The 2011 Annual Report of the Monitoring Avian Productivity and Survivorship (MAPS) Program in Yosemite National Park

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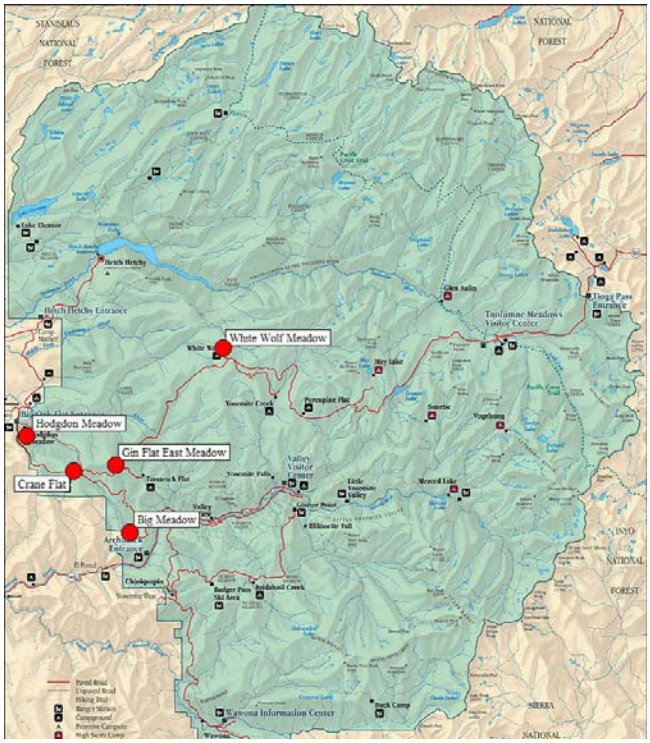

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Introduction

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. 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.

Application of standardized constant-effort mist netting and modern capture-recapture analytical techniques can provide information on population trends and demographic rates of many landbird species at a variety of spatial and temporal scales (DeSante et al. 2004, Robinson et al. 2009). In North America, constant-effort mist-netting stations operated during the breeding season typically follow protocols established by the Monitoring Avian Productivity and Survivorship (MAPS) program (DeSante and Kaschube 2009). Collaborators have contributed data from > 1000 stations to the program since its establishment in 1989. A core component of the MAPS program has been the long-term operation of stations in large protected areas, such as national parks, which 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). MAPS stations in national parks and other protected areas can provide insights into how land management practices on these areas may be affecting birds, as well as into the extent to which broad-scale factors (e.g., climate change) or factors operating outside of breeding areas (e.g., on overwintering areas of migratory species) may be driving population dynamics. Avian population monitoring in parks can be especially important because parks are among the few sites in the United States where population trends resulting from large-scale regional and global climate change patterns are relatively unconfounded by local changes in land-use practices (Simons et al. 1999, Siegel et al. 2011).

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. Here we report summary monitoring results from the MAPS program in Yosemite in 2011. For more in-depth analysis of Yosemite's MAPS data, we refer the reader to Siegel et al. (2012).

Methods

Establishment and operation of stations

Five MAPS stations were re-established and operated in Yosemite National Park in 2011, 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 2011.

Through the efforts of two IBP field biologist interns (Keegan Tranquillo and Kristen Walter) and Yosemite NP field tech Matt Brady, trained and supervised by IBP Biologist Erin Rowan and Yosemite Wildlife Biologist Sarah Stock, these five MAPS banding stations were operated during 2011 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 2011, 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 six periods between June 21 and August 8 (see Table 1). The operation of all stations occurred on schedule in 2011 during each of the ten-day periods, with the exception of the first two periods of the two higher elevation stations. These stations were unable to operate during their first scheduled period, and were delayed in their second, due to heavy snow packs.

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).

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.

