East Molera Grassland Avian Monitoring Report

A Collaborative Effort Between:

California Department of Parks and Recreation
&
Ventana Wilderness Society's Big Sur Ornithology Lab

May 2001 - February 2003

March 2003

Compiled By:

Sarah L. Hamilton, Jason W. Scott, Jeff D. Frey

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

Introduction

Andrew Molera State Park is a 4,786 acre coastal unit of the State Park System located 26 miles south of Monterey on State Highway 1. The unit extends along the Pacific Coast for about two miles from Molera Point at the northwest boundary to Cooper Point at the southeast boundary. The 2,145 acres to the southwest of State Highway 1 is known as West Molera. It is bordered by private land to the southeast and northwest and by the Pacific Ocean to the west and southwest. East Molera, the 2,641 acres to the northeast of State Highway 1, is bordered by the Los Padres National Forest to the northeast and by private land to the northwest. The Big Sur River runs through the length of the park and empties into the Pacific Ocean just south of Molera Point.

Beginning this year in 2003 the California Department of Parks and Recreation (DPR) will implement a habitat restoration project in East Molera with the intent of restoring hundreds of acres to native coastal prairie. Grass species that typically occur in the coastal prairie plant community along this section of the Big Sur Coast are *Melica californica* (California melic), *Melica imperfecta* (small flowered melic), *Nassella pulchra* (purple needlegrass), and *Nassella cernua* (nodding needlegrass). A variety of native forb and wildflower species also occur in coastal prairie communities. Currently, large areas of East Molera are dominated by invasive non-native species such as *Bromus diandrus* (ripgut brome), *Cirsium vulgare* (bull thistle), *Carduus pycnocephalus* (Italian thistle), and *Raphanus sativus* (wild radish). Other areas of East Molera consist largely of coastal prairie indicator species (as listed above), or consist of a mixture of invasive non-natives and native coastal prairie species. Extensive stands of *Baccharis pilularis* (coyote brush), a native shrub, also exist in East Molera. The objectives of this restoration project are to reduce the number of invasive non-native plant species, reduce the current overgrowth of *Baccharis pilularis*, and seed/plant the area with native coastal prairie species.

Bird populations are widely considered to be an important indicator of the quality of habitat for all wildlife (Marzluff and Sallabanks 1998). To aid in evaluation of the planned habitat restoration efforts, we collected baseline data on the presence and relative abundance of landbird species using the East Molera Grasslands. We employed the area search method developed by the Point Reyes Bird Observatory and modified by the Big Sur Ornithology Lab. Area searches can be easily performed with limited equipment and personnel and is an effective means to assess land management techniques (Ralph et al. 1993). To monitor changes in vegetation composition and to determine possible management techniques and/or effects of the restoration, we recommend area searches be conducted throughout the restoration process.

Methods

In 2001 we established six permanent study plots (Appendix 1) in the East Molera Grasslands at Andrew Molera State Park in Monterey County, California. Plots were chosen to best represent the different structural components of the surrounding grassland and were spaced accordingly to reduce the potential of recounting individual birds from adjacent plots. We surveyed each plot for thirty minutes three times in spring 2001 (20 May - 20 June) and 2002 (1 May – 5 June), summer 2001 and 2002 (20 June – 25 July), fall 2001 and 2002 (15 September – 20 October), and winter 2001-02 and 2002-03 (15 December – 20 January) for a total of twenty-four survey days for each plot. During each season, we conducted two morning surveys and one afternoon survey in each of the six plots, using a standardized data sheet (Appendix 2).

Each survey day, two experienced observers split up and surveyed three plots each during a three-hour period. Morning searches began one-half hour after sunrise and afternoon searches started three and a half hours before sunset. We surveyed the plots on a rotating schedule such that each plot was sampled at different times during each set of searches. We documented bird species (Table 1) within each plot by song, call note(s), or visual identification. In addition to documenting species richness and abundance, we also documented breeding behaviors, e.g., copulation, territorial display, carrying food, carrying material, active nest, fledglings. Species observed flying over a study plot were not included as species using a plot.

Data presentation and Analysis

Species abundance and species richness for each site was compiled by totaling the number of individuals and species detected, respectively, from area search data. We calculated the SDI using the total number of individuals detected at each plot during each season and year.

The species diversity index (H) was derived from the Shannon-Wiener index (Krebs 1989). It reflects both the number and relative proportion of those species present in a sample. This index serves as a measure of the degree of uncertainty of predicting the species of an individual picked at random from an area search survey. The diversity index increases as the number of species and equability between species increases. The following formula was used to calculate species diversity (Pielou 1966).

For the Sum of $i = 1$ to $i = S$, $\quad H = - \Sigma (p_i)(\log p_i), \quad i = 1,2,\ldots S$

Where H = species diversity, S = the number of species in the sample, and p_i = the proportion of all individuals belonging to the *i*th species. The index varies from 0, in which all individuals belong to the same species, to a relatively high number with many species and an even distribution of individuals

among species. In general, greater species diversity implies greater heterogeneity in the sample (Nur et al. 1999).

