USGS
science for a changing world

Ecosystems Mission Area—Species Management Research Program

Distribution and Demography of Coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in Southern San Diego County, California—2021 Data Summary

Data Report 1159

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

Cover. Coastal Cactus Wren (*Campylorhynchus brunneicapillus*). Photograph by Alexandra Houston, U.S. Geological Survey, April 4, 2018.

Distribution and Demography of Coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in Southern San Diego County, California—2021 Data Summary

By Suellen Lynn and Barbara E. Kus

Ecosystems Mission Area—Species Management Research Program

Data Report 1159

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

U.S. Geological Survey, Reston, Virginia: 2022

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment—visit https://www.usgs.gov or call 1–888–ASK–USGS.

For an overview of USGS information products, including maps, imagery, and publications, visit https://store.usgs.gov/.

Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this information product, for the most part, is in the public domain, it also may contain copyrighted materials as noted in the text. Permission to reproduce copyrighted items must be secured from the copyright owner.

Suggested citation:
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: Data Report 1159, 14 p., https://doi.org/10.3133/dr1159.

Associated data for this publication:
Kus, B.E., and Lynn, S., 2022, Surveys and monitoring of Coastal Cactus Wren in Southern San Diego County: U.S. Geological Survey data release, accessed December 13, 2021, at https://doi.org/10.5066/F76H4FK5.

ISSN 2771-9448 (online)

Acknowledgments

This study was funded by the San Diego Association of Governments.

We thank the biologists who assisted in data collection for this project: Annabelle Bernabe, Aaron Gallagher, Alexandra Houston, and Stéphane Vernhet of the U.S. Geological Survey. We also thank the land managers, property owners, and other stakeholders who facilitated access to the survey plots, including but not limited to: Pete Famolaro (Sweetwater Authority), John Martin (San Diego National Wildlife Refuge), Debbie Lundy and Kira Haley (Helix Water District), Lisa Coburn-Boyd (Otay Water District), Michael Galloway (California Department of Transportation), Patricia Smith (City of Chula Vista), Brian Canaris (Otay Project LP), Andrew Field (City of San Diego), Joshua Lambdin, Mika Shamada-Cicirelli, and Mark Berninger (City of San Diego Parks and Recreation), Margaret Diss, Jennifer Price, James Stowers, Roger Covalt, Michael Verderber, Lauren Raduc, and David Collins, (San Diego County Parks and Recreation), Tracie Nelson (California Department of Fish and Wildlife), Tony Sawyer (San Diego County Department of General Services), Pastor Dan Grant and Tylene Howarter (Skyline Church).

Contents

Figures

Tables

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)
kilometer (km)	0.6214	mile (mi)
kilometer (km)	0.5400	mile, nautical (nmi)
meter (m)	1.094	yard (yd)

Datum

Horizontal coordinate information is referenced to the World Geographic System of 1984 (WGS84).

Supplemental Information

Note to U.S. Geological Survey users: Use of hectare (ha) as an alternative name for square hectometer (hm^2) is restricted to the measurement of small land or water areas.

Abbreviation

USGS U.S. Geological Survey

Distribution and Demography of Coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in Southern San Diego County, California—2021 Data Summary

By Suellen Lynn and Barbara E. Kus

Executive Summary

We surveyed for coastal Cactus Wren (*Campylorhynchus brunneicapillus*) in 378 established plots in southern San Diego County in 2021, encompassing 3 genetic clusters (Otay, Lake Jennings, and Sweetwater/Encanto). Two surveys were completed at each plot between March 1 and July 31. Cactus Wrens were detected in 130 plots (34 percent of plots), remaining virtually the same as the percentage of plots occupied in 2020 (35 percent). There were 113 Cactus Wren territories detected across all survey plots in 2021, an increase from 109 in 2020. At least 86 percent of Cactus Wren territories were occupied by pairs, and 50 fledglings were observed in 2021.

We observed 48 color-banded Cactus Wrens in 2021, 44 of which we could identify to individual. Adults of known age ranged from 2 to at least 7 years old. Adult Cactus Wrens moved, on average, 0.1 kilometers (maximum 0.5 kilometers) from their 2020 territories to their 2021 territories. No known-identity Cactus Wrens moved between genetic clusters from 2020 to 2021.

Vegetation at Cactus Wren plots typically was dominated by coastal sage scrub shrubs, such as California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), lemonadeberry (*Rhus integrifolia*), and San Diego sunflower (*Bahiopsis laciniata*). Twenty-nine percent of plots contained blue elderberry (*Sambucus nigra* ssp. *caerulea*), 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 more healthy cactus than plots that were not occupied by Cactus Wrens. Thirteen percent of plots had 5 percent or less of the cactus crowded or overtopped by vines and shrubs. Although in 2020, Cactus Wrens occupied proportionally more plots with 5 percent or less of cactus crowded or overtopped by vines and shrubs, this pattern was not found in 2021. Non-native annual cover was 5 percent or less at 29 percent of plots and, unlike in 2020, Cactus Wrens appeared to occupy proportionally more plots with less non-native annual cover than plots with more than 5-percent annual 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), little is known about actual connectivity among populations in southern California. Juvenile dispersal, whereby young birds leave their natal territories and establish breeding territories of their own, is the key process by which genetic connectivity is achieved, yet this stage of the life history of birds is probably the most poorly understood.