Results

A total of 1,770.5 net-hours was accumulated at the five MAPS stations operated in Yosemite National Park in 2011 (Table 1). Data from 1,663.3 of these net-hours could be compared directly to the previous year's data in a constant-effort manner.

2011 indices of adult population size and post-fledging productivity

We present the 2011 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 1,554 captures of 61 species was recorded during the summer of 2011. Newly banded birds comprised 63.1% of the total captures. The greatest number of total captures (568) was recorded at the Hodgdon Meadow station and the smallest number of total captures (116) was recorded at the White Wolf Meadow station. The highest species richness occurred at Hodgdon Meadow (41 species) and the lowest species richness occurred at White Wolf Meadow (18 species).

The 2011 capture rates (per 600 net-hours) of individual adult and young birds and the 2011 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 2011 was greatest at Crane Flat (325.3 adults/600 net-hours), followed in descending order by Hodgdon Meadow (269.9), Big Meadow (178.1), Gin Flat East Meadow (173.5), and White Wolf Meadow (137.2). The capture rate of young of all species

pooled at each station in 2011 was highest at Gin Flat East Meadow (192.0 young/600 net-hours), followed by Hodgdon Meadow, Crane Flat, White Wolf Meadow, and Big Meadow (Table 3). Reproductive index (the number of young per adult) at the five stations in 2011 was greatest at Gin Flat East Meadow (1.11), followed by White Wolf Meadow (0.45), Hodgdon Meadow (0.39), Crane Flat (0.29), and Big Meadow (0.27). The mean adult capture rate for the five stations combined was 230.8 per 600 net hours and the overall reproductive index was 0.43 in 2011.

In 2011 Dark-eyed Junco was the most frequently captured species, followed by Lincoln's Sparrow, Yellow-rumped Warbler, MacGillivray's Warbler, Song Sparrow, Orange-crowned Warbler, Anna's Hummingbird, Warbling Vireo, and Nashville Warbler (Table 2). Overall, the most abundant breeding species in 2011 (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, Yellow-rumped Warbler, MacGillivray's Warbler, Lincoln's Sparrow, Warbling Vireo, Song Sparrow, American Robin, Lazuli Bunting, Western Tanager, Black-headed Grosbeak, Dusky Flycatcher, and Purple Finch. 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 2011 (Table 3):

White Wolf Meadow
Yellow-rumped Warbler
Dark-eyed Junco
American Robin
Dusky Flycatcher
Brown Creeper
Chipping Sparrow

Gin Flat East Meadow
Dark-eyed Junco
Yellow-rumped Warbler
Lincoln's Sparrow
American Robin

Crane Flat
Dark-eyed Junco
Yellow-rumped Warbler
Lincoln's Sparrow
Warbling Vireo
MacGillivray's Warbler
Dusky Flycatcher
Golden-crowned Kinglet
Western Tanager
Hermit Warbler

Hodgdon Meadow
MacGillivray's Warbler
Lincoln's Sparrow
Song Sparrow
Warbling Vireo
Dark-eyed Junco
Yellow-rumped Warbler
Purple Finch
Black-headed Grosbeak
Hermit Warbler
Western Wood-Pewee
American Robin

Big Meadow
Lazuli Bunting
Spotted Towhee
Lesser Goldfinch
Lawrence's Goldfinch
Black-headed Grosbeak
Song Sparrow
Yellow-rumped Warbler
Red-breasted Sapsucker

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.

Acknowledgments

We are grateful to our 2011 field crew: Erin Rowan (crew leader), Keegan Tranquillo, and Kristen Walter. Additional assistance in the field was provided by Yosemite NP technician Matt Brady. Financial support for the MAPS Program in Yosemite National Park during 2011 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 Conservancy. This is Contribution Number 431 of The Institute for Bird Populations.

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Table 1. Summary of the 2011 operation of the five MAPS stations in Yosemite National Park.

