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DISTRIBUTION AND ABUNDANCE OF SPOTTED OWLS ON TWO SOUTHERN CALIFORNIA HABITAT ISLANDS¹

by

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ABSTRACT

The California Department of Fish and Game funded this study to estimate distribution, density, and occupancy of known, historic territories for two populations of California Spotted Owls (*Strix occidentalis occidentalis*) occurring on Mt. San Jacinto and Palomar Mountain, southern California. Spotted Owls on Mt. San Jacinto were well distributed throughout upper elevation forested habitats. Thirty-two Spotted Owls were sighted and banded on Mt. San Jacinto (13 males, 15 females, and 4 juveniles). Crude and ecological densities were estimated to be 0.16 and 0.24 owls/km², respectively. In contrast, owl distribution appeared to be affected by recent fires on Palomar Mountain. Twelve owls were banded (6 males and 6 females) and an additional nine adult and subadult birds (3 males and 6 females) and 3 juveniles were observed but not captured on Palomar Mountain. Crude and ecological density estimates for all banded and unbanded adult and subadults were 0.65 and 1.12 owls/km², respectively. While the crude density estimate for Mt. San Jacinto was similar to other density estimates for Spotted owls, the estimates for Palomar Mountain were more than double the crude densities and almost double the ecological reported in other parts of California. Several possible explanations were developed that may account for these differences. The ratio of subadults to adult territorial birds in both of these isolated populations was over twice that reported for contiguous populations of Northern and California Spotted Owls. Territory occupancy was similar to that reported elsewhere in that only one historic site was found not to contain owls.

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OF CALIFORNIA SPOTTED OWLS ON TWO
ISOLATED HABITAT ISLANDS IN SOUTHERN CALIFORNIA**

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INTRODUCTION

A great deal of research attention has been paid to the ecology of the Northern Spotted Owl (*Strix occidentalis caurina*) because of its decline following old-growth conifer logging in the Pacific Northwest (Gutiérrez and Carey 1985; Dawson et al. 1987). Thus we know much about the natural and life history of this bird (Forsman et al. 1984; Gutiérrez et al. 1984; Gutiérrez 1985; Franklin et al. in press). In contrast, much less is known about the ecology of the California Spotted Owl (*S. o. occidentalis*) and its response to environmental perturbations (Laymon 1988; Bias 1989).

Unlike the northern subspecies, the California Spotted Owl occurs as island populations in southern California (Grinnell and Miller 1944). Since much of the current controversy surrounding the Spotted Owl concerns the population size necessary to maintain demographic viability, studies of island populations will provide insight to the question of viable population management. Therefore, during 1988 we estimated the distribution, density, and general habitat use of California Spotted Owls on two isolated populations on Mt. San Jacinto, Riverside County and Palomar Mountain, San Diego County, California.

STUDY AREAS

Mt. San Jacinto (MSJ) and Palomar Mountain (PM) are two disjunct mountains located south of Banning, Riverside County and north of San Diego, California, respectively. Most of these mountains are covered with chaparral vegetation. However, at the higher elevations mixed conifer, pure pine (*Pinus* sp.), fir (*Pseudotsuga* sp.), and hardwood stands are present. In addition, live oak and riparian forests are found in some of the deeper canyons.

Surveys were conducted within forested habitats. Thus 17,272 ha (42,662 acres) on MSJ and 3,245 ha (8,014 acres) on MP were inventoried for Spotted Owls.

Both areas are influenced by opposing climatic patterns. They are influenced by the Mediterranean climate typical of coastal California on the west and by the inland desert to the east. Precipitation falls in winter primarily as rain with snow common at the highest elevations. Average annual precipitation is 64.3 cm (25.3 in) on MSJ and 73.9 cm (29.1 in) on PM. These areas are hot and dry during the summer. The average annual temperatures for MSJ is 5 to 21° c (39.5 to 70.0° F) with summer maximum temperatures 23 to 35° c (74 to 95° F) and winter minimum temperatures -9 to 4° c (15 to 39° F). PM's average annual temperatures range from 6 to 23° c (43 to 73.0° F) with summer maximum temperatures 24 to 33° c (76 to 91° F) and winter minimum temperatures -8 to 7° c (18 to 45° F).

