual birds captured at Lion Meadow than at Zumwalt Meadow (Table 2). Standardized capture rates (captures per 600 net-hours) of individual adult and young birds and the proportion of young in the catch are presented for each of 34 breeding species and all species pooled at Lion Meadow, Zumwalt Meadow, and both stations combined (Table 3). We present standardized capture rates of adults and young so that the data can be compared among stations and years which, because of the vagaries of weather and accidental net damage, can differ from one another in effort expended.

For all species pooled, the standardized capture rate of adults was very similar at the two stations (Table 3), but the capture rate of young birds (and the reproductive index) was nearly twice as high at Lion Meadow as at Zumwalt (Table 3).

Again pooling all species, fewer adult birds were captured at the two combined stations in 2005 than in 2004, with the decrease occurring primarily at Zumwalt Meadow (Table 4). The most striking decreases in adult captures of particular species occurred in American Robin, Nashville Warbler, and Dark-eyed Junco (Table 4). However, although the 2005 combined-station capture rate (152.6 birds per 600 net-hours; Table 3) was somewhat lower than the rate for 2004, it was very similar to the average annual capture rate over the period 2001-2004 (150.0 birds per net-hour; DeSante et al. 2005b).

The two stations combined also caught fewer young birds than in 2004, and again the difference from last year was most pronounced at Zumwalt Meadow, where total captures of young birds dropped by over 73% (Table 5). Pooling data from both stations, the number of young birds of 19 species decreased, while those of only four species increased, a statistically significant preponderance of decreasing species ($P < 0.01$; one-sided binomial test). The combined-station capture rate of 26.5 young birds per 600 net-hours was far below the average of 61.0 birds per 600 net-hours for the period 2001-2004 (DeSante et al. 2005b). As would be expected from the dramatic decrease in young birds, the reproductive indices were generally lower in 2005 than in 2004 (Table 6); the reproductive index for all species pooled at the two stations combined declined by nearly 50%, with Zumwalt Meadow accounting for a larger share of the reduction than did Lion Meadow (Table 6).

This year's apparently poor reproductive performance of birds at Lion Meadow and especially Zumwalt Meadow is somewhat surprising, as preliminary data tabulations suggest quite different results at the Yosemite MAPS stations, where numbers of both adult and young birds appear to have been quite high. If pending analysis of the 2005 Yosemite data confirm that 2005 was indeed a good year for landbird productivity at the Yosemite stations, then additional research to elucidate factors that might be depressing landbird productivity at Lion and Zumwalt Meadows, at least relative to the Yosemite meadows being monitored, may be warranted.

ACKNOWLEDGMENTS

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LITERATURE CITED

DeSante, D. F., K. M. Burton, P. Velez, and D. Froehlich. 2005a. Maps Manual: 2005 Protocol. The Institute for Bird Populations, Point Reyes Station, CA.

DeSante, D. F., P. Pyle, and D. R. Kaschube. 2005b. 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 Period and Locations. The Institute for Bird Populations, Point Reyes Station, CA.

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

Table 1. Summary of the two MAPS stations in Sequoia and Kings Canyon National Parks that were operated in 2005 and various prior years.

Station			Major Habitat Type	Latitude-longitude	Avg Elev. (m)	2005 operation		
Name	Code	No.				Total number of net-hours ¹	No. of periods	Inclusive dates
Lion Meadow	LIME	11109	Coniferous forest, montane meadow, montane chaparral	36°44'45"N,-118°58'57"W	1853	454.0 (429.2)	8	6/01 - 8/02
Zumwalt Meadow	ZUME	11110	Riparian corridor, conifer forest, oak woodland	36°47'27"N,-118°35'58"W	1494	410.0 (369.3)	8	5/31 - 8/03
ALL STATIONS COMBINED						861.0 (798.5)	8	5/31 - 8/03

Table 2. Capture summary for the two individual MAPS stations, and both stations pooled, operated at Sequoia and Kings Canyon National Parks in 2005. N = Newly Banded, U = Unbanded, R = Recaptures of banded birds.

