Western Riverside County MSHCP
Biological Monitoring Program
California Gnatcatcher 2021 Survey Protocol

INTRODUCTION

The Coastal California Gnatcatcher (*Polioptila californica californica;* gnatcatcher) is one of 45 bird species covered by the Western Riverside County MSHCP (Multiple Species Habitat Conservation Plan) and is designated as threatened at the Federal level. Gnatcatchers are specialists of coastal sage scrub (CSS) habitat, one of the unique plant communities found in coastal and inland southern California and Baja California. This habitat type is characterized by low-growing, drought-deciduous, and semi-woody shrubs, such as California buckwheat (*Eriogonum fasciculatum*), coast brittle-bush (*Encelia californica*), California sagebrush (*Artemisia californica*), black sage (*Salvia mellifera*), and white sage (*S. apiana*) (Dudek & Associates 2003). CSS habitat is one of the most endangered habitats in the U.S. In western Riverside County, suitable CSS habitat for gnatcatchers has declined by 48% since the 1980s (Hulton VanTassel et al. 2017). Significant trends, however, have not been demonstrated for gnatcatcher populations in southern California between 1966 and 2000 (Mock 2004), so intensive monitoring is critical due to the rapid decline of this species' breeding habitat.

Gnatcatchers are non-migratory insectivores and are distributed in southern coastal California and Baja California (Atwood and Bontrager 2020). In the Plan Area, they are found in the southwestern region, especially in the Riverside Lowlands and San Jacinto Foothills Bioregions along the Interstate 15/215 corridor from the Santa Ana River to Temecula, and into the Vail Lake/Wilson Valley area (Dudek & Associates 2003).

Gnatcatchers primarily use CSS, but they occasionally use desert scrub and Riversidean alluvial fan scrub vegetation communities for breeding (Dudek & Associates 2003). Their breeding season starts in approximately mid-February and ends in mid-August in Riverside County. Gnatcatchers nest in relatively dense stands of CSS shrubs and select a wide variety of CSS shrubs as a nest substrate such as California buckwheat, coast brittle-bush, white sage, and California sagebrush (Biological Monitoring Program 2019; Atwood and Bontrager 2020). Gnatcatchers in southern California usually lay three or four eggs and incubate for a mean of 14 days, and nestlings fledge approximately 14 days after hatching (Atwood and Bontrager 2020).

In the spring and summer of 2021, we will document the reproductive success of Coastal California Gnatcatchers by searching for and monitoring their nests. MSHCP species-specific objectives for gnatcatchers require confirmation of distribution and successful reproduction within at least 75% of specified Core Areas once every three years (Dudek & Associates 2003). Successful reproduction is defined as a nest that produces at least one fledgling (Dudek & Associates 2003). We documented that gnatcatchers met the distribution objective in 2020 during USGS California Gnatcatcher Regional Survey; therefore, we will focus our 2021 survey effort on the reproductive objective. We will use a modified area search method to study the reproduction of gnatcatchers. We will monitor nests until they fail or fledge young. Nest searching and

monitoring will continue until we document successful reproduction by gnatcatchers in at least 75% of their Core Areas, or mid-August, 2021, whichever occurs first.

Goals and Objectives

1. Determine whether gnatcatchers are successfully breeding in at least 75% of their Core Areas.
    a. Locate and monitor active gnatcatcher nests until either fledging or failure occurs.

2. Estimate nest survival of gnatcatchers.
    a. Use the nest survival model included with Program MARK to estimate the daily nest survival rate (DSR) (White and Burnham 1999; Dinsmore et al. 2002)
    b. Use the most recent robust nest survival model, a general Bayesian hierarchical model, by WINBUGS to estimate the DSR (Schmidt et al. 2010) and compare with the DSR calculated by program MARK.

