

# DISTRIBUTION OF THE SPOTTED OWL IN CALIFORNIA

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The Fish and Wildlife Service (Bureau of Sport Fisheries and Wildlife 1973) listed the Spotted Owl (*Strix occidentalis*) as a species whose status needed to be determined. Until recently the status of this secretive woodland raptor was unknown by government wildlife agencies and considered to be rare. Furthermore, land practices were reducing the habitat of the Spotted Owl. For these reasons, the California Department of Fish and Game and the United States Forest Service cooperatively initiated and financed this study in July 1973. In 1974 the National Park Service became involved.

In 1973 I conducted surveys in the forested mountains in northwestern California. From March to September 1974 surveys were conducted throughout the remaining areas of coniferous forest in California. During the 1975, 1976 and 1977 breeding seasons, voids in the range were checked and known sites monitored by the author and other agency biologists.

## METHODS

Spotted Owls are located easily, especially during the breeding season (March through June) by using recordings or vocal imitations of their calls. Variations of the location call described by Forsman (1975) were used. In surveys where stops were made every one-half mile, owls usually responded to calls within 10 minutes. Frequently, these owls will approach the caller to defend their territory. Apparently only Spotted Owls that are paired adults will respond vigorously to calls (Forsman 1977). Where one owl was located, the mate would usually appear if imitation of calls continued. Sexes can be differentiated by their calls. The call of the female is higher pitched than the male's and she shows a greater use of the contact and agitated contact calls described by Forsman (1975).

Sightings of Spotted Owls noted in this report are limited to those where responses to calls were elicited, where calling was heard, and where pairs or adults with young were observed. Therefore, the locations noted herein should be representative of breeding territories. Though many visual observations have been made of Spotted Owls throughout the state, many of these are not representative of possible breeding territories. Young Spotted Owls disperse in the fall and as a result have produced a number of sightings not truly representative of the owl's habitat. Among the more notable of these are sightings of single individuals at Woodson Bridge State Park, Tehama County, on 24

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November 1972; San Diego Sports Arena, San Diego County, on 19 November 1973; Cottonwood Canyon, Riverside County, in November 1973; and Chico Cemetery, Butte County, from 31 January to 1 February 1975.

A search of literature and of museum specimens disclosed 102 historical localities of occurrence. Questionnaires completed by field ornithologists provided another 81 localities. These were used as a basis for establishing surveys. Other localities were checked when convenient.

### RESULTS

#### PAST DISTRIBUTION

Until recently, Grinnell and Miller's (1944) work included the only information available regarding the distribution of the California Spotted Owl (*S. o. occidentalis*) and the Northern Spotted Owl (*S. o. caurina*). A few additional locality records have been published for the Lake Tahoe area (Johnson and Russell 1962), Sequoia National Park (Sumner and Dixon 1953), the Laguna Mountains (Sams and Stott 1959), and other scattered localities (most notably in *Audubon Field Notes/American Birds*). These sightings are useful in determining the historical distribution of Spotted Owls in California.

California Spotted Owls have been recorded at sites in San Luis Obispo and Monterey counties, outside of the range defined by Grinnell and Miller (1944). Although the majority of sightings from this area have been reported in the last 10 years, Bent (1938) reported Spotted Owls in San Luis Obispo County. Additional extensions have been noted westward to Solvang in Santa Barbara County and south through the Cuyamaca Mountains in San Diego County.

The distribution of California Spotted Owl in the Sierra Nevada has changed little from that described by Grinnell and Miller (1944). Two recent sightings (Cogswell and Pray 1955; Sequoia-Kings Canyon National Park specimen taken 1965) have extended slightly the known range into central Tulare County. Johnson and Russell (1962) found Spotted Owls directly north of Lake Tahoe, only a few miles west of the California-Nevada border. Spotted Owls have not been reported from Nevada, although suitable habitat may exist in the Lake Tahoe area. Prior to this study, Spotted Owls had not been reported from the area between Placer County and Lassen National Park even though this area was included in the range described by Grinnell and Miller (1944).

#### PRESENT DISTRIBUTION

Spotted Owls, apparently occupying territories, were found at 317 sites in 36 counties (Appendix 1). Of these, 122 sites were in the range of the Northern Spotted Owl and 195 were in the range of the California Spotted Owl (Figure 1).

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Two pairs were located east of the previously described range of the Northern Spotted Owl in Shasta and Siskiyou counties. Future survey work in this area may indicate that these pairs near Mt. Shasta City and Lake McCloud are not isolated but are within an area where the population is sparse.

The California Spotted Owl was found in several areas outside of the range described by Grinnell and Miller (1944). In the south coast area, a large northward extension of the previously described range in the coastal mountains through Santa Barbara, San Luis Obispo and Mon-



Figure 1. Distribution of the Spotted Owl (*Strix occidentalis*) in California. The dashed line indicates the range described by Grinnell and Miller (1944). Dots represent localities of presumed breeding territories, 1973-1977.

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terey counties was substantiated. Also, a southern extension of the known range in San Diego County through Cuyamaca Rancho State Park and into the Laguna Mountains was noted.

In the southern Sierra Nevada, Spotted Owls were found in Sequoia National Park and on the Sequoia National Forest. These sightings extended the previously known range from the General Grant Grove and Redwood Mountain areas in northern Tulare County, south through Tulare County and into Kern County as far as Breckenridge Mountain.

Sightings of the California Spotted Owl in the remaining Sierran part of its range generally were within the range described by Grinnell and Miller (1944). Sightings made during this study demonstrated a greater continuity in distribution than had been reported previously. Most notable were sightings in El Dorado, Nevada, Yuba, Sierra, Butte and Plumas counties.