Species	Lion Meadow			Zumwalt Meadow			Both stations pooled		
	N	U	R	N	U	R	N	U	R
Red-breasted Sapsucker	1						1		
Northern Flicker	1						1		
Western Wood-Pewee				2		2	2		2
Hammond's Flycatcher	3		1				3		1
Dusky Flycatcher	8		1				8		1
"Western" Flycatcher	6		1	3		3	9		4
Black Phoebe	1			5			6		
Cassin's Vireo				2			2		
Warbling Vireo	2		2	6	1		8	1	2
Steller's Jay	1						1		
Mountain Chickadee	4						4		
Bushtit	7						7		
Red-breasted Nuthatch	2		1				2		1
Brown Creeper	5			4		1	9		1
Winter Wren	1						1		
Golden-crowned Kinglet	3						3		
Swainson's Thrush				1		2	1		2
American Robin	2		1	1	1	3	3	1	4
Orange-crowned Warbler	3			11			14		
Yellow Warbler				1			1		
Yellow-rumped Warbler	11		4				11		4
Black-throated Gray Warbler				1			1		
Hermit Warbler	2		1				2		1
MacGillivray's Warbler	29		21	16		4	45		25
Wilson's Warbler	3			1			4		
Western Tanager	2			7			9		
Spotted Towhee	2			2		1	4		1
Fox Sparrow	1		1				1		1
Song Sparrow				4		1	4		1
Lincoln's Sparrow	10		25	10		5	20		30
Dark-eyed Junco	15		6	1		2	16		8
Black-headed Grosbeak	1			12		5	13		5
Lazuli Bunting				3			3		
Red-winged Blackbird				4		1	4		1
Purple Finch	3			14		4	17		4
ALL SPECIES POOLED	129	0	65	111	2	34	240	2	99
Total Number of Captures		194			147			341	
Number of Species	27	0	12	22	2	13	35	2	20
Total Number of Species		27			22			35	

Table 3. Numbers of adult and young individual birds captured per 600 net-hours and reproductive index (young/adult) at the two individual MAPS stations, and both stations pooled, operated at Sequoia and Kings Canyon National Parks in 2005.

Species	Lion Meadow			Zumwalt Meadow			Both stations pooled		
	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index	Ad.	Yg.	Repr. index
Red-breasted Sapsucker	1.3	0.0	0.00				0.7	0.0	0.00
Northern Flicker	1.3	0.0	0.00				0.7	0.0	0.00
Western Wood-Pewee				4.4	0.0	0.00	2.1	0.0	0.00
Hammond's Flycatcher	4.0	0.0	0.00				2.1	0.0	0.00
Dusky Flycatcher	9.3	1.3	0.14				4.9	0.7	0.14
"Western" Flycatcher	7.9	0.0	0.00	7.3	1.5	0.20	7.7	0.7	0.09
Black Phoebe	1.3	0.0	0.00	5.9	1.5	0.25	3.5	0.7	0.20
Cassin's Vireo				1.5	1.5	1.00	0.7	0.7	1.00
Warbling Vireo	2.6	0.0	0.00	10.2	0.0	0.00	6.3	0.0	0.00
Steller's Jay	1.3	0.0	0.00				0.7	0.0	0.00
Mountain Chickadee	4.0	1.3	0.33				2.1	0.7	0.33
Bushtit	6.6	1.3	0.20				3.5	0.7	0.20
Red-breasted Nuthatch	4.0	0.0	0.00				2.1	0.0	0.00
Brown Creeper	2.6	2.6	1.00	5.9	0.0	0.00	4.2	1.4	0.33
Winter Wren	1.3	0.0	0.00				0.7	0.0	0.00
Golden-crowned Kinglet	4.0	0.0	0.00				2.1	0.0	0.00
Swainson's Thrush				2.9	0.0	0.00	1.4	0.0	0.00
American Robin	2.6	0.0	0.00	4.4	1.5	0.33	3.5	0.7	0.20
Yellow Warbler				1.5	0.0	0.00	0.7	0.0	0.00
Yellow-rumped Warbler	18.5	0.0	0.00				9.8	0.0	0.00
Black-throated Gray Warbler				1.5	0.0	0.00	0.7	0.0	0.00
Hermit Warbler	2.6	0.0	0.00				1.4	0.0	0.00
MacGillivray's Warbler	29.1	15.9	0.54	16.1	7.3	0.46	23.0	11.8	0.51
Wilson's Warbler	4.0	0.0	0.00	1.5	0.0	0.00	2.8	0.0	0.00
Western Tanager	2.6	0.0	0.00	10.2	0.0	0.00	6.3	0.0	0.00
Spotted Towhee	2.6	0.0	0.00	2.9	0.0	0.00	2.8	0.0	0.00
Fox Sparrow	1.3	0.0	0.00				0.7	0.0	0.00
Song Sparrow				5.9	1.5	0.25	2.8	0.7	0.25
Lincoln's Sparrow	19.8	1.3	0.07	13.2	1.5	0.11	16.7	1.4	0.08
Dark-eyed Junco	14.5	10.6	0.73	2.9	0.0	0.00	9.1	5.6	0.62
Black-headed Grosbeak	1.3	0.0	0.00	19.0	0.0	0.00	9.8	0.0	0.00
Lazuli Bunting				4.4	0.0	0.00	2.1	0.0	0.00
Red-winged Blackbird				4.4	1.5	0.33	2.1	0.7	0.33
Purple Finch	4.0	0.0	0.00	23.4	0.0	0.00	13.2	0.0	0.00
ALL SPECIES POOLED	154.6	34.4	0.22	149.3	17.6	0.12	152.6	26.5	0.17
Number of Species	26	7		21	8		34	13	
Total Number of Species		26			21			34	