METHODS

Survey Design

First, we will revisit the locations within Core Areas where we detected gnatcatcher pairs or nests during previous studies. Second, if apparently appropriate habitat is on a parcel that has been recently acquired as conserved or does not have any prior gnatcatcher records, we will conduct an area search to confirm suitable gnatcatcher habitat, and then search for pairs of gnatcatchers. The Core Areas for gnatcatchers are El Cerrito/Lake Mathews/Estelle Mountain (5500 ha), Lake Skinner/Diamond Valley Lake (6585 ha), Vail Lake/Wilson Valley/Temecula Creek (5790 ha), Alberhill (726 ha), Hogbacks/Murrieta Hot Springs (987 ha), North Peak Conservation Bank/Meadowbrook (428 ha), Quail Valley (616 ha), Railroad Canyon/Sedco Hills (611 ha), and Wasson Canyon (457 ha).

The surveys will occur within 250 m × 250 m grids that were developed for MSHCP terrestrial herpetological surveys. If we see a pair of gnatcatchers using two or three grid squares, we will observe them and choose one grid square where the most active behavior is observed. Once we identify the grid square for the pair, we will record all of our survey time in the grid square the pair belongs to, even if we survey adjacent grid squares while observing the pair. Similarly, if the pair builds a nest in an adjacent grid square, we will use the original grid ID on the datasheet, not the grid ID of the nest location. The pair ID will not change during this breeding season, so if the pair's territory shifts and they use a larger portion of adjacent grid squares late in the season, we will still write the original grid ID on the datasheet while monitoring the pair.

We will start surveys using a passive method, walking in a survey area and trying to find a California Gnatcatcher pair by visual and auditory cues. If we cannot find any pair after 30 minutes of searching, we will use gnatcatcher call playbacks. We will play a maximum of two 20-second call bouts, then will search again for gnatcatchers. We will play broadcasts again after 30 minutes of searching if no gnatcatchers have been found. Under no circumstances will biologists broadcast gnatcatcher calls if gnatcatchers have

been detected. We will conduct nest searches for gnatcatchers without time-of-day constraints and will continue until the species reproduction objective is met (i.e., we observe fledglings in at least 75% of Core Areas), or the end of the breeding season, whichever comes first.

Field Methods

Nest Searching

We will upload assigned survey grids on our handheld GPS unit. When we find a pair of gnatcatchers during a survey within an assigned survey grid, we will stay in that area and observe the birds' behaviors until we have recorded the data necessary to determine the status of the pair. We will record on our datasheets (Appendix A) and maps any behaviors and locations associated with nesting. If we see a gnatcatcher carrying nesting materials or food, or hear begging or alarm calls, these behaviors may indicate an active nest is nearby. During observations, we will maintain a safe distance (>20 m) from the potential nest site to minimize stress on gnatcatchers and the likelihood of potential nest predators being drawn to the nest. If it is too difficult to observe these behaviors due to rough terrain or dense vegetation cover, we will try to identify the primary area used by the gnatcatchers then systematically check each shrub within this area (Reynolds 1981).

During the last four surveys conducted in 2008, 2011, 2014, and 2018 by our program, we found 140 gnatcatcher nests. The most commonly selected nest substrates in our Plan Areas were California buckwheat (n = 45 nests) followed by coast brittle-bush (n = 24), white sage (n = 21), yellow bush-penstemon (*Keckiella antirrhinoides*) (n = 11), California sagebrush (n = 11), and black sage (n = 10), hickleaf yerba santa (*Eriodictyon crassifolium*) (n = 5) and others (Biological Monitoring Program 2019). These selections generally reflect the CSS shrub availability in our Plan Area, except for white sage, which is preferentially selected based upon its availability in the landscape.

Upon identifying a potential nest site, we will approach the nest site and attempt to determine whether it is active. We will mark the location of the nest using a handheld GPS unit and record the nest information as required for the nest datasheet (Appendix B). The GPS coordinates will be collected above the nest, without disturbing the nest site. If there is a risk of damaging the nest site when collecting the coordinates, we will mark the waypoint from a distance, then report the bearing and distance between the waypoint and the nest on the datasheet. Investigation of the actual nest will be as brief and non-intrusive as possible.

