

**Western Riverside County MSHCP
Biological Monitoring Program
2021 California Spotted Owl Surveys**

INTRODUCTION

The California Spotted Owl (*Strix occidentalis occidentalis*) is one of 45 bird species covered by the Western Riverside County MSHCP (Dudek & Associates 2003) and is a Species of Special Concern (year-round) in the State of California (Davis and Gould 2008). California Spotted Owls are one of three subspecies of Spotted Owl and their range generally extends from the southern Cascade Range of northern California, south along the mountains of central and southern California to the Mexican border (Davis and Gould 2008; Gutiérrez et al. 2020). The statewide population is considered moderately reduced (>20% to ≤40%) since population estimates reported by Grinnell and Miller (1944), with a current estimate of 1000–10,000 birds. Additionally, the range size of California Spotted Owls in California is stable (≤10% reduced) or increasing since the publication of Grinnell and Miller (1944). Habitat loss, habitat degradation, or other human-induced threats are projected to moderately reduce (>10% to ≤15%) the species' population in California by 2028 (Davis and Gould 2008).

In general, California Spotted Owls prefer microhabitats containing trees with a diameter at breast height of 52–90 cm and canopy closures >40% (Call et al. 1992; Gutiérrez et al. 2020). From sea level to about 1000 m in elevation, Spotted Owl habitats are dominated by hardwoods, primarily oak (*Quercus* spp.); at higher elevations, conifers (Class Pinopsida) dominate (Gutiérrez et al. 2020). Within San Bernardino County, California, California Spotted Owls occurred from 885–2560 m in elevation and more often nested in conifers (71% of nests) rather than hardwoods (29%). Most nests were platform nests and were constructed an average of 16.1 m above ground. The owls preferred sites with great structural complexity, and these sites had more variation in tree size, higher canopy closure, and greater basal area of large trees compared to areas unused for nesting (LaHaye et al. 1997).

California Spotted Owls may begin laying eggs by early March and can be caring for nestlings as late as mid-June. Clutches typically contain 1–4 eggs and females are the only sex to incubate the eggs. The average incubation period is 30 d and nestlings typically fledge 34–36 d post-hatching. Both parents will provide care for the fledglings through August, after which the young will be independent (Gutiérrez et al. 2020).

The MSHCP states that Spotted Owls are sparsely distributed within the Plan Area in montane coniferous and oak deciduous woodlands and forests of the Santa Ana, San Bernardino, and San Jacinto mountains Bioregions (Fig. 1). The Biogeographic Information and Observation System (BIOS), however, does not identify any locations within the Santa Ana Mountains in the Plan Area where California Spotted Owls have been detected. BIOS data further indicate that the species has been detected at 13 locations within the San Jacinto Mountains from 1908–2017. Additionally, California Spotted Owls have been detected at one general location within the portion of the San Bernardino Mountains in the Plan Area, from 1989–2016 (Keiser 2020) (Fig. 2). Finally, our Program's biologists have detected California Spotted Owls at seven locations within the San Jacinto Mountains Bioregion since 2007, and all of these locations overlap with locations identified in the BIOS dataset (Fig. 2).

The MSHCP identifies two species objectives for California Spotted Owls. Objective 1 requires the conservation of $\geq 41,370$ ac ($\geq 16,742$ ha) of montane coniferous and oak deciduous woodland and forest within the Plan Area, including 7350 ac (2974 ha) in the Santa Ana Mountains, 1620 ac (656 ha) in the San Bernardino Mountains, and 32,400 ac (13,112 ha) in the San Jacinto Mountains. Objective 2 requires the conservation of any nesting locations within the Santa Ana, San Bernardino, and San Jacinto mountains (Dudek & Associates 2003). Because it is not explicitly stated in the species objectives, we assume that we must document that California Spotted Owls are using $\geq 75\%$ of the aforementioned Bioregions at least once every eight years (*see* Volume I, Section 5.0, Table 5-8 of the MSHCP; Dudek & Associates 2003).

For this project, we will survey for California Spotted Owls by broadcasting conspecific vocalizations within apparently suitable habitat in the three Bioregions identified by the MSHCP. We will attempt to visit each survey point up to six times between March and August 2021.

Goals and Objectives

1. Determine whether California Spotted Owls are using any of the Bioregions identified in the MSHCP.
 - a. Conduct repeat-visit call-playback surveys within appropriate habitat in the three aforementioned Bioregions.