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

Table 4. Percentage changes between 2004 and 2005 in the numbers of individual ADULT birds captured at two constant-effort MAPS stations at Sequoia and Kings Canyon National Parks.

Species	Both stations combined						
	Lion Meadow	Zumwalt Meadow	n ¹	Number of adults		Percent change	SE ²
				2004	2005		
Red-breasted Sapsucker	0.0		1	1	1	0.0	
Downy Woodpecker		-100.0	1	1	0	-100.0	
Hairy Woodpecker	-100.0		1	1	0	-100.0	
White-headed Woodpecker	-100.0		1	1	0	-100.0	
Northern Flicker	++++ ³		1	0	1	++++ ³	
Western Wood-Pewee		-40.0	1	5	3	-40.0	
Hammond's Flycatcher	200.0		1	1	3	200.0	
Dusky Flycatcher	133.3		1	3	7	133.3	
"Western" Flycatcher	-33.3	25.0	2	13	11	-15.4	24.9
Black Phoebe	++++	++++ ³	2	0	5	++++	
Cassin's Vireo	-100.0	-66.7	2	5	1	-80.0	16.0
Warbling Vireo	++++	-22.2	2	9	9	0.0	44.4
Steller's Jay	++++		1	0	1	++++	
Violet-green Swallow		-100.0	1	1	0	-100.0	
Mountain Chickadee	50.0	-100.0	2	3	3	0.0	66.7
Bushtit	++++		1	0	5	++++	
Red-breasted Nuthatch	0.0		1	3	3	0.0	
Brown Creeper	-66.7	33.3	2	9	6	-33.3	44.4
House Wren			0	0	0		
Winter Wren	-50.0		1	2	1	-50.0	
Golden-crowned Kinglet	50.0		1	2	3	50.0	
Townsend's Solitaire	-100.0		1	1	0	-100.0	
Swainson's Thrush		-33.3	1	3	2	-33.3	
American Robin	-75.0	-76.9	2	21	5	-76.2	0.9
Nashville Warbler		-100.0	1	13	0	-100.0	
Yellow Warbler		-66.7	1	3	1	-66.7	
Yellow-rumped Warbler	25.0	-100.0	2	9	10	11.1	24.7
Black-throated Gray Warbler		++++	1	0	1	++++	
Hermit Warbler	0.0	-100.0	2	3	2	-33.3	44.4
MacGillivray's Warbler	-4.3	-26.7	2	38	33	-13.2	10.7
Wilson's Warbler	++++	-80.0	2	5	4	-20.0	120.0
Western Tanager	++++	133.3	2	3	9	200.0	133.3
Spotted Towhee	-33.3	++++	2	3	4	33.3	133.3
Fox Sparrow	++++		1	0	1	++++	
Song Sparrow	-100.0	33.3	2	7	4	-42.9	65.3
Lincoln's Sparrow	25.0	++++	2	12	24	100.0	150.0

Table 4. (cont.) Percentage changes between 2004 and 2005 in the numbers of individual ADULT birds captured at two constant-effort MAPS stations at Sequoia and Kings Canyon National Parks.

