Monitoring Avian Productivity and Survival
2002 Annual Report

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Abstract

We conducted mist netting surveys of breeding passerines from the second week of May through the first week of August, 2002 at the Los Banos Wildlife Area (Los Banos WA) and the O'Neill Forebay Wildlife Area (O'Neill Forebay WA) of the Grasslands Ecological Area in Merced County, CA. These surveys are part of the long-term Monitoring Avian Productivity and Survivorship (MAPS) bird banding project to monitor passerine demographics throughout the United States. MAPS stations have been operated since 1998 at the Los Banos Wildlife Complex, where we have captured a total of 1,820 birds. Of these, 361 birds were recaptures. During the 2002 MAPS season, we caught and processed 494 songbirds of 38 species, including 105 recaptured individuals. Productivity rates remained relatively constant at the Los Banos banding station from 1998 to 2002 and at the O'Neill Forebay station from 1999 to 2001, with an increase at O'Neill Forebay WA during 2002. Shannon diversity index showed significantly higher species diversity at O'Neill Forebay WA compared to Los Banos WA. Jaccard's similarity index illustrated that approximately half the species were shared by both sites. The difference in community composition may have been related to habitat structure and landscape features of the sites. Management practices that enhance habitat may increase species diversity at Los Banos WA.

Keywords: *bird banding, MAPS, Los Banos Wildlife Complex, mist- netting, O'Neill Forebay Wildlife Area*

Introduction

The California Department of Fish and Game has been conducting passerine mist netting on the Los Banos Wildlife Area (Los Banos WA) and the O'Neill Forebay Wildlife Area (O'Neill Forebay WA) since 1998, as part of the national Monitoring Avian Productivity and Survival (MAPS) program. The Institute for Bird Populations, now a partner with the United States Geological Survey in the Biological Resources Division, created the MAPS program in 1989 as a long term study of landbird population demography over large areas and multiple spatial scales. Currently there exist approximately 500 MAPS sites, or banding stations, in the nation. The Institute for Bird Populations has identified three long term objectives for the MAPS program: 1) to provide information on productivity, adult survival rates, recruitment rates, population growth rates and population estimation on a large number of resident and migratory target species; 2) to identify and describe the temporal and spatial patterns in the demographic information gathered and determine the relationships between them; and 3) to use these patterns and relationships to determine reasons for population change, suggest management strategies, and evaluate the effectiveness of management implementations (DeSante and O'Grady 2000). Results of landbird population demography studies assist in ascertaining long term environmental health and stressors, and the effects of management actions on the populations studied.

On a local scale, the MAPS project is a useful way to track and monitor land bird use of particular habitats, response to management practices, and population fluctuations. Management strategies to maintain better habitats can then be directly integrated on the wildlife areas with regard to the data collected from the MAPS project. For example, at Los Banos WA, trees are being planted and managed to create more extensive riparian habitat. Additionally, a comparison may be made between the responses of landbirds to younger versus older reforestation sites. Therefore, information from the MAPS study can be immediately useful in management of songbird habitat and in long-term comparisons of habitat quality if continued over time.

Study Area:

Los Banos WA is a managed wetland/grassland complex located within the Grasslands Ecological Area in the central San Joaquin Valley. It is approximately three miles north of the city of Los Banos, in western Merced County, California (37^{o} 08' 05" N; 120^{o} 47' 57"W). Los Banos WA consists of 15,000 ha of wetland, grassland, and riparian habitats, and lies in the center of the Grassland Ecological Area (GEA) (Figure 1). The GEA (73,000 ha) is a mosaic of grassland, wetland, riparian, desert scrub, and agriculture owned by a diverse array of federal, state, and private landowners, which is the largest contiguous patch of wetlands remaining in California (Fredrickson and Laubhan 1995). The mist netting site at Los Banos WA is located along the Salt Slough riparian area (Figure 2). O'Neill Forebay WA is a 285 ha managed riparian area located on the southwest edge of the city of Santa Nella, California (37˚ 04' 50.65"N; 121° 01' 12.61"W), approximately 12 miles southwest of Los Banos (Figure 3). The habitat is consistent with the Grasslands Ecological Area habitat mentioned above, and the mist netting site is situated around a pond.