Results

Comparisons of seasonal abundance, species richness, and species diversity indices for each area are summarized in Table 2. The following figures (Figures 1-6) display the annual mean abundance of species by season for each of the six areas. Figure 1 shows the total bird species plotted against the seasonal mean abundance detected in Area #1 for a total of 60 individuals of 39 species. Figure 2 shows the total bird species plotted against the seasonal mean abundance detected in Area #2 for a total of 35 individuals of 33 species. Figure 3 shows the total bird species plotted against the seasonal mean abundance detected in Area #3 for a total of 99 individuals of 37 species. Figure 4 shows the total bird species plotted against the seasonal mean abundance detected in Area #4 for a total of 101 individuals of 40 species. Figure 5 shows the total bird species plotted against the seasonal mean abundance detected in Area #5 for a total of 88 individuals of 30 species. Figure 6 shows the total bird species plotted against the seasonal mean abundance detected in Area #6 for a total of 44 individuals of 34 species.

Discussion

Areas with high densities of exotic vegetation (Areas 3 and 5) generally had greater abundance (0= 93.5) and lower species diversity indices (0= 2.5) (Table 2). Although Area 3 had relatively high species richness (37 species), Area 5 had the lowest species richness (30 species) (Table 2). In general, flocking avian species dominated areas with high densities of exotic vegetation- owing to the high avian abundance and low avian species diversity, compared to the areas with more native vegetation. In this case, Golden-crowned Sparrows and Bushtits were abundant in Area 3 and House Finches were abundant in Area 5.

During the breeding season these areas dominated by exotic vegetation had avian species present that would not normally be found in a grassland community, e.g. Red-winged Blackbirds were documented as probable breeders in Area 5. Furthermore we found that Song Sparrows (a riparian obligate) had a relatively higher level of abundance in these plots. Nest searching studies would reveal if these areas were acting as population sinks by documenting productivity for Song Sparrows and other certain focal species.

Areas containing less exotic vegetation (Areas 1, 2, 4, and 6) had variable avian abundance and avian species diversity. In particular, Areas 2 and 6 had the least avian abundance (0 = 39.5) and rather low avian species richness (0 = 33.5) (Table 2). Areas 2 and 4 had the highest avian species diversity indices (0 = 2.75) (Table 2). In general, specialized avian species, such as Grasshopper Sparrow and Western Meadowlark, and fewer flocks were observed most often in these areas, compared to areas with higher densities of exotic vegetation.

Area 4 consistently had the highest species richness and abundance throughout the year, averaging 40 species of 101 individuals. The greater number of birds in Area 4 may be because the area has a higher density of *Baccharis pilularis* than the other plots and is bordered by a riparian draw to the south. High densities of Bushtits throughout the year were observed in Area 4, owing to the high abundance over-all.

Species richness and abundance varied by season. Bushtits and Song Sparrows were present in large numbers during spring and summer in all areas, except Area 6 where Song Sparrows were observed in relatively lower numbers and Grasshopper Sparrows and Western Scrub-Jays were observed in relatively higher numbers. White-crowned and Golden-crowned Sparrows were only present during fall and winter surveys, with large numbers of these species documented in all areas except Area 2, where Lark Sparrows and Grasshopper Sparrows were more dominant. The Lark Sparrow, a predominately grassland species, was not detected at any other site.

Continued avian monitoring coupled with vegetation assessments are necessary to understand the relationship between exotic and native plant species with generalist and specialized bird species in the East Molera Grasslands. Because the levels of exotic plant species (both herbaceous and woody vegetation) appeared to vary significantly within each of the study plots, we feel it premature at this time to make further comparisons of bird use between plots.

To provide a more comprehensive analysis of how avian use relates to vegetation composition in the restoration area, we recommend the following actions.

- Area searches should be conducted for all seasons and years prior to restoration activities, (e.g. spring 2003, summer 2003, fall 2003, and winter 2003-04). Additional bird surveys prior to habitat restoration will enhance the data set and allow us to better evaluate the effectiveness of habitat restoration efforts.
- Area searches should be continued throughout the habitat restoration period, followed by post-restoration monitoring for at least five years.
- Thorough habitat assessment, including vegetation structure and composition, should take place in all plots during each season and year that avian monitoring is conducted. Habitat assessments during each season are necessary to associate bird use with specific habitat types that differ between plots.

Literature Cited

Krebs, C. 1989. Ecological Methodology. Harper and Row, N.Y.

Marzluff J.M. and R. Sallabanks 1998. Avian conservation: research and management. Island Press, Washington D.C., 512 p.

Nur, N., S. W. L. Jones, and G. R. Geupel. 1999. A statistical guide to data analysis of avian monitoring programs. U.S. Department of the interior, Fish and Wildlife Service, BTP-R6001-1999, Washington, D.C.

Pielou, E.C. 1966. The measurement of diversity in different types of biological collections. J. Theor. Biol. 13:131 – 144.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of field methods for monitoring landbirds. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 41 p.

Table 1. Avian species detected in six study sites in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).