Station						2011 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	214.3 (203.2)	6	6/24 - 8/04
Gin Flat East Meadow	GFEM	11980	Wet montane meadow, mixed fir forest	37°45'59"N,-119°45'37"W	2073	259.3 (242.8)	6	6/21 - 8/03
Crane Flat	CRFL	11907	Wet montane meadow, willow/ aspen thickets, mixed coniferous forest	37°45'20"N,-119°48'13"W	1875	339.3 (320.7)	8	6/04 - 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	580.2 (542.7)	8	5/21 - 8/01
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	377.3 (354.)	8	5/20 - 7/30
ALL STATIONS COMBINED						1770.5 (1663.3)	8	5/20 - 8/04

[1] Total net-hours in 2011. Net-hours in 2011 that could be compared in a constant-effort manner to 2010 are shown in parentheses.

Table 2. Capture summary for the five individual MAPS stations rated in Yosemite National Park in 2011, and all stations pooled.
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
American Kestrel														1			1	
Mountain Quail														3			3	
California Quail														1			1	
Northern Pygmy-Owl														1			1	
Anna's Hummingbird					2			5			19			57			83	
Calliope Hummingbird		1									3			5			9	
Rufous Hummingbird		1			5			3			4			2			15	
Allen's Hummingbird														2			2	
Unident. Selasphorus Hum.					1			2			3			14			20	
Acorn Woodpecker													2			2		
Williamson's Sapsucker	2			1												3		
Red-breasted Sapsucker				3			2			6		2	4		1	15		3
Hairy Woodpecker							1									1		
White-headed Woodpecker				1									2			3		
Northern Flicker							1			1		1	1		1	3		2
Olive-sided Flycatcher										2		2				2		2
Western Wood-Pewee										7	1	6	2			9	1	6
Hammond's Flycatcher	1		1	2	1		2	1	1	1						6	2	2
Dusky Flycatcher	3			1		1	10		5	3						17		6
Western Flycatcher							1			5		2	1			7		2
Unident. Empidonax Flycat.					1			1			2						4	
Black Phoebe										1			6			7		
Cassin's Vireo							1			3		2	1		2	5		4
Warbling Vireo				1			18	1	4	19		6	1			39	1	10
Steller's Jay	1	1								2	2					3	3	

Table 2 (continued). Capture summary for the five individual MAPS stations rated in Yosemite National Park in 2011, and all stations pooled. 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
Mountain Chickadee				2		2	5		4	4						11		6
Bushtit													1			1		
Red-breasted Nuthatch				1			4			1						6		
White-breasted Nuthatch													1			1		
Brown Creeper	6		1	1		1	4		3	8			1			20		5
Bewick's Wren													2			2		
House Wren				2	1		3			6	1	2	15			26	2	2
Pacific Wren	1									1						2		
Golden-crowned Kinglet				5			19		2	3						27		2
Ruby-crowned Kinglet										1						1		
Townsend's Solitaire					1												1	
Hermit Thrush	1									1						2		
American Robin	5		4	11			1	2		7	2	3	2	2		26	6	7
Orange-crowned Warbler	11		2	6		1	19		2	21	1	5	23		2	80	1	12
Nashville Warbler	8		1	3	1		20	1		9			6		1	46	2	2
Yellow Warbler										1		1	3		7	4		8
Yellow-rumped Warbler	20		3	61	1	3	31		3	16		1	5			133	1	10
Hermit Warbler				2			11			15	1					28	1	
MacGillivray's Warbler				1			17		8	44	5	53	5		3	67	5	64
Wilson's Warbler							1			3			2			6		
Western Tanager			2	3			8			7		1			1	18		4
Spotted Towhee													6	2	3	6	2	3
Chipping Sparrow	3		1				3		2	1		3				7		6
Savannah Sparrow										1						1		
Fox Sparrow				2		1	1		1							3		2