The climate of the Grasslands Ecological Area is characterized by hot, dry summers and cool, wet winters. Precipitation averages 21 cm/year and occurs primarily between November and March (Los Banos Wildlife Area unpublished data 1970-2000). The terrain is flat, ranging in elevation from 29 m to 33 m.

Methods:

We established banding sites according to MAPS protocols, which outline several important factors: 1) sites should be representative of the landscape of the surrounding area; 2) sites occur in an area where the structure of the vegetation is such that birds fly low through the area, therefore, a dense understory is desirable, 3) sites contain edge habitat for capturing a large number of dispersing young and adult birds; and 4) sites are free of any disturbances such as a major road which may influence bird flight through the site (Desante et al. 2002). The net sites were in close enough proximity to each other that they could all be checked on foot in approximately ten minutes.

The operation of our MAPS stations strictly followed the MAPS protocol. Twelve nylon mist nets (12 m long by 2.6 m tall) at O'Neill Forebay WA and 11 at Los Banos WA were opportunistically placed in riparian corridors according to the above site selection guidelines. The MAPS project defined ten 10-day periods of the breeding season beginning May 1, 2002, and ending August 8, 2002 (DeSante et al. 2002). Our sites were operated once each period from the second through the tenth period. We assembled and opened mist nets one half-hour before sunrise in fixed net lane locations, and banded for five hours after the first net was opened, checking each net at 30- to 40-minute intervals. We closed nets early if we perceived that adverse conditions (e.g. high winds or direct sunlight on the nets) could have endangered the lives of captured birds. Birds were handled by trained technicians who used cotton bags to transport the birds to a central location to be processed. The birds were banded with the appropriate size band (or the band number was recorded if it was a recaptured bird) and data were recorded for the time and net location of capture, species, age, sex, wing chord, breeding characteristics (a brood patch or cloacal protuberance), fat accumulation, molting patterns and any other measurements that were needed for species or sex determination (Pyle 1997). Finally, we released the bird when identification and measurement of the above were complete. We were careful to release breeding birds at the locations where they were caught in order to prevent a bird from crossing through hostile territories or getting lost.

Analysis

Cumulative sample sizes are not sufficient for computing survival rates, so abundance measures for 2002 and recapture rates throughout MAPS banding years were computed and displayed for comparison. Productivity rates, showing the ratio of adult to juvenile captures, were also calculated for both mist netting locations. When calculating productivity rates, we omitted migrant and transient (non-breeding) birds in order to represent breeding birds only. Migrant and transient birds were included in all other results, and all numbers of captured

birds include birds that were unbanded (unless it is specified that a result includes only banded birds).

We computed the Shannon diversity index at both sites for all years combined to compare species diversity, based on proportional abundances (Magurran 1998). Because the values generated by the diversity index are relative and not directly comparable, we calculated a t-test in order to detect any difference in diversity between the sites (Magurran 1998). The level of significance for the test was 0.05. We also calculated Jaccard's similarity indexes for all years individually and combined to show the similarity of bird communities between the sites (Magurran 1998). Jaccard's index values range from zero to one; a value of one indicates that all species are shared, and a value of zero indicates that no species are shared between two sites (Magurran 1998).