Nest Monitoring

We will revisit active nests once or twice each week (Heath et al. 2008), and during these follow-up visits, we will determine whether the nest is active by watching the behavior of the adults from a safe distance. Doing this will allow surveyors to determine the nest's stage (e.g., incubation or nestling[1]) while minimizing stress on the adults.

[1]If only one adult is making food carries to the nest, the nest is likely in the incubation stage; however, if both adults are making food carries, the nest is in the nestling stage.

When we need to approach the nest for checking nest stages and contents, we will minimize time spent near the nest. We will take different paths to the nest each time to avoid making a clear path to the nest and will conduct mock checks for nests into nearby vegetation both before and after investigating the actual nest, which will decrease the chance of predators detecting the nest (Martin and Geupel 1993). If we see avian predators perching or soaring, we will not approach the nest until the predators are no longer present. We will keep in mind that the primary focus of this project is to document successful gnatcatcher nests, and of distant secondary importance is gathering information about clutch size, incubation stage duration, etc. If investigating a nest's contents will lead to damaging the nest substrate, or unnecessarily stressing the parents (e.g., because the nest is in dense foliage), we will forego assessing the nest contents and will instead simply observe whether it is active by watching the behaviors of the parents from a safe distance (Heath et al. 2008). Follow-up visits will occur until each nest fledges young[2] or fails[3].

COVID-19 modification: When working on the same grid, surveyors will wear gloves, and mask, will not share equipment, and will maintain a distance between them of 6ft or more. Equipment may only be shared after it is wiped down with a disinfecting wipe and allowed to air dry before being shared. Surveyors will not share vehicles to reach the sites. These procedures are to be consistent with and do not supersede other departmental Covid-19 Safety Procedures.

Field Procedure

Nest Searching

1. Before going into the field, we will upload the previous gnatcatcher locations from S:\Projects\Birds\ CAGN 2021\CAGN previous locations, and assigned survey grids from S:\Projects\birds\CAGN 2021\survey grids, to our handheld GPS units.
2. When we start nest searching on the survey grid, we will record survey grid ID, surveyor's name, date, start time and start temp on the datasheet (Appendix A).
3. If we encounter gnatcatcher(s) during a survey, we will record the following on the datasheet (Appendix A): sex, age, time, behaviors, and locations.
4. We will also write down information about the pair, with detailed descriptions, on the map.
5. During the observation, we will watch for any gnatcatcher behaviors that might indicate an active nest.
6. If we cannot find any pair after 30 min of the search, we will start using gnatcatcher call playbacks. We will play a maximum of two 20-second bouts of gnatcatcher calls. We can play again after 30 min of search, if necessary.

[2]Confirmed by hearing begging calls of young birds and observing parents delivering food to areas other than the nest (Heath et al. 2008).

[3]Confirmed when either adult is observed attending a new nest site, or the female stops exhibiting incubation behaviors prior to the expected hatch date (Heath et al. 2008).

7. If an active nest is suspected, we will approach the nest in a circuitous manner, while conducting mock nest searches in vegetation along the way. Inspection of the actual nest will be brief and is meant simply to confirm the presence of the active nest rather than assessing its contents.
8. We will take a GPS waypoint above the nest if it can be done without damaging the substrate. If there is a risk of damaging the nest substrate, we will take a waypoint of the nest from a distance then record on the datasheet the bearing and distance to the nest.
9. We will record on the datasheet the nest status and adult bird behavior(s). During the initial visit we will also record the nest substrate species, if possible.
10. Following inspection of the nest, we will continue conducting mock nest searches as we walk away from the nest site.
11. When we return to the office or home, we will fill in the collected information on the 2021 Nest Monitoring Data Sheet (Appendix B).
12. Upon returning from the field, preferably the same day the observations are made, the information collected will be reported to the project lead even if no nest is found.
13. We will conduct nest searches for gnatcatchers without time-of-day constraints.