Table 2 (continued). Capture summary for the five individual MAPS stations rated in Yosemite National Park in 2011, and all stations pooled. 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
Song Sparrow							7		9	42	4	41	7		4	56	4	54
Lincoln's Sparrow		3	6	14	2	10	17	6	40	31	3	22	2			64	14	78
Dark-eyed Junco	17		8	32		8	34	2	29	34	1	15	3		2	120	3	62
Unidentified Sparrow											2						2	
Black-headed Grosbeak				1						6		8	6		2	13		10
Lazuli Bunting							1						21		2	22		2
Red-winged Blackbird										2						2		
Brewer's Blackbird													1	1		1	1	
Pine Grosbeak	2															2		
Purple Finch										15	2	1	6	1		21	3	1
Cassin's Finch				1			4		1	2	1					7	1	1
Pine Siskin				2			5			2						9		
Lesser Goldfinch													9	1		9	1	
Lawrence's Goldfinch													8			8		
ALL SPECIES POOLED	81	6	29	159	16	27	251	24	114	334	57	177	155	93	31	980	196	378
Total Number of Captures		116			202			389			568			279			1554	
Number of Species	14	4	10	24	8	8	29	8	15	38	15	20	31	13	13	52	28	30
Total Number of Species		18			27			31			41			40			61	

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, and all stations pooled, operated in Yosemite National Park in 2011.

	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													3.2	0.0	0.00	0.7	0.0	0.00
Williamson's Sapsucker	5.6	0.0	0.00	2.3	0.0	0.00										1.0	0.0	0.00
Red-breasted Sapsucker				2.3	4.6	2.00	1.8	1.8	1.00	6.2	1.0	0.17	8.0	0.0	0.00	4.4	1.4	0.31
Hairy Woodpecker							1.8	0.0	0.00							0.3	0.0	0.00
White-headed Woodpecker				2.3	0.0	0.00							3.2	0.0	0.00	1.0	0.0	0.00
Northern Flicker							1.8	0.0	0.00	1.0	1.0	1.00	1.6	0.0	0.00	1.0	0.3	0.33
Olive-sided Flycatcher										3.1	0.0	0.00				1.0	0.0	0.00
Western Wood-Pewee										10.3	1.0	0.10	3.2	0.0	0.00	4.1	0.3	0.08
Hammond's Flycatcher	0.0	2.8	und.	0.0	4.6	und.	3.5	0.0	0.00	0.0	1.0	und.				0.7	1.4	2.00
Dusky Flycatcher	8.4	0.0	0.00	2.3	0.0	0.00	19.5	0.0	0.00	3.1	0.0	0.00				6.1	0.0	0.00
Western Flycatcher							1.8	0.0	0.00	3.1	2.1	0.67	1.6	0.0	0.00	1.7	0.7	0.40
Black Phoebe										1.0	0.0	0.00	3.2	6.4	2.00	1.0	1.4	1.33
Cassin's Vireo							1.8	0.0	0.00	4.1	1.0	0.25	3.2	0.0	0.00	2.4	0.3	0.14
Warbling Vireo				2.3	0.0	0.00	33.6	0.0	0.00	20.7	0.0	0.00	1.6	0.0	0.00	13.9	0.0	0.00
Steller's Jay	0.0	2.8	und.							2.1	0.0	0.00				0.7	0.3	0.50
Mountain Chickadee				6.9	0.0	0.00	7.1	5.3	0.75	2.1	2.1	1.00				3.1	1.7	0.56
Bushtit													1.6	0.0	0.00	0.3	0.0	0.00
Red-breasted Nuthatch				0.0	2.3	und.	1.8	5.3	3.00	0.0	1.0	und.				0.3	1.7	5.00
White-breasted Nuthatch													0.0	1.6	und.	0.0	0.3	und.
Brown Creeper	8.4	8.4	1.00	2.3	2.3	1.00	5.3	5.3	1.00	0.0	8.3	und.	1.6	0.0	0.00	2.7	5.1	1.88
Bewick's Wren													1.6	1.6	1.00	0.3	0.3	1.00
House Wren													3.2	20.7	6.50	0.7	4.4	6.50
Pacific Wren	2.8	0.0	0.00							0.0	1.0	und.				0.3	0.3	1.00
Golden-crowned Kinglet				2.3	9.3	4.00	14.1	19.5	1.38	1.0	2.1	2.00				3.4	5.8	1.70
Ruby-crowned Kinglet										1.0	0.0	0.00				0.3	0.0	0.00

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, and all stations pooled, operated in Yosemite National Park in 2011.