Sightings made during this study extended the previously described range into the eastern Sierra Nevada. Numerous records in the upper drainages of the Feather River in Plumas County are east of the boundaries of the old range but there are none in drainages of the east side of this section of the Sierra Nevada. Three sites were identified during this study in the Carson River drainage, an east side drainage, in Alpine County. Presently, these are the only known active sites on the east side of the Sierra Nevada; the site north of Lake Tahoe (Johnson and Russell 1962) was checked and no evidence of the two reported pairs was found.

### POPULATION SIZE

Four hundred and eighty-four Spotted Owls (191 Northern, 293 California), presumably representing 317 pairs, were located during this study. An accurate estimation of the statewide population cannot be derived from these figures since the amount of suitable habitat surveyed and the total available have not been calculated.

Enough data have been collected to delineate a number of population concentrations. The largest concentration of Spotted Owls in the state, along the South Fork of the Trinity River and into the Yolla Bolly Wilderness Area, Trinity and Tehama counties, and a major concentration on Point Reyes Peninsula, Marin County, are population centers for the Northern Spotted Owl. The largest concentrations of the California Spotted Owl exist along the Western Divide and in the Greenhorn Mountains, Tulare and Kern counties, Sequoia National Park, Tulare and Fresno counties, northwest of Yosemite Valley, Tuolumne and Mariposa counties, and in the Deep Creek and Green Valley area, San Bernardino County. Populations are scattered in Monterey, San Luis Obispo and Santa Barbara counties. Throughout the remainder of their range Spotted Owls appear to be rather evenly distributed in the available habitat.

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Spotted Owl (*Strix occidentalis*) with young in abandoned Goshawk (*Accipiter gentilis*) nest, Hot Springs Creek, Alpine Co., California, 8 June 1977.  
Photo by Rick Kline

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### POPULATION TREND

Since the size of past or present Spotted Owl populations in California is unknown, direct comparisons of population size cannot be made. However, during the study an attempt was made to check a number of historical reports more than 30 years old (Appendix 2). Spotted owls were present at 72% of the historical sites checked.

### HABITAT REQUIREMENTS

Elevation, timber type (using United States Forest Service timber type designations), topographic type, water availability and slope exposure were noted at 192 sites where Spotted Owls were found (Gould 1974). The habitat characteristics noted below are representative of territories defended by Spotted Owls.

In the north coast area, Spotted Owls were found frequently from 18 to 250 m elevation, an area dominated by Redwood (*Sequoia sempervirens*) and occasionally Bishop Pine (*Pinus muricata*) (Table 1). Grand Fir (*Abies grandis*), Douglas-fir (*Pseudotsuga menziesii*), California Laurel (*Umbellularia californica*), Red Alder (*Alnus rubra*) and Pacific Madrone (*Arbutus menziesii*) were secondary species in this area.

Douglas-fir was the dominant tree species where Spotted Owls were found between 850 and 1,800 m elevation in the north coast area. At about 16% of the sites Ponderosa Pine (*Pinus ponderosa*) was dominant. Understory hardwoods were Pacific Madrone, Tanoak (*Lithocarpus densiflorus*) and oak (*Quercus* sp.).

Canyon Live Oak (*Q. chrysolepis*) was the dominant tree species at 91% of the locations below 1,100 m elevation where Spotted Owls were found in the south coast area. Frequently California Laurel was found in association with Canyon Live Oak.

Above 1,100 m Ponderosa Pine became dominant. Incense Cedar (*Libocedrus decurrens*), Sugar Pine (*P. lambertiana*) and Coulter Pine (*P. coulteri*) were dominant at some sites. California Black Oak (*Q. kelloggii*) was the dominant understory at higher elevations. However, as a deciduous oak, it was incapable of providing, by itself, adequate habitat for Spotted Owls.

Spotted Owls were found almost exclusively in the mixed conifer zone, usually dominated by Ponderosa Pine, in the southern Sierra Nevada. The elevation, at sites occupied by Spotted Owls, varied from 825 m in Mariposa County to 2,300 m on Big Baldy Ridge in northern Tulare County. South of Amador County most sites were between 1,100 and 2,200 m elevation. Sugar Pine, White Fir (*Abies concolor*), Giant Sequoia (*Sequoia gigantea*), Douglas-fir, Incense Cedar, and California Black Oak were present with the Ponderosa Pine. Jeffrey Pine (*P. jeffreyi*) was present at only 8 of 58 sites where Spotted Owls were

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found in the southern Sierra Nevada and where the timber type was noted. None were located in the higher elevation timber types dominated by Red Fir (*A. magnifica*) and Lodgepole Pine (*P. contorta*).



Spotted Owl (*Strix occidentalis*), Hot Springs Creek, Alpine Co., California, spring 1977.

Photo by Rick Kline

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Table 1. Dominant timber types at 192 sites defended by Spotted Owls in California (Gould 1974). Comparative points were distributed on the frequency of occurrence of a timber type in the quarter quarter section where owls were located. Two points were given to the most common or major timber type in the quarter quarter section. One point was given to the second most common or minor timber type, provided it covered more than approximately 20% of the quarter quarter section, and three points were given to a timber type if it covered more than 80% of the quarter quarter section. This system considers minor timber types as well as major timber types at each site.

