

Ecosystems Mission Area—Species Management Research Program

# Distribution and Demography of Coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in San Diego County, California—2022 Data Summary



Data Report 1174

**Cover.** Coastal Cactus Wren (*Campylorhynchus brunneicapillus*). Photograph by Alexandra Houston, U.S. Geological Survey, June 5, 2020.

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By Suellen Lynn and Barbara E. Kus

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**U.S. Department of the Interior  
U.S. Geological Survey**

## U.S. Geological Survey, Reston, Virginia: 2023

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## Conversion Factors

International System of Units to U.S. customary units

Multiply	By	To obtain
Length		
centimeter (cm)	0.3937	inch (in.)
meter (m)	3.281	foot (ft)
millimeter (mm)	0.03937	inch (in.)
meter (m)	1.094	yard (yd)

## Datum

Horizontal coordinate information is referenced to the World Geographic System of 1984 (WGS 84).



# Distribution and Demography of Coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in San Diego County, California—2022 Data Summary

By Suellen Lynn and Barbara E. Kus

## Executive Summary

We surveyed for coastal Cactus Wren (*Campylorhynchus brunneicapillus*) in 507 established plots in San Diego County in 2022, encompassing 4 genetic clusters (Otay, Lake Jennings, Sweetwater/Encanto, and San Pasqual). Two surveys were completed at each plot between March 1 and July 31. Cactus Wrens were detected in 214 plots (42 percent of plots). Cactus Wrens were detected in 31 percent of plots that have been consistently surveyed since 2020, indicating less plot occupancy than in 2021 (34 percent) and 2020 (35 percent). There were 202 Cactus Wren territories detected across all survey plots in 2022. In plots that have been consistently surveyed since 2020, we documented 94 territories, which is a decrease from 113 territories in 2021 and 109 in 2020. The number of territories declined from 2021 to 2022 in the Lake Jennings and Otay genetic clusters but remained virtually the same in the Sweetwater/Encanto genetic cluster. At least 78 percent of Cactus Wren territories were occupied by pairs, and 134 fledglings were observed in 2022.

We observed 24 banded Cactus Wrens in 2022, 20 of which we could identify individually by band combination. Adults of known age ranged from 3 to at least 7 years old. All individually identifiable adult Cactus Wrens remained on the same territory in 2022 that they occupied in 2021, and we detected no movement of banded Cactus Wrens between genetic clusters.

Vegetation at Cactus Wren survey plots was dominated by coastal sage scrub shrubs, such as California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), lemonadeberry (*Rhus integrifolia*), jojoba (*Simmondsia chinensis*), and San Diego sunflower (*Bahiopsis laciniata*). No definitive signs of fungal pathogens were observed on cactus within and around survey plots. Blue elderberry (*Sambucus nigra* ssp. *caerulea*) was detected at 39 percent of plots, and Cactus Wrens occupied proportionally more plots with elderberry than plots without elderberry. Very little dead or unhealthy cactus was observed within all survey plots, and the plots that were occupied by Cactus Wrens were likely to contain fewer dead cactus than plots that were not

occupied by Cactus Wrens. Almost 80 percent of plots had more than 5 percent of cactus crowded or overtopped by vines and shrubs. Similar to 2020, Cactus Wrens occupied proportionally more plots with 5 percent or less of cactus crowded or overtopped by vines and shrubs, although this pattern was not observed in 2021. Non-native annual cover was less prevalent in survey plots in 2022 than in 2021, and Cactus Wrens did not preferentially occupy survey plots with 5 percent or less non-native annual cover than plots with more non-native cover.

## Introduction

The coastal Cactus Wren (*Campylorhynchus brunneicapillus*, wren) is a fragmentation-sensitive resident species in southern California that requires thickets of cholla (*Cylindropuntia* spp.) or prickly pear cactus (*Opuntia* spp.) for nesting. Limited naturally by the patchy distribution of this habitat, wren populations have become further fragmented in recent decades by urbanization, habitat degradation, and stochastic events, such as wildfire (Solek and Szijj, 2004; Hamilton and others, 2020). As a result, wren populations have been diminished in size and distribution and occur largely as islands in a matrix of generally unsuitable habitat.

Among the possible consequences of habitat fragmentation on wren viability is genetic isolation, which can lead to loss of genetic variability and ability to adapt to changing environments (Barr and others, 2015). Although wrens, like other birds, are mobile and can presumably fly long distances between patches (Preston and Kamada, 2012; Barr and others 2012, 2013; Kamada and Preston, 2013), movement of wrens between habitat patches in southern California seems to be rare (Lynn and others, 2022). Juvenile dispersal, whereby young birds leave their natal territories and establish breeding territories of their own, is the primary process by which genetic connectivity is achieved. Few juveniles have been documented dispersing among cactus sites in San Diego County (Lynn and others, 2022).

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In addition to isolation, population declines in part of the range have raised concerns regarding the capacity for long-term persistence of wrens in San Diego County. Coastal Cactus Wren populations have declined in southern California during the last three decades (Preston and Kamada, 2012); however, in San Diego County, particularly steep declines have been documented in the southern part of the County near Otay Valley. Wren territories on conserved lands in this region, which numbered 53 in 1992, declined to 14 in 2014 (The Nature Conservancy and San Diego Management and Monitoring Program, 2015). Although the wren population in Otay Valley increased to 43 territories by 2021 (Lynn and Kus, 2022), this population remains below the minimum effective population size of 50–100 individuals to prevent inbreeding depression (Frankham and others, 2014; Vandergast and others, 2022).

Although associated with long-term declines, neither fire nor development seem to be the primary factor responsible for the more recent and localized Otay wren population decline. Recent multiple years of drought could have affected wren abundance by reducing arthropod food resources, which could lower fecundity and survival (Preston and Kamada, 2012, Lynn and others, 2022). Annual precipitation has been less than 75 percent of average (24.0 centimeters) in half of the last 22 years (2000–22); precipitation was less than 50 percent of average in 7 of those years (5 years between 2000 and 2010; 2 years between 2011 and 2022; National Centers for Environmental Information, 2022). In 2014, an extreme drought year, productivity was exceptionally low, with only 3 fledglings observed during surveys of a population occupying 14 territories in the Otay region (The Nature Conservancy and San Diego Management and Monitoring Program, 2015). Between 2015 and 2019, when the Cactus Wren population in the Otay region was monitored more intensely, the number of fledglings per pair ranged from three to eight, with the lowest productivity in 2018, which was another extreme drought year (Lynn and others, 2022). More recently, 18 fledglings were observed during surveys at 43 territories in the Otay region in 2021, which was a less extreme drought year (Lynn and Kus, 2022).