METHODS

Forested habitat was first delineated on aerial photographs. These areas were then surveyed according to the methods of Franklin et al. (In press). Two types of night surveys were used to locate owls: point and cruise (Franklin et al. in press). Once a bird(s) was heard calling we attempted to find it the following morning during a "walk-in" survey (Franklin et al. in press). Once

an owl was located we attempted to capture the bird using noose poles or mist nets. Birds that we were unable to capture during walk-in or cruise surveys, we attempted to capture at night using mist nets. All captured birds were sexed, aged and banded with U. S. Fish and Wildlife Service locking aluminum bands on one leg and a unique color band/colored tab combination on the other leg (see Franklin et al. 1987 for a complete description of the band).

RESULTS

Surveys

Mt. San Jacinto

Eighty-six surveys consisting of 127 call points, 37 cruise surveys, and 27 walk-in surveys were conducted at 30 areas in the mountain range (Appendix 1). Thirty-two Spotted Owls were captured of which 13 were adult or subadult males and 15 were adult or subadult females (Table 1; Appendix 2; Figure 1). Four birds were juveniles fledged from three nests (Figure 1). All owls observed on MSJ were captured. A fourth pair attempted to nest but failed to fledge young. These birds represented 12 pairs and four single birds for a total of 16 owl sites.

Table 1. Age and sex composition of two isolated populations of banded Spotted Owls in southern California during 1988.

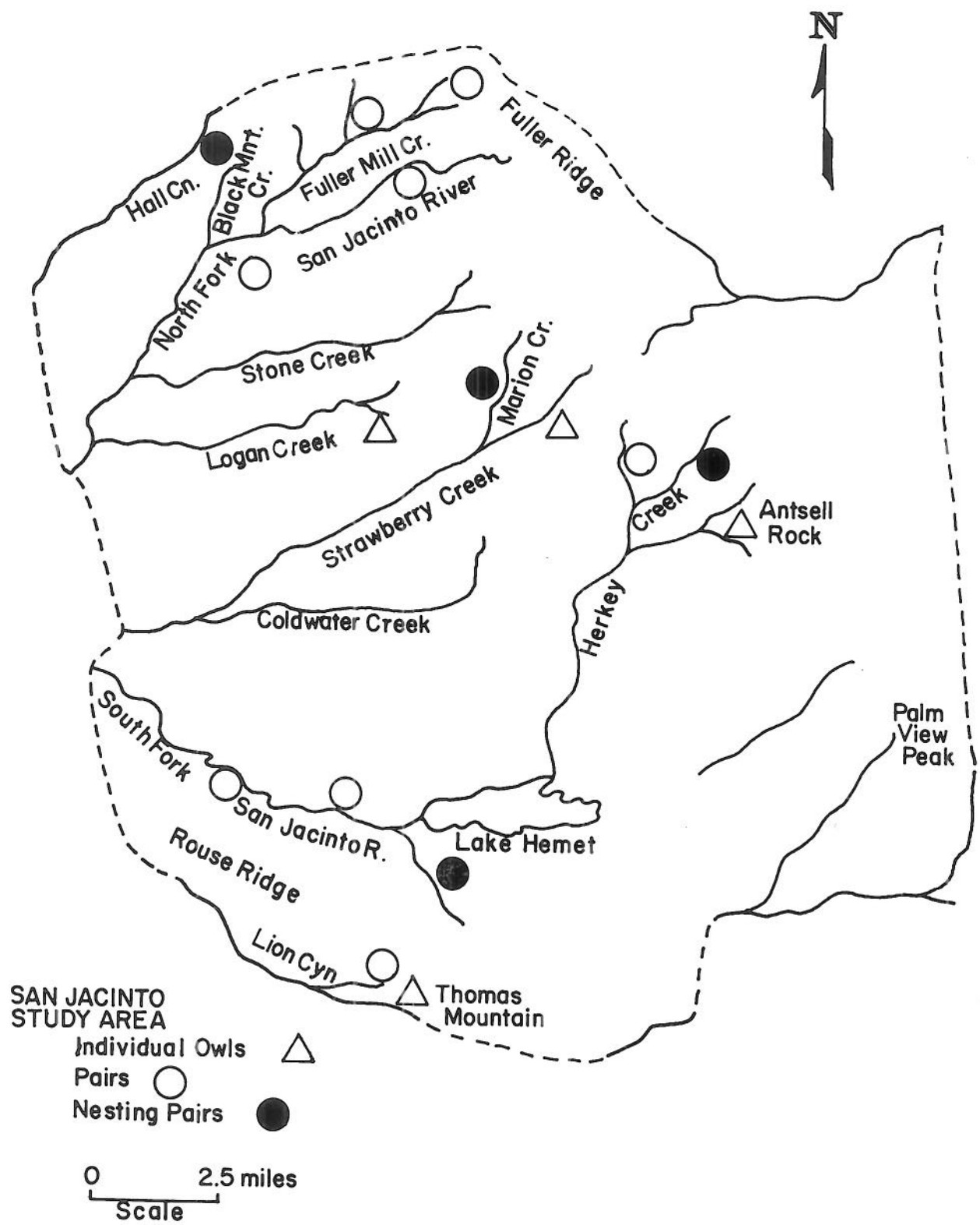
Area	AM ¹	SAM	U	AF	SAF	U	J
Mt. San Jacinto	10	1	2	8	5	2	4
Palomar Mt.	5	0	1	3	3	0	0
¹ AM=Adult Male; SAM=Subadult Male; U=Unknown age; AF=Adult Female; SAF=Subadult Female; J=Juvenile of unknown sex							