METHODS

Survey Design

We began study site selection by selecting California Spotted Owl habitats that were identified as suitable for breeding, foraging, wintering use, and dispersal movement (i.e., montane coniferous forest, and oak deciduous woodland and forest) by the MSHCP (Dudek & Associates 2003) within our ArcGIS (ESRI 2019) vegetation layer (CDFG et al. 2005). After we identified appropriate California Spotted Owl habitat in GIS, we clipped that layer to a separate GIS layer consisting of the three Bioregions identified by the MSHCP. Next, we generated regularly-spaced survey points separated from one another by at least 600 m within the aforementioned survey areas. We then selected a subsample of these points that were near hiking trails or U.S. Forest Service roads, and ultimately moved the points on to the trail or road (Franklin et al. 1996; USFWS 2011), maintaining the minimum 600-m spacing.

We will conduct call-playback surveys for California Spotted Owls (Franklin et al. 1996; LaHaye et al. 2001; USFWS 2011) by making repeat visits ($n =$ up to six visits) to survey points ($n = 50$ points) within the three MSHCP-identified Bioregions (Fig. 1). During the fall of 2020, we will visit all potential survey points within the aforementioned areas to determine their suitability for California Spotted Owls, and to verify that they are accessible. Suitable points shall be in montane coniferous or oak woodland habitat and will have a relatively high degree of canopy closure by the dominant tree species (Call et al. 1992; LaHaye et al. 1997).

Field Methods

We will define individual survey efforts by a single survey point from which we will be broadcasting Spotted Owl vocalizations. We will survey each site up to six times during this project (USFWS 2011). Our surveys will begin on or about 15 March 2021, which is the USFWS (2011) suggested start date and is approximately the earliest time when we could expect

California Spotted Owls to begin laying eggs (Gutiérrez et al. 2020). The visits may extend through the end of August 2021, at which point any hatch-year California Spotted Owls will be independent (Gutiérrez et al. 2020). We will separate subsequent visits to points by ≥ 7 d, and we will attempt to visit each point at least three times by 30 June 2021 (USFWS 2011). Ideally, we will conduct surveys between official apparent sunset and sunrise (USFWS 2011); however, if surveying at a location during this time period presents safety concerns to our biologists, we will conduct surveys during the daylight hours (Franklin et al. 1996; LaHaye et al. 2001; USFWS 2011). Finally, we will not conduct surveys during periods of rain, heavy fog, or high winds (i.e., maximum wind speed >24 km/h; USFWS 2011).

Surveys will begin when a pair of observers reaches a survey point. Upon arrival, observers will record on the datasheet (Appendix A) the date, their initials, and the survey point number. Next, observers will record the starting weather, temperature, and wind speed. After these initial data are recorded, observers will set up the broadcasting equipment and then move approximately 25 m away. Observers will record on their datasheet the survey start time when the recorded vocalizations begin broadcasting and will record the end time at the conclusion of the broadcast period. The broadcast period will last approximately 13 min, consisting of four complete cycles of the Spotted Owl broadcast sequence available at the USFWS Northern Spotted Owl Recovery website (USFWS 2013), followed by 2 min of silence. Observers will turn the speaker 90° following each broadcast cycle, thereby ensuring the broadcast is evenly dispersed across the habitat. Observers will immediately terminate the broadcast sequence if they detect a California Spotted Owl. Additionally, we will not broadcast any agitated or barking Spotted Owl vocalizations near suspected nest sites (USFWS 2011).

Observers will record information on their datasheet for all bird species detected while at the survey point. For non-Covered Species, observers will record the four-letter species code, age class information, and sex for only the first individual of that species detected, which provides species richness data for the site. For Covered Species, observers will record the four-letter species code, age class, and sex for every individual detected during the survey. If observers are unsure whether they have already recorded data on an individual (i.e., they are double-counting), they will err on the side of caution and record information on that individual.

TRAINING

All field personnel will demonstrate proficiency at visual and aural identification of California Spotted Owls prior to conducting surveys. Additionally, observers will demonstrate the ability to identify bird species likely to be detected near the survey points. To demonstrate this, observers will pass a quiz consisting of photographs and audio recordings of 52 bird species. Observers must correctly identify every covered species on the quiz and $\geq 85\%$ of the non-covered species before being allowed to participate in surveys. All personnel will also demonstrate proficiency with survey techniques before field surveys commence. After surveys start, less experienced personnel will continue to train by accompanying more experienced personnel on surveys. Less experienced personnel will not conduct surveys on their own until they have accompanied experienced personnel on a minimum of 15 surveys.

DATA MANAGEMENT

While observers are in the field, they will collect data on paper datasheets that are designed to correspond with a data entry form within the MSHCP electronic database. This will

assure inferential integrity of collected data. After observers have returned to the office, they will enter their field data into an electronic Microsoft Access database, after which the data sheet will be marked as having been entered. Datasheets that have been entered into the database will be double-checked by another biologist and subsequently certified by the data manager.