Cactus Wrens are restricted to cactus scrub habitat, which is a rare vegetation community in San Diego County. Cactus scrub habitat is vulnerable to degradation by invasion

of non-native annual plants and grasses and is slow to recover from wildfire (Mitrovich and Hamilton, 2007; Hamilton, 2009). Dense non-native annual plants and grass within cactus scrub likely reduce the suitability of these areas for wrens, which primarily glean arthropod prey from bare ground and litter at the base of cactus and shrubs (Lynn and others, 2022).

Elderberry (*Sambucus nigra* spp. *caerulea*) has been suggested as an important resource for Cactus Wrens. Kristine Preston (U.S. Geological Survey, oral commun., 2015) observed elderberry in many wren territories in Orange County and suggested that it provided territorial advertising perches for adults, escape cover for fledglings, and also could be an important host for prey arthropods. This pattern occurred in San Diego County as well, where wrens were more likely to occupy plots with elderberry than plots without elderberry (Lynn and Kus, 2021, 2022). Arthropod abundance also was higher in elderberry than in other species in cactus scrub habitat in southern San Diego County (Lynn and others, 2022).

The Cactus Wren was selected as one of several indicator species by the San Diego Management and Monitoring Program to evaluate the state of the regional preserve system in San Diego County (Preston and others, 2022). The wren serves as an indicator for cactus scrub, a rare vegetation community, and is also a species of very high conservation priority within the regional preserve system. Metrics for evaluating the overall status of the species include the proportion of cactus plots occupied by wrens and the quality of the cactus habitat. The goals of the 2022 Cactus Wren effort were to perform surveys to assess the population status and to provide data to address both metrics used to evaluate the condition of the population in Western San Diego County. In addition, we collected data to enhance the understanding of demographics within the wren population, including resighting banded birds to determine age and movement of individuals, determining breeding status of wrens by observing paired behavior and documenting active nests and fledglings observed during surveys, and summarizing habitat attributes in occupied and unoccupied cactus wren survey plots in San Diego County. Data presented in this report can be found in a data release (Kus and Lynn, 2022). This report is the annual update to surveys that have been performed since 2015 (2015, 2017, 2018, 2019, 2020, and 2021; Lynn and Kus, 2021, 2022; Kus and Lynn, 2022; Lynn and others, 2022).

## Study Area and Methods

Survey plots were established throughout San Diego County by the U.S. Fish and Wildlife Service in 2011. We selected a subset of these plots that included four genetic clusters: (1) Otay genetic cluster, (2) Lake Jennings genetic cluster (also called “San Diego” genetic cluster in the data release [Kus and Lynn, 2022]), (3) Sweetwater/Encanto genetic cluster, and (4) San Pasqual genetic cluster (Barr and others, 2015; fig. 1). Plots in the Otay, Lake Jennings, and Sweetwater/Encanto genetic clusters were surveyed initially in 2015 and have been surveyed annually from 2017 to 2022. Plots in the San Pasqual genetic cluster were surveyed in 2019 and 2022. We surveyed 18 new plots in the northern part of the Lake Jennings genetic cluster in 2022 to detect northward movement of wrens.

Each survey plot was visited twice during a survey year: once between March 1 and May 31 and once between June 1 and July 31. Upon arrival, plots were scanned for wrens and wren nests and if wrens were not immediately detected, a wren song was broadcasted for 15–30 seconds to elicit a response. If wrens were not detected, plots were then carefully traversed for up to 20 minutes, looking for wrens or wren nests and periodically broadcasting the wren song. In addition to recording presence or absence of wrens, observers attempted to count all wrens within the plot, determine their age, resight legs to record color-band combinations of birds banded in previous studies (Lynn and others, 2022), and record the presence of active nests. A Global Positioning System point (World Geographic System of 1984 [WGS84]) was collected where wrens were located, and if no wrens were observed, points were collected at confirmed wren nests.

Cactus Wren territories often included all or parts of multiple survey plots; therefore, occupancy of survey plots alone likely overestimated the actual number of wrens in the survey areas. To arrive at a more standard population count, surveyors observed the behavior of wrens during surveys to determine the actual number of wrens using a block of survey plots. Population parameters, including number of wrens, age, breeding status (whether or not the wrens were paired), evidence of breeding (nests or fledglings observed), and color-band status were compiled by territory rather than by survey plot. Because Cactus Wrens do not show obvious sex- or age-distinguishing characteristics when observed under normal field conditions, sex and age typically were determined by specific behavioral cues or morphology when captured during previous years. Sex-related behavioral cues include position during copulation or incubation only by female. When in the hand, sex can be determined by the presence of a brood patch (females only) or cloacal protuberance (males only). If no sex-related behavioral cues were observed, we assigned an adult as “male” if it sang or called more frequently or was more visually obvious (potentially advertising

territory boundaries), although females also can exhibit these behaviors. Juvenile behavior that helped distinguish age included begging from adults, rudimentary vocalizations, and sibling group behavior. Young juveniles had shorter bills and tails and a more diffuse throat patch than adults and generally appeared bright and clean compared to adults with worn and brownish plumage.