	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.
Hermit Thrush	2.8	0.0	0.00							0.0	1.0	und.				0.3	0.3	1.00
American Robin	11.2	2.8	0.25	16.2	9.3	0.57	1.8	0.0	0.00	8.3	1.0	0.13	4.8	0.0	0.00	7.8	2.0	0.26
Nashville Warbler										3.1	6.2	2.00	6.4	3.2	0.50	2.4	2.7	1.14
Yellow Warbler										1.0	0.0	0.00	6.4	1.6	0.25	1.7	0.3	0.20
Yellow-rumped Warbler	42.0	22.4	0.53	37.0	104.1	2.81	47.7	10.6	0.22	16.5	1.0	0.06	8.0	0.0	0.00	26.8	20.3	0.76
Hermit Warbler				0.0	4.6	und.	10.6	8.8	0.83	11.4	4.1	0.36				5.8	3.7	0.65
MacGillivray's Warbler				2.3	0.0	0.00	28.3	3.5	0.13	50.7	11.4	0.22	6.4	1.6	0.25	23.7	4.7	0.20
Wilson's Warbler							0.0	0.0	0.00	3.1	0.0	0.00	3.2	0.0	0.00	1.7	0.0	0.00
Western Tanager	2.8	0.0	0.00	6.9	0.0	0.00	14.1	0.0	0.00	7.2	0.0	0.00	1.6	0.0	0.00	6.8	0.0	0.00
Spotted Towhee													14.3	0.0	0.00	3.1	0.0	0.00
Chipping Sparrow	8.4	0.0	0.00				5.3	0.0	0.00	4.1	0.0	0.00				3.4	0.0	0.00
Fox Sparrow				6.9	0.0	0.00	1.8	0.0	0.00							1.4	0.0	0.00
Song Sparrow							7.1	10.6	1.50	24.8	30.0	1.21	8.0	3.2	0.40	11.2	12.5	1.12
Lincoln's Sparrow	5.6	0.0	0.00	30.1	11.6	0.39	38.9	3.5	0.09	25.9	8.3	0.32	3.2	0.0	0.00	21.7	5.1	0.23
Dark-eyed Junco	33.6	22.4	0.67	44.0	37.0	0.84	58.4	19.5	0.33	20.7	19.6	0.95	4.8	0.0	0.00	29.5	18.3	0.62
Black-headed Grosbeak				0.0	2.3	und.				13.4	0.0	0.00	9.5	0.0	0.00	6.4	0.3	0.05
Lazuli Bunting							1.8	0.0	0.00				31.8	3.2	0.10	7.1	0.7	0.09
Red-winged Blackbird										1.0	0.0	0.00				0.3	0.0	0.00
Brewer's Blackbird													1.6	0.0	0.00	0.3	0.0	0.00
Pine Grosbeak	5.6	0.0	0.00													0.7	0.0	0.00
Purple Finch										15.5	1.0	0.07	4.8	4.8	1.00	6.1	1.4	0.22
Cassin's Finch				2.3	0.0	0.00	7.1	0.0	0.00	2.1	0.0	0.00				2.4	0.0	0.00
Pine Siskin				4.6	0.0	0.00	8.8	0.0	0.00	2.1	0.0	0.00				3.1	0.0	0.00
Lesser Goldfinch													14.3	0.0	0.00	3.1	0.0	0.00
Lawrence's Goldfinch													12.7	0.0	0.00	2.7	0.0	0.00

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, and all stations pooled, operated in Yosemite National Park in 2011.