DATA ANALYSIS

If we have sufficient data, we will estimate per-visit detection probabilities (p) of California Spotted Owls using a closed-capture occupancy model available in Program MARK (White and Burnham 1999; MacKenzie et al. 2006). Next, we will construct a candidate set of models that examines the time-varying (i.e., among visits) effect on p , but will model estimates of occupancy ($\hat{\psi}$) as being constant across visits because we will be assuming a closed population of California Spotted Owls within our study areas and throughout our survey period.

We will then rank models in each candidate set according to Akaike's Information Criterion (AIC_c) for small samples, calculate Akaike weights (w_i), and average estimates of p across the entire candidate set (Burnham and Anderson 2002). We will then calculate cumulative detection probabilities (P^*) across visits according to the following formula, where p_i is the detection probability on a given visit or shift: $P^* = 1 - (\prod_{i=1}^6 (1 - p_i))$.

TIMELINE

- Summer 2020: GIS work, specifically identifying habitat, assigning survey points.
- Autumn 2020: Distribution of study materials, getting access to survey areas, and ground-truthing potential survey sites.
- March through August 2021: Surveys will be conducted. Data will be entered concurrently with surveys.
- Fall 2021: Data analysis and report writing.

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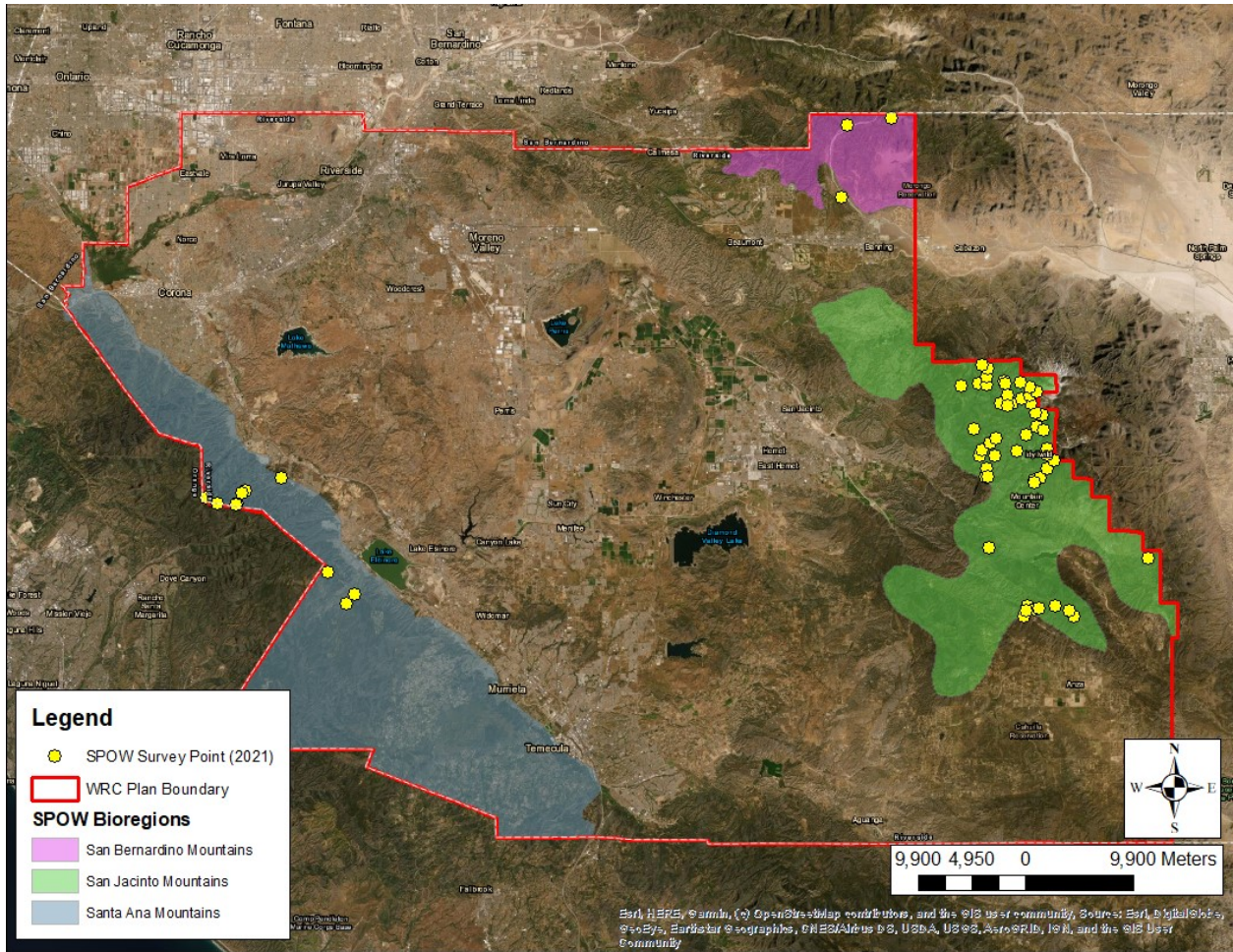


Figure 1. Locations of 2021 Spotted Owl survey points within the Bioregions identified by the MSHCP.