Species	Both stations combined						
	Lion Meadow	Zumwalt Meadow	n ¹	Number of adults		Percent change	SE ²
				2004	2005		
Dark-eyed Junco	-42.9	-77.8	2	23	10	-56.5	16.6
Black-headed Grosbeak	0.0	62.5	2	9	14	55.6	12.3
Lazuli Bunting		++++	1	0	2	++++	
Red-winged Blackbird		0.0	1	2	2	0.0	
Brewer's Blackbird			0	0	0		
Brown-headed Cowbird		-100.0	1	1	0	-100.0	
Purple Finch	-50.0	6.7	2	21	19	-9.5	23.1
Lesser Goldfinch		-100.0	1	3	0	-100.0	
ALL SPECIES POOLED	-4.3	-20.0	2	240	210	-12.5	7.8
No. species that increased ⁴	14(8)	11(5)				15(7)	
No. species that decreased ⁵	13(5)	17(8)				22(8)	
No. species remained same	4	1				5	
Total Number of Species	31	29				42	
Proportion of increasing (decreasing) species	(0.419)	(0.586)				(0.524)	
Sig. of increase (decrease) ⁶	(0.859)	(0.229)				(0.439)	

¹ Number of stations lying within the breeding range of the species at which at least one individual adult bird of the species was captured in either year.

² Standard error of the percent change in the number of individual adults captured.

³ Increase indeterminate (infinite) because no adult was captured during 2004.

⁴ No. of species for which adults were captured in 2005 but not in 2004 are in parentheses.

⁵ No. of species for which adults were captured in 2004 but not in 2005 are in parentheses.

⁶ Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.

Table 5. Percentage changes between 2004 and 2005 in the numbers of individual YOUNG birds captured at two constant-effort MAPS stations at Sequoia and Kings Canyon National Parks.

Species	Both stations combined						
	Lion Meadow	Zumwalt Meadow	n ¹	Number of young		Percent change	SE ²
				2004	2005		
Red-breasted Sapsucker			0	0	0		
Downy Woodpecker		-100.0	1	1	0	-100.0	
Hairy Woodpecker			0	0	0		
White-headed Woodpecker			0	0	0		
Northern Flicker			0	0	0		
Western Wood-Pewee			0	0	0		
Hammond's Flycatcher	-100.0		1	1	0	-100.0	
Dusky Flycatcher	-50.0		1	2	1	-50.0	
"Western" Flycatcher		0.0	1	1	1	0.0	
Black Phoebe		-50.0	1	2	1	-50.0	
Cassin's Vireo		++++ ³	1	0	1	++++ ³	
Warbling Vireo		-100.0	1	1	0	-100.0	
Steller's Jay			0	0	0		
Violet-green Swallow			0	0	0		
Mountain Chickadee	0.0		1	1	1	0.0	
Bushtit	++++ ³		1	0	1	++++	
Red-breasted Nuthatch			0	0	0		
Brown Creeper	-50.0	-100.0	2	15	2	-86.7	19.6
House Wren		-100.0	1	2	0	-100.0	
Winter Wren	-100.0		1	2	0	-100.0	
Golden-crowned Kinglet			0	0	0		
Townsend's Solitaire			0	0	0		
Swainson's Thrush			0	0	0		
American Robin		++++	1	0	1	++++	
Nashville Warbler		-100.0	1	2	0	-100.0	
Yellow Warbler			0	0	0		
Yellow-rumped Warbler			0	0	0		
Black-throated Gray Warbler		-100.0	1	1	0	-100.0	
Hermit Warbler			0	0	0		
MacGillivray's Warbler	50.0	0.0	2	13	17	30.8	23.7
Wilson's Warbler	-100.0		1	1	0	-100.0	
Western Tanager		-100.0	1	1	0	-100.0	
Spotted Towhee	-100.0		1	1	0	-100.0	
Fox Sparrow	-100.0		1	1	0	-100.0	
Song Sparrow	-100.0	-88.9	2	14	1	-92.9	5.1
Lincoln's Sparrow	-75.0	++++	2	4	2	-50.0	50.0