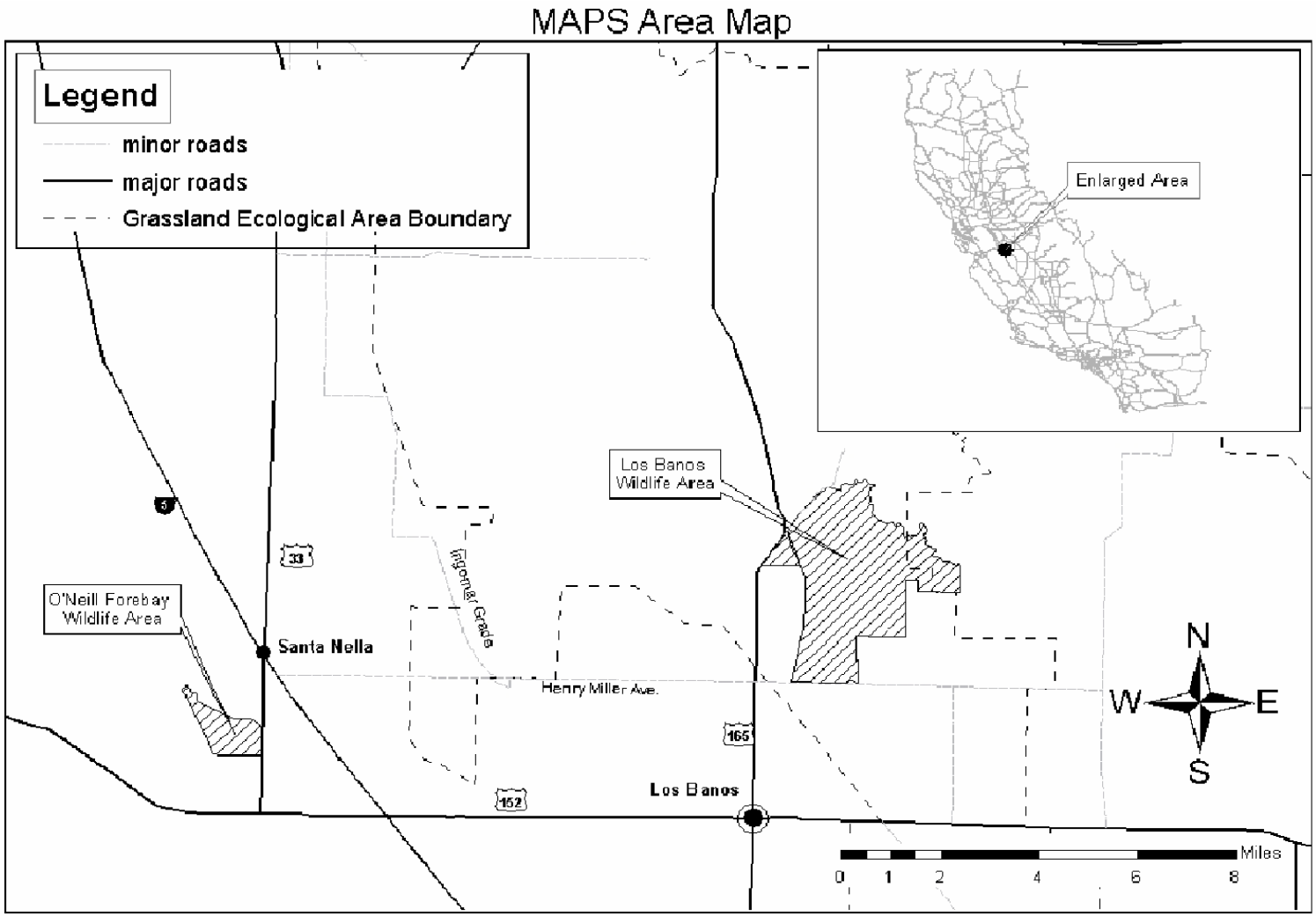

Figure 1. Locations of the Los Banos Wildlife Area and O'Neill Forebay Wildlife Area, Merced County, California.