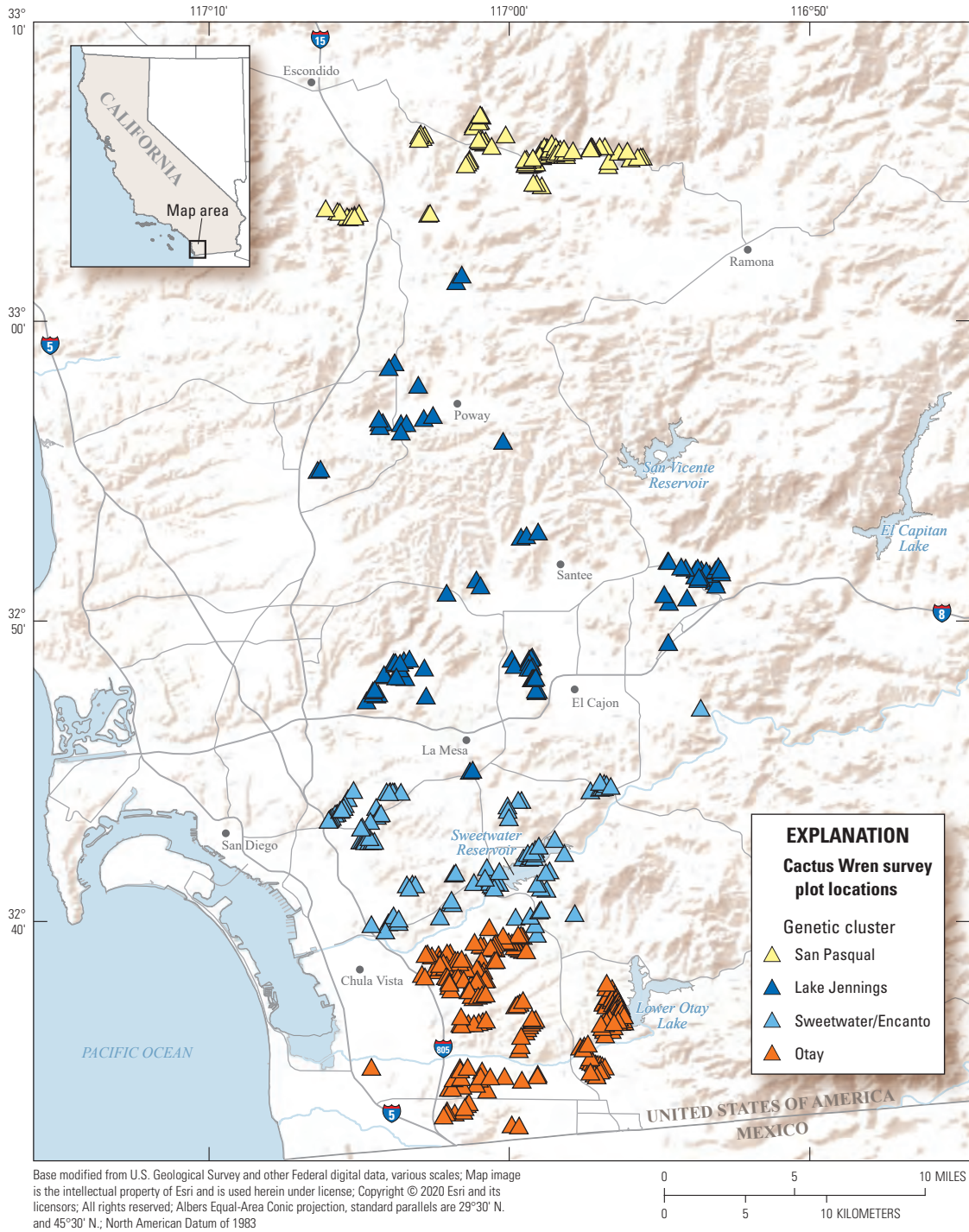
## Cactus Wren Age and Movement

In 2022, we attempted to resight all wrens at survey plots to identify individuals based on color-band combinations. When bands were missing or observations were unclear, we returned on non-survey days to obtain photographs using a Canon 7D Mark II digital single lens reflex camera with a Canon 100–400 millimeters F/4.5–5.6 zoom lens. Photographs were useful in determining fine color differences (faded bands) or reading numbers on metal bands. Color-band resighting data were used to determine age and document movement from banding sites.

## Vegetation Characteristics

General vegetation type (Holland, 1986, modified by Sawyer and others, 2009) for each plot was assigned by overlaying San Diego vegetation type maps (Landrum, 2018) over the survey plots using ArcMAP (Environmental Systems Research Institute, 2019). The dominant general vegetation type for each plot was selected based on the maximum area of that vegetation type mapped within the plot. When the mapped general vegetation type was inaccurate based on examination of aerial photos (mapping polygons lacked precision or vegetation had changed post-mapping), surveyors selected the most appropriate general vegetation type (ground-truthing). Surveyors also looked for signs of fungal pathogens on cactus (for example, *Fusarium brachygibbosum* and *Cladosporium cladosporioides*). During the first of the two annual surveys, observers noted habitat characteristics at each plot. These data included (1) dominant and co-dominant tree or shrub species, (2) presence or absence of blue elderberry (elderberry), (3) the percentage of cactus that was dead, (4) the percentage of cactus that was unhealthy, (5) the percentage of cactus overtopped or crowded by vines or shrubs, and (6) the percentage of the plot that was covered by non-native annual plant species. Vegetation characteristics (numbers 3–6) were visually estimated by the surveyor and assigned to one of seven categories: (1) 0-percent cover, (2) greater than 0 but less than 1-percent cover, (3) 1–5-percent cover, (4) greater than 5 percent and up to 25-percent cover, (5) greater than 25 percent and up to 50-percent cover, (6) greater than 50 percent and up to 75-percent cover, and (7) greater than 75-percent cover.

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**Figure 1.** Locations of Cactus Wren survey plots in San Diego County, California, 2022.

After examining the distribution of percent cover for each of the vegetation characteristics, we lumped together category numbers 1–3 (0–5-percent cover) and category numbers 4–7 (greater than 5-percent cover). We used chi-square analyses to determine if wrens were detected in different proportions between plots with 0–5 percent cover or greater than 5-percent cover of each vegetation characteristic. We also used

chi-square analyses to determine if wrens occupied the same proportion of plots that contained elderberry as those that did not contain elderberry. Given the sensitive status of coastal Cactus Wrens, we assigned statistical significance as  $P \leq 0.10$  to avoid overlooking potentially meaningful relationships relevant to management of the species in San Diego County.

## Results

We surveyed 507 plots for Cactus Wrens in 2022 (table 1). Wrens were detected at 42 percent of all plots (214/507), 22 percent of Otay plots (46/209), 29 percent of Lake Jennings plots (25/87), 47 percent of Sweetwater/Encanto plots (47/100), and 86 percent of San Pasqual plots (96/111; table 1). We observed 202 wren territories throughout all survey plots (table 2). We determined that wrens in 158 territories (78 percent) were paired and we could not determine the breeding status of birds in the remaining 44 territories. We detected active brood nests or fledglings at 100 territories, and we observed 134 fledglings during the surveys.