Species Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
Acorn Woodpecker (ACWO) *Melanerpes formicivorus*			■			
Allen's Hummingbird (ALHU) *Selasphorus sasin*		■			■	
American Goldfinch (AMGO) *Carduelis tristis*	■	■	■			
American Kestrel (AMKE) *Falco sparverius*		■	■	■	■	■
American Robin (AMRO) *Turdus migratorius*	■	■		■		■
Anna's Hummingbird (ANHU) *Calypte anna*	■	■	■	■	■	■
Ash-throated Flycatcher (ATFL) *Myiarchus cinerascens*		■	■			■
Audubon's Warbler (AUWA) *Dendroica auduboni*	■					
Bewick's Wren (BEWR) *Thryomanes bewickii*	■	■	■	■	■	■
Black-headed Grosbeak (BHGR) *Pheucticus melanocephalus*				■		
Black Pheobe (BLPH) *Sayornis nigricans*	■	■	■	■		
Blue-gray Gnatcatcher (BGGN) *Polioptila caerulea*	■			■	■	■
Bushtit (BUSH) *Psaltriparus minumus*	■	■	■	■	■	■
California Quail (CAQU) *Callipepla californica*	■	■	■	■	■	■
California Towhee (CALT) *Pipilo crissalis*	■	■	■	■	■	■
California Thrasher (CATH) *Toxostoma redivivum*		■	■	■	■	
Chestnut-backed Chickadee (CBCH) *Poecile rufescens*			■	■		■
Chipping Sparrow (CHSP) *Spizella passerine*	■					
Common Snipe (COSN) *Gallinago gallinago*	■					
Common Yellowthroat (COYE) *Geothlypis trichas*	■					
Downy Woodpecker (DOWO) *Picoides pubescens*			■	■		
European Starling (EUST) *Sturnus vulgaris*	■	■	■	■	■	■
Golden-crowned Sparrow (GCSP) *Zonotrichia atricapilla*	■	■	■	■	■	■
Grasshopper Sparrow (GRSP) *Ammodramus savannarum*	■	■	■	■	■	■
Hermit Thrush (HETH) *Catharus guttatus*	■	■		■		
House Finch (HOFI) *Carpodacus mexicanus*	■		■	■	■	■
House Wren (HOWR) *Troglodytes aedon*			■	■	■	■
Hutton's Vireo (HUVI) *Vireo huttoni*				■		■
Lark Sparrow (LASP) *Chondestes grammacus*	■	■				
Lazuli Bunting (LAZB) *Passerina amoena*	■	■	■	■	■	■
Lesser Goldfinch (LEGO) *Carduelis psaltria*	■	■	■	■	■	■
Lincoln's Sparrow (LISP) *Melospiza lincolnii*				■	■	■
Loggerhead Shrike (LOSH) *Lanius ludovicianus*	■					
Mouring Dove (MODO) *Zenaida macroura*	■		■	■	■	
Myrtle Warbler (MYWA) *Dendroica coronata*	■				■	

Table 1 (cont.). Avian species detected in six study sites in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).

Species Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
Northern Harrier (NOHA) *Circus cyaneus*	■	■		■	■	■
Nuttal's Woodpecker (NUWO) *Picoides nuttallii*		■				
Oak Titmouse (OATI) *Baeolophus inornatus*			■			
Orange-crowned Warbler (OCWA) *Vermivora celata*			■			
Oregon Junco (ORJU) *Junco hyemalis oreganos*			■	■	■	■
Olive-sided Flycatcher (OSFL) *Contopus cooperi*						■
Pacific-slope Flycatcher (PSFL) *Empidonax difficilis*			■			
Purple Finch (PUFI) *Carpodacus purpureus*	■		■	■	■	■
Red-shafted Flicker (RSFL) *Colaptes auratus cafer*	■	■	■	■		■
Red-shouldered Hawk (RSHA) *Buteo lineatus*			■			
Red-tailed Hawk (RTHA) *Buteo jamaicensis*	■	■				■
Red-winged Blackbird (RWBL) *Agelaius phoeniceus*					■	
Ruby-crowned Kinglet (RCKI) *Regulus calendula*	■	■	■	■		■
Say's Pheobe (SAPH) *Sayornis saya*	■	■			■	■
Sharp-shinned Hawk (SSHA) *Accipiter striatus*		■		■		
Song Sparrow (SOSP) *Melospiza melodia*	■	■	■	■	■	■
Spotted Towhee (SPTO) *Pipilo maculates*	■	■	■	■	■	■
Steller's Jay (STJA) *Cyanocitta stelleri*			■	■		
Townsends' Warbler (TOWA) *Dendroica townsendi*						■
Turkey Vulture (TUVU) *Cathartes aura*						■
Violet-green Swallow (VGSW) *Tachycineta thalassina*	■					
Western Bluebird (WEBL) *Sialia mexicana*				■		
Western Meadowlark (WEME) *Sturnella neglecta*	■	■	■	■	■	
Western Scrub Jay (WESJ) *Aphelocoma californica*	■	■	■	■	■	■
Wilson's Warbler (WIWA) *Wilsonia pusilla*	■					
White-crowned Sparrow (WCSP) *Zoniotrichia leucophrys*	■	■	■	■	■	■
White-tailed Kite (WTKI) *Elanus leucurus*	■	■		■		
White-throated Sparrow (WTSP) *Zonotrichia albicollis*			■			
Wrentit (WREN) *Chamaea fasciata*	■	■	■	■	■	■

Shaded Blocks = species detected within area

Table 2. Comparisons of abundance, species richness, and species diversity indices in six study sites in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).