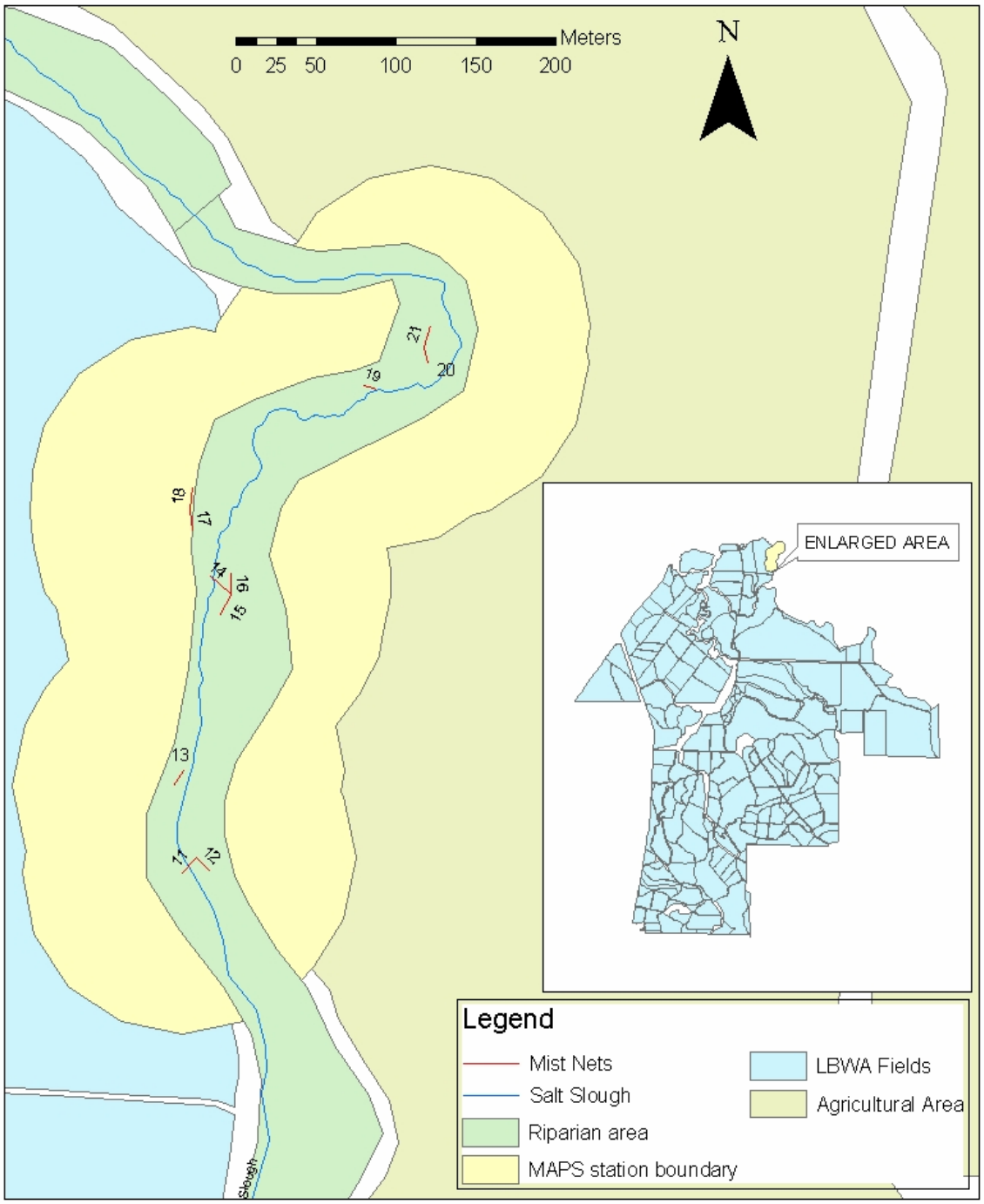

Figure 2. Location of MAPS site on Los Banos Wildlife Area, Merced County, California.

Figure 3. Location of MAPS site on O'Neill Forebay Wildlife Area, Merced County, California.

Results

Species

In 2002, we captured 38 species on the two MAPS sites (24 at Los Banos WA and 30 at O'Neill Forebay WA). We also banded two subspecies of Yellow-rumped Warbler (Audubon's and Myrtle) and two subspecies of White-crowned Sparrow (Gambel's and Puget Sound). Four new species were captured for the first time at each of the banding sites (Appendix 1 and 2).