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 over the last three decades (Preston and Kamada, 2012); however, in San Diego County, particularly steep declines have been detected (recently) in the southern part of the County in the vicinity of 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 associated with long-term declines, neither fire nor development appear 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). Annual precipitation has been less than 75 percent of average (24.0 centimeters [cm]) in half of the last 22 years (2000–21); precipitation was less than 11 cm in 5 of those years. 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).

Food availability for wrens could be affected by annual precipitation and mediated by habitat quality, as characterized by the composition and cover of native and non-native plant species, amount of bare ground, and microsite characteristics, such as soils, slope and aspect. Poor habitat quality could exacerbate food limitation during drought years; thus, improving habitat quality through management could increase food availability and enhance wren productivity and survival. Developing management strategies to increase the stability of wren populations in years with low rainfall may be of particular importance if droughts become more frequent, intense, and prolonged in the future, as predicted by climate change models.

The goal of the 2021 Cactus Wren effort was to perform surveys to assess the population status, banding status, breeding status, nesting status, and habitat attributes of wrens in southern 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, and 2020; Kus and Lynn, 2022; Lynn and Kus, 2021).

Study Area and Methods

Surveys

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 in southern San Diego County that included three genetic clusters: (1) Otay genetic cluster, (2) Lake Jennings genetic cluster, and (3) Sweetwater/Encanto genetic cluster (Barr and others, 2015; fig. 1).

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. Plots were scanned for wrens and wren nests on arrival, and if wrens were not immediately detected, a wren song was broadcast for 15–30 seconds to elicit response. If no wrens were detected, plots were then carefully traversed, looking for wrens or wren nests, periodically broadcasting the wren song for up to 20 minutes. In addition to recording presence or absence of wrens, observers attempted to count all wrens using the plot, determine their age, resight legs to record color-band combinations, and record presence of active nests. A Global Positioning System point 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.

Banded Cactus Wrens

Cactus Wrens had previously been banded in the study area as part of a demographic study performed in 2015 through 2019 (Kus and Lynn, 2022). Adult wrens were captured opportunistically at monitored territories using mist nets and song playback and then banded with a unique combination of colored leg bands; in addition, nestlings from accessible nests in monitored territories were banded. In 2021, 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 millimeter (mm) 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.

Cactus Wrens do not exhibit obvious sexual dimorphism when observed under normal field conditions. Gender typically is determined by specific behavioral cues (position during copulation, incubation only by female) or morphology when the bird is in the hand (females have brood patches, males have cloacal protuberances). Gender is not determinable for nestlings without genetic analysis. If none of these 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. As a result, we did not have a large sample of confirmed gender adults and therefore did not attempt gender-related analyses of survivorship or movements, except as general summaries.