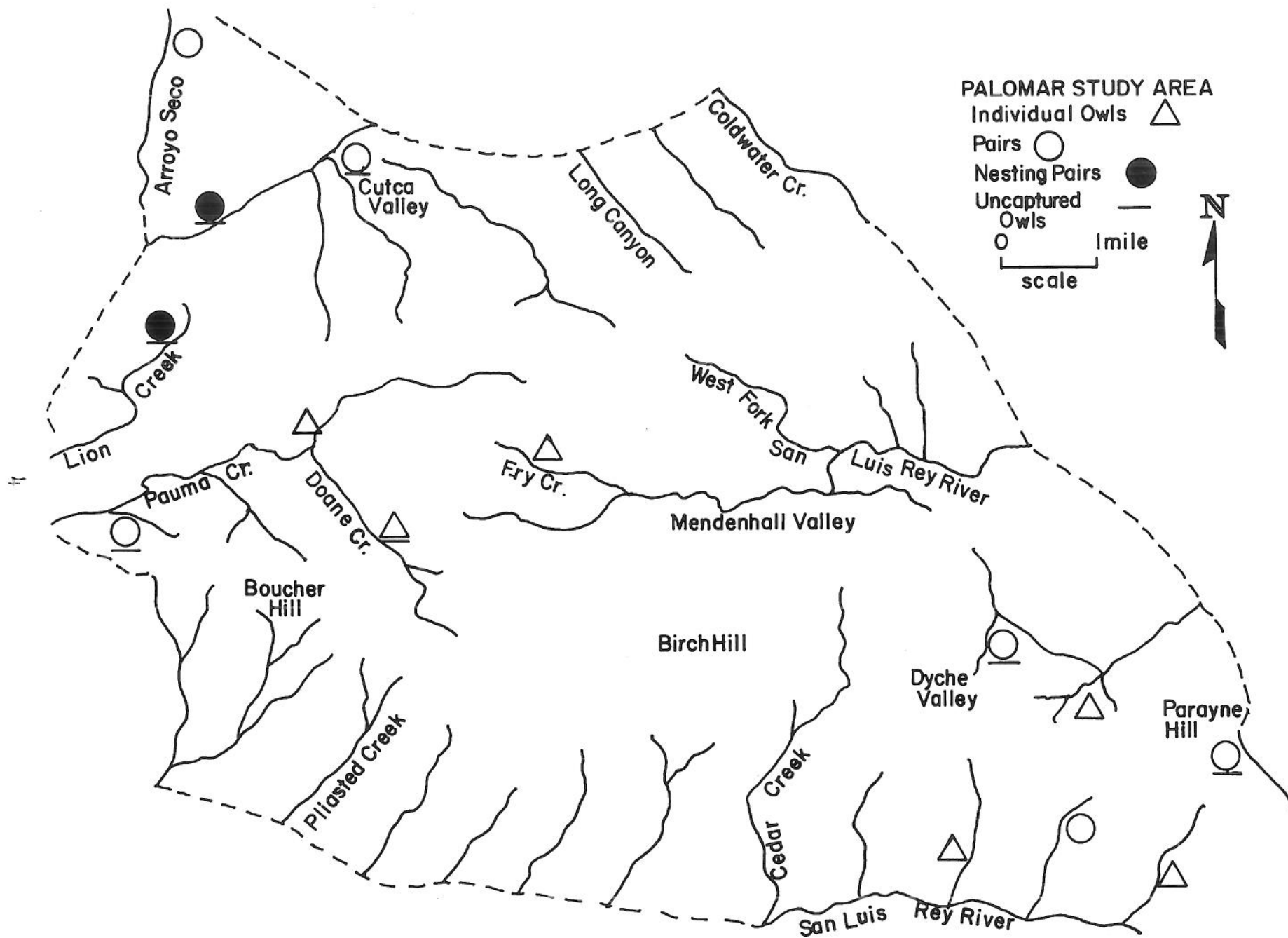
Palomar Mountain

Eighty surveys consisting of 95 call points, 28 cruise surveys, and 21 walk-in surveys were conducted in this area (Appendix 1). Twelve owls were banded of which six were male and six were female adult or subadults (Table 1). Nine additional adults and three juveniles from two pairs were not captured (Appendix 2). Thus, there was a minimum of 21 adult and subadults producing at least three juveniles on MP. We estimated that these birds represented eight pairs and six single birds for a total of 14 owl sites (Figure 2).

Distribution And Habitat Use

Spotted Owls were found throughout the forested canyons of the study areas. They occurred above 1,200 and 900 m elevation on MSJ and PM, respectively. We located owls in almost all drainages on MSJ. In contrast, much of MP west side forests were destroyed by fire in 1987. There was a major difference between the distribution of habitats in which owls were located and a random





selection of habitats within the area (Table 2). Most of the observed owls on MSJ used mixed conifer habitats while a few used hardwood stands; whereas most of the owls used mixed conifer-hardwood habitats on MP (Table 2). Chaparral was a dominant habitat on both areas but we never observed its use by owls. Because of this lack of chaparral habitat use, we could not statistically analyze the observed and expected distribution of owl habitat use on the study areas.

