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Distribution and Abundance of Least Bell's Vireos (*Vireo bellii pusillus*), Southwestern Willow Flycatchers (*Empidonax traillii extimus*), and Coastal California Gnatcatchers (*Polioptila californica californica*) at the Carbon Canyon Dam, Orange County, California—2025 Data Summary

Data Report 1221

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

Cover. Riparian habitat and dam structure at the Carbon Canyon Dam. Photograph by Lisa Allen, U.S. Geological Survey, May 15, 2025.

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U.S. Geological Survey, Reston, Virginia: 2026

Suggested citation:
Howell, S.L., and Kus, B.E., 2026, Distribution and abundance of Least Bell's Vireos (*Vireo bellii pusillus*), Southwestern Willow Flycatchers (*Empidonax traillii extimus*), and Coastal California Gnatcatchers (*Polioptila californica californica*) at the Carbon Canyon Dam, Orange County, California—2025 data summary: U.S. Geological Survey Data Report 1221, 11 p., https://doi.org/10.3133/dr1221.

ISSN 2771-9448 (online)

Acknowledgments

This work was funded by the U.S. Army Corps of Engineers. Data either are not available or have limited availability owing to restrictions of the funding entity (U.S. Army Corps of Engineers). Please contact the Operations Division, Los Angeles District, U.S. Army Corps of Engineers for more information. The authors thank U.S. Geological Survey biologist Lisa Allen, who assisted in data collection for this project. All activities were authorized under Federal 10(a)1(A) Recovery Permit ESPER0004080_0.3.

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International System of Units to U.S. customary units

Multiply	By	To obtain
	Length	
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
	Area	
hectare (ha)	2.471	acre

Datum

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

Abbreviations

USFWS U.S. Fish and Wildlife Service

USGS U.S. Geological Survey

Distribution and Abundance of Least Bell's Vireos (*Vireo bellii pusillus*), Southwestern Willow Flycatchers (*Empidonax traillii extimus*), and Coastal California Gnatcatchers (*Polioptila californica californica*) at the Carbon Canyon Dam, Orange County, California—2025 Data Summary

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Executive Summary

We surveyed for Least Bell's Vireos (*Vireo bellii pusillus*; vireo), Southwestern Willow Flycatchers (*Empidonax traillii extimus*; flycatcher), and Coastal California Gnatcatchers (*Polioptila californica californica*; gnatcatcher) at the Carbon Canyon Dam study area near Brea, California, in 2025. Four gnatcatcher and vireo surveys were completed between April 22 and June 25, 2025, and three flycatcher surveys were completed between May 15 and June 25, 2025.

We detected 14 territorial male vireos, 12 of which were paired. We also detected a transient vireo. Juvenile vireos were observed in two territories during surveys. Of the five vireo nests incidentally located during surveys, three were parasitized by Brown-headed Cowbirds (*Molothrus ater*). Vireos were reported in four habitat types: (1) mixed willow riparian, (2) riparian scrub