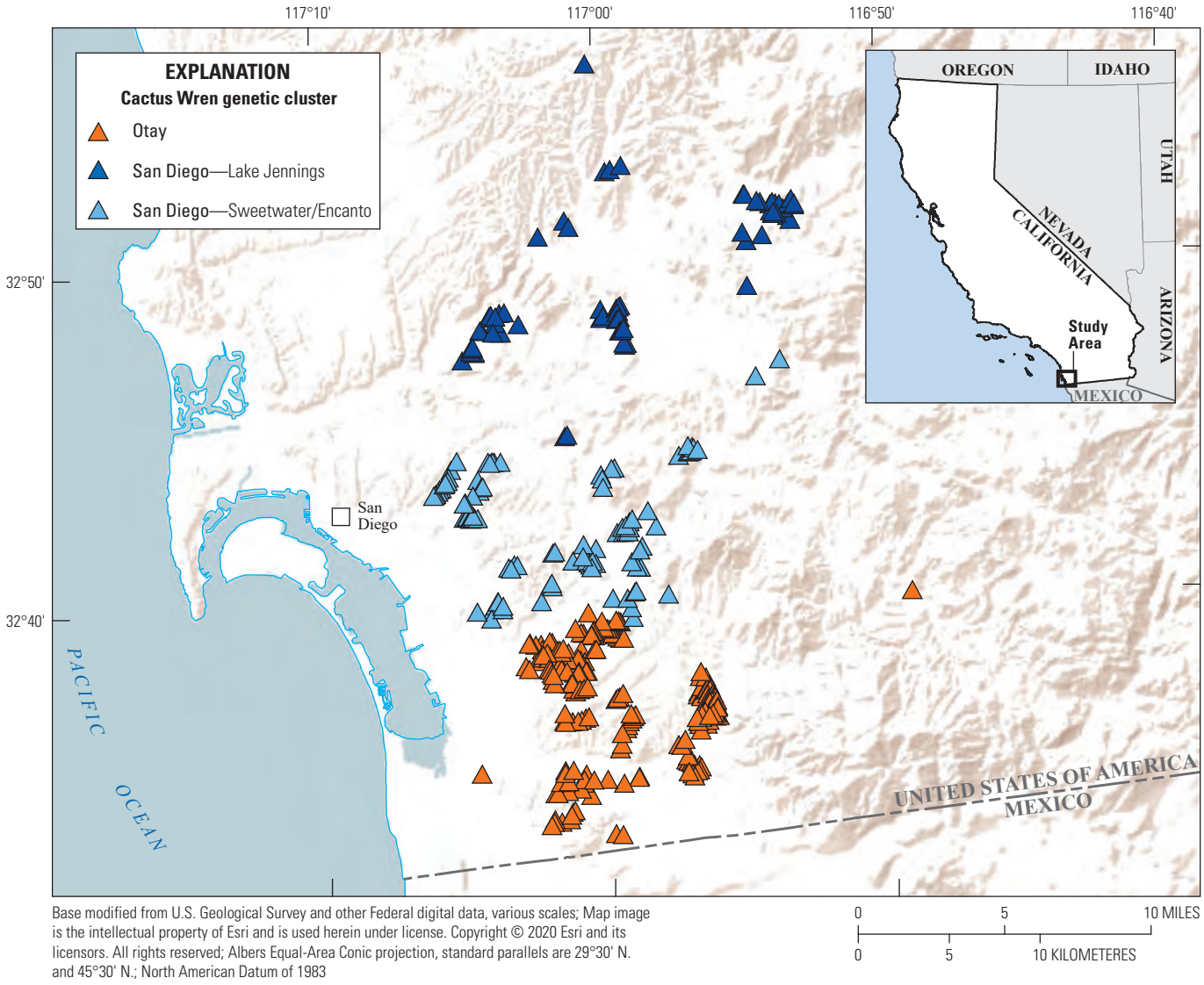

Figure 1. Locations of Cactus Wren survey plots in southern San Diego County, California, 2021.

Vegetation Characteristics

During the first survey, observers noted habitat characteristics at each plot. These data included dominant and co-dominant tree or shrub species, presence or absence of blue elderberry (elderberry; *Sambucus nigra* spp. *caerulea,* present in many wren territories in coastal southern California and thought to provide important resources for wrens, K. Preston, oral commun., 2015), the percent of cactus that was dead, the percent of cactus that was unhealthy, the percent of cactus overtopped or crowded by vines or shrubs, and the percent of the plot that was covered by non-native annual plant species. 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).

We used chi-square analyses to determine if wrens occupied plots that were classified as containing 5 percent or less of each vegetation characteristic in the same proportion that they occupied plots with more than 5 percent of that vegetation characteristic. The four vegetation characteristics for which we analyzed wren occupancy in this way were (1) percent of dead cactus, (2) percent of unhealthy cactus, (3) percent of cactus that was crowded or overtopped by vines or shrubs, (4) percent of non-native annual grass and forb cover. 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. We considered $P \leq 0.10$ to be a significant result.

Results

Surveys

We surveyed 378 plots for Cactus Wrens in 2021 (table 1). Wrens were detected at 34 percent of all plots (130/378), 26 percent of Otay plots (54/209), 45 percent of Lake Jennings plots (31/69), and 45 percent of Sweetwater/Encanto plots (45/100). We observed 113 wren territories throughout all survey plots (table 2). We determined that wrens in 97 territories (86 percent) were paired and we could not determine the paired status of birds in 16 territories. We observed 50 fledglings during surveys.

Banded Cactus Wrens

We were able to observe 198 adult wrens on surveys well enough to determine banding status in 2021, although not all banded wrens were observed well enough to conclusively identify the individual (banding status was determined for 110 males, 98 percent of all males and 88 females, 90 percent of all females). We observed 48 banded wrens in 2021, all of which had been banded in 2019 or earlier (table 3). Four females could not be identified because resights were inconclusive (three with missing bands and one with an incomplete resight). Therefore, we were able to identify 44 wrens that had unique color-band combinations in 2021. Two of the females with missing bands continued to occupy the same territories that they occupied in 2020; hence, we included them in movement summaries. Adult birds ranged from 2 to at least 7-years old. At least 41 percent of adult banded birds were 2-years old in 2021.

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 43 adults (29 males and 14 females) at territories in 2020 that were detected again in 2021 (table 4). Of these 43 birds, 34 (22 males and 12 females) remained in the same breeding territory in 2021 that they occupied in 2020 (within 100 meters [m]). Six males and two females moved to a neighboring territory (more than 100 m but less than 300 m from their 2020 territory). One male wren moved more than 300 m from its 2020 territory but stayed within the canyon it occupied in 2020. On average, adult wrens moved 0.1±0.1 km between 2020 and 2021 (range 0.0–0.5 km; males 0.1±0.1 km, range 0.0–0.5 km; females 0.0±0.1 km, range 0.0–0.2 km). We did not detect adult movement between genetic clusters from 2020 to 2021.

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

[Survey 1: April 1 through May 31, 2021. Survey 2: June 1 through July 31, 2021]

Genetic cluster	Number of plots				
	Surveyed	Occupied survey 1	Occupied survey 2	Total occupied	Percent occupied
Otay	209	42	39	54	26
Lake Jennings	69	24	28	31	45
Sweetwater/ Encanto	100	37	42	45	45
Total	**378**	**103**	**109**	**130**	**34**

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

[No., number of]

Genetic cluster	Breeding status		Total territories	No. fledglings
	Paired	Unknown		
Otay	37	6	43	18
Lake Jennings	23	6	29	14
Sweetwater/Encanto	37	4	41	18
Total	**97**	**16**	**113**	**50**

Table 3. Location, number, and proportion (within each genetic cluster) of color-banded Cactus Wrens by genetic cluster in 2021.