Table 2. Habitats used and available to Spotted Owls on Mt. San Jacinto and Palomar Mountain, California during 1988.

Area	Observed ¹	Expected
Mt. San Jacinto		
Conifer	12	5
Hardwood	5	4
Chaparral	0	8
Palomar Mt.		
Conifer	2	1
Hardwood	1	1
Conifer-hardwood	11	4
Chaparral	0	7
Grassland	0	1
¹ Observed = number of observations of Spotted Owls in habitat type Expected = number of observations for an equal sample of randomly selected habitat types.		

Density

Two estimates of density were calculated for each study area. Crude density was the number of birds divided by the total area sampled. Ecological density was the number of owls divided by the area of subjectively defined suitable habitat (e.g., mature stands of conifers, mixed conifers and hardwoods).

Crude density estimates for MSJ and PM were 0.16 and 0.65 owls/km², respectively. Ecological densities for MSJ were 0.24 owls/km² and 1.12 owls/km² on PM.

Territory Occupancy

Prior to this study six areas were known to harbor owls on MSJ and ten areas on PM. Four areas previously known to contain owls were surveyed in 1987 on MSJ by Gould et al. (1987) and three still contained owls (Appendix 2). They found owls still at four of seven sites checked on MP. We were unable to locate owls in only one of the 16 historic sites.