### Cactus Wren Age and Movement

During surveys, we were able to observe 295 adult wrens well enough to determine banding status in 2022, although not all banded wrens were observed well enough to conclusively identify the individual (banding status was determined for 187 males [93 percent of all males] and 108 females [68 percent of all females]). We detected 24 banded wrens in 2022 (table 3). Two males and two females could not be identified because resights were inconclusive (three were missing bands and one had been banded with only a single silver federal band and was not recaptured to read the band number to identify the individual). Therefore, we were able to identify 20 wrens with unique color-band combinations in 2022. Two of the females with missing bands continued to occupy the same territories that they occupied in 2020 and 2021; hence, we included them in movement summaries. Adult birds ranged from 3 to at least 7 years old.

Resighting banded birds allowed us to identify individuals that either remained in the same territory they used in the previous year or moved to a different location. We identified 20 adults (15 males and 5 females) at territories in 2021 that were detected again in 2022 (table 4). All 20 of these birds remained in the same breeding territory in 2022 that they occupied in 2021 (within 100 meters). We did not detect adult movement between genetic clusters from 2021 to 2022.

### Vegetation Characteristics

Vegetation characteristics were recorded at all 507 Cactus Wren survey plots in 2022. The prevalent general vegetation type was Diegan coastal sage scrub (table 5). Valley and foothill grassland and maritime succulent scrub were dominant at 6 percent and 5 percent of plots, respectively. Land cover heavily affected by human presence (urban/developed, disturbed habitat, and non-native grassland) predominated at 4 percent of survey plots. The remaining vegetation cover types (southern mixed chaparral and chaparral) dominated 2 percent or fewer of survey plots. The general vegetation type was updated in 2022 by ground-truthing at 10 percent

of all plots (49/507): 8 percent of Otay genetic cluster plots (17/209), 14 percent of Lake Jennings plots (12/87), 11 percent of plots in the Sweetwater/Encanto genetic cluster (11/100), and 8 percent of San Pasqual genetic cluster plots (9/111). Most of the updates to general vegetation type occurred where former agriculture, orchard, or urban/developed lands had transitioned to Diegan coastal sage scrub, disturbed habitat, or maritime succulent scrub.

Common coastal sage scrub species were the dominant shrub species at most of the plots, including California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), lemonadeberry (*Rhus integrifolia*), jojoba (*Simmondsia chinensis*), and San Diego sunflower (*Bahiopsis laciniata*; table 6). No definitive signs of fungal pathogens were observed on cactus within and around survey plots.

Of 507 plots, 198 (39 percent) contained elderberry. Wrens occupied a significantly higher proportion of plots that contained elderberry (61 percent; 121/198) than plots that did not contain elderberry (30 percent; 93/309; chi-square=47.6,  $P<0.001$ ).

At most of the wren survey plots (78 percent) in 2022, 5 percent or less of cactus was dead (table 7). Between 5 and 25 percent of cactus was dead in 20 percent of plots and, in 2 percent of plots, more than 25 percent of cactus was dead. Wrens occupied proportionately more plots (45 percent; 176/391) with 5 percent or less dead cactus than plots with more than 5 percent dead cactus (33 percent; 38/115; chi-square=5.2,  $P=0.02$ ; fig. 2).

At most of the wren plots (80 percent), 5 percent or less of cactus showed signs of stress (table 8). Between 5 and 25 percent of cactus was unhealthy at 18 percent of plots. Two percent of the plots contained more than 25 percent of cactus that was unhealthy. There was no difference in wren occupancy of plots with 5 percent or less unhealthy cactus (42 percent; 171/403) than plots with more than 5 percent unhealthy cactus (41 percent; 43/104; chi-square=0.04,  $P=0.84$ ; fig. 3).

Shrubs and vines crowded or overtopped 5 percent or less of cactus at 21 percent of plots (table 9). Between 5 and 25 percent of cactus was overtopped by shrubs and vines at 36 percent of plots. At 43 percent of plots, vines and shrubs crowded or overtopped at least 25 percent of cactus. Wrens occupied proportionately more plots (61 percent; 66/108) with 5 percent or less cactus that was overtopped by shrubs and vines than plots with more than 5 percent overtopped cactus (37 percent; 148/399; chi-square=20.1,  $P<0.01$ ; fig. 4).

Non-native annual grasses and forbs covered 5 percent or less of the wren survey plots at 48 percent of plots (table 10). Between 5 and 25 percent of the plot was covered by non-native annual grasses and forbs at 36 percent of plots. There was more than 25-percent non-native annual cover at 16 percent of the plots. There was no difference in wren occupancy of plots with 5 percent or less non-native annual cover (43 percent; 104/240) than plots with greater than 5-percent non-native cover (41 percent; 110/267; chi-square=0.2,  $P=0.63$ ; fig. 5).

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**Table 1.** Number of plots surveyed and number occupied by Cactus Wrens by genetic cluster.

[Survey 1, April 1 through May 31, 2022; Survey 2, June 1 through July 31, 2022]

Genetic cluster	Number of plots				
	Total surveyed	Occupied survey 1	Occupied survey 2	Total occupied	Percent occupied
Otay	209	38	40	46	22
Lake Jennings	87	22	19	25	29
Sweetwater/Encanto	100	38	42	47	47
San Pasqual	111	91	85	96	86
<b>Total</b>	<b>507</b>	<b>189</b>	<b>186</b>	<b>214</b>	<b>42</b>

**Table 2.** Number and breeding status of Cactus Wren territories by genetic cluster.

[No., number]

Genetic cluster	Breeding status		Total territories	No. territories with active nests	No. fledglings
	Paired	Unknown			
Otay	27	7	34	23	33
Lake Jennings	18	6	24	12	17
Sweetwater/Encanto	35	6	41	28	44
San Pasqual	78	25	103	37	40
<b>Total</b>	<b>158</b>	<b>44</b>	<b>202</b>	<b>100</b>	<b>134</b>

**Table 3.** Location, number, and proportion (within each genetic cluster) of banded Cactus Wrens by genetic cluster in 2022.