	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.
ALL SPECIES POOLED	137.2	61.6	0.45	173.5	192.0	1.11	325.3	93.7	0.29	269.9	105.5	0.39	178.1	47.7	0.27	230.8	98.3	0.43
Number of Species	12	6		17	11		25	11		30	21		30	10		49	29	
Total Number of Species		14			21			25			35			31			50	

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

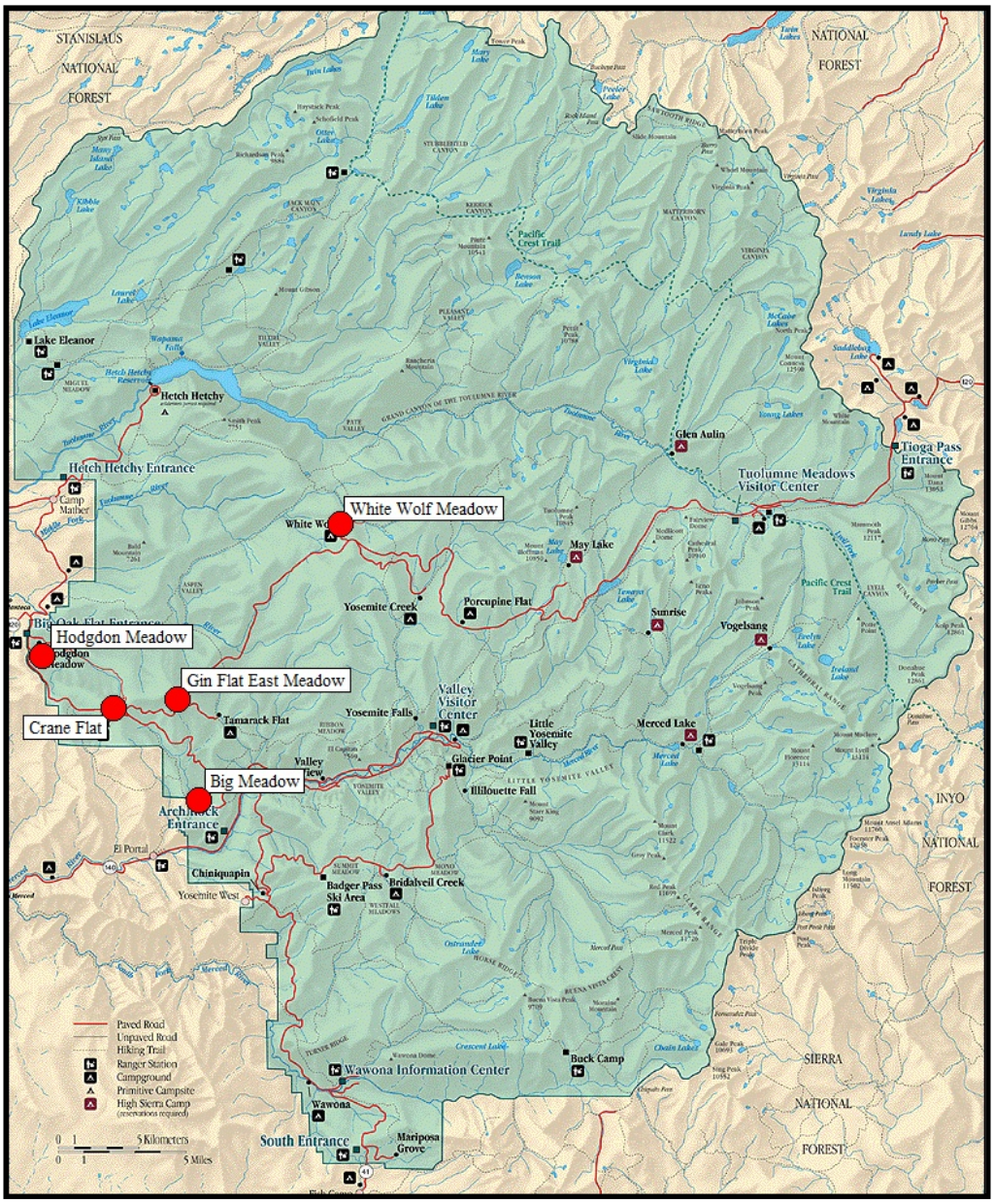

Figure 1. Locations of ongoing Monitoring Avian Productivity and Survivorship (MAPS) bird banding stations at Yosemite National Park.

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 22 years, 1990-2011, of the MAPS Program on the six stations ever operated in 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	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		
03002	SOGR	Sooty Grouse	O					
03040	WITU	Wild Turkey				T	T	
03100	MOUQ	Mountain Quail	O	U	O	U	B	
03130	CAQU	California Quail				O	O	
03370	VIRA	Virginia Rail				T		T
03430	SORA	Sora				M		
03780	KILL	Killdeer					T	
04020	SPSA	Spotted Sandpiper	O					
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	

Appendix I, continued.

NUMB	SPEC	SPECIES NAME	WHWO	GFEM	CRFL	HODG	BIME	TAME
06830	NOPO	Northern Pygmy-Owl		T		O	T	
06940	SPOW	Spotted Owl				O		
06970	GGOW	Great Gray Owl	T	U	O	O		
07040	NSWO	Northern Saw-whet Owl				T		
07330	BLSW	Black Swift					T	
07410	VASW	Vaux's Swift				T	T	
07530	WTSW	White-throated Swift	T	O		T	T	
08640	BCHU	Black-chinned Hummingbird			T	T	T	
08670	ANHU	Anna's Hummingbird	T	O	O	U	U	T
08680	COHU	Costa's Hummingbird					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	O	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	T			U
09800	RSFL	Red-shafted Flicker	U	B	U	B	B	U