DISCUSSION

Spotted Owls have been recorded as early as 1908 on MSJ (Grinnell and Swarth 1913) and 1892 on PM (Stephens 1892). Owls were located at or near both of these historical sites during this study. Additionally, multiple records for one site on MSJ exist for eight of the last 16 years suggesting high site fidelity. In fact, only one site (Thomas Mountain, MSJ) on either area with previous occupancy was not observed to be occupied by owls in 1988. In the latter case, Franklin et al. (1987) considered it premature to declare a territory abandoned until at least two years of surveys were completed. This high site fidelity is well known for Northern Spotted Owls (Forsman et al. 1984). Continuous occupancy of an area could be related to either the species longevity, habitat suitability or habitat stability (Gutiérrez 1985).

Of particular interest was the ratios of adults to subadults on MSJ. Although our sample size was small, it represented at least 75% of the territorial population on MSJ. Twenty-two percent of the banded population on MSJ was subadult. Thirty-three percent of the females on MSJ were subadults. While the data for PM were not as extensive the trend was the same with 50% of the six banded females being subadult. These ratios were considerably higher than those reported for contiguous populations of Northern Spotted Owls (11% subadult; Franklin et al. 1988) and Sierra Nevada California Spotted Owls (4% subadult; unpublished data). This suggests that there was a higher turnover rate (i.e., mortality rate), particularly among females, in these isolated populations than in contiguous populations. Noon and Biles (in review) have modeled Spotted Owl population dynamics and concluded that variation in female mortality was most the important population parameter affecting population dynamics.

Spotted Owls were found primarily in conifer or mixed conifer and hardwood forests. A few birds were observed in live oak forests in deep canyons. All conifer habitats were well structured (i.e., had several vegetation layers), had high canopy closure (>70%), and contained relatively larger sized trees than in other forested habitats. Spotted Owl habitats on MSJ were similar in structure and composition to those found in the San Bernardino Mountains to the north (pers. obs.). PM habitats were slightly different in composition. They contained more hardwoods than did MSJ habitats. Like other studies of Northern and California Spotted Owl populations, birds on both MSJ and PM did not use grasslands, chaparral or open canopied habitats (Solis 1983; LaHaye 1988; Bias 1989).

The crude density of owls on MSJ was similar to that reported for both a Northern and a Sierra Nevada California Spotted Owl population (Franklin et al. in press; Bias and Gutiérrez 1987). However, the ecological density of Spotted Owls on PM was higher than that reported for Northern Spotted Owls (Franklin in press). These densities were computed only for adult and subadult owls. Since we believe more territorial owls still exist on both areas (see below), these density estimates should increase slightly with additional sampling.

There were several possible explanations for the high density on PM: 1) Spotted Owl habitat was more disjunct on PM; 2) the recent fires (1987) on PM may have displaced owls from the west side of the mountain to the east side; 3) we incorrectly calculated the area of suitable habitat on PM; 4) the number

of owls was overestimated; and 5) the small area sampled may have inflated the density estimate. First, Spotted Owl habitat was more disjunct on PM. Spotted Owls were usually in canyons with distinct habitat boundaries. Thus they were "isolated" by short distances of unsuitable (e.g., chaparral) habitat. Second, several historic sites were destroyed by fire during 1987. Several pairs of owls could have been easily displaced into areas already occupied by owls. If this was true then we should see a lower density in future years. Third, we calculated suitable habitat from U. S. Forest Service vegetation maps. These maps reflected plant species occurrences only. Therefore, we were unable to specifically categorize habitats except for those areas we actually visited. Fourth, since not all the birds were banded on PM we could have double sampled a few birds. In fact, we eliminated some observations for which this possibility was likely. This was possible based on movement patterns of Spotted Owls (Gutiérrez 1985). Yet there was enough accountability among the owl locations that we feel this was a minor error. In addition, future surveys probably will reveal other birds in areas where we found none. The last possibility was the effect of the small study area on estimating density. Franklin et al. (in press) predicted that an area as small as PM would have inflated estimates of density.

A combination of these factors may account for the high Spotted Owl density on PM. However, if this density is accurate then it would represent a marked deviation from the normal pattern of density recorded for Spotted Owls throughout the rest of their California range.

We believe that at least 4-6 additional pairs of owls may exist on MSJ judging from their present distribution and the habitat present. Several more pairs may also exist on PM for the same reasons. Continued studies of these two areas may prove useful in understanding the dynamics of small isolated populations.