Abundance

Since 1998, we have caught 1,820 birds, including 361 recaptures. In 2002, we processed 515 birds during the MAPS period. A greater number of birds, both new and recaptured, were processed at the Los Banos station than at O'Neill Forebay in 2002 (Table 1). The number of bird species caught in 2002 is greater than in any other single MAPS season at Los Banos WA and O'Neill Forebay WA combined (Appendix 1 and 2). Recapture rates have fluctuated at both sites among years, though they have been more stable at O'Neill between 2000 and 2002 (Table 2).

Table 1. Abundance data for MAPS banding stations at Los Banos Wildlife Area and O'Neill Forebay Wildlife Area, 2002.

Wildlife Area	***Total Birds Caught***	***Number of Banding Days***	***Average Number of Birds/Day***	***New Captures***	***Recaptures***
Los Banos	288	45	6.4	218	58
O'Neill	227	55	4.1	171	47

Table 2. Passerine recapture rates for all years at Los Banos Wildlife Area and O'Neill Forebay Wildlife Area.

Wildlife Area	***1998***	***1999***	***2000***	***2001***	***2002***
Los Banos	0.17		0.10	0.31	0.20
O'Neill		0.14	0.24	0.25	0.21

Survival Rates

We will compute survival rates for individual species when large enough numbers (>30) of adults have been recaptured in multiple years for 3 years or more (Nur et al. 1999). We soon expect to have collected significant MAPS

season data for House Wrens at Los Banos WA, Bewick's Wrens at O'Neill Forebay WA, and Song Sparrows at both sites (Table 3). As more juvenile birds are recaptured in successive years, we will also calculate survival rates of individuals initially captured as juveniles.

Table 3. Number of breeding adult birds per species recaptured across multiple years.

SPECIES	***Los Banos Station***	***O'Neill Station***
American Goldfinch	2	8
American Robin	2	5
Ash-throated Flycatcher	1	
Bewick's Wren	6	20
Brown-headed Cowbird	1	5
Black-headed Grosbeak		4
Bullock's Oriole		2
Bushtit	4	14
California Towhee	1	
Common Yellowthroat	1	
House Finch		4
House Wren	14	2
Loggerhead Shrike		1
Nuttall's Woodpecker	2	3
Song Sparrow	30	16
Spotted Towhee	9	8
TOTAL	78	120

Productivity

In 2002, juvenile birds represented 32% of captures at Los Banos WA and 36% at O'Neill Forebay WA. Productivity between 2001 and 2002 remained relatively stable at the Los Banos banding station, though rates varied in previous years and at O'Neill Forebay (Table 4).

Table 4. Passerine productivity rates for all years at Los Banos Wildlife Area and O'Neill Forebay Wildlife Area.

Wildlife Area	***1998***	***1999***	***2000***	***2001***	***2002***
Los Banos	0.30	N/A	0.42	0.34	0.32
O'Neill	N/A	0.28	0.14	0.23	0.36

Diversity and Similarity

Shannon diversity index (H') calculations were computed for all years combined at each site, resulting in H' of 2.50 and 2.91 at Los Banos WA and O'Neill Forebay WA, respectively. T-test results showed that O'Neill Forebay WA had significantly greater diversity of birds than Los Banos ($t = 7.61$, $df = 1586.05$, $P < 0.001$). Jaccard similarity indexes showed that the two sites had approximately half of their species in common, with slightly greater similarity in community composition during 2001 (2000 = 0.52, 2001= 0.63, 2002 = 0.48, all years combined = 0.54).