Table 5. (cont.) Percentage changes between 2004 and 2005 in the numbers of individual YOUNG birds captured at two constant-effort MAPS stations at Sequoia and Kings Canyon National Parks.

Species	Both stations combined						
	Lion Meadow	Zumwalt Meadow	n ¹	Number of young		Percent change	SE ²
				2004	2005		
Dark-eyed Junco	-11.1	-100.0	2	11	8	-27.3	26.4
Black-headed Grosbeak			0	0	0		
Lazuli Bunting			0	0	0		
Red-winged Blackbird			0	0	0		
Brewer's Blackbird		-100.0	1	2	0	-100.0	
Brown-headed Cowbird			0	0	0		
Purple Finch		-100.0	1	1	0	-100.0	
Lesser Goldfinch			0	0	0		
ALL SPECIES POOLED	-33.3	-73.2	2	80	37	-53.8	19.9
No. species that increased ⁴	2(1)	3(3)				4(3)	
No. species that decreased ⁵	10(6)	12(10)				19(13)	
No. species remained same	1	2				2	
Total Number of Species	13	17				25	
Proportion of increasing (decreasing) species	(0.769)	(0.706)				(0.760)	
Sig. of increase (decrease) ⁶	(0.046)	(0.072)				(0.007)	
	**	*				***	

¹ Number of stations lying within the breeding range of the species at which at least one individual young bird of the species was captured in either year.

² Standard error of the percent change in the number of individual young captured.

³ Increase indeterminate (infinite) because no young bird was captured during 2004.

⁴ No. of species for which young birds were captured in 2005 but not in 2004 are in parentheses.

⁵ No. of species for which young birds were captured in 2004 but not in 2005 are in parentheses.

⁶ Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.

*** $P < 0.01$; ** $0.01 < P < 0.05$; * $0.05 < P < 0.10$.

Table 6. Changes between 2004 and 2005 in the REPRODUCTIVE INDEX (young/adult) at two constant-effort MAPS stations at Sequoia and Kings Canyon National Parks.