[yrs, years; ≥, greater than or equal to; —, none]

Age in 2022	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	San Pasqual genetic cluster	Total
7 yrs	1 (0.07)	—	—	—	1 (0.04)
6 yrs	1 (0.07)	1 (0.20)	2 (0.50)	—	4 (0.17)
≥6 yrs	—	1 (0.20)	—	—	1 (0.04)
5 yrs	3 (0.21)	—	—	—	3 (0.13)
≥5 yrs	1 (0.07)	1 (0.20)	1 (0.25)	—	3 (0.13)
4 yrs	—	—	1 (0.25)	—	1 (0.04)
3 yrs	5 (0.36)	2 (0.40)	—	—	7 (0.29)
<b>Subtotal</b>	<b>11</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>20</b>
Unknown identity					
≥5 yrs	1 (0.07)	—	—	—	1 (0.04)
≥3 yrs	2 (0.14)	—	—	1 (1.00)	3 (0.13)
<b>Total</b>	<b>14</b>	<b>5</b>	<b>4</b>	<b>1</b>	<b>24</b>

**Table 4.** Between-year movement by adult Cactus Wrens detected in 2022, San Diego County, California.

[**Genetic cluster codes:** OT, Otay genetic cluster; SW-EN, Sweetwater/Encanto genetic cluster; LJ, Lake Jennings genetic cluster. **Abbreviation:** km, kilometers]

Genetic cluster/territory		Distance moved (km)	Sex
Previous year	2022		
Last seen in 2021			
OT/153c	OT/153c	0.00	Female
OT/634c	OT/634c	0.01	Male
SW-EN/254c	SW-EN/254c	0.01	Male
LJ/4c_a	LJ/4c	0.01	Male
OT/635c_a	OT/635a_c	0.01	Male
OT/635c_a	OT/635a_c	0.01	Female
OT/Owl	OT/Owl	0.02	Male
OT/288c	OT/288c	0.02	Male
OT/686c	OT/686c	0.03	Male
SW-EN/67c	SW-EN/67c	0.03	Male
OT/278c	OT/278c	0.04	Male
OT/635c	OT/635c	0.06	Male
LJ/566c	LJ/566c	0.06	Male
LJ/298c	LJ/298c	0.07	Female
OT/155c	OT/155c	0.09	Female
LJ/Helix	LJ/Helix	0.09	Male
LJ/Helix	LJ/Helix	0.09	Female
SW-EN/65c	SW-EN/65c	0.09	Male
SW-EN/64c02	SW-EN/64c	0.11	Male
OT/268c	OT/268c	0.12	Male
Last seen in 2020			
OT/138c	OT/138c	0.02	Male
Last seen in 2016			
OT/268c	OT/269c	0.18	Female

## 8 Distribution and Demography of Coastal Cactus Wrens in San Diego County, California

**Table 5.** Dominant vegetation cover types at Cactus Wren survey plots, San Diego County, updated in 2022.

[Vegetation maps (Landrum, 2018) updated in 2022 by ground-truthing. Vegetation cover type codes developed by Holland (1986) and modified by Sawyer and others (2009). Proportion of plots of that vegetation type within the cluster is in parentheses. **Abbreviations:** —, not present]

Dominant vegetation cover type	Number of plots				Total
	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	San Pasqual genetic cluster	
Diegan coastal sage scrub	155 (0.74)	82 (0.94)	82 (0.82)	103 (0.93)	422 (0.83)
Valley and foothill grassland	11 (0.05)	2 (0.02)	11 (0.11)	6 (0.05)	30 (0.06)
Maritime succulent scrub	23 (0.11)	—	—	—	23 (0.05)
Disturbed habitat	7 (0.03)	1 (0.01)	5 (0.05)	1 (0.01)	14 (0.03)
Southern mixed chaparral	11 (0.05)	—	—	—	11 (0.02)
Non-native grassland	2 (0.01)	1 (0.01)	1 (0.01)	1 (0.01)	5 (0.01)
Chaparral	—	1 (0.01)	—	—	1 (0.002)
Urban/developed	—	—	1 (0.01)	—	1 (0.002)
<b>Total</b>	<b>209</b>	<b>87</b>	<b>100</b>	<b>111</b>	<b>507</b>

**Table 6.** Shrub species that were dominant or co-dominant at Cactus Wren survey plots in 2022, San Diego County, California.

[Proportion of plots containing that plant species within the genetic cluster is in parentheses. A plot may have more than 1 co-dominant plant species so proportions do not add to 1. **Abbreviations:** —, not present; <, less than]

Dominant or co-dominant shrub species	Number of plots				Total
	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	San Pasqual genetic cluster	
California sagebrush	131 (0.63)	55 (0.63)	65 (0.65)	74 (0.67)	325 (0.64)
California buckwheat	42 (0.20)	31 (0.36)	21 (0.21)	87 (0.78)	181 (0.36)
Lemonadeberry	57 (0.27)	11 (0.13)	13 (0.13)	—	81 (0.16)
Jojoba	68 (0.33)	—	13 (0.13)	—	81 (0.16)
San Diego sunflower	32 (0.15)	11 (0.13)	13 (0.13)	—	56 (0.11)
Broom baccharis ( <i>Baccharis sarothroides</i> )	4 (0.02)	28 (0.32)	14 (0.14)	—	46 (0.09)
Laurel sumac ( <i>Malosma laurina</i> )	—	12 (0.14)	7 (0.07)	22 (0.20)	41 (0.08)
California brittlebush ( <i>Encelia californica</i> )	10 (0.05)	—	1 (0.01)	3 (0.03)	14 (0.03)
Western ragweed ( <i>Ambrosia psilostachya</i> )	12 (0.06)	—	—	1 (0.01)	13 (0.03)
Black sage ( <i>Salvia mellifera</i> )	—	5 (0.06)	2 (0.02)	—	7 (0.01)
Acacia species ( <i>Acacia</i> spp.)	1 (<0.01)	—	1 (0.01)	—	2 (<0.01)
Eucalyptus species ( <i>Eucalyptus</i> spp.)	—	—	2 (0.02)	—	2 (<0.01)
Peruvian pepper tree ( <i>Schinus molle</i> )	—	—	2 (0.02)	—	2 (<0.01)
Mule fat ( <i>Baccharis salicifolia</i> )	—	1 (0.01)	—	—	1 (<0.01)
Black mustard ( <i>Brassica nigra</i> )	1 (<0.01)	—	—	—	1 (<0.01)
Perennial ryegrass ( <i>Lolium perenne</i> )	1 (<0.01)	—	—	—	1 (<0.01)
Sage species ( <i>Salvia</i> spp.)	—	—	1 (0.01)	—	1 (<0.01)
Saltcedar ( <i>Tamarix</i> spp.)	1 (<0.01)	—	—	—	1 (<0.01)