Area 1

	Spring		Summer		Fall		Winter		Total
	2001	2002	2001	2002	2001	2002	2001	2002-03	
Abundance	42	60	81	32	25	74	35	127	0 = 60
S.R.[a]	9	16	11	10	9	12	11	15	x = 39
S.D.I.[b]	1.87	2.44	1.75	2.08	1.99	2.01	2.23	1.61	0[c] = 2.68

Area 2

	Spring		Summer		Fall		Winter		Total
	2001	2002	2001	2002	2001	2002	2001	2002-03	
Abundance	28	42	47	62	19	46	21	15	0 = 35
S.R.[a]	10	12	9	13	8	12	12	11	x = 33
S.D.I.[b]	2.01	2.03	1.86	1.72	1.88	2.07	2.36	2.30	0[c] = 2.79

Area 3

	Spring		Summer		Fall		Winter		Total
	2001	2002	2001	2002	2001	2002	2001	2002-03	
Abundance	74	64	87	82	112	238	19	119	0 = 99
S.R.[a]	16	17	13	12	11	20	9	15	x = 37
S.D.I.[b]	2.21	2.28	1.95	2.24	2.00	1.97	1.99	1.99	0[c] = 2.51

Area 4

	Spring		Summer		Fall		Winter		Total
	2001	2002	2001	2002	2001	2002	2001	2002-03	
Abundance	85	51	69	124	129	131	126	95	0 = 101
S.R.[a]	14	12	12	16	16	22	19	17	x = 40
S.D.I.[b]	2.01	2.38	2.29	2.01	2.10	2.36	2.43	2.27	0[c] = 2.71

Area 5

	Spring		Summer		Fall		Winter		Total
	2001	2002	2001	2002	2001	2002	2001	2002-03	
Abundance	112	60	98	112	100	58	22	142	0 = 88
S.R.[a]	14	10	14	17	18	12	8	7	x = 30
S.D.I.[b]	2.17	1.44	2.32	2.38	2.26	2.02	1.64	1.05	0[c] = 2.58

Area 6

	Spring		Summer		Fall		Winter		Total
	2001	2002	2001	2002	2001	2002	2001	2002-03	
Abundance	34	56	31	70	29	48	28	53	0 = 44
S.R.[a]	12	9	10	14	10	14	10	11	x = 34
S.D.I.[b]	2.11	1.54	2.14	1.82	2.14	2.03	1.81	1.26	0[c] = 2.46

[a] Species Richness
[b] Species Diversity Index
[c] mean annual Total SDI

Figure 1. Mean number of individuals detected each season in Area 1 in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).

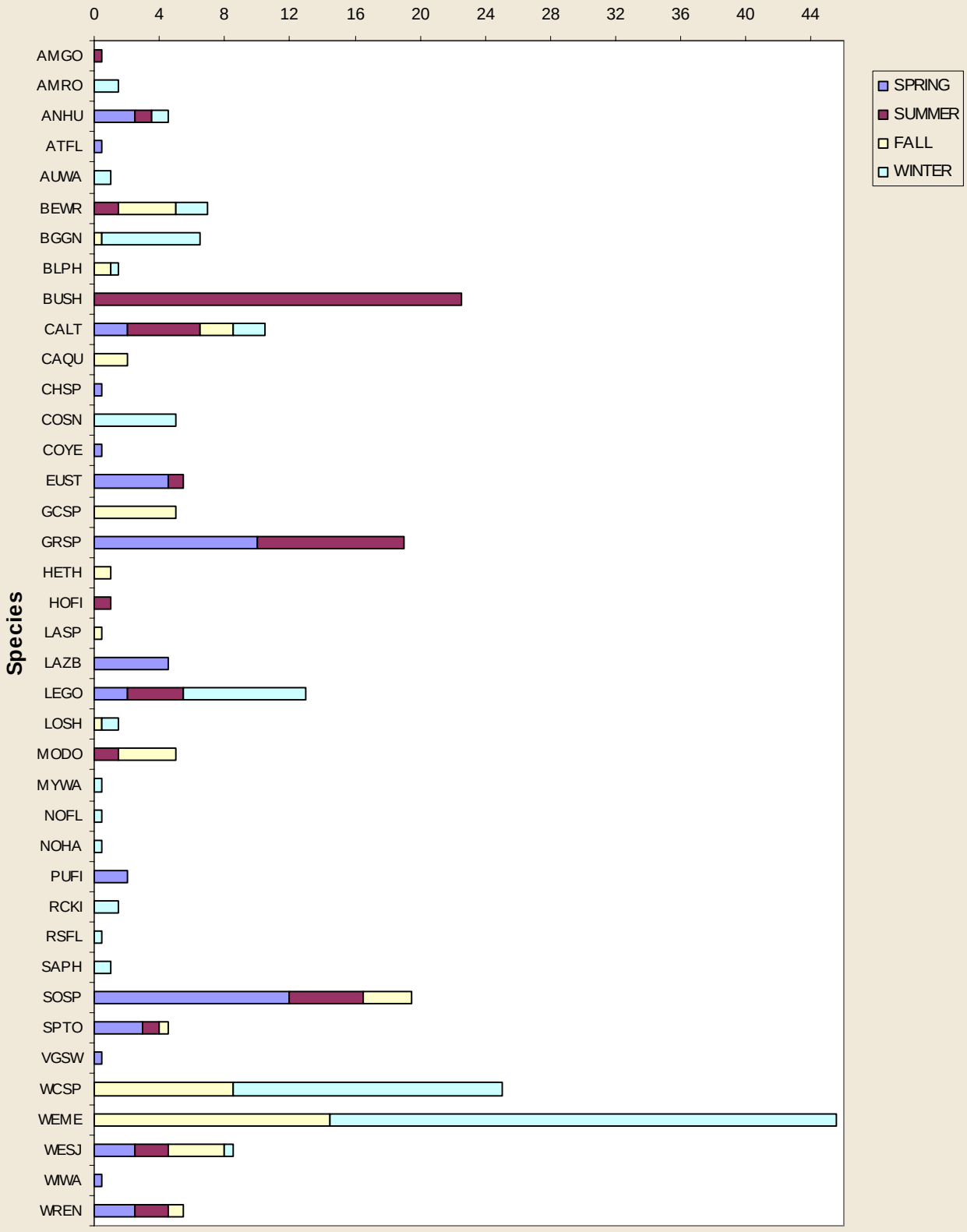


Figure 2. Mean number of individuals detected each season in Area 2 in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).