[≥, greater than or equal to; yrs, years; —, no data]

Age in 2021	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	Total
		Banded in 2015		
≥7 yrs	—	1 (0.06)	—	1 (0.02)
6 yrs	—	1 (0.06)	—	1 (0.02)
		Banded in 2016		
5 yrs	1 (0.06)	1 (0.06)	2 (0.2)	4 (0.09)
		Banded in 2017		
≥5 yrs	—	1 (0.06)	—	1 (0.02)
4 yrs	6 (0.33)	4 (0.25)	2 (0.2)	12 (0.27)
		Banded in 2018		
≥4 yrs	1 (0.06)	1 (0.06)	2 (0.2)	4 (0.09)
4 yrs	—	1 (0.06)	—	1 (0.02)
3 yrs	—	—	2 (0.2)	2 (0.05)
		Banded in 2019		
2 yrs	10 (0.56)	6 (0.38)	2 (0.2)	18 (0.41)
Subtotal	**18**	**16**	**10**	**44**
		Unknown		
≥4 yrs	1	—	—	1
≥2 yrs	3	—	—	3
Total	**22**	**16**	**10**	**48**

Table 4. Between-year movement by adult Cactus Wrens detected in 2021, southern San Diego County, California.

[**Genetic cluster codes**: Otay, Otay genetic cluster; LJ, Lake Jennings genetic cluster; SW-EN, Sweetwater/Encanto genetic cluster. **Sex codes**: F, female; M, male. **Abbreviation**: km, kilometer]

Genetic cluster / Territory		Distance moved (km)	Sex
Previous year	2021		
	Last seen in 2020		
LJ / 31ac	LJ / 31ac	0.00	M
LJ / 298c	LJ / 298c	0.00	F
SW-EN / 63c	SW-EN / 63c	0.00	F
SW-EN / 252c	SW-EN / 252c	0.01	M
SW-EN / 64c01	SW-EN / 64c01	0.01	F
SW-EN / 64c01	SW-EN / 64c01	0.01	M
Otay / 635c	Otay / 635c	0.01	F
SW-EN / 314c	SW-EN / 314c	0.01	M
Otay / Owl	Otay / Owl	0.01	F
Otay / Owl	Otay / Owl	0.01	M
LJ / 4c	LJ / 4c_a	0.01	M
LJ / 2c	LJ / 2c	0.02	M
LJ / 2c	LJ / 2c	0.02	F

Table 4. Between-year movement by adult Cactus Wrens detected in 2021, southern San Diego County, California.—Continued

[**Genetic cluster codes**: Otay, Otay genetic cluster; LJ, Lake Jennings genetic cluster; SW-EN, Sweetwater/Encanto genetic cluster. **Sex codes**: F, female; M, male. **Abbreviation**: km, kilometer]

Genetic cluster / Territory		Distance moved (km)	Sex
Previous year	2021		
Last seen in 2020—Continued			
SW-EN / 254c	SW-EN / 254c	0.02	M
Otay / 155c	Otay / 155c	0.02	F
Otay / 117c	Otay / 117c	0.02	F
LJ / 580c	LJ / 581c	0.02	F
LJ / 31c	LJ / 31c	0.02	M
SW-EN / 67c	SW-EN / 67c	0.02	M
LJ / Helix	LJ / Helix	0.02	M
LJ / Helix	LJ / Helix	0.02	F
SW-EN / Rice	SW-EN / Rice	0.02	M
Otay / 686c	Otay / 686c	0.02	M
Otay / 288c	Otay / 288c	0.03	M
LJ / 566c	LJ / 566c	0.03	M
LJ / 34c	LJ / 34c	0.04	M
Otay / 635c	Otay / 635c_a	0.05	F
SW-EN / 64c02	SW-EN / 64c02	0.05	M
LJ / 299c	LJ / 299c	0.06	M
LJ / 299c	LJ / 299c	0.06	F
Otay / 634c	Otay / 634c	0.06	M
Otay / 151c	Otay / 150c	0.06	M
SW-EN / 65c	SW-EN / 65c	0.07	M
Otay / 278c	Otay / 278c	0.07	M
Otay / Raven	Otay / 635c_a	0.11	M
Otay / 268c	Otay / 268c	0.11	M
Otay / 114c	Otay / 639c	0.13	F
Otay / CSC02c	Otay / CSC01c	0.15	M
Otay / 143c	Otay / 144c	0.16	M
Otay / Raven2	Otay / Raven	0.17	F
Otay / Raven2	Otay / Raven	0.17	M
LJ / 0c	LJ / 1c	0.19	M
Otay / 115c	Otay / 114c	0.48	M
Last seen in 2019			
LJ / 5c	LJ / 5c	0.04	M
LJ / Sentry	LJ / 4c_a	1.22	F
Otay / Sis	Otay / VU01c	5.62	M

Vegetation Characteristics

Vegetation characteristics were recorded at all 378 Cactus Wren survey plots in 2021. The prevalent general vegetation type was Diegan coastal sage scrub (table 5). Land cover heavily affected by human presence (urban/developed, disturbed, and extensive agriculture) predominated at 11 percent of survey plots. Valley and foothill grassland and maritime succulent scrub were dominant at 6 percent and 5 percent of plots, respectively. The remaining vegetation cover types (southern mixed chaparral, non-native grassland, and chaparral) dominated fewer than 5 percent of plots.