09860	PIWO	Pileated Woodpecker	O	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	U	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
11555	WEFL	Western Flycatcher	T	O	U	U	O	T
11595	UEFL	Unidentified Empidonax Flycatcher	?	?	?	?	?	
11600	BLPH	Black Phoebe	O	O	T	O	B	

Appendix I, continued.

NUMB	SPEC	SPECIES NAME	WHWO	GFEM	CRFL	HODG	BIME	TAME
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	U	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
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	O	T
13440	VGSW	Violet-green Swallow		T		T	O	T
13490	NRWS	Northern Rough-winged Swallow				T	U	
13520	CLSW	Cliff Swallow					T	
13540	BARS	Barn Swallow				T	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	PAWR	Pacific 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		
14350	BGGN	Blue-gray Gnatcatcher				T	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

Appendix I, continued.

NUMB	SPEC	SPECIES NAME	WHWO	GFEM	CRFL	HODG	BIME	TAME
15110	WREN	Wrentit					U	
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		
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	O	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		O	O	O	U	
17850	CALT	California Towhee					T	
18020	CHSP	Chipping Sparrow	U	O	U	U	U	B
18110	SAGS	Sage Sparrow					T	
18130	SAVS	Savannah Sparrow				M	M	
18140	GRSP	Grasshopper Sparrow					M	
18220	FOSP	Fox Sparrow	T	O	O	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	

Appendix I, continued.

NUMB	SPEC	SPECIES NAME	WHWO	GFEM	CRFL	HODG	BIME	TAME
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	B	U	O
19360	CAFI	Cassin's Finch	U	O	O	O	O	O
19370	HOFI	House Finch			T	T	O	
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				T	T	M
19580	EVGR	Evening Grosbeak	O	T	T	T	O	T
19920	HOSP	House Sparrow					T	
20085	UNBI	Unidentified Bird	?		?	?	?	?