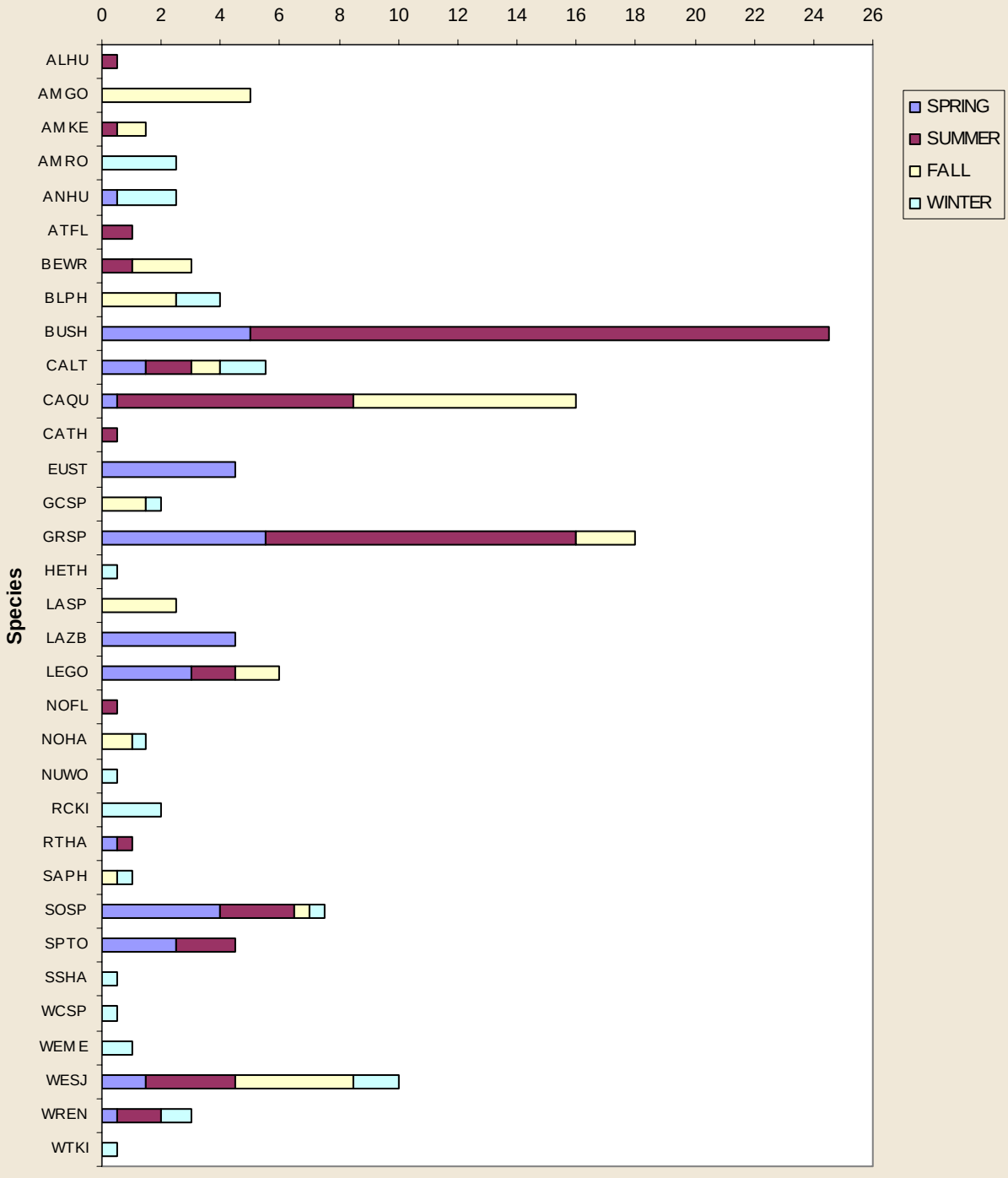


Figure 3. Mean number of individuals detected each season in Area 3 in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).