Common coastal sage scrub shrub species were the dominant species at most of the plots, including California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), lemonadeberry (*Rhus integrifolia*), and San Diego sunflower (*Bahiopsis laciniata*; table 6).

In 2021, we excluded elderberry presence data for 130 plots because of inconsistency in data collection. Of the 248 plots where we were confident of the presence or absence of elderberry, 72 (29 percent) contained elderberry. Wrens occupied a higher proportion of plots that contained elderberry (50 percent; 36/72) than plots that did not contain elderberry (36 percent; 63/176; chi-square=3.73, P=0.05).

At most of the wren survey plots (70 percent) in 2021, 5 percent or less of cactus was dead (table 7). Between 5 and 25 percent of cactus was dead in 22 percent of plots and, in 8 percent of plots, more than 25 percent cactus was dead. Wrens occupied proportionately more plots (39 percent) with 5 percent or less dead cactus than plots with more than 5 percent dead cactus (24 percent; chi-square=6.76, P<0.01; fig. 2).

At most of the wren plots (56 percent), 5 percent or less cactus showed signs of stress (table 8). Between 5 and 25 percent of cactus was unhealthy at 33 percent of plots. Eleven percent of plots contained more than 25-percent cactus that was unhealthy. Wrens occupied proportionately more plots (43 percent; 93 of 215 plots) where 5 percent or less of the cactus was unhealthy than plots with more than 5 percent unhealthy cactus (23 percent; 37 of 163 plots; chi-square=16.46, P<0.01; fig. 3).

Shrub and vines crowded or overtopped 5 percent or less of the cactus at 13 percent of plots (table 9). Between 5 and 25 percent of cactus was overtopped by shrubs and vines at 36 percent of plots. At 51 percent of plots, vines and shrubs crowded or overtopped at least 25 percent of the cactus. There was no difference in wren occupancy of plots with greater or less than 5 percent of cactus crowded or overtopped by vines or shrubs (39 percent; 19 of 49 plots; and 34 percent; 111 of 328 plots, respectively; chi-square=0.27; P=0.61; fig. 4).

Non-native annual grasses and forbs covered 5 percent or less of the wren survey plots at 29 percent of plots (table 10). Between 5 and 25 percent of the plot was covered by non-native annual grasses and forbs at 40 percent of plots. Thirty percent of plots had more than 25 percent non-native annual cover. Cactus Wrens occupied 41 percent (45 of 110) of the plots with 5 percent or less non-native annual cover compared to 32 percent (85 of 268) of plots with greater than 5 percent non-native cover, a difference that was likely biologically significant but not quite statistically significant (chi-square=2.53, P=0.11; fig. 5).

Table 5. Dominant vegetation cover types at Cactus Wren survey plots, southern San Diego County, 2021.

[Vegetation cover type codes developed by Holland (1986) and modified by Sawyer, Keeler-Wolf, and Evens (2009). Proportion of plots of that vegetation type within the cluster are in parentheses. **Abbreviation**: —, not present]

Predominant vegetation cover type	Number of plots			Total
	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	
Diegan coastal sage scrub	147 (0.70)	55 (0.80)	74 (0.74)	276 (0.73)
Urban/developed	8 (0.04)	11 (0.16)	7 (0.07)	26 (0.07)
Valley and foothill grassland	11 (0.05)	1 (0.01)	11 (0.11)	23 (0.06)
Maritime succulent scrub	20 (0.10)	—	—	20 (0.05)
Southern mixed chaparral	12 (0.06)	—	—	12 (0.03)
Disturbed habitat	3 (0.01)	1 (0.01)	6 (0.06)	10 (0.03)
Extensive agriculture	6 (0.03)	—	—	6 (0.02)
Non-native grassland	2 (0.01)	—	2 (0.02)	4 (0.01)
Chaparral	—	1 (0.01)	—	1 (0.00)
Total	**209**	**69**	**100**	**378**

Table 6. Shrub species that were dominant or co-dominant at Cactus Wren survey plots in 2021, southern San Diego County, California.