Discussion

Community compositions at the Los Banos and O'Neill Forebay banding stations have remained consistent across MAPS seasons. Bird communities may differ between the two sites because of differences in habitat and, subsequently, habitat use by birds. For example, there is a greater abundance of cavity nesting birds at Los Banos than at O'Neill. This difference may be related to a greater number of snags and older trees at the Los Banos WA site than at the O'Neill Forebay WA site. Additionally, Common Yellowthroats, a species that breeds in overgrown fields around riparian areas (Ehrlich et al. 1988), have been caught often at Los Banos WA, where the mist netting site is surrounded by upland fields, but rarely at O'Neill Forebay WA. The bird community at the Los Banos WA banding station may also have resulted from management practices on the adjacent seasonally flooded wetland and upland fields, and the edge habitat that is created between the riparian habitat and managed fields. For example, species that are more frequently captured at Los Banos WA compared to O'Neill Forebay WA such as the Spotted Towhee, Ash-throated Flycatcher, and Western Kingbird are species that use this edge habitat as a foraging area. The crop that is planted in the upland field and the timing of the irrigation may influence which species are captured at the MAPS site. Finally, migratory warblers have been captured at O'Neill Forebay WA more frequently than at Los Banos WA. Migration routes may be a cause of this difference. O'Neill Forebay

WA is closer to the Coast Range Mountains, a dominant geographic feature that migrants may use to orient themselves (Sibley 2001). This property may also attract migrants because it is one of few forested islands on the east side of the Coast Range Mountains. Forested islands are important stopover locations (for refueling) for long distance migrants such as warblers (Sibley 2001). A Chipping Sparrow was another first-time capture in 2002. Chipping Sparrows are migratory species in the study area, and this individual could have been a late migrant or out of its usual migratory route.

Common resident birds at Los Banos WA such as the Red-winged Blackbird, Bullock's Oriole, and Mourning Dove were caught for the first time this year. This may be attributed to habitat use differences and flight patterns. Red-winged Blackbirds primarily use grassland fields and wetland habitats (Erlich et al. 1998). Because our banding area is a riparian area composed of larger trees and a dense understory, it is rare for a Red-winged Blackbird to fly through this area. Similarly, Bullock's Orioles and Mourning Doves do not tend to breed in dense riparian habitats; they are usually found in open woodlands, agricultural areas, and suburbs with scattered trees (Erlich et al. 1998). Due to their size, Mourning Doves also have a tendency to escape from mist nets; this may also account for their low capture rate.

Differences in species diversity between the two sites may also be attributed to the different types and structure of habitats provided by each site. The banding station at O'Neill Forebay WA has a well established shrub layer and a greater number of tree species, creating a more varied habitat. Conversely, the Los Banos WA banding station has only two species of trees with a sparser shrub layer, and is not regenerating very rapidly.

Management Implications

Los Banos WA and O'Neill Forebay WA are both managed wetland/grassland properties. Passerine breeding and wintering population demographics and survival rates are important in determining appropriate management practices. Over time, species and abundance trends will be helpful information to assist in making management suggestions that involve breeding

passerines. Through management, useful breeding habitat can be maintained. Specifically, the greater diversity of breeding birds at O'Neill Forebay WA is in part attributed to the vegetation structure of the habitat. The creation of a more complex habitat through planting of vegetation could promote a desirable shrub layer at Los Banos WA and benefit the breeding bird diversity. Management practices at O'Neill Forebay WA can be used as a model for Los Banos WA to increase the amount of breeding passerines. Other strategies may include grazing/burning of grasslands, gap creation in riparian areas to allow necessary regeneration, leaving snags for bird use and planting or allowing for suitable conditions for increased riparian habitat. This is particularly important with grassland birds due to declining populations within the United States (Sauer et al. 2003).

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Appendix 1. All species captured (including unbanded birds) and recaptured during the MAPS season at Los Banos Wildlife Area.

SPECIES	1998		2000		2001		2002	
	Cap.	Recap.	Cap.	Recap.	Cap.	Recap.	Cap.	Recap.
American Goldfinch	12		16	1	5	2	20	2
American Robin	2		6	2	2	1	4	
Ash-throated Flycatcher	5		4		3	1	13	1
Bewick's Wren	4	3	6	1	5	3	3	2
Brown-headed Cowbird	2	1	2	1	1	2	3	3
Blue Grosbeak	1		1					
Black-chinned Hummingbird			2					
Black Phoebe	2		1		1		8	
Bullock's Oriole							1	
Bushtit	4		21	1	9		8	3
California Towhee			1					1
Chipping Sparrow							1	
Common Yellowthroat	1		6		16	1	35	3
Downy Woodpecker			2					
Gray Flycatcher			1					
House Finch	6		9		5		4	
House Wren	25	9	36	4	16	15	31	14
Lazuli Bunting					1			
Loggerhead Shrike					1			
MacGillivray's Warbler	1							
Mourning Dove							1	
Northern Rough-winged Swallow			1		1			

Appendix 1 *continued*. All species captured (including unbanded birds) and recaptured during the MAPS season at Los Banos Wildlife Area.