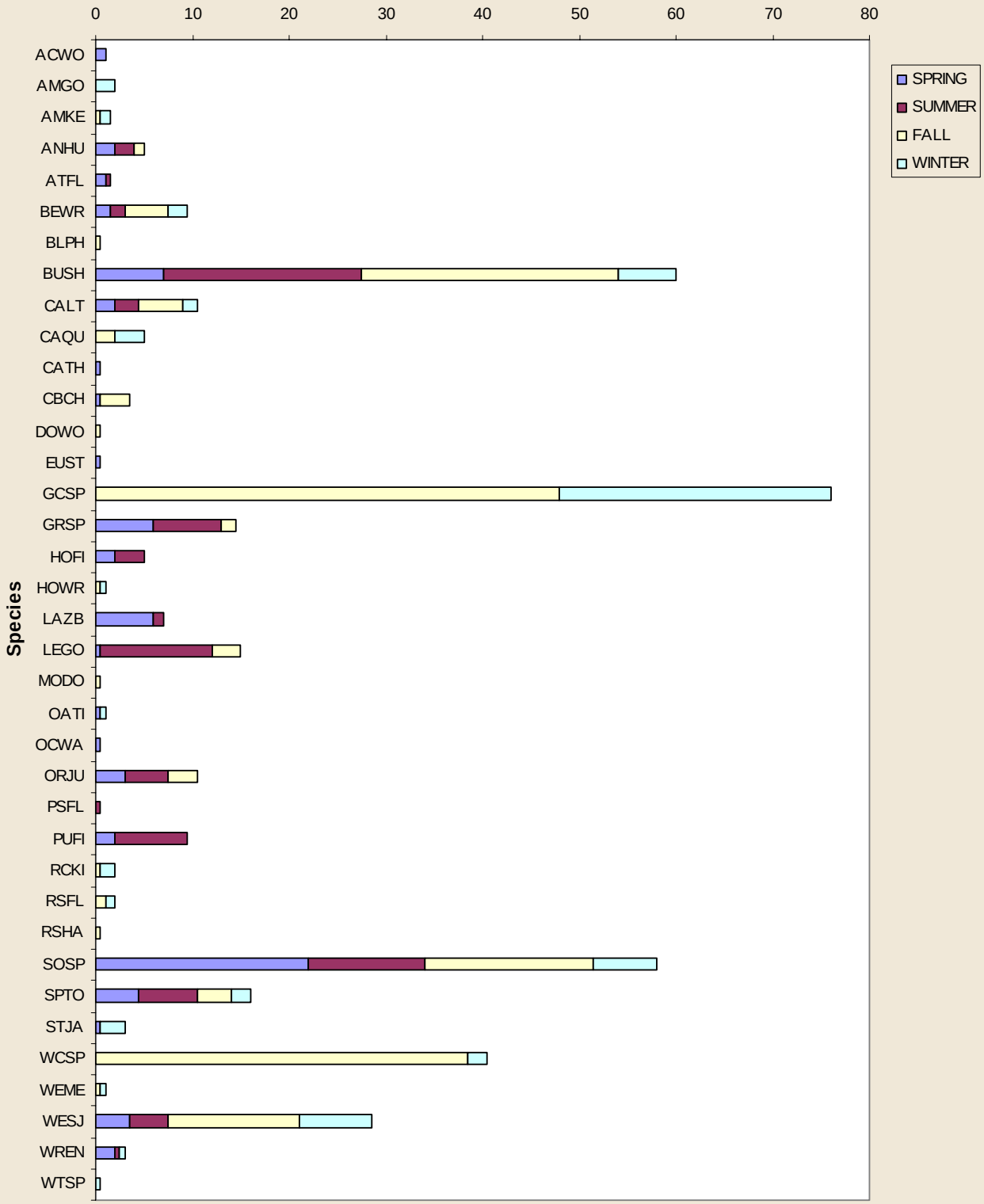


Figure 4. Mean number of individuals detected each season in Area 4 in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).