Timber Type	Points for Timber Type						Total
	North Coast		South Coast		Sierras		
	Red- woods	Doug. fir	Hard- woods	Coni- fer	<u>South</u> Mixed	<u>North</u> Mixed	
Douglas-fir	—	83	—	—	2	4	89
" dominant	—	36	—	—	4	19	59
Yellow pine	—	21	—	13	39	2	75
" dominant	—	1	—	4	44	21	70
Sugar Pine	—	1	—	2	2	—	5
" dominant	—	2	—	2	41	7	52
Bishop Pine	9	1	—	—	—	—	10
" dominant	—	—	—	—	—	—	—
Coulter Pine	—	—	—	—	—	—	—
" dominant	—	—	—	2	—	—	2
White Fir	—	—	—	—	6	2	8
" dominant	3	1	—	—	39	20	63
Redwood	47	—	3	—	—	—	50
" dominant	3	—	—	—	—	—	3
Giant Sequoia	—	—	—	—	—	—	—
" dominant	—	—	—	—	17	—	17
Incense Cedar	—	—	—	—	—	—	—
" dominant	—	—	—	6	3	—	9
Hardwoods	1	5	—	—	—	—	6
Calif. Laurel	—	—	5	—	—	—	5
Calif. Black Oak	—	—	—	3	—	—	3
Canyon Live Oak	—	—	19	—	—	—	19
" dominant	—	—	6	1	—	—	7
Noncommercial lands	—	2	—	—	1	—	3

North of Amador County, in the Sierra Nevada, Douglas-fir and White Fir approached Ponderosa Pine as being the most frequent dominant tree species. Most sites were between 1,100 and 1,700 m in elevation. The only sites where Spotted Owls were located in Red Fir occurred in Red Fir-White Fir associations on two occasions each in Plumas and Tehama counties and once each in Fresno and Tulare counties.



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Generally, in areas occupied by Spotted Owls, the quality of the forest was quite similar: a multi-layered forest with a diversity of tree species. Trees in the dominant timber type were larger than 0.83 m d.b.h. at 83% of the sites and were classed as moderately decadent to decadent. The canopy closure of the trees was at least 40% at 90% of the sites. Canopy height varied with forest type, but allowed flight space for the owls under the canopy.

Spotted Owls were found on the lower slopes of canyons at 89% of the sites. Water courses were present within 0.3 km of 90% of the sites. Spotted Owls were found on slopes with a northern exposure more than on slopes with other exposures.

### HABITAT DISTURBANCES

Fire must be considered when determining the permanency of occupation of any Spotted Owl territory. Within the last three years fires came close to destroying habitat at three occupied territories in the Los Angeles area. One site is believed to have been abandoned.

Human occupation and usurpation of habitat are major factors affecting populations of Spotted Owls today. Fourteen percent of 192 sites where the degree of human use was noted are in areas heavily used by humans. These sites include Yosemite Valley and Muir Woods National Monument with millions of visitors annually and the town of Idyllwild, basically a vacation home community. The key to the owl's continued occupation of these territories seems to be the quiet, apparently unperturbed disposition of the owl, the absence of disturbance in the still dense forest canopy, and the availability of habitat away from human disturbance.

Logging and other forest cutting practices appear to be the major causes making forest habitat unsuitable for Spotted Owls. Two adjacent sites reported occupied in 1960 and 1961 (Johnson and Russell 1962) were unoccupied in 1974. Since originally reported, both sites had been logged, removing approximately 80% of the canopy over 80% of the area around the sites. The destruction of the habitat apparently caused the owls to abandon their territories. Habitat destruction, usually involving logging, was the major cause believed responsible for the absence of Spotted Owls at five historical sites checked (Appendix 2).

In some areas where sufficient forest remains, Spotted Owls exist adjacent to areas that have been clear cut. On the Sequoia National Forest a series of adjacent drainages with similar habitat was checked for Spotted Owls. Areas with extensive clear cutting did not support owls, but less heavily cut areas of similar habitat did. The amount of area that could be clear cut and still have the area support a pair of Spotted Owls varied with habitat quality. On the Sequoia National Forest, high quality habitat appeared to contain groves of Giant Se-

quoia. These areas could maintain Spotted Owls with as much as 30% of the habitat clear cut. In lower quality habitat Spotted Owls were present with a maximum of only 10% of the available habitat removed by clear cutting.

## DISCUSSION

Spotted Owls are more widely distributed in California than previously believed. Even considering that habitat remains unchecked and that only a portion of the total population is reported here, the total numbers of this species are still quite small. I believe that the majority of prime habitat in the state has been surveyed during this study, and that not more than twice the number of pairs reported here can exist.

The extensions noted in the range of the Spotted Owl in California probably are not expansions in range; rather, they reflect greater effort to locate this species in areas previously overlooked.

Upon further investigation gaps in the range of the Spotted Owl may prove to be occupied. Checks of sightings made by cooperators in San Mateo and Santa Cruz counties, north and east of Lake Almanor in Lassen and Modoc counties, and on the east side of the Sierra Nevada in Mono County were negative. Perhaps those areas are marginal, and do not support breeding individuals. Also, a single night's check may have been inadequate to locate owls in these areas; this seems improbable though, because 15 surveys were run in these areas and Spotted Owls were found on approximately 60% of all surveys made.

The recent discovery of a pair of Spotted Owls near Lake McCloud, in north central Shasta County, presents the possibility of others in this area and further east on the Modoc Plateau.

Sites near Red Bluff, in the upper Sacramento Valley, although reportedly occupied, were not checked. No surveys were made in Amador County; however, the habitat here is continuous with adjacent areas along the western slope of the Sierra Nevada where Spotted Owls exist.

The assumptions that 28% of historical sites no longer support Spotted Owls and that populations have been reduced proportionally are questionable. Historical sites may not have been accurately described to facilitate relocation and some surveys may not have exposed owls which actually were present. But, for several reasons, this presumed reduction in population size probably is conservative. Early ornithologists may not have checked areas where logging has since occurred. Historical sites still occupied may have supported more pairs formerly than early reports indicate. And even though some historical sites were not accurately described, Spotted Owls are easily located and have been re-located at some ambiguously described, 70 year old sites. Finally, the recent expansion of usable habitat for Spotted Owls probably is nil.