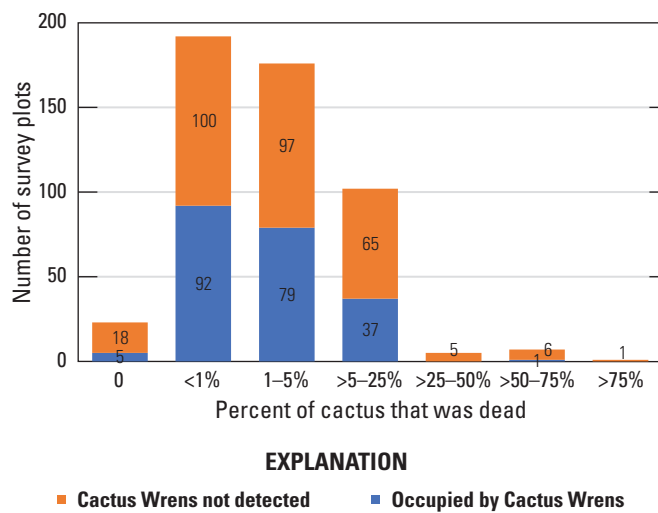


**Table 7.** Proportion of cactus that was dead at Cactus Wren survey plots in 2022, San Diego County, California.

[<, less than; >, greater than]

Percent cover	Proportion of plots				Total
	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	San Pasqual genetic cluster	
0	0.03	0.09	0.06	0.02	0.05
<1	0.49	0.36	0.40	0.17	0.38
1–5	0.35	0.16	0.34	0.50	0.35
>5–25	0.09	0.37	0.18	0.30	0.20
>25–50	0.01	0.01	0.02	0.00	0.01
>50–75	0.02	0.01	0.00	0.01	0.01
>75	0.00	0.00	0.00	0.00	0.00
<b>Total plots</b>	<b>1208</b>	<b>87</b>	<b>100</b>	<b>111</b>	<b>506</b>

<sup>1</sup>Data were not collected at one survey plot in 2022.



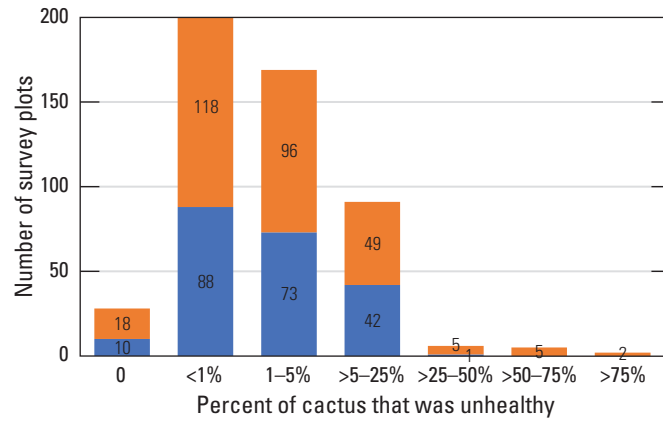
**Figure 2.** Number of survey plots that were occupied by Cactus Wrens by the percentage of cactus present that was dead, San Diego County, 2022. Abbreviation: %, percent.

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**Table 8.** Proportion of cactus that was unhealthy at Cactus Wren survey plots in 2022, San Diego County, California.

[<, less than; >, greater than]

Percent cover	Proportion of plots				Total
	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	San Pasqual genetic cluster	
0	0.01	0.14	0.05	0.07	0.06
<1	0.52	0.26	0.54	0.19	0.41
1–5	0.38	0.25	0.24	0.40	0.33
>5–25	0.07	0.31	0.14	0.32	0.18
>25–50	0.00	0.03	0.02	0.01	0.01
>50–75	0.02	0.00	0.01	0.00	0.01
>75	0.00	0.00	0.00	0.01	0.00
<b>Total plots</b>	<b>209</b>	<b>87</b>	<b>100</b>	<b>111</b>	<b>507</b>



**EXPLANATION**

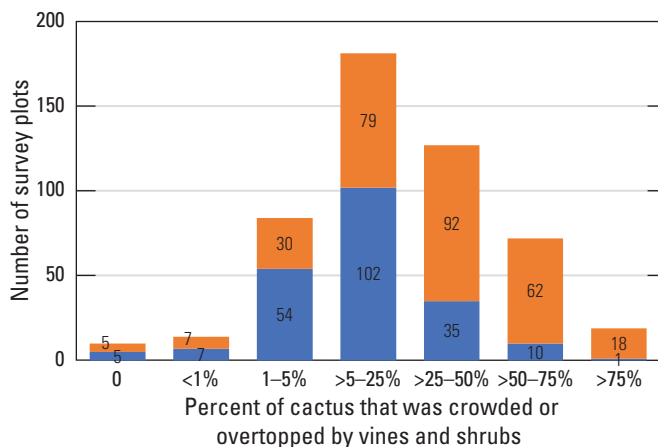
- Cactus Wrens not detected
- Occupied by Cactus Wrens

**Figure 3.** Number of survey plots that were occupied by Cactus Wrens by the percentage of cactus present that was unhealthy, San Diego County, 2022. Abbreviation: %, percent.

**Table 9.** Proportion of cactus that was crowded or overtopped by vines and shrubs at Cactus Wren survey plots in 2022, San Diego County, California.