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

Shrub species	Number of plots			Total
	Otay genetic cluster	Lake Jennings genetic cluster	Sweetwater/Encanto genetic cluster	
California sagebrush	134 (0.64)	50 (0.72)	69 (0.69)	253 (0.67)
California buckwheat	48 (0.23)	18 (0.26)	24 (0.24)	90 (0.24)
Lemonadeberry	69 (0.33)	8 (0.12)	12 (0.12)	89 (0.24)
San Diego sunflower	60 (0.29)	13 (0.19)	16 (0.16)	89 (0.24)
Jojoba (*Simmondsia chinensis*)	53 (0.25)	—	16 (0.16)	69 (0.18)
Broom baccharis (*Baccharis sarothroides*)	7 (0.03)	25 (0.36)	15 (0.15)	47 (0.12)
California sunflower (*Encelia californica*)	2 (0.01)	1 (0.01)	12 (0.12)	15 (0.04)
Laurel sumac (*Malosma laurina*)	—	11 (0.16)	4 (0.04)	15 (0.04)
Coyote brush (*Baccharis pilularis*)	1 (0.00)	5 (0.07)	2 (0.02)	8 (0.02)
Black sage (*Salvia mellifera*)	—	1 (0.01)	3 (0.03)	4 (0.01)
Black mustard (*Brassica nigra*)	1 (0.00)	—	2 (0.02)	3 (0.01)
Acacia spp.	2 (0.01)	—	—	2 (0.01)
Western ragweed (*Ambrosia psilostachya*)	2 (0.01)	—	—	2 (0.01)
Eucalyptus spp.	—	—	1 (0.01)	1 (0.00)
Mexican/blue elderberry	1 (0.00)	—	—	1 (0.00)
Peruvian pepper (*Schinus molle*)	—	—	1 (0.01)	1 (0.00)
Sticky monkey flower (*Diplacus* spp.)	—	1 (0.01)	—	1 (0.00)
California sycamore (*Platanus racemosa*)	—	—	1 (0.01)	1 (0.00)
Star thistle (*Centaurea* spp.)	1 (0.00)	—	—	1 (0.00)
White sage (*Salvia apiana*)	1 (0.00)	—	—	1 (0.00)

Table 7. Proportion of cactus that was dead at Cactus Wren survey plots in 2021, southern 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	
0	0.00	0.00	0.02	0.01
<1	0.23	0.12	0.34	0.24
1–5	0.41	0.49	0.52	0.45
>5–25	0.27	0.28	0.10	0.22
>25–50	0.07	0.04	0.01	0.05
>50–75	0.01	0.03	0.01	0.02
>75	0.01	0.04	0.00	0.01
Total plots	**209**	**69**	**100**	**378**

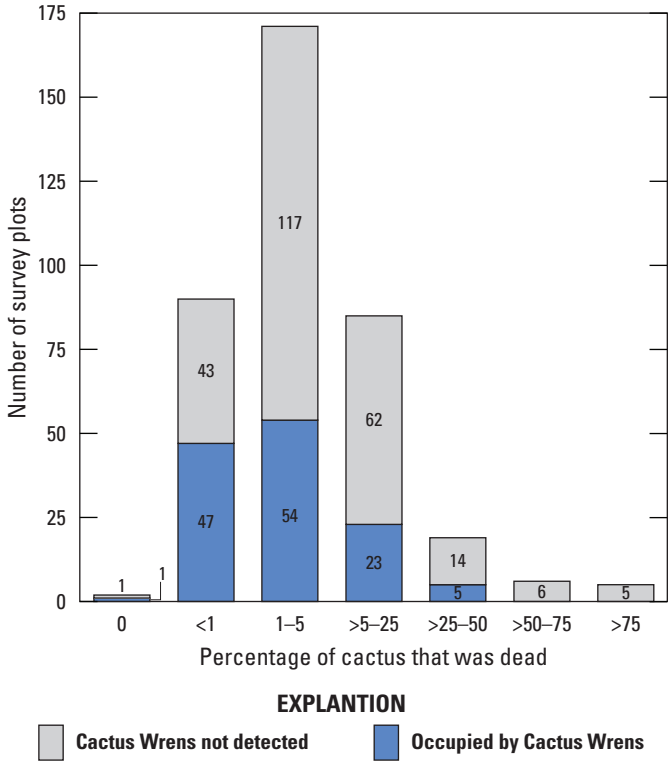

Figure 2. Number of survey plots that were occupied by Cactus Wrens by the percentage of cactus present that was dead, southern San Diego County, 2021. Abbreviations: <, less than; >, greater than.

Table 8. Proportion of cactus that was unhealthy at Cactus Wren survey plots in 2021, southern 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	
0	0.00	0.01	0.00	0.00
<1	0.12	0.20	0.07	0.12
1–5	0.39	0.38	0.61	0.44
>5–25	0.33	0.36	0.30	0.33
>25–50	0.13	0.04	0.00	0.08
>50–75	0.02	0.00	0.02	0.02
>75	0.01	0.00	0.00	0.01
Total plots	**209**	**69**	**100**	**378**