Habitat types of areas maintaining Spotted Owls, although diverse, are similar. The multi-layered, evergreen forest, containing a variety of species, provides a diverse habitat for prey species. The decadent nature of the mature forest occupied by Spotted Owls provides nest sites in cavities or in broken topped trees. Even in mature evergreen forests, tree reproduction usually is occurring, and dense groves of young trees combined with a closed forest canopy provide protection from adverse weather for both owls and prey species. This protection from warm weather is apparent in the location of territories close to water and on north facing slopes in canyon situations.

It appears that human usurpation of habitat has had an adverse effect on Spotted Owl populations. Logging apparently has been responsible for the abandonment of territories, and although Spotted Owls still may be found in some areas of high human use or logging, the true measure of their population stability, their recruitment rate, is unknown.

#### SUMMARY

The distribution, population size, and basic habitat requirements of the two subspecies of Spotted Owl found in California are discussed. Expansions of the previously described range were noted in two areas along the eastern edge of the range in the north coast area, north to Monterey County and south in San Diego County in the south coast area, and south into northern Kern County in the Sierra Nevada. Also, the continuum of the range in the northern Sierra Nevada was confirmed.

One hundred and ninety-one Northern and 293 California Spotted Owls, believed to represent 122 and 195 pairs, respectively, were located during this study. Six areas of major population concentrations were identified. Comparing historical site occupation with present occupation of these sites indicates a reduction of 28% in population size.

Spotted Owls were located most frequently in dense coniferous forests at elevations from less than 30 to 2,300 m above sea level. Dominant tree species varied from one geographic area to another, but all were evergreen. Generally, forests at sites occupied by Spotted Owls were mature and multi-layered, had trees greater than 0.83 m d.b.h., contained a variety of tree species, displayed a moderate degree of decadence, and formed a canopy where the closure was greater than 40%. Spotted Owls usually were found in canyon situations, on north facing slopes, and within 0.3 km of water.

Human usurpation of habitat appears to be the major detrimental effect on Spotted Owl populations in California.

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### APPENDIX 1

Listed below are the most recent California records (through 1977) of which I am aware. Records are listed by county and within the county by chronological order in which they were found; however, dates and names correspond to the most recent report for each location. Numbers in parenthesis indicate the number of territories at that general location.

Individuals responsible for multiple sightings listed below are noted with the following abbreviations: Katherine Balderston, KB; Cameron Barrows, CB; Tom Beck, TB; Margaret Bell, MB; Dennis Clemins, DCl; Dave Connell, DC; Jim Cook, JC; Nicolle Culbertson, NC; Larry Forbis, LF; Bob Gale, BG; Dave Garber, DG; Gordon Gould, GG; Bill Harvey, BH; Jerry Ingco, JI; Andrew Lovato, AL; Kathy Lucich, KL; Tom Newman, TN; Point Reyes Bird Observatory, PRBO; Bernie Rios, BR; and Jim Snowden, JS. Individuals in parenthesis were responsible only for conveying sightings to me.

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To reduce the likelihood of owl disturbance, locality descriptions are given in general terms. More precise locality data, for use by land management agencies, are available in Department of Fish and Game files in Sacramento.

- Alpine Co. Pleasant Valley Creek: early June 1976, Rick Kline. Hot Springs Creek: 8 June 1977, Rick Kline. East Fork Carson River: 1 July 1976, Wally Sumner.
- Butte Co. Butte Creek: 20 June 1975, JS. Forest Ranch: 3 June 1977, JS. Big Kimshe Creek: Oct. 1976, JS. Flea Mountain: Nov. 1976, JS. Mooreville Ridge: 25 May 1977, TN.
- Calaveras Co. Summit Level Ridge: 30 May 1974, TB. Calaveras Big Trees: 24 July 1976, Margaret Keith. Doud Hill: 31 May 1974, GG, Dave Sinclair. North Fork Stanislaus River: 15 June 1975, Ron Jurek.
- Colusa Co. South Fork Stony Creek (2): 12 July 1974, BR.
- Del Norte Co. Jed Smith State Park: 18 Aug. 1973, GG. South Fork Smith River (2): 1 Aug. 1973, DG, GG, and 15 Aug. 1973, GG. South Siskiyou Fork Smith River: 15 Aug. 1973, GG.
- El Dorado Co. Big X Mountain: 9 June 1974, GG, Warren Kelly. Camp Creek: 7 June 1974, GG, Warren Kelly. North Fork Consumnes River: 8 June 1974, GG, Warren Kelly.
- Fresno Co. Shaver Lake: 3 June 1974, BG, GG. Bald Mountain: 2 June 1974, BG, GG. Dinkey Creek: 2 June 1974, BG, GG. Patterson Mountain: 1 June 1974, BG, GG. Wilsonia: 15 June 1975, NC. Kings Canyon: 8 June 1974, John Bosworth. Hall Mountain (2): 13 Aug. 1975, Calson, and 12 Mar. 1974, BG. Mammoth Pools Reservoir: 13 Aug. 1974, BG. Kaiser Peak: 25 Aug. 1975, McCarty, Stabler. Dinkey Creek: 13 Aug. 1975, McCarty, Stabler. Tornado Creek: 18 June 1975, NC. Hall Mountain: Sept. 1976, Ed Toth.
- Glenn Co. Black Butte: 20 July 1974, GG, BR.
- Humboldt Co. Blue Creek: 27 Aug. 1973, DG, GG. Prairie Creek State Park: 5 Aug. 1973, GG. Redwood Creek, Redwood National Park (4): 9 Sept. 1973, GG. Packsaddle Ridge (2): 16 Aug. 1973, DG, GG and 17 Aug. 1973, GG. Grizzly Creek State Park: April 1973, Stan Harris, Ron LeValley. Mattole River: 10 July 1974, Bill Clow. King Range: 24 July 1973, Jack Booth, GG. Richardson Grove State Park: 28 June 1973, Bob LaBelle. Charles Mountain: 20 May 1977, Doris Horn, Sharon Whisler. Eel River (2): 21 May 1977, GG. South Fork Eel River: 21 May 1977, GG, Sarah Gould. Gilham Butte (2): 31 May 1977, Doris Horn, Sharon Whisler.
- Kern Co. Sunday Peak (2): 6 July 1975 and 22 May 1975, NC. Greenhorn Summit: 21 May 1975, NC. Breckenridge Mountain (2): 23 May 1975, NC.
- Lake Co. Crockett Peak: 11 July 1974, GG, BR.
- Los Angeles Co. Arroyo Seco: 2 Apr. 1977, Arthur Langton, Jr. Mt. Wilson: 17 Apr. 1974, GG. Little Rock Creek: 19 Apr. 1974, GG. San Dimas Experimental Forest: 18 Apr. 1974, GG, Jack Spruill. Potato Mountain: Apr. 1977, (Daniel Guthrie). Prairie Fork San Gabriel River: 17 Oct. 1975, GG.
- Madera Co. Speckerman Mountain (3): 5 Aug. 1975, BG, 5 June 1974, GG. Jackass Butte: 5 June 1974, BG, GG. Minarets Work Center: 5 June 1974, GG. Chiquito Creek: 5 June 1974, BG. West Fork Chiquito Creek (2): 4 June 1974, BG, GG and 1975 BG. Mammoth Pools Reservoir: 4 June 1974, BG, GG.
- Marin Co. Tomales Bay State Park (2): 8 Feb. 1974, GG and 15 Mar. 1974, Dick Brown, GG, Grace Miller. Inverness: 15 Mar. 1974, Dick Brown, GG, Grace Miller. Bear Valley: 17 Mar. 1974, GG. Inverness Ridge (2): 16 Mar. 1974, GG, Tom Vaughn. Palomarin (2): Aug. 1977, (PRBO) and 1972 (PRBO). Samuel P. Taylor State Park (2): 13 Mar. 1974, GG and 13 Mar. 1974, GG.