[<, less than; >, greater than]

Percent cover	Proportion of plots				Total
	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	San Pasqual genetic cluster	
0	0.00	0.02	0.01	0.05	0.02
<1	0.00	0.03	0.02	0.07	0.03
1–5	0.11	0.03	0.23	0.32	0.17
>5–25	0.31	0.29	0.42	0.44	0.36
>25–50	0.35	0.32	0.18	0.07	0.25
>50–75	0.17	0.25	0.11	0.04	0.14
>75	0.06	0.05	0.03	0.00	0.04
<b>Total plots</b>	<b>209</b>	<b>87</b>	<b>100</b>	<b>111</b>	<b>507</b>



**EXPLANATION**

- Cactus Wrens not detected
- Occupied by Cactus Wrens

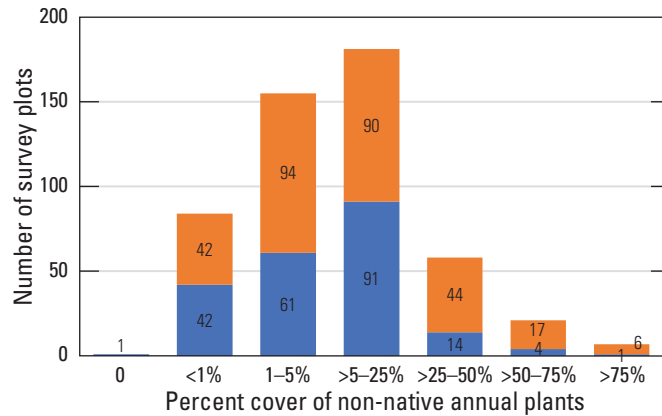
**Figure 4.** Number of survey plots that were occupied by Cactus Wrens by the percentage of cactus present that was crowded or overtopped by vines or shrubs, San Diego County, 2022. Abbreviation: %, percent.

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**Table 10.** Proportion of non-native annual cover at Cactus Wren survey plots in 2022, San Diego County, California.

[<, less than; >, greater than]

Percent cover	Proportion of plots				Total
	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	San Pasqual genetic cluster	
0	0.00	0.00	0.00	0.01	0.00
<1	0.14	0.09	0.20	0.24	0.17
1–5	0.40	0.17	0.28	0.26	0.31
>5–25	0.29	0.47	0.35	0.41	0.36
>25–50	0.13	0.17	0.10	0.06	0.11
>50–75	0.05	0.08	0.03	0.01	0.04
>75	0.00	0.01	0.04	0.01	0.01
<b>Total plots</b>	<b>209</b>	<b>87</b>	<b>100</b>	<b>111</b>	<b>507</b>



**EXPLANATION**

- Cactus Wrens not detected
- Occupied by Cactus Wrens

**Figure 5.** Number of survey plots that were occupied by Cactus Wrens by the percent cover of non-native annual plants, San Diego County, 2022. Abbreviation: %, percent.

## Summary

Cactus Wrens were detected in 42 percent of all survey plots in 2022. Excluding plots that were not surveyed in 2021 (San Pasqual genetic cluster and other plots in the northern section of the Lake Jennings genetic cluster), Cactus Wrens were detected in 31 percent of plots, which is a slight drop from the 34 percent of all plots that were occupied in 2021 and the 35 percent of plots occupied in 2020 (Lynn and Kus, 2021; Kus and Lynn, 2022). The number of wren territories in plots that were surveyed consistently from 2020 through 2022 decreased to 94 in 2022 from 113 in 2021 and 109 in 2020. The decrease in number of territories primarily occurred in the Lake Jennings and Otay genetic clusters, where the number of territories dropped from 43 to 34 (Otay) and from 29 to 20 (Lake Jennings) from 2021 to 2022. We did not detect any movement of wrens between genetic clusters between 2021 and 2022.

Although most of the wren plots did not contain elderberry, wrens were more likely to occupy plots with elderberry than plots without elderberry in our study area, which is consistent with occupancy and elderberry-containing plots in 2020 and 2021. Wren habitat mostly was characterized by typical coastal sage scrub plant species but with a strong component of taller woody shrubs, such as lemonadeberry and laurel sumac. The cactus in most survey plots was healthy and, like in 2020 and 2021, wrens preferentially selected survey plots with less dead cactus. At 79 percent of survey plots, more than 5 percent of cactus was crowded or overtopped by vines and shrubs and, like in 2020 but unlike 2021, wrens preferentially selected plots with less shrub and vine crowding and overtopping. Non-native annual cover was less prevalent in survey plots in 2022 than in 2021 (48 percent versus 29 percent of plots with 5 percent or less non-native annual cover, respectively), and wrens did not preferentially occupy survey plots with less non-native annual cover in 2022.

## References Cited

- Barr, K.R., Vandergast, A.G., and Kus, B.E., 2012, Genetic connectivity in the Coastal Cactus Wren: U.S. Geological Survey Data Summary report prepared for the San Diego Management and Monitoring Program, 30 p., accessed September 13, 2022, at [https://sdmmp.com/download.php?cid=CiteID\\_1603251358357780](https://sdmmp.com/download.php?cid=CiteID_1603251358357780).
- Barr, K.R., Vandergast, A.G., and Kus, B.E., 2013, Genetic structure in the Cactus Wren in coastal southern California: U.S. Geological Survey, Data Summary report prepared for the California Department of Fish and Wildlife, 27 p., accessed September 13, 2022, at [nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=65007](https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=65007).
- Barr, K.R., Kus, B.E., Preston, K.L., Howell, S., Perkins, E., and Vandergast, A.G., 2015, Habitat fragmentation in coastal southern California disrupts genetic connectivity in the Cactus Wren (*Campylorhynchus brunneicapillus*): *Molecular Ecology*, v. 24, no. 10, p. 2349–2363. [Available at <https://doi.org/10.1111/mec.13176>.]
- Environmental Systems Research Institute, 2019, ArcMAP version 10.7.1: Redlands, Calif., Environmental Systems Research Institute.
- Frankham, R., Bradshaw, C.J.A., and Brook, B.W., 2014, Genetics in conservation management—Revised recommendations for the 50/500 rules, Red List criteria and population viability analyses: *Biological Conservation*, v. 170, p. 56–63, accessed October 12, 2022, at <https://doi.org/10.1016/j.biocon.2013.12.036>.
- Hamilton, R.A., 2009, 2008 Surveys—Cactus Wrens and California Gnatcatchers San Dieguito River Valley, San Diego County: Long Beach, Calif., Hamilton, R.A., prepared for the Conservation Biology Institute, 112 p., accessed October 12, 2022, at [https://sdmmp.com/view\\_article.php?cid=CiteID\\_1603251358355960](https://sdmmp.com/view_article.php?cid=CiteID_1603251358355960).
- Hamilton, R.A., Proudfoot, G.A., Sherry, D.A., and Johnson, S.L., 2020, Cactus Wren (*Campylorhynchus brunneicapillus*) (ver. 1.0, March 4, 2020), in Poole, A.F., ed., *Birds of the world*: Ithaca, N.Y., Cornell Lab of Ornithology, accessed September 2022 at <https://doi.org/10.2173/bow.cacwre.01>.
- Holland, R.F., 1986, Preliminary descriptions of the terrestrial natural communities of California: Sacramento, Calif., State of California, The Resources Agency, Department of Fish and Game, 156 p. [Available at <https://nrmsecure.dfg.ca.gov/FileHandler.ashx?DocumentID=75893>.]
- Kamada, D., and Preston, K., 2013, Nature reserve of Orange County—Coastal Cactus Wren dispersal and survival surveys, genetics & parasite sampling, and arthropod foraging ecology in 2012: Annual report prepared in fulfillment of reporting requirements for the memorandum of understanding between Dana Kamada and the California Department of Fish and Wildlife, 92 p., accessed September 13, 2022, at [https://sdmmp.com/upload/SDMMP\\_Repository/0/25hms3p4y9qxw7rv18gdkzncbft0j6.pdf](https://sdmmp.com/upload/SDMMP_Repository/0/25hms3p4y9qxw7rv18gdkzncbft0j6.pdf).
- Kus, B.E., and Lynn, S., 2022, Surveys and monitoring of Coastal Cactus Wrens in southern San Diego County (ver. 3.0, May 2023): U.S. Geological Survey data release, <https://doi.org/10.5066/F76H4FK5>.