Nest Monitoring

1. When we conduct nest monitoring, we will determine whether the nest is active by watching the behavior of the adults from a safe distance.
2. When we need to approach the nest, we will minimize time spent near the nest and follow the methods described under Field Methods/Nest monitoring.
3. When we return to the office or home, we will update the 2021 Nest Monitoring Data Sheet (Appendix B).
4. Following nest failure or fledging, we will record the height of the nest and the nest substrate.

Equipment

- Binoculars (at least 8x magnification power)
- Handheld GPS
- Field maps
- Anemometer/thermometer combination
- Compass
- Datasheets
- Telescoping mechanic’s mirror (optional)

Training

Biologists will demonstrate proficiency at both visual and aural identification of gnatcatchers, Covered CSS birds, as well as other common co-occurring CSS bird species. Biologists will also demonstrate an understanding of the field methods associated with the study, as well as the desired methods of approaching and observing potential

gnatcatcher nest locations. We will practice visual and aural identification, using avian field guides (e.g., Sibley 2000) and computer software (e.g., Thayer's Guide to Birds of North America, v. 3.5).

Additionally, we will receive training in the reproductive biology of the gnatcatchers (see Appendix C). Inexperienced surveyors will go to the field with experienced surveyors and work together several times as shadow surveyors until they completely understand the method for nest searching and monitoring.

COVID-19 modification: An experienced surveyor will train in the field inexperienced surveyors. Surveyors will reach the field site independently, will wear gloves, and mask, will not share equipment, and will maintain a distance of 6ft or more. Other details about sharing equipment apply and are explained in the Field Methods section above.

Training Results

Surveyors who successfully complete the above training will be able to correctly identify gnatcatchers and co-occurring CSS birds by both sight and sound. Additionally, they will be able to conduct nest searching and monitoring, as described above. Finally, we will be able to monitor gnatcatcher nests in a manner that will minimize stress on the adult birds and minimize the likelihood of attracting potential nest predators.

Data Management

The datasheets using for the survey are designed to correspond with a data entry form within the MSHCP electronic database. This will assure inferential integrity of collected data. When we come back to the office or home, we will enter these data into the MSHCP electronic database, after which the datasheets will be stored in a folder labeled "CAGN Nest 2021 entered." A different biologist will be assigned to check the datasheets and the corresponding data that have been entered into the database for accuracy. When these tasks have been completed, datasheets will then be placed in a folder labeled "CAGN Nest 2021 entered and checked."

Data Analysis

Nest Survival

We will estimate the DSR for gnatcatchers by using the nest survival model in Program MARK (White and Burnham 1999, Dinsmore et al. 2002), and use the most recent robust nest survival model, a general Bayesian hierarchical model using statistical software WINBUGS (Schmidt et al. 2010). The nest survival model used in Program MARK is based on binomial distribution framework. Binomial distribution is generally restrictive to fit field data and commonly lacks heterogeneity and independence. As a result, the DSR calculated by binomial distribution is often underestimated (Schmidt et al. 2010). We will compare the DSRs estimated by these two models and determine how much the results differ, and which model will be better to use for future nest survival analysis.

We will pool all reproductive data from all Core Areas where we found nests, and then estimate a DSR. We will raise DSR estimates to the 30^{th} power to estimate survival rates from egg-laying initiation to fledging, which is usually 30 days (Atwood

and Bontrager 2020).

Timeline

- December 2020–January 2021: GIS work, specifically identifying habitat, assigning survey points.
- December 2020–February 2021: Distribution of study materials, protocol development, obtaining access to survey areas, and ground-truthing potential survey sites.
- January–February 2021: Training of surveyors in nest searching and monitoring, and bird identification.
- February–August 2021: Surveys and nest searching/monitoring will be conducted. Data will be entered concurrently with surveys.
- Fall 2021: Data analysis and report writing.