Species	Both stations combined						
	Lion Meadow	Zumwalt Meadow	n ¹	Reproductive Index		Change	SE ²
				2004	2005		
Red-breasted Sapsucker	0.000		1	0.000	0.000	0.000	
Downy Woodpecker		+--+ ³	1	1.000	und. ⁴	+--+ ³	
Hairy Woodpecker	+--+ ³		1	0.000	und.	+--+	
White-headed Woodpecker	+--+		1	0.000	und.	+--+	
Northern Flicker	+--+		1	und. ⁴	0.000	+--+	
Western Wood-Pewee		0.000	1	0.000	0.000	0.000	
Hammond's Flycatcher	-1.000		1	1.000	0.000	-1.000	
Dusky Flycatcher	-0.524		1	0.667	0.143	-0.524	
"Western" Flycatcher	0.000	-0.050	2	0.077	0.091	0.014	0.146
Black Phoebe	+--+	+--+	2	und.	0.200	+--+	
Cassin's Vireo	+--+	1.000	2	0.000	1.000	1.000	0.000
Warbling Vireo	+--+	-0.111	2	0.111	0.000	-0.111	
Steller's Jay	+--+		1	und.	0.000	+--+	
Violet-green Swallow		+--+	1	0.000	und.	+--+	
Mountain Chickadee	-0.167	+--+	2	0.333	0.333	0.000	
Bushtit	+--+		1	und.	0.200	+--+	
Red-breasted Nuthatch	0.000		1	0.000	0.000	0.000	
Brown Creeper	0.333	-3.667	2	1.667	0.333	-1.333	1.405
House Wren		+--+	1	und.	und.	+--+	
Winter Wren	-1.000		1	1.000	0.000	-1.000	
Golden-crowned Kinglet	0.000		1	0.000	0.000	0.000	
Townsend's Solitaire	+--+		1	0.000	und.	+--+	
Swainson's Thrush		0.000	1	0.000	0.000	0.000	
American Robin	0.000	0.333	2	0.000	0.200	0.200	0.160
Nashville Warbler		+--+	1	0.154	und.	+--+	
Yellow Warbler		0.000	1	0.000	0.000	0.000	
Yellow-rumped Warbler	0.000	+--+	2	0.000	0.000	0.000	0.000
Black-throated Gray Warbler		+--+	1	und.	0.000	+--+	
Hermit Warbler	0.000	+--+	2	0.000	0.000	0.000	0.000
MacGillivray's Warbler	0.198	0.121	2	0.342	0.515	0.173	0.041
Wilson's Warbler	+--+	0.000	2	0.200	0.000	-0.200	0.400
Western Tanager	+--+	-0.333	2	0.333	0.000	-0.333	
Spotted Towhee	-0.333	+--+	2	0.333	0.000	-0.333	
Fox Sparrow	+--+		1	und.	0.000	+--+	
Song Sparrow	+--+	-2.750	2	2.000	0.250	-1.750	0.857
Lincoln's Sparrow	-0.267	+--+	2	0.333	0.083	-0.250	

Table 6. (cont.) Changes between 2004 and 2005 in the REPRODUCTIVE INDEX (young/adult) at two constant-effort MAPS stations at Sequoia and Kings Canyon National Parks.

Species	Both stations combined						
	Lion Meadow	Zumwalt Meadow	n ¹	Reproductive Index		Change	SE ²
				2004	2005		
Dark-eyed Junco	0.357	-0.222	2	0.478	0.800	0.322	0.378
Black-headed Grosbeak	0.000	0.000	2	0.000	0.000	0.000	0.000
Lazuli Bunting		+--+	1	und.	0.000	+--+	
Red-winged Blackbird		0.000	1	0.000	0.000	0.000	
Brewer's Blackbird		+--+	1	und.	und.	+--+	
Brown-headed Cowbird		+--+	1	0.000	und.	+--+	
Purple Finch	0.000	-0.067	2	0.048	0.000	-0.048	0.027
Lesser Goldfinch		+--+	1	0.000	und.	+--+	
ALL SPECIES POOLED	-0.103	-0.218	2	0.333	0.176	-0.157	0.063
No. species that increased	3	3				5	
No. species that decreased	6	7				11	
No. species remained same	9	6				11	
Total Number of Species ⁵	18	16				27	
Proportion of increasing (decreasing) species	(0.333)	(0.438)				(0.407)	
Sig. of increase (decrease) ⁶	(0.952)	(0.773)				(0.876)	

¹ Number of stations lying within the breeding range of the species at which at least one individual aged bird of the species was captured in either year.

² Standard error of the change in the reproductive index.

³ The change in reproductive index is undefined at this station because no adult individual of the species was captured in one of the two years.

⁴ Reproductive index not given because no adult individual of the species was captured in the year shown.

⁵ Species for which the change in the reproductive index is undefined are not included.

⁶ Statistical significance of the one-sided binomial test that the proportion of increasing (decreasing) species is not greater than 0.50.

*** $P < 0.01$; ** $0.01 \leq P < 0.05$; * $0.05 \leq P < 0.10$

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 eight years, 1991-1993 and 2001-2005, of the MAPS Program on the two stations operated in Sequoia and Kings Canyon National Parks.