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- John Trenmer. Lagunitas Creek: 19 Mar. 1974, GG. Bolinas Ridge: Apr. 1977, (KB, CB). Muir Woods National Monument: 7 Aug. 1975 (National Park Service). San Geronimo Creek: Aug. 1977, KB, CB. Phoenix Lake: 1977, (PRBO).
- Mariposa Co. Shingle Hill: 26 May 1974, TB, GG. Buck Meadows (2): 27 May 1974, TB, GG. Smith Ridge: 27 May 1974, GG, John Wells. Bower Cave: 27 May 1974, TB, GG. Big Grizzly Mountain: 26 May 1974, TB, GG, John Wells. Big Meadow (2): 20 May 1974, GG, Dale Harmes. Feliciano Mountain: 5 June 1974, BG, GG. Jerseydale: 5 June 1974, BG, GG. Heness Ridge (2): 18 May 1974, GG, Herb Sansum. Yosemite Valley: 20 May 1974, GG, Dale Harmes. Wawona: 19 May 1974, GG, Herb Sansum.
- Mendocino Co. Russian Gulch State Park: 5 Mar. 1974, GG. Jackson State Forest: 4 Mar. 1974, GG. South Fork Big River: 28 June 1975, Oliver Kolkman. Bald Mountain (2): 11 July 1974, GG, BR. Point Arena: 6 Mar. 1974, GG. Ornbau Valley: 6 Mar. 1974, GG. Little Red Mountain: 8 June 1977, Doris Horn, Sharon Whisler. Iron Peak: 1975, Ted Wenzel. South Fork Eel River (3): Aug. 1977, KB, CB and 9 June 1977, Doris Horn, Sharon Whisler.
- Monterey Co. Chew's Ridge: Aug. 1977, (Ronald Branson). Nacimiento Summit (2): 29 Mar. 1974, GG, Don Pine. Carmel Valley: 28 Dec. 1976, (Ronald Branson).
- Nevada Co. Banner Peak: 11 June 1974, DC, GG. Stepphollow Creek: 12 June 1974, DC, GG. Burlington Ridge: 11 June 1974, DC, GG. Poorman Creek: 13 June 1974, DC, GG. Nevada City: 1974, (DC). South Fork Yuba River (2): 12 June 1974, DC, GG and 8 June 1976, AL.
- Orange Co. Trabuco Peak: 11 June 1974, Peter Bloom.
- Placer Co. Mosquito Ridge (2): 10 June 1974, DC, GG. Duncan Peak: Aug. 1975, Phil Tuma. Secret Canyon: 11 June 1976, AL.
- Plumas Co. Swain Mountain: 9 Aug. 1974, Gary Davis. Mosquito Ridge: 19 June 1974, GG, JI. North Fork Feather River: 19 June 1974, GG, JI. Round Valley: 21 June 1974, JI. Moonlight Peak: 20 June 1974, GG. Lights Creek: 27 June 1974, JI. Duffy Dome: 18 June 1974, GG, Karl Kahre. Rock Creek (2): 3 July 1974, Stewart McCormick. Quincy (2): 17 June 1974, GG, Stewart McCormick and Sept. 1977, TN. Middle Fork Feather River: 22 July 1974, (Stewart McCormick). Mills Peak: 19 July 1974, Stewart McCormick. Grizzly Creek: 27 Feb. 1976, (Mike McCullom). Snake Lake: 30 June 1977, TN. Bucks Lake: 16 Sept. 1975, TN. Mooreville Ridge: 25 May 1976, TN.
- Riverside Co. Black Mountain: 18 June 1976, JC, GG. Mount San Jacinto: 18 June 1976, JC, GG. Strawberry Valley: 18 June 1976, JC, GG. Thomas Mountain: 26 Apr. 1974, GG.
- San Bernardino Co. Mount Baldy: 1976, JC. Wrightwood (2): 1976, JC. Green Valley Lake: 26 Sept. 1976, JC, GG. Crafts Peak (2): 1976, JC and 26 Sept. 1976, JC, GG. Delamar Mountain: 1976, JC. Lytle Creek Ridge: 1976, JC. North Fork Lytle Creek: 1976, JC. Middle Fork Lytle Creek: 1976, JC. Silverwood: 1976, JC. Skyforest: 1976, JC. Deep Creek (2): 1976, JC. Heaps Peak (2): 1976, JC. Butler Peak: 1976, JC. Timber Mountain: 1976, JC. Barton Creek (2): 1976, JC. Jenks Lake: 1976, JC. Poopout Hill: 1976, JC. Santa Ana River (2): 25 Aug. 1976, JC and 24 Sept. 1976, Vernon Bleich, GG. Mill Creek: 1976, JC.
- San Diego Co. Palomar State Park: 29 Apr. 1974, GG, BH. Palomar Mountain: 29 Apr. 1974, GG, BH. San Diego River: 30 Apr. 1974, GG, BH. North Peak: 30 Apr. 1974, GG, BH, Harold McKinnie. Cuyamaca Rancho State Park (2): 30 Apr. 1974, GG, BH, Harold McKinnie. Laguna Mountain: 28 May 1975, BH.
- San Luis Obispo Co. Lopez Reservoir: 5 Apr. 1974, GG. Huasna: 5 Apr. 1974, GG. Cuyama River: 24 Aug. 1974, David Murdock, Turalu Murdock.

