Western Riverside County MSHCP
Biological Monitoring Program
2021 Purple Martin Surveys

INTRODUCTION

The Purple Martin (*Progne subis*; also "martin") is one of 45 bird species covered by the Western Riverside County Multiple Species Habitat Conservation Program (MSHCP; Dudek & Associates 2003) and is a Species of Special Concern (breeding) in the State of California (Airola and Williams 2008). The statewide population is considered greatly reduced (>40% to ≤80%) since population estimates reported by Grinnell and Miller (1944), with a current estimate of 1000–10,000 birds. Additionally, the range size of Purple Martins in California is moderately reduced (>20% to ≤40%) 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 (Airola and Williams 2008).

Purple Martins are a rare migrant and breeder within the Plan Area, predominantly within the woodlands of foothills and within the montane areas (Garrett and Dunn 1981; Dudek & Associates 2003). Martins do not winter within the Plan Area and may be observed foraging or migrating throughout the Plan Area, specifically outside of suitable breeding habitat (Dudek & Associates 2003). Historic nesting locations within the Plan Area include Thomas Mountain and Dripping Springs areas (Patten 1998, personal communication, *in* Dudek & Associates 2003). Additional historic nest sites include Lake Hemet as recently as 2012, and within the Cleveland National Forest (Dudek & Associates 2003). Finally, our Program's biologists have detected martins within the Plan Area just six times since 2006 (Fig. 1), with all detections occurring between 1 April and 31 July.

The MSHCP identifies three species objectives for Purple Martins. The first Objective requires the conservation of ≥45,020 ac (≥18,218 ha) of suitable nesting and foraging habitat, including riparian scrub, forest, and woodland; deciduous woodland and forest; and montane coniferous forest. The second Objective requires the conservation of two Core Areas including Dripping Springs and Thomas Mountain. Finally, the third Objective requires the inclusion of microhabitat (i.e., groups of large snags) in potential nesting habitat within the MSHCP Conservation Area (Dudek & Associates 2003). Because it is not explicitly stated in the species objectives, we assume that we must document that Purple Martins are using ≥75% of the aforementioned Core Areas at least once every eight years (*see* Volume I, Section 5.0, Table 5-8 of the MSHCP; Dudek & Associates 2003).

In general, martins in the western U.S. prefer to nest in woodpecker (Family Picidae) holes (Brown and Tarof 2020) within either snags (Airola and Williams 2008) or dead portions of live trees (Svoboda et al. 1980). Martins usually choose to nest within sycamores (*Platanus* spp.), conifers (Division Pinophyta; Airola and Williams 2008), or oaks (*Quercus* spp.; White et al. 2011) within southern California. Conifers are most frequently selected as nest sites by martins within California, with >70% of martins nesting in such trees (Airola and Williams 2008), although the Tehachapi Mountains of southern California contain the only known oak habitat in California in which martins persist (White et al. 2011). Rangewide, martins prefer nest sites that are <2600 m in elevation (Brown and Tarof 2020), and martins within the Tejon Ranch of southern California's Tehachapi Mountains occupied elevations of 430–1830 m (White et al.

2011). Martins prefer nest sites that have open space above the nest and relatively abundant aerial insect prey nearby. Additionally, nest sites are typically surrounded by ≤20% canopy cover at nest height and within 100 m of the nest tree (Airola and Williams 2008). Nest trees are often at elevations <2600 m (Brown and Tarof 2020) and in prominent positions, usually on the upper slopes of hilly or mountainous terrain (Airola and Williams 2008). Finally, European Starlings (*Sturnus vulgaris*) are strong competitors with Purple Martins for nest sites and are thus generally rare or absent near martin nest sites (White et al. 2011).

Egg-laying and incubation by martins peaks between mid-April and late May, with a peak in nestling presence occurring from late May to late July (Brown and Tarof 2020). Clutches usually contain 3–6 eggs (Brown and Tarof 2020) that are incubated for 15–18 d (Allen and Nice 1952; Finlay 1971; Brown and Tarof 2020). Nestlings typically fledge 28 or 29 d post-hatching (Allen and Nice 1952; Brown and Tarof 2020).

Threats to Purple Martins within California include removal of snags for fire management, loss of wetland habitat in which martin prey are produced, competition from cavity-nesting European Starlings, and incremental loss of sycamore woodland due to age and lack of regeneration (Airola and Williams 2008). Furthermore, conservation of martin habitat is complicated by the possibility that the species may require habitat features not yet identified by investigators, as illustrated by the fact that some areas go unused by the species despite containing apparently suitable habitat (Brown and Tarof 2020).