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Appendix 1. Spotted Owl survey effort on Mt. San Jacinto and Palomar Mountain, California during 1989.

Location	Survey Effort ¹	Call Points ²	Cruise	Walk In	Location	Survey Effort ¹	Call Points ²	Cruise	Walk In
<u>San Jacinto</u>					<u>Palomar</u>				
Hall Canyon	9	18	9		Prison Camp Creek	3	6		
Oak Flat	1	2			Chimney Creek	3	3		
Azalea Creek	2	2	1		Upper Doane Valley	4		3	1
Twin Pines Creek	2	2			Boucher Hill	6			
Black Mountain Cr.	3	12		2	Pauma Creek	5	15		1
Fuller Ridge	3		3	2	Lion Creek	3	2		1
Fuller Mill Cr.	3	3	1		Lower Doane Valley	2	2		
N F San Jacinto R.	4	8	2	2	Iron Spring Creek	3	3		
Stone Creek	6	14	3		Fry Creek	4	12	4	1
Dark Canyon	3	15		2	Upper French Valley	3	6	1	
Marian Ridge	1		1		Morgan Hill	2	4		
Logan Creek	3	6			Cutca Valley	3	9	1	1
Marian Creek	6		2	4	Palomar Truck Trail	3		3	
Strawberry Creel	4		4	2	Auga Tibia Boundary	3		1	2
Fern Valley	3		3		Arroyo Seco	2	4		1
S J Wilderness	1		1		Crosley Saddle	1		1	
Coldwater Creek	2	4			Parayne Hill	4		2	2
E. Fork Herkey Cr.	2		2		Whigam Creek	2			2
W. Fork Herkey Cr.	2		2		Dyche Creek	2			2
Antsell	3		3		Barkeley Creek	2			2
Spillway Canyon	2	1		1	Will Valley	1			1
Thomas Mountain	3	18			Dyche Valley	6		2	4
Rouse Ridge	2			2	Cedar Creek	1	1		
N F Lion Canyon	4	8	2	1	Frazier Point	4	8		
S F Lion Canyon	3	4	1	1	Pedley Valley	3	6	3	
Palm View Peak	1		1		Mendenhall Valley	2	4	2	
Cedar Spring	1		1		Barker Valley	1		1	
S F San Jacinto R	1				Colb Valley	2		2	
	86	127	37	27	Cottonwood Creek	1	1		
					Long Canyon	1	1		
					Guard Station	2	2		
						80	95	28	21

¹ Survey Effort = number of times individual areas were surveyed

² There can be multiple call points, cruise surveys and walk-in census during each survey.

Appendix 2. Locations and occupancy of 61 sites surveyed during 1988 in the San Jacinto and Palomar study areas, San Bernardino and Cleveland National Forests, California. Legal descriptions give general location only.

Terr. Number	Location ¹	Town- ship ²	Range	Section	Occupancy Status by Year ³
San Jacinto Territories					
RI001	Hall Canyon	4S	2E	21	73(U), 74(H), 76(P) 79(M), 80(2), 81(R) 83(X), 87(Q), 88(P)
RI002	Dark Canyon	4S	2E	25	72(U), 74(P), 76(P) 82(X), 87(M), 88(P)
RI003	Strawberry Cr.	5S	3E	4	71(R), 74(M), 76(M) 83(2), 88(F)
RI004	Thomas Mtn.	6S	3E	28,29,34	74(M), 76(X), 87(X), 88(X)
RI006	Fuller Ridge	4S	2E	13	87(M), 88(P)
RI007	Pinewood	4S	2E	14	87(M), 88(P)
RI011	N Fk San Jac. R.	4S	2E	27	88(P)
RI012	Logan Creek	5S	2E	2	88(F)
RI013	Marian Creek	5S	3E	6	76(P), 82(1), 88(R)
RI014	W Fk Herkey Cr.	5S	3E	16	88(P)
RI015	E Fk Herkey Cr.	5S	3E	15	88(Q)
RI016	Antsell Rock	5S	3E	22	88(M)
RI017	Rouse Ridge	6S	2E	10	88(P)
RI018	S Fk San Jac. R.	6S	2E	12	88(P)
RI019	Spillway Canyon	6S	3E	17	88(Q)
RI020	N Fk Lion Canyon	6S	3E	30	88(P)
RI021	S Fk Lion Canyon	6S	3E	30	88(F)
	Oak Flat	4S	1E	13	88(X)
	Azalea Creek	4S	2E	9	88(X)
	Twin Pines Cr.	4S	2E	10	88(X)
	Black Mountain	4S	2E	11,14,15	88(X)
	Black Mtn. Cr.	4S	2E	22	88(X)
	Fuller Mill Cr.	4S	2E	23	88(X)
	Stone Creek	4S	2E	36	88(X)
		5S	2E	3	88(X)
	Marian Ridge	5S	2E	1,6	88(X)
	Fern Valley	5S	3E	4,5,6	88(X)
	S J Wilderness	4S	3E	34,35,36	88(X)
	Coldwater Cr.	5S	2E	26,30	88(X)
	Palm View Peak	6S	4E	5	88(X)
	Cedar Spring	6S	4E	4	88(X)