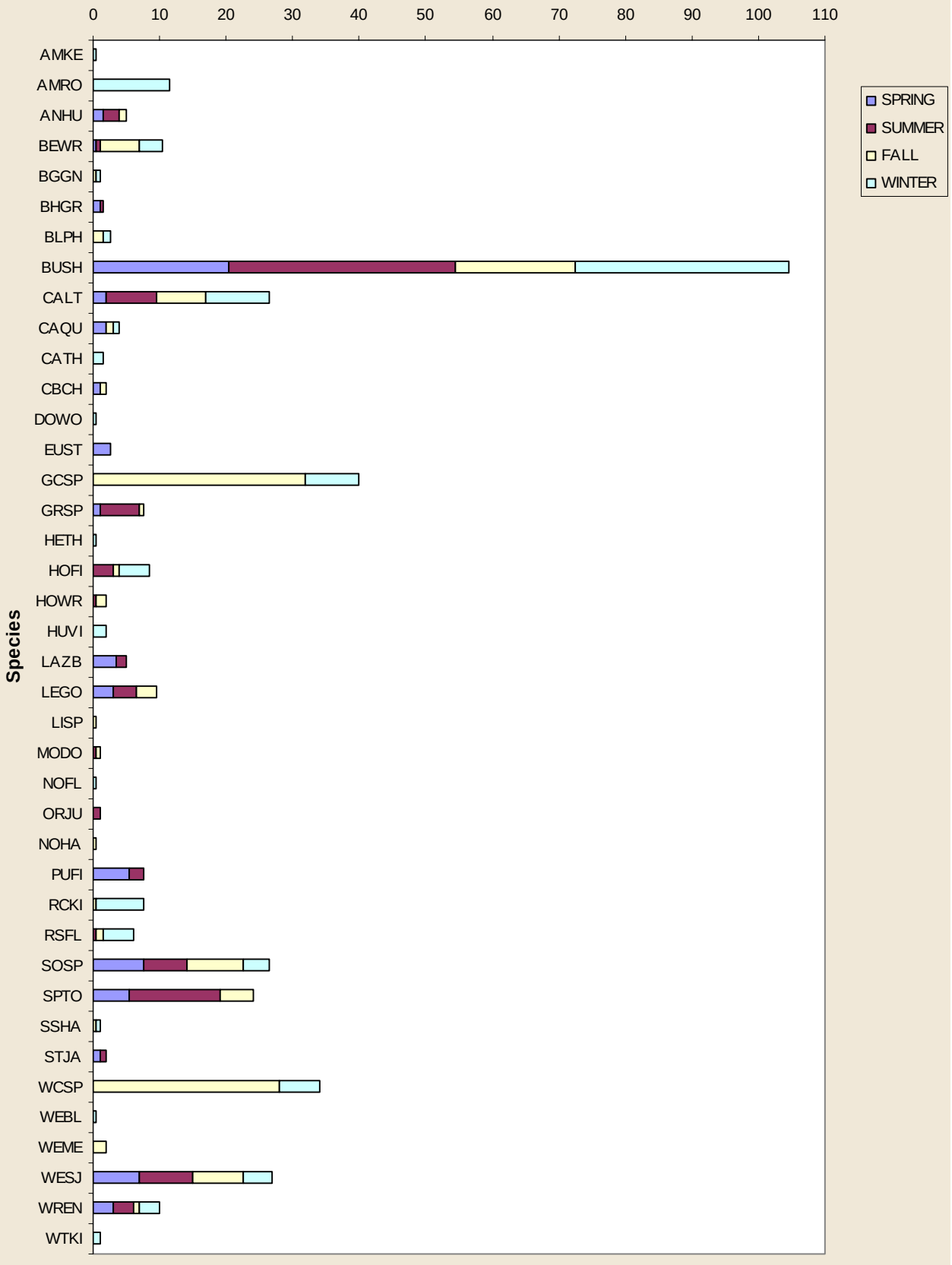


Figure 5. Mean number of individuals detected each season in Area 5 in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).