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- Santa Barbara Co. Gaviota Peak: 26 May 1975, Parkinson. Figueroa Mountain: 9 Apr. 1974, GG. New Cuyama: 2 June 1976, GG, Gary Stacey.
- Shasta Co. Little Black Rock: 3 July 1974, GG, KL. Lake McCloud: 22 Sept. 1975, KL.
- Sierra Co. Oregon Creek: 14 June 1974, DC, GG. Middle Yuba River: 13 June 1974, DC, GG. Canyon Creek (2): 21 July 1975, TN. Saddleback Mountain: 23 June 1976, AL.
- Siskiyou Co. Thompson Creek: 18 July 1973, GG. Condrey Mountain: 13 Aug. 1975, LF. Grider Ridge: 7 Aug. 1973, GG. Dillon Mountain: 8 Aug. 1973, GG. Trail Mountain: 16 Aug. 1973, DG, GG. Salmon Mountain: 9 Aug. 1973, GG. Sawyers Bar: 13 Sept. 1973, LF, GG. Crawford Creek: 28 Sept. 1973, Doug Claypole, GG. Happy Camp: 1975, Carl Wolf. Box Canyon Reservoir: Sept. 1976, Becky Aus-Provart, KL. Ukonom Mountain: 3 June 1976, LF. Bald Mountain: Aug. 1976, Ben Harbour. Gazelle Mountain: (BLM-Redding). Cow Creek: June 1974, LF. Ten Bear Mountain: June 1977, LF.
- Sonoma Co. Guerneville: 28 May 1977, GG. Monte Rio: 11 Mar. 1974, Allan Buckman, GG. Willow Creek: 28 May 1977, GG.
- Tehama Co. Anthony Peak: 9 July 1974, GG, BR. Thomes Creek (4): 29 May 1974, BR and 8 July 1974, GG, BR and 7 June 1974, Cloyd Cleghorn. Mineral: 24 June 1974, Gary Davis, GG. Mill Creek: 25 June 1974, Gary Davis, GG. Morgan Mountain (2): 21 June 1974, GG. South Fork Cottonwood Creek (3): 24-25 July 1974, KL. Round Mountain: 16 July 1974, KL.
- Trinity Co. Ironside Mountain: 19 July 1973, GG. Big Creek: 31 July 1974, KL. East Creek: 1 July 1974, KL. Miller Springs: 5 Sept. 1973, GG. Lemonade Spring: 3 July 1974, GG, KL. Klondike Mine: 6 Sept. 1973, GG. Collins Creek: 2 July 1974, GG, KL. Silver Creek: 12 Sept. 1973, GG. South Fork Trinity River: 12 Sept. 1973, GG. Bierce Creek: 7 Sept. 1973, GG. Happy Camp Creek: 7 Sept. 1973, GG. Bierce Ridge: 24 Sept. 1973, GG. Raspberry Gulch: 11 Sept. 1973, GG. Red Mountain (2): 11 Sept. 1973, GG. East Fork Smoky Creek: 30 June 1974, KL. Middle Fork Smoky Creek: 12 Sept. 1973, GG. Rattlesnake Ridge: 12 Sept. 1973, GG. Granite Peak: 24 Aug. 1974, KL. East Fork Trinity River (2): 5 Sept. 1974, KL. Big French Creek (2): 8 Aug. 1974, KL. Hyampom Mountain: 4 Aug. 1974, KL. Pattison Peak: 6 Aug. 1974, KL. Corral Creek: 5 Aug. 1974, KL. Wells Mountain: 3 Aug. 1974, KL. Clear Creek: 11 July 1974, KL. Horse Ridge (2): 13 Aug. 1974, KL. Van Horn Peak: 13 Aug. 1974, KL. East Fork South Fork Trinity River: 17 July 1974, KL. Plummer Peak: 1974, Herrett. North Yolla Bolly: 18 July 1974, KL. Stockton Ridge: 23 July 1974, KL. Brooks Ridge: 22 July 1974, KL. Buckeye Ridge: 13 Sept. 1974, KL. Stuart Fork: 1974, KL. Lewiston Reservoir: 12 Dec. 1976, Phil Detrich, Stephen Laymon. Casoose Creek: June 1976, Brandon, Phil Detrich, Kahle.
- Tulare Co. Redwood Mountain (3): 13 May 1974, GG, Dave Parsons and 16 June 1975, NC. Generals Highway (3): 12 May 1974, GG, R. Smith and 13 May 1974, GG, Dave Parsons. Little Baldy (2): 13 May 1974, GG. Giant Forest (2): 11 May 1974, GG. Clough Cave: 16 May 1974, GG, Walt Hoffman, Maurice Zardus. Rogers Camp (2): 19 June 1975, NC. South Fork Middle Fork Tule River: 8 May 1974, GG. Lloyd Meadows: 9 May 1974, GG. Trout Meadows: 9 May 1974, GG. Table Mountain (2): 3 May 1974, MB, GG and 11 June 1975, NC. Hatchet Peak: 5 May 1974, GG. Cold Springs Peak: 6 May 1974, MB, GG. Packsaddle Meadow: 6 May 1974, MB, GG. Deer Creek: 9 June 1975, NC. Sugarloaf Peak: 30 June 1975, NC. Hellum Creek: 30 June 1975, NC. Tobias Peak: 10 June 1975, NC. Speas Creek: 12 June 1975, NC. Johnsondale: 25 June 1975, NC. Black Mountain: 17 June 1975, NC. Jordan