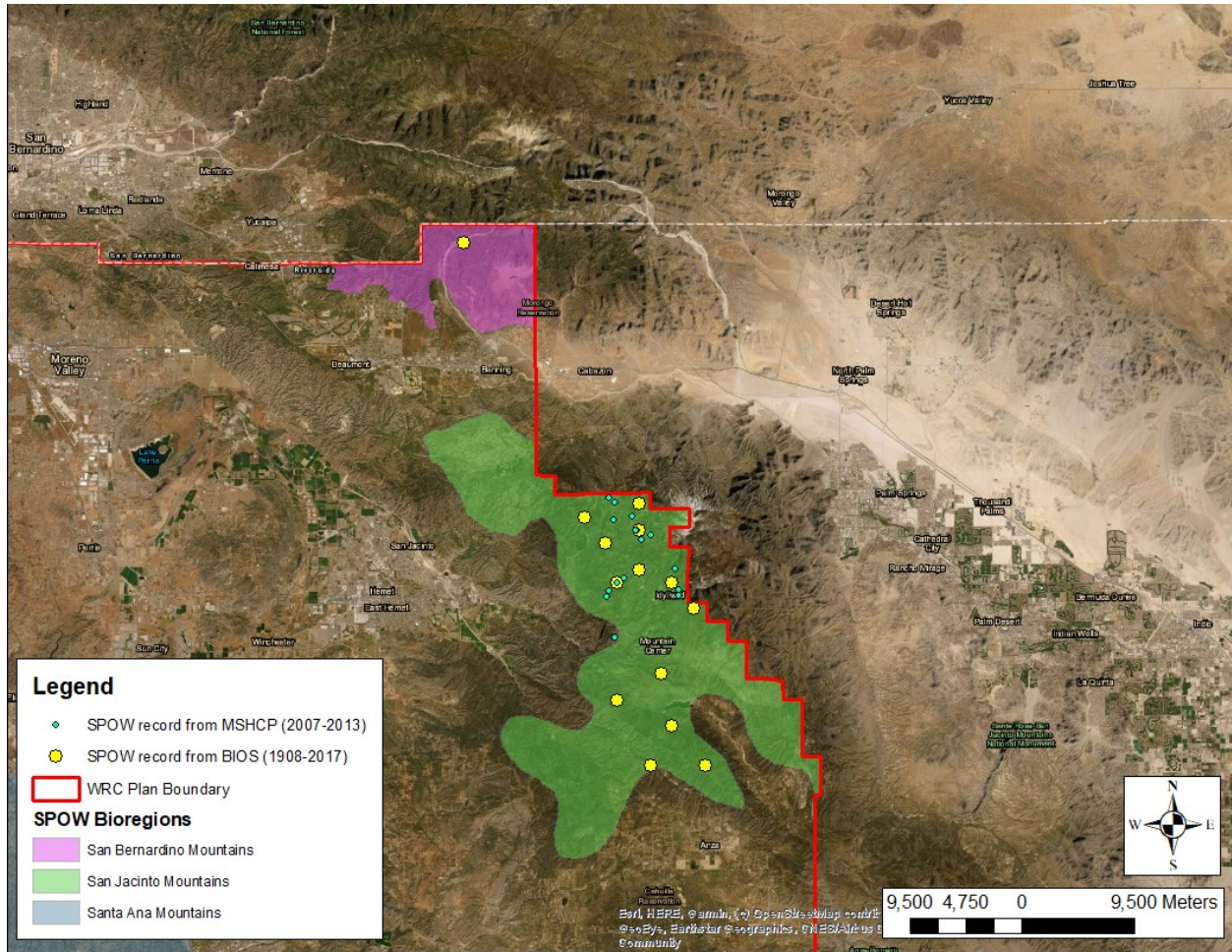


Figure 2. Historical BIOS detections of Spotted Owls within the San Bernardino and San Jacinto mountains Bioregions from 1908–2017, and MSHCP detections within the San Jacinto Mountains Bioregion from 2007–2013.