For this project, we will survey for Purple Martins by conducting area searches within apparently suitable habitat in the two Core Areas identified by the MSHCP, as well as Garner Valley, which includes the area in which martins nested in 2012; and San Jacinto Wildlife Area (WA), in which 50% of our incidental detections of the species have occurred. We will attempt to visit each survey point a minimum of three times between 1 April and 30 July 2021.

Goals and Objectives

1. Determine whether Purple Martins are using any of the Core Areas identified in the MSHCP, as well as Garner Valley and San Jacinto WA.
    a. Conduct repeat-visit area searches within apparently suitable Purple Martin habitat in the Dripping Springs and Thomas Mountain Core Areas, in addition to Garner Valley and San Jacinto WA.
2. Estimate detection probabilities based upon presence or absence of Purple Martins at survey sites using a closed-capture occupancy model included with Program MARK (White and Burnham 1999).
    a. Conduct repeat-visit area searches within the aforementioned areas.

METHODS

Survey Design

We began study site selection by selecting Purple Martin habitats that were identified as suitable nesting and foraging habitat (i.e., riparian scrub, forest, and woodland; deciduous woodland and forest; and montane coniferous forest) by the MSHCP (Dudek & Associates 2003)

within our ArcGIS (ESRI 2019) vegetation layer (CDFG et al. 2005). After we identified appropriate martin habitat in GIS, we clipped that layer to a separate GIS layer consisting of the two Purple Martin Core Areas designated by the MSHCP, plus Garner Valley and San Jacinto WA. Next, we generated regularly-spaced survey points separated from one another by 200 m within our aforementioned survey areas.

We will conduct area search surveys for Purple Martins (White et al. 2011) by making repeat visits (n = three visits) to survey points (n = 83 points) within the two MSHCP-identified Core Areas, and Garner Valley and San Jacinto WA (Fig. 1). During the fall of 2020 and winter of 2020–2021, we will visit all potential survey sites within the aforementioned areas to determine their suitability for Purple Martins, and accessibility for our biologists.

Field Methods

Individual survey efforts will be defined by a single survey point around which we will conduct an area search for Purple Martins. Survey points will be located within apparently suitable habitat for Purple Martins and will be separated by ≥200 m. Observers will conduct area searches within 100 m of each survey point (White et al. 2011) and each survey point will be surveyed a minimum of three times during this project. The first survey will occur on or after 1 April 2021, which is early in the egg-laying period for local martins (Brown and Tarof 2020). The visits will extend through the end of July 2021, at which point most nestlings will have fledged (Brown and Tarof 2020). Subsequent visits to survey points will be separated by at least 7 d.

We will conduct surveys between 0730 h and 1330 h (White et al. 2011) and we will not conduct surveys during periods of rain, heavy fog, or when maximum wind speed >24 km/h. Surveys will begin when a pair of observers reach a survey point. Upon arrival, observers will record on their data sheet (Appendix A) the date, their initials, and the survey point number. They will then record the starting weather, temperature, wind speed, and survey start time. Observers will then separate from one another and conduct an area search for martins within 100 m (3.14 ha) of the survey point after these initial data are recorded. Observers will spend approximately 30 min conducting the area search (White et al. 2011), during which time they will observe the area for Purple Martins, paying particular attention to snags or dead portions of live trees that contain woodpecker holes.

During surveys, observers will record in a notebook information for all bird species detected. For non-covered species, observers will record information for only the first individual of that species detected, which provides species richness data for the site. For such species, observers will record the four-letter species code, age class information, and sex. 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. Finally, observers will record GPS coordinates of the location of any martins within the 3.14-ha search area. At the conclusion of the 30-min period, observers will meet at the survey point and record on their data sheet (Appendix A) the ending environmental data as well as the survey end time.

TRAINING

All field personnel will demonstrate proficiency at visual and aural identification of Purple Martins prior to conducting surveys. Additionally, observers will demonstrate the ability to identify bird species likely to be detected near the Purple Martin survey points. To demonstrate this, observers will pass a quiz consisting of photographs and audio recordings of 84 bird species. Observers must correctly identify every covered species on the quiz and ≥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. When personnel have spare office time, they will take datasheets that have been entered into the database and double-check that the data have been accurately entered into the database. When complete, datasheets will then be marked as having been checked.

DATA ANALYSIS

If we have sufficient data, we will estimate per-visit detection probabilities (p) of Purple Martins 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 Purple Martins 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: $P^* = 1-(\prod_{i=1}^{3}(1-p_i))$.

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.
- April through July 2021: Surveys will be conducted. Data will be entered concurrently with surveys.
- Fall 2021: Data analysis and report writing.