## 14 Distribution and Demography of Coastal Cactus Wrens in San Diego County, California

- Landrum, P., 2018, Vegetation (County): San Diego Association of Governments/SanGIS Regional GIS Data Warehouse Open Data Portal, accessed September 8, 2022, at <https://sdgis-sandag.opendata.arcgis.com/datasets/SANDAG::vegetation-county/explore?location=32.955610%2C-116.751224%2C9.54>.
- Lynn, S., and Kus, B.E., 2021, Distribution and demography of coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in southern San Diego County, California—2020 data summary: U.S. Geological Survey Data Series 1138, 12 p., accessed September 13, 2022, at <https://doi.org/10.3133/ds1138>.
- Lynn, S., and Kus, B.E., 2022, Distribution and demography of coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in southern San Diego County, California—2021 data summary: U.S. Geological Survey Data Report 1159, 14 p., accessed September 13, 2022, at <https://doi.org/10.3133/dr1159>.
- Lynn, S., Houston, A., and Kus, B.E., 2022, Distribution and demography of Coastal Cactus Wrens in Southern California, 2015–19: U.S. Geological Survey Open-File Report 2022–1044, 44 p., accessed September 13, 2022, at <https://doi.org/10.3133/ofr20221044>.
- Mitrovich, M.J., and Hamilton, R.A., 2007, Status of the Cactus Wren (*Campylorhynchus brunneicapillus*) within the coastal subregion of Orange County, California: Prepared for Nature Reserve of Orange County, 18 p., accessed October 12, 2002, at [https://sdmmp.com/view\\_article.php?cid=CiteID\\_1603251358359050](https://sdmmp.com/view_article.php?cid=CiteID_1603251358359050).
- National Centers for Environmental Information, 2022, Global summary of the month (GSOM), version 1: National Centers for Environmental Information, National Oceanic and Atmospheric Administration, accessed October 12, 2002, at <https://www.ncei.noaa.gov/access/search/data-search/global-summary-of-the-month?dataTypes=PRCP&bbox=32.718,-117.161,32.564,-117.007>.
- Preston, K., and Kamada, D., 2012, Nature reserve of Orange County—Monitoring Coastal Cactus Wren reproduction, dispersal and survival, 2009–2011: Final report prepared for California Department of Fish and Game, LAG# P0982013, 92 p., accessed September 13, 2022, at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=46786&inline>.
- Preston, K.L., Perkins, E.E., Brown, C.W., McCutcheon, S.J., Bernabe, A.E., Luciani, E., Kus, B.E., and Wynn, S., 2022, State of the regional preserve system in western San Diego County: San Diego, Calif., San Diego Association of Governments, 131 p. + appendixes, accessed April 11, 2023, at [https://www.sdmmp.com/view\\_article.php?cid=SDMMP\\_CID\\_71\\_63979fd98137e#](https://www.sdmmp.com/view_article.php?cid=SDMMP_CID_71_63979fd98137e#).
- Sawyer, J.O., Keeler-Wolf, T., and Evens, J.M., 2009, A manual of California vegetation (2d ed.): Sacramento, Calif., California Native Plant Society, 1300 p.
- Solek, C., and Szijj, L.J., 2004, Cactus Wren (*Campylorhynchus brunneicapillus*), in Szijj, L.J., ed., The coastal shrub and chaparral bird conservation plan—A strategy for protecting and managing coastal scrub and chaparral habitats and associated birds in California: Berkeley, Calif., California Partners in Flight, accessed September 13, 2022, at [http://www.prbo.org/calpif/htmldocs/species/scrub/cactus\\_wren.html](http://www.prbo.org/calpif/htmldocs/species/scrub/cactus_wren.html).
- The Nature Conservancy and San Diego Management and Monitoring Program, 2015, South San Diego County Coastal Cactus Wren (*Campylorhynchus brunneicapillus*) habitat conservation and management plan—Prepared for San Diego Association of Governments: The Nature Conservancy and San Diego Management and Monitoring Program, 37 p. + appendixes, accessed September 13, 2022, at [https://sdmmp.com/upload/projects/20160330\\_2357\\_194.pdf](https://sdmmp.com/upload/projects/20160330_2357_194.pdf).
- Vandergast, A.G., Kus, B.E., Smith, J.G., and Mittelberg, A., 2022, Recent declines in genetic diversity with limited dispersal among coastal Cactus Wren populations in San Diego County, California: Conservation Science and Practice, v. 4, no. 9, p. 1–16. [Available at <https://doi.org/10.1111/csp2.12780>.]

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