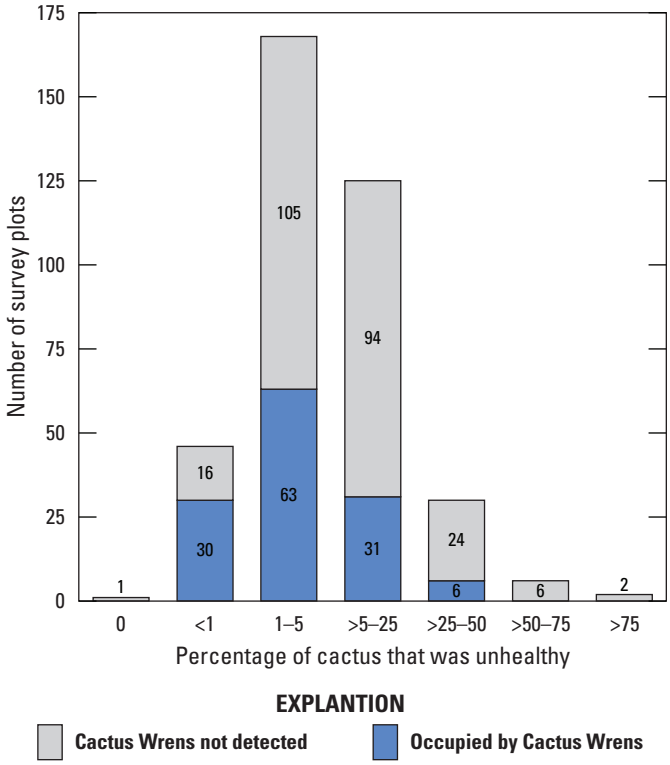

Figure 3. Number of survey plots that were occupied by Cactus Wrens by the percentage of cactus present that was unhealthy, southern San Diego County, 2021. Abbreviations: <, less than; >, greater than.

Table 9. Proportion of cactus that was crowded or overtopped by vines and shrubs at Cactus Wren survey plots in 2021, southern 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	
0	0.00	0.00	0.00	0.00
<1	0.02	0.00	0.02	0.02
1–5	0.10	0.04	0.18	0.11
>5–25	0.32	0.49	0.35	0.36
>25–50	0.26	0.32	0.26	0.27
>50–75	0.24	0.13	0.17	0.20
>75	0.06	0.01	0.02	0.04
Total plots	**209**	**69**	**100**	**378**

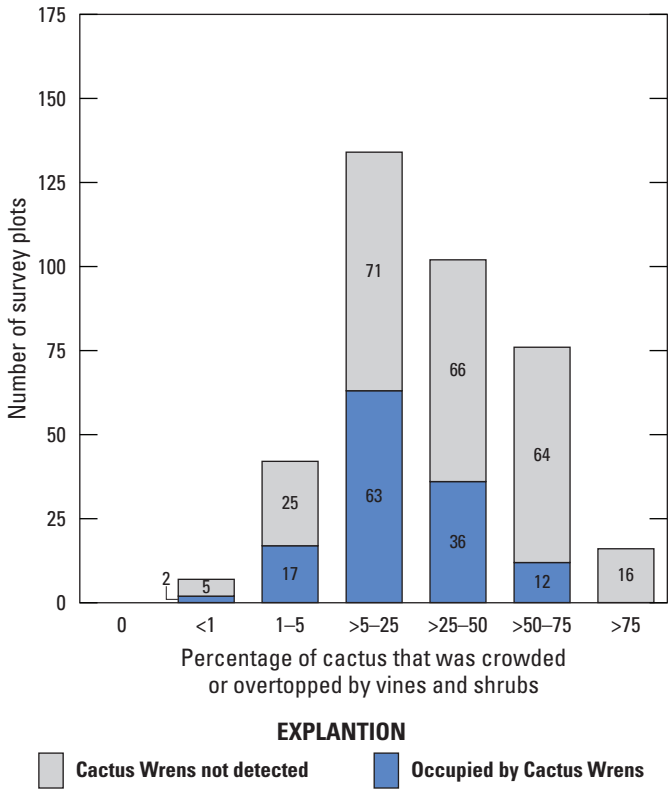

Figure 4. Number of survey plots that were occupied by Cactus Wrens by the percentage of cactus present that was crowded or overtopped by vines or shrubs, southern San Diego County, 2021. Abbreviations: <, less than; >, greater than.

Table 10. Proportion of non-native annual cover at Cactus Wren survey plots in 2021, southern 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	
0	0.00	0.00	0.00	0.00
<1	0.04	0.00	0.03	0.03
1–5	0.22	0.25	0.36	0.26
>5–25	0.43	0.38	0.36	0.40
>25–50	0.19	0.29	0.16	0.20
>50–75	0.09	0.09	0.06	0.08
>75	0.03	0.00	0.03	0.02
Total plots	**209**	**69**	**100**	**378**