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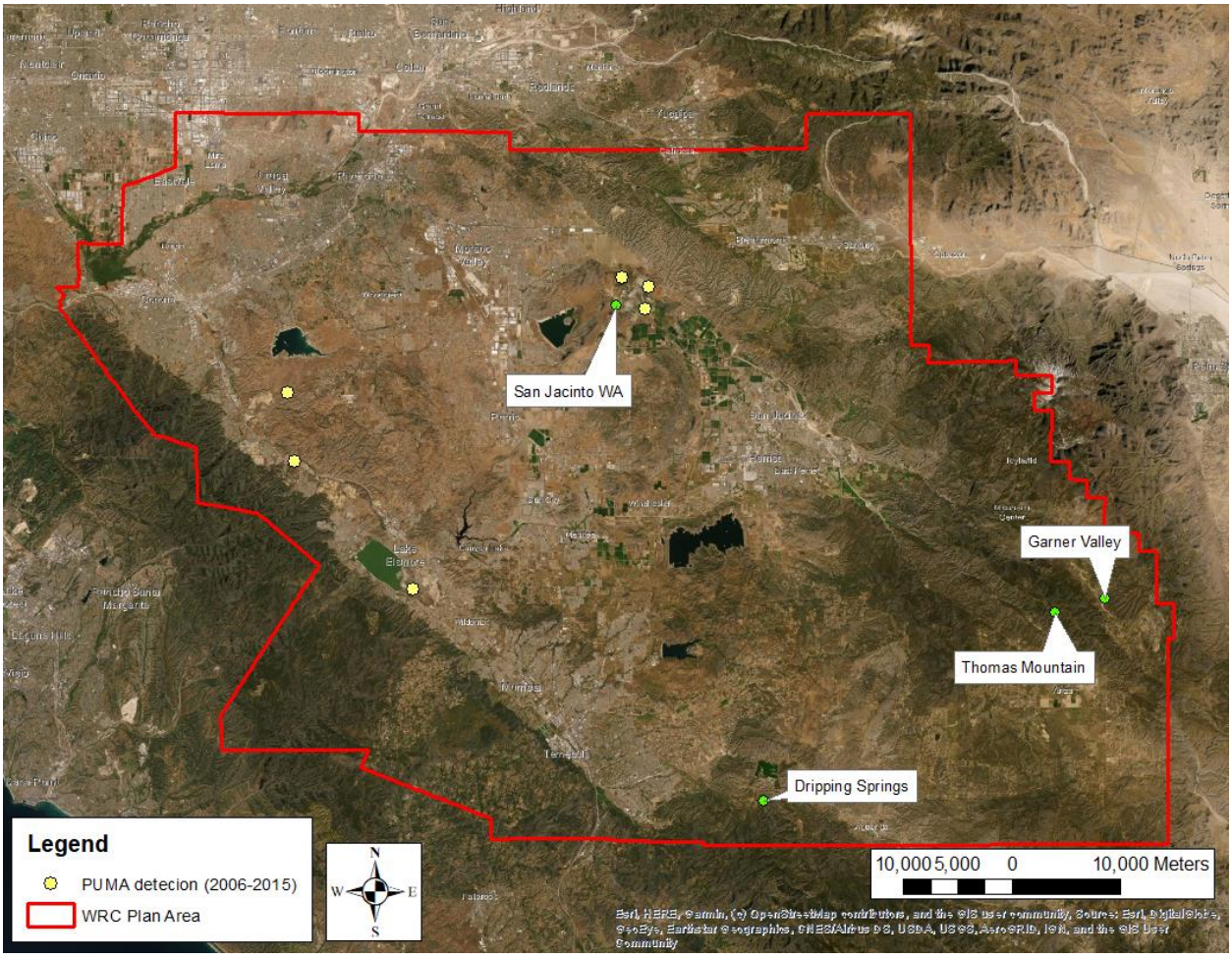

Figure 1. Locations of Purple Martin detections by Biological Monitoring Program biologists from 2006–2015. Callouts indicate the general areas in which we will be conducting Purple Martin surveys in 2021.

Appendix A. 2021 Purple Martin survey datasheet.

MSHCP Purple Martin Survey Data Sheet, 2021

Transect ID:	**PM13-**	Visit #:	Site conditions			
Date:				Interval	Result	Units
			Avg. wind	@ start		km/h
Observers:			Max. wind	@ start		km/h
			Temperature	@ start		°C
			Sky Code	@ start		N/A
Start time:			Noise	@ start		N/A
End time:						

Species code	Sex (M, F, U)	Age (Ad, Ju, Fl, U)	Notes

Notes, species observed in transit, etc.

Sky Condition Codes: 0 = clear or few clouds; 1 = partly cloudy; 2 = overcast; 3 = fog or smoke; 4 = light drizzle; 5 = constant snow; 6 = constant rain.
Noise Codes: 0 = no noise; 1 = noise, but not affecting bird detection; 2 = moderate noise, may be affecting detection; 3 = loud noise, reducing ability to detect birds; 4 = very loud noise, difficult to hear anything at all.