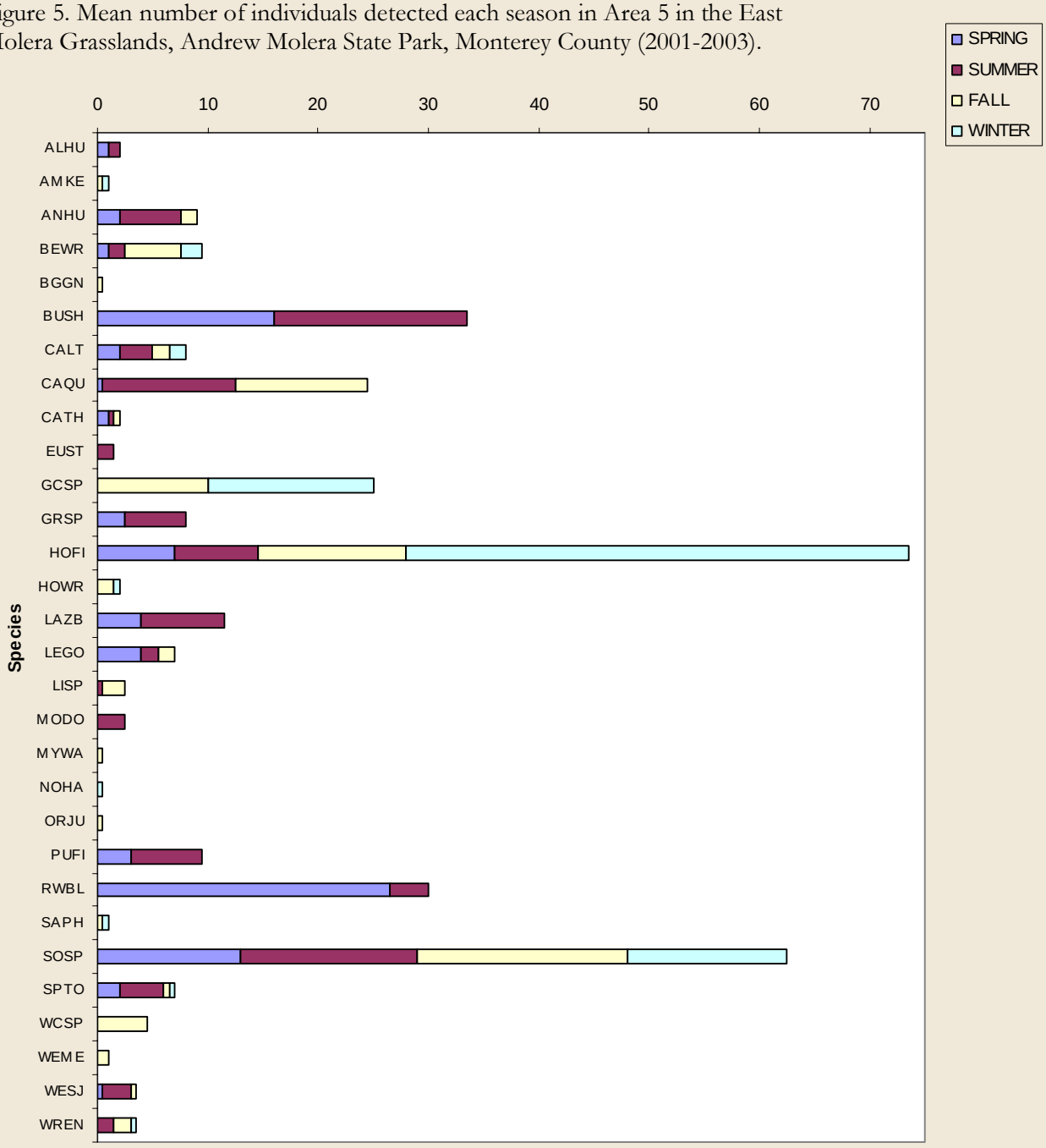
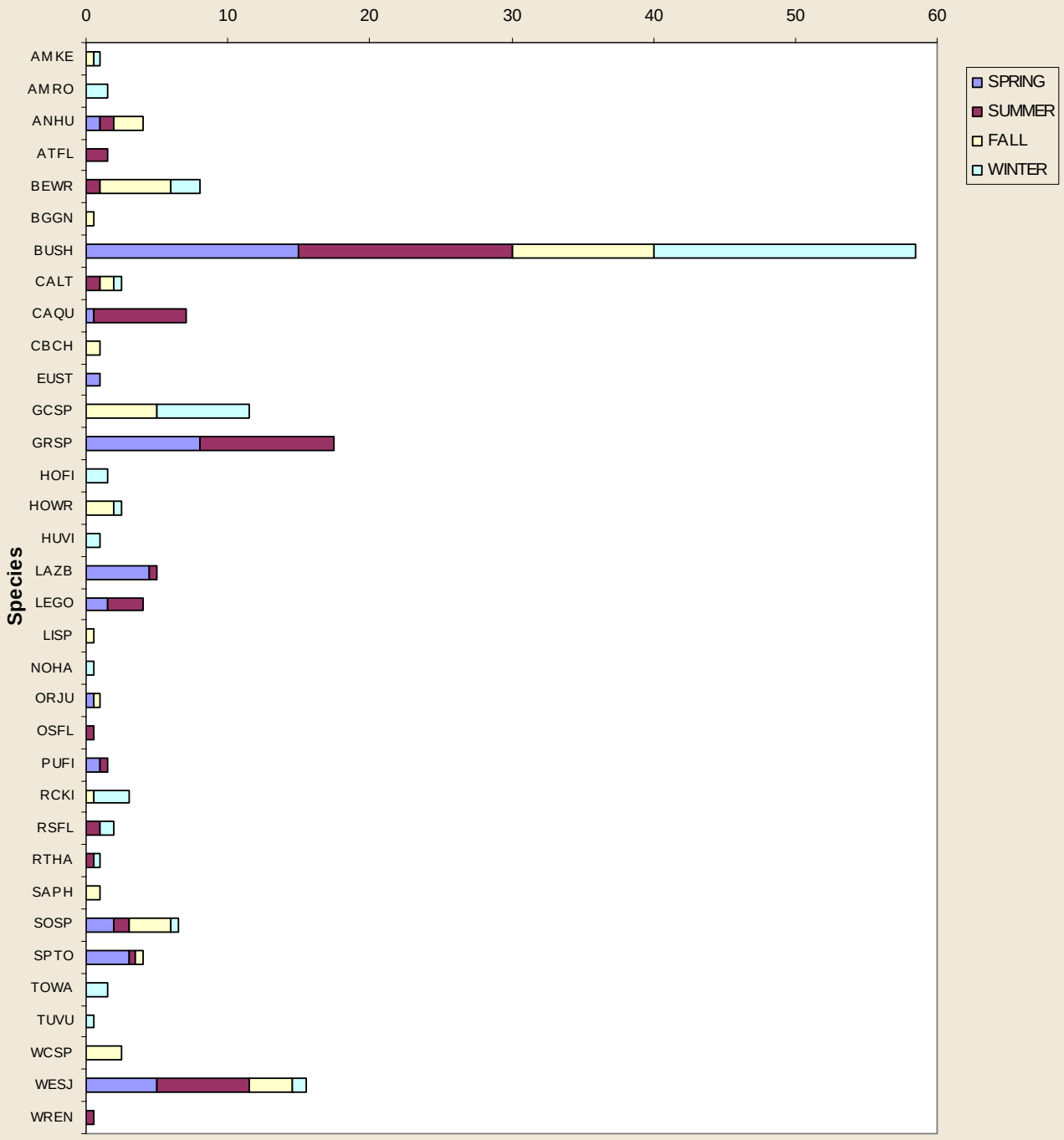


Figure 6. Mean number of individuals detected each season in Area 6 in the East Molera Grasslands, Andrew Molera State Park, Monterey County (2001-2003).



Appendix 1. Aerial Photo of Study Area (see hard copy)

Appendix 2. Area Search Data Sheet

EAST MOLERA GRASSLAND RESTORATION PROJECT

AREA SEARCH FORM

Area # __________ Visit # _______ Date: _________________
Start Time: _________ End Time: __________
Temperature _______°C Cloud Cover ______% Wind Speed ______ (BFT)
Observers: ______________
Explanation if Start Time to End Time is not 30 min:

Species				**Tally of Individuals** Song, Visual, Call, one letter per individual	***Total***	***Behavior*** (check if applicable)*								
						FO	***FL***	***CO***	***DI***	***PA***	***CM***	***CF***	***NE***	***FLE***

FO-foraging, FL-flock, CO-copulation, DI-territorial display, PA-par, CM-carrying material, CF-carrying food, NE-nest, FLE- fledgling

Notes and flyovers: ____