Appendix 2 cont'd.

Terr. Number	Location ¹	Town- ship ²	Range	Section	Occupancy Status by Year ³
Palomar Territories					
SD001	Upper Doane V.	10S	1E	5	74(M), 79(3), 87(X), 88(F)
SD002	Fry Creek	9S	1E	33	74(M), 79(M), 82(U), 86(M), 87(X), 88(F)
SD008	Pauma Creek ⁴	10S	1W	1	79(M), 87(X), 88(P)
SD009	Lower French V.	9S	1W	31	79(M), 87(P), 88(F)
SD012	Arryo Seco	9S	1W	11	82(U), 87(P), 88(P)
SD013	Agua Tibia Bd.	9S	1W	13	82(U), 87(M), 88(R)
SD014	Cutca Valley	9S	1E	20	82(2), 86(1), 88(P)
SD015	Lion Creek ⁴	9S	1W	25	82(U), 87(F), 88(N)
SD017	Upper French V.	9S	1E	28,29,33	82(3), 86(1), 87(X), 88(X)
SD018	Pedley Valley	10S	1E	11	82(U), 87(X), 88(X)
SD018	Mendenhall V.	10S	1E	12	82(U), 87(X), 88(X)
SD019	Will Valley	10S	2E	20	82(U), 85(1), 86(X), 88(P)
SD022	Pine Valley	10S	2E	18	85(P), 86(M), 87(X), 88(P)
SD025	Pine Creek	10S	2E	29	88(P)
SD026	Parayne Hill	10S	2E	28	88(P)
SD027	Barkeley Creek	10S	2E	30	88(M)
SD028	Wigham Creek	10S	2E	32	88(F)
	Boucher Hill	10S	1E	6	88(X)
	Prison Camp Cr.	10S	1E	16	88(X)
	Chimney Creek	10S	1E	9	88(X)
	Lower Doane V.	9S	1E	31,32	88(X)
	Iron Spring Cr.	10S	1E	3,4	88(X)
	Morgan Hill	9S	1E	30	88(X)
	Palomar Truck T.	9S	1W	23,24	88(X)
	Crosley Saddle	9S	1W	10	88(X)
	Cedar Creek	10S	1E	23,24	88(X)
	Frazier Point	10S	1E	15	88(X)
	Barker Valley	10S	1E	1	88(X)
	Colb Valley	9S	1E	35	88(X)
	Cottonwood Cr.	9S	1E	25	88(X)
	Long Canyon	9S	1E	26	88(X)
	Guard Station	9S	1E	27	88(X)

¹ Area may have multiple call points and/or survey routes.

² Township, range and section location during 1988.

³ Occupancy status codes:

U = unknown sex,

unknown number of birds present.

1 = 1 owl, unknown sex

2 = 2 owls, unknown sex

3 = 3 owls, unknown sex

F = Female

M = Male

P = Pair

X = No owls detected

Q = Pair with 1 juvenile

R = Pair with 2 juveniles

H = Female with 2 juveniles

N = Male with 1 juvenile

⁴ Areas need to be surveyed again to verify pair status, only one male banded.