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APPENDIX A. Datasheet for 2021 California Gnatcatcher nest monitoring surveys.

MSHCP California Gnatcatcher Reproduction Survey Data Sheet, 2021

Purpose: Grid Survey or Follow up or Pair Monitoring

Grid ID: _____ Date: _____ Start Temp: _____

Core Area: _____ Start Time: _____ End Temp: _____

Observer: _____ End Time: _____ Sky Code: _____

Pair Info:

Pair ID:	UTM E:	UTM N:	M Behav:	F Behav:	Nest ID:	Nstage:	Notes:

Unpaired Info:

UTM E:	UTM N:	Age:	Sex:	Behav:	Notes:

Notes:

Purpose: Grid Survey or Follow up or Pair Monitoring

Grid ID: _____ Date: _____ Start Temp: _____

Core Area: _____ Start Time: _____ End Temp: _____

Observer: _____ End Time: _____ Sky Code: _____

Pair Info:

Pair ID:	UTM E:	UTM N:	M Behav:	F Behav:	Nest ID:	Nstage:	Notes:

Unpaired Info:

UTM E:	UTM N:	Age:	Sex:	Behav:	Notes:

Notes:

Behavior Code: Visible, Singing, Calling, CaRry nest material, Carry/give Food, Incubating, Brooding, FOraging, or SColding

Nest stage Code: Construction, LaYing, Incubating, Nestlings, Fledged, Depredated, Abandoned, FaiLed, Unknown.

Data Entered on _____ by _____ Data Checked on _____ by _____

APPENDIX B. Datasheet for 2021 California Gnatcatcher nest monitoring.

MSHCP Biological Monitoring Program
2021 CAGN Nest Monitoring Data Sheet

General Nest Information

Grid ID:	Nest ID:
Nesting substrate:	Substrate height (m):
Nest height (m):	XY Coordinates:

Visit Information

			Behavior[1]		Target Species			BHCO	
Observer	Date (mm/dd/yyyy)	Nest Status[2]	Male	Female	# eggs	# nestlings	# fledglings	# eggs	# nestlings

Notes:

[1] Visible, Singing, Calling, CaRry nest material, Carry/give Food, Incubating, Carry fEcal sac, Brooding, or NL (Not Located)
[2] Construction, LaYing, Incubating, Nestlings, Fledged, Depredated, Abandoned, FaiLed, Unknown, or NL (Not Located)

Data entered by _____ on _____ Data checked by _____ on _____

APPENDIX C.

California Gnatcatcher reproductive biology

The California gnatcatcher (*Polioptila californica*; gnatcatcher) is a permanent resident of southern California's coastal sage scrub habitat (Atwood and Bontrager 2020). This shrub-nester was Federally listed in 1993 as threatened due in large part to massive habitat degradation. Gnatcatchers feed insects in shrubs or on grounds. Their territory sizes vary, influenced by habitat conditions and locations. In inland regions, gnatcatchers defend an average of 3.4 ha (Braden et al. 1997). Gnatcatchers build an open-cup nest using fine grasses and various bark fibers for outer layers, and using fine grasses, fur, feathers, and downy flower parts for liners (Grishaver et al. 1998). Nests in southern California usually contain 2–5 eggs that are incubated for a mean of 14 d (Erlich et al. 1988). Nestlings stay in the nest approximately 13 d, and parents keep feeding fledglings for another 3 weeks (Grishaver et al. 1998). Gnatcatchers are somewhat unusual in behavior because the male selects the nest site and shares in some of the incubation duties. Investigators have documented nest construction as early as 18 February, and because of its non-migratory status, Gnatcatchers typically begin breeding earlier than migrants that share breeding habitat (Atwood and Bontrager 2020). Furthermore, nesting activity may coincide with annual winter rains in southern California (Atwood and Bontrager 2020). Despite the elevated status, and auxiliary protections afforded this species, there is relatively little known about the ecology of the California Gnatcatcher.

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