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Peak: 26 June 1975, NC. Woodward Creek: 11 June 1975, NC. Mineral King: 1975, NC. Camp Nelson: 1975, NC. Onion Meadow Peak: 11 June 1975, NC. Tuolumne Co. Calaveras Big Trees: 29 May 1974, GG. Middle Fork Stanislaus River (2): 29 May 1974, TB, GG and 10 June 1974, DCl. Pikes Peak (2): 3 June 1974, DCl. South Fork Stanislaus River: 30 May 1974, DCl. Dodge Ridge (2): TB, DCl, GG. Shanahan Flat: 27 May 1974, TB, GG, John Wells. South Fork Tuolumne River: 27 May 1974, TB, GG. Pilot Peak: 28 May 1974, TB, GG. Ackerson Meadow: 22 May 1974, GG, Herb Sansum. Crane Flat: 21 May 1974, GG, Dale Harmes. Ventura Co. Quatal Canyon: 27 July 1977, (Phil Schempf). Yuba Co. Bullards Bar Reservoir: 22 June 1976, AL.

### APPENDIX 2

The following are locations of Spotted Owls known prior to 1950 which were checked for occupancy during this study. The first date given indicates date first located; second date indicates when Spotted Owls were relocated on these territories.

#### Locations where owls are still present:

Palomar Mountain, San Diego Co.: June 1892, 29 April 1974. Calaveras Big Trees, Calaveras Co.: 22 Aug. 1900, 29 May 1974. Arroyo Seco, Los Angeles Co.: 22 Oct. 1900, 17 Apr. 1974. San Dimas Experimental Forest, Los Angeles Co.: 14 Feb. 1903, 18 Apr. 1974. Mount Wilson, Los Angeles Co.: 21 Mar. 1905, 17 Apr. 1974. Strawberry Valley, Riverside Co.: prior to 1913, 25 Apr. 1974. Thomas Mountain, Riverside Co.: prior to 1913, 26 Apr. 1974. Yosemite Valley, Mariposa Co.: 24 June 1915, 20 May 1974. Feliciana Mountain, Mariposa Co.: 30 Oct. 1915, 5 June 1974. Kings Canyon, Fresno Co.: 12 Sept. 1916, 15 May 1924. South Fork Mountain, Trinity Co.: 9 Dec. 1917, Sept. 1973. Shingle Hill, Mariposa Co.: 23 July 1920, 26 May 1974. South Fork Tuolumne River, Tuolumne Co.: 15 June 1922, 27 May 1974. Bower Cave, Mariposa Co.: 16 June 1974, 27 May 1974. Orndorff Valley, Mendocino Co.: 1924-37, 6 Mar. 1974, Monte Rio, Sonoma Co.: prior to 1927, 11 Mar. 1974. Mineral, Tehama Co.: 1929, 24 June 1974. Jackson State Forest, Mendocino Co.: 26 May 1932, 4 Mar. 1974. Redwood Mountain, Tulare Co.: 1933, 13 May 1974. Giant Forest, Tulare Co.: 1933, 11 May 1974. Lost Grove, Tulare Co.: Sept. 1941, 12 May 1974. Samuel P. Taylor State Park, Marin Co.: 6 Nov. 1943, 13 Mar. 1974. Little Black Rock, Shasta Co.: 8 June 1947, 3 July 1974.

#### Locations where owls were not found:

Little Tujunga Canyon, Los Angeles Co.: 1888. Shackleford Creek, Siskiyou Co.: 1899. Millard Canyon, Los Angeles Co.: 1902. Pacoima Canyon, Los Angeles Co.: 1912. Ferndale, Humboldt Co.: 1913. Near Kelly's, Tehama Co.: 1925. Hendy Woods, Mendocino Co.: early 1930s. Mount Pinos, Kern Co.: prior to 1933. General Grant Grove, Tulare Co.: 1940.

*Accepted 7 March 1978*



## THE SPOTTED OWL AT ZION NATIONAL PARK, UTAH

KENNETH KERTELL, Zion National Park, Springdale, Utah 84767

The first sighting of the Spotted Owl (*Strix occidentalis*) at Zion National Park was on 9 November 1963 (Wauer and Carter 1965). Although a pair was closely observed by Theron Twogood on 29 August of the following year, there were no more reports of this uncommon western owl for several years. Then, between 1974 and 1976, employees at Zion carefully identified this species at six different locations. In 1974 a total of six Spotted Owls was observed at three locations. In 1975 one of the 1974 sites was found inactive but a new one was discovered; a total of five owls was at three locations. In 1976 two new locations were found and, although two previously active sites were not investigated, five owls were seen at four locations. In light of the scarcity of information on the Spotted Owl in Utah (Behle and Perry 1975), these sightings are certainly heartening.