SPECIES	1998		2000		2001		2002	
	Cap.	Recap.	Cap.	Recap.	Cap.	Recap.	Cap.	Recap.
Nuttall's Woodpecker	3	2	3		3	4	4	2
Pacific-slope Flycatcher	1		2					
Red-shafted Flicker	1				2			
Red-winged Blackbird							1	
Song Sparrow	36	8	105	14	15	13	37	23
Spotted Towhee	10	2	10	7	2	3	8	4
Swainson's Thrush	2		28		3		13	
Tree Swallow	1				1			
Unidentified Empidonax flycatcher	1							
Warbling Vireo			1				1	
Western Tanager	3							
Western Scrub Jay					1		1	
Western Wood Peewee					1		1	
Willow Flycatcher							3	
Wilson's Warbler	1		3		1		4	
Yellow Warbler	2				2			
TOTAL	126	25	267	31	97	45	230	58

Appendix 2. All species captured (including unbanded birds) and recaptured during the MAPS season at O'Neill Forebay Wildlife Area.

	1999		2000		2001		2002	
SPECIES	**Cap.**	**Recap.**	**Cap.**	**Recap.**	**Cap.**	**Recap.**	**Cap.**	**Recap.**
Anna's Hummingbird	2		1				1	
American Goldfinch	21	2	12	4	3	3	8	4
American Robin	16	4	8	3	5		3	4
Ash-throated Flycatcher					3			
Black-chinned Hummingbird			2		1			
Bewick's Wren	19	10		17	23	22	22	16
Brown-headed Cowbird	5	5	2	1	2	2	4	
Black-headed Grosbeak	2		5	1		1	6	
Blue Grosbeak			1		2		2	
Black Phoebe			4		11	1	5	
Bullock's Oriole	3		5	1	2		6	1
Bushtit	9	3	14	3	24	8		1
Common Yellowthroat	1				1		1	
Gray Flycatcher							1	
Hermit Thrush	1							
Hermit Warbler			1					
House Finch	17	1	35	4	14	1	34	5
House Wren			5	1	8		7	1
Lazuli Bunting					1			
Loggerhead Shrike	1				1			1
MacGillivray's Warbler	4				4		4	
Mourning Dove	1				2	1	4	
Nashville Warbler	1							
Northern Bobwhite							1	

Appendix 2 *continued*. All species captured (including unbanded birds) and recaptured during the MAPS season at O'Neill Forebay Wildlife Area.

	1999		2000		2001		2002	
SPECIES	**Cap.**	**Recap.**	**Cap.**	**Recap.**	**Cap.**	**Recap.**	**Cap.**	**Recap.**
Northern Mockingbird					1		2	
Nuttall's Woodpecker	2		9	3	4		7	4
Orange-crowned Warbler	2		1					
Pacific-slope Flycatcher	3		2		1		2	
Ruby-crowned Kinglet	1							
Red-shafted Flicker							1	
Savannah Sparrow							1	
Song Sparrow	7	3	6	11	28	23	11	8
Spotted Towhee	3	2	4	7	3	7	2	2
Swainson's Thrush	27		19		29		13	
Unknown Hummingbird							3	
Warbling Vireo					1			
Western Tanager	1				1			
Western Scrub-jay					1			
Western Wood-peewee			2					
Willow Flycatcher	2		1					
Wilson's Warbler	20		17		26		22	
Yellow-breasted Chat	1							
Yellow Warbler	8		1		4		5	
TOTAL	180	30	173	56	206	69	180	47