NUMB	SPEC	SPECIES NAME
01300	TUVU	Turkey Vulture
01630	MALL	Mallard
02200	SSHA	Sharp-shinned Hawk
02240	NOGO	Northern Goshawk
02460	RTHA	Red-tailed Hawk
02630	AMKE	American Kestrel
02700	PEFA	Peregrine Falcon
03100	MOUQ	Mountain Quail
04020	SPSA	Spotted Sandpiper
05440	BTPI	Band-tailed Pigeon
05570	MODO	Mourning Dove
06800	GHOW	Great Horned Owl
06830	NOPO	Northern Pygmy-Owl
07530	WTSW	White-throated Swift
08670	ANHU	Anna's Hummingbird
08690	CAHU	Calliope Hummingbird
08730	RUHU	Rufous Hummingbird
08740	ALHU	Allen's Hummingbird
08774	USHU	Unidentified Selasphorus Hummingbird
08775	UNHU	Unidentified Hummingbird
09110	BEKI	Belted Kingfisher
09430	ACWO	Acorn Woodpecker
09600	RBSA	Red-breasted Sapsucker
09650	DOWO	Downy Woodpecker
09660	HAWO	Hairy Woodpecker
09690	WHWO	White-headed Woodpecker
09800	RSFL	Red-shafted Flicker
09860	PIWO	Pileated Woodpecker
11340	OSFL	Olive-sided Flycatcher
11380	WEWP	Western Wood-Pewee
11510	HAFL	Hammond's Flycatcher
11520	GRFL	Gray Flycatcher
11530	DUFL	Dusky Flycatcher
11555	PSFL	Pacific-slope Flycatcher
11600	BLPH	Black Phoebe
12085	UNFL	Unidentified Flycatcher
12710	CAVI	Cassin's Vireo
12740	HUVI	Hutton's Vireo
12760	WAVI	Warbling Vireo

Appendix I. continued

NUMB	SPEC	SPECIES NAME
12920	STJA	Steller's Jay
13110	WESJ	Western Scrub-Jay
13150	CLNU	Clark's Nutcracker
13300	CORA	Common Raven
13440	VGSW	Violet-green Swallow
13490	NRWS	Northern Rough-winged Swallow
13580	MOCH	Mountain Chickadee
13680	BUSH	Bushtit
13690	RBNU	Red-breasted Nuthatch
13700	WBNU	White-breasted Nuthatch
13710	PYNU	Pygmy Nuthatch
13730	BRCR	Brown Creeper
13850	CANW	Canyon Wren
14070	HOWR	House Wren
14110	WIWR	Winter Wren
14210	AMDI	American Dipper
14240	GCKI	Golden-crowned Kinglet
14570	WEBL	Western Bluebird
14590	TOSO	Townsend's Solitaire
14810	SWTH	Swainson's Thrush
14820	HETH	Hermit Thrush
15000	AMRO	American Robin
15110	WREN	Wrentit
15660	OCWA	Orange-crowned Warbler
15670	NAWA	Nashville Warbler
15750	YWAR	Yellow Warbler
15800	AUWA	Audubon's Warbler
15810	BTYW	Black-throated Gray Warbler
15840	TOWA	Townsend's Warbler
15850	HEWA	Hermit Warbler
16140	MGWA	MacGillivray's Warbler
16290	WIWA	Wilson's Warbler
16840	WETA	Western Tanager
17790	GTTO	Green-tailed Towhee
17810	SPTO	Spotted Towhee
18130	SAVS	Savannah Sparrow
18220	FOSP	Fox Sparrow
18230	SOSP	Song Sparrow
18240	LISP	Lincoln's Sparrow
18320	ORJU	Oregon Junco
18335	UNSP	Unidentified Sparrow
18600	RBGR	Rose-breasted Grosbeak

Appendix I. continued

NUMB	SPEC	SPECIES NAME
18610	BHGR	Black-headed Grosbeak
18660	LAZB	Lazuli Bunting
18730	RWBL	Red-winged Blackbird
18860	BRBL	Brewer's Blackbird
18960	BHCO	Brown-headed Cowbird
19105	BUOR	Bullock's Oriole
19350	PUFI	Purple Finch
19360	CAFI	Cassin's Finch
19430	PISI	Pine Siskin
19490	LEGO	Lesser Goldfinch
19500	LAGO	Lawrence's Goldfinch
19510	AMGO	American Goldfinch
19580	EVGR	Evening Grosbeak
20085	UNBI	Unidentified Bird