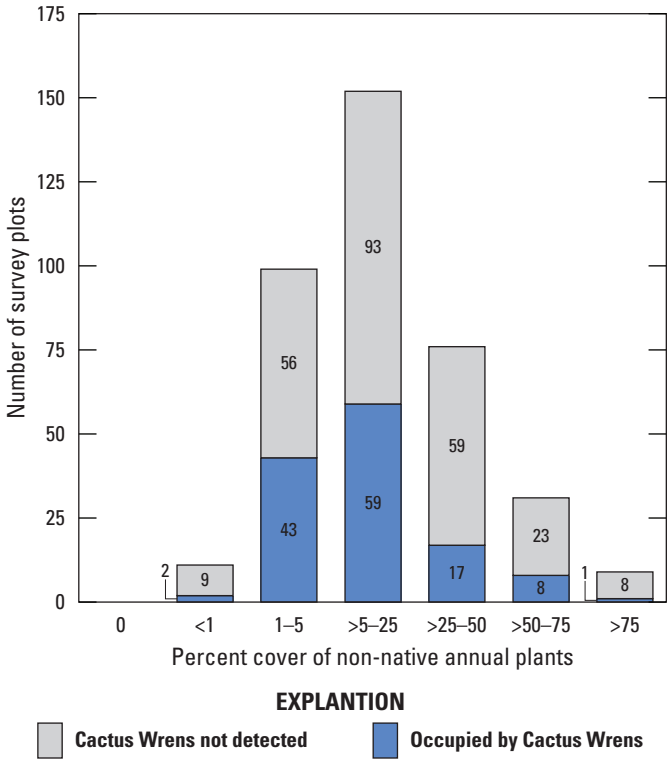

Figure 5. Number of survey plots that were occupied by Cactus Wrens by the percent cover of non-native annual plants, southern San Diego County, 2021. Abbreviations: <, less than; >, greater than.

Summary

Cactus Wrens were detected in 34 percent of all survey plots in 2021, which is virtually the same as the 35 percent of plots occupied in 2020 (Kus and Lynn, 2021). However, the number of wren territories increased from 109 in 2020 to 113 in 2021. The increase in number of territories occurred in the Lake Jennings genetic cluster, where the number of territories from 2020 to 2021 increased from 23 to 29. The number of territories in the Otay genetic cluster decreased slightly from 45 to 43 between 2020 and 2021. We did not detect any movement of wrens between genetic clusters between 2020 and 2021.

Elderberry has been suggested as an important resource for Cactus Wrens. Kristine Preston (U.S. Geological Survey, oral commun., 2015) noticed elderberry was present in many wren territories in Orange County and suggested that it provided territorial advertising perches for adults, escape cover for fledglings, and could also be an important host for prey arthropods. Although most of the wren plots did not contain elderberry, like in 2020, wrens were more likely to occupy plots with elderberry than plots without elderberry in our study area. 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, wrens preferentially selected survey plots with less dead or unhealthy cactus. Cactus that was crowded or overtopped by vines and shrubs was more common and, unlike in 2020, wrens did not preferentially select plots with less shrub and vine crowding and overtopping. Non-native annual cover was 5 percent or less at 29 percent of plots and, unlike in 2020, wrens seemed to be more likely to occupy survey plots with less non-native annual cover, although statistically this difference was not quite significant.

References Cited

Barr, K.R., Vandergast, A.G., and Kus, B.E., 2012, Genetic connectivity in the Coastal Cactus Wren: Data summary report prepared for the San Diego Management and Monitoring Program, accessed March 25, 2022, at https://sdmmp.com/view_article.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: Data summary report prepared for the California Department of Fish and Wildlife, accessed December 13, 2021, at 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. [Also 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.

Hamilton, R.A., Proudfoot, G.A., Sherry, D.A., and Johnson, S.L., 2020, Cactus Wren (*Campylorhynchus brunneicapillus*), version 1.0, *in* Poole, A.F., ed., Birds of the World: Ithaca, NY, USA, Cornell Lab of Ornithology, accessed October 14, 2020, at https://doi.org/10.2173/bow.cacwre.01.

Holland, R.F., 1986, Preliminary descriptions of the terrestrial natural communities of California—State of California: Sacramento, California, The Resources Agency, Department of Fish and Game, 156 p. [Also 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 and 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 December 13, 2021, at https://sdmmp.com/upload/SDMMP_Repository/0/25hms3p4y9qxw7rv18gdkznc bft0j6.pdf.

Kus, B.E., and Lynn, S., 2022, Surveys and monitoring of Coastal Cactus Wren in Southern San Diego County: U.S. Geological Survey data release, accessed December 13, 2021, at https://doi.org/10.5066/F76H4FK5.

Landrum, P., 2018, Vegetation (County): San Diego Association of Governments/SanGIS Regional GIS Data Warehouse Open Data Portal, accessed June 8, 2022, at https://sdgis-sandag.opendata.arcgis.com/datasets/SANDAG::vegetation-county/explore?location=33.037224%2C-116.844950%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 December 13, 2021, at https://doi.org/10.3133/ds1138.

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, 85 p., accessed December 13, 2021, at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=46786&inline.

Sawyer, J.O., Keeler-Wolf, T., and Evens, J.M., 2009, A manual of California vegetation (2d ed.): Sacramento, California Native Plant Society, 1,300 p.

Solek, C., and Szijj, L.J., 2004, Cactus Wren (*Campylorhynchus brunneicapillus*), *in* The coastal shrub and chaparral bird conservation plan—A strategy for protecting and managing coastal scrub and chaparral habitats and associated birds in California: California Partners in flight, accessed October 14, 2020, at 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, June 18, 2015, 37 p. + appendices, accessed December 13, 2021, at https://sdmmp.com/upload/projects/20160330_2357_194.pdf.

For more information concerning the research in this report, contact the

Director, Western Ecological Research Center
U.S. Geological Survey
3020 State University Drive East
Sacramento, California 95819
https://www.usgs.gov/centers/werc

Publishing support provided by the U.S. Geological Survey
Science Publishing Network, Sacramento Publishing Service Center

https://doi.org/10.3133/dr1159