A brief look at the owl's habitat in Zion might help explain its abundance. All six locations show important geologic and climatic similarities. All sightings have been in or around very narrow, steep-walled canyons cut out of the Navajo sandstone formation by intermittent streams at an elevation of approximately 1560 m. Because of the highly resistant lower red portion of the Navajo, it is not unusual to find many canyons at this elevation. Owl canyons 1 and 2 are excellent examples of "hanging" canyons, left suspended about 270 m above, and on opposite sides of, the floor of Zion Canyon, which is about 1290 m at this point. They are no more than 15 m wide in most places with walls rising mostly vertically about 360 m. Both canyons are about 1.6 km in length. Canyon 3 is about 11.2 km long and was formed by a major tributary of the Virgin River. It is also about 360 m deep and at the place where the owl was seen is as narrow as canyons 1 and 2. Canyons 4 and 5 are extremely narrow, cool, vegetation-choked crevices that have eroded along fractures in the sandstone and run at steep angles into canyons of much larger size. Canyon 6 deviates from the usual pattern, being more open and thus warmer than the others. It does, however, have a few cool, vegetated crevices near the place where the owls were consistently seen. The approximate distance between each canyon and the nearest other canyon where owls were located is as follows: Canyon 1-canyon 2, 1.6 km; canyon 2-canyon 3, 5.6 km; canyon 2-canyon 4, 7.2 km; canyon 4-canyon 5, 2.4 km; canyon 5-canyon 6, 5.6 km.

The high elevation and extreme narrowness of these canyons and crevices results in summer temperatures perhaps 20°F cooler than one would expect at the bottom of Zion Canyon or on the plateau above. Outside the visitor center, at the bottom of Zion Canyon, temperatures may be close to 38°C during June, July and August with the plateau

only slightly cooler. The comparative coolness of the canyons is reflected in the growth of such trees as White Fir (*Abies concolor*), Douglas Fir (*Pseudotsuga menziesii*), Bigtooth Maple (*Acer grandidentatum*) and Boxelder (*A. negundo*) on their floors. Sixty-five percent of our sightings have been of an owl or owls perched at midday in this lush canyon bottom vegetation. A few Ponderosa Pines (*Pinus ponderosa*), Gambel Oaks (*Quercus gambelii*) and Shrub Live Oaks (*Q. turbinella*) are mixed in, but generally grow along the more exposed upper walls and rim, and are common on the plateau. The apparent absence of this owl from the plateau and the bottom of Zion Canyon further emphasizes the importance of these cool canyons. Also, as it has been noted in Arizona (Phillips et al. 1964), Spotted Owls appear to be absent from most or all areas inhabited by Great-horned Owls (*Bubo virginianus*), which at Zion are common everywhere except in these narrow canyons.

The abundant elevated potholes and crevices in the walls of these canyons may be very important to Spotted Owls as nest sites. Although no nests have been discovered, there is excellent evidence that the Spotted Owl is nesting successfully. In five of the six locations two adults, a young bird or all three have been seen on at least one occasion in the last three years. Pairs were noted at canyon 1 on 3 July 1975, at canyon 2 on 23 June, 13 and 22 August and 5 September 1976, and a pair with one young was at canyon 6 on 18 July 1974. This young owl was seen again on the night of 22 July. With the aid of flashlights observers could see distinct horizontal barring on the breast and clumps of down still in evidence there and on the belly. The young owl shrieked continually, especially in response to a prey-bearing adult. Two other well-developed young have been reported. One was perched with a single adult at canyon 4 on 9 August 1974 and one was perched alone at canyon 3 on 4 September 1975. Both were identified as young by the remaining tufts of down.

Woodrats may be an important source of food for these owls. The skulls of four woodrats (probably *Neotoma lepida*) and a pocket gopher (*Thomomys* sp.) were found in five pellets collected under a perch at canyon 2 on 23 June 1976. An adult passed to a young what appeared to be a woodrat on the night of 22 July 1974 at canyon 4. The fledgling experienced continued difficulties in trying to swallow the large rodent. At canyon 2 the casing of a rhinoceros beetle (subfamily Dynastinae) was found in a pellet collected on 3 September 1976.

The Spotted Owl has responded readily upon two occasions to taped recordings played in spring and early summer. In mid-May 1976 Tom Boner of the Utah Division of Wildlife Resources called in and recorded a single adult at canyon 4 by playing Spotted and Barred owl calls taken from Kellogg et al. (1962). The second response was on the night of 23 June 1976 when Nancy Sprague, Donna Sakamoto and I entered canyon

## SPOTTED OWL AT ZION NATIONAL PARK

2 hoping to verify the presence of Spotted Owls there. At 2015, while it was still light, we heard the “ho ho-ho hooo” call of a Spotted Owl from somewhere up in the canyon. At 2030 one flew to a perch 3.6 m up in a White Fir about 7.5 m away from us. At 2045 it was joined by its mate. They perched together for 15 minutes before moving away in the approaching darkness. At 2119 I played a short Spotted Owl recording and immediately both birds flew back and perched about 6.5 m above us. For 10 minutes they made an incredible variety of calls. They began with a series of short barks very similar to those of a small dog, and apparently designed to drive the intruder away. Occasionally one



Spotted Owls (*Strix occidentalis*). Zion National Park, Utah, 3 July 1975.

*Photo by K. Kertell*

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would issue a series of 10-13 hoots changing quality at the end, sounding like "hohohohohohohohoho hu hu hu," as described by Burton (1973). After about 7 minutes of this and as the owls began moving away, apparently losing interest, they began giving whistles and a few "ho ho-ho hooo" songs.

The Spotted Owl appears to be enjoying excellent success at Zion National Park. With the large number of relatively inaccessible canyon sites meeting the owl's habitat demands at Zion, and in the surrounding plateau country, there is every reason to believe the owl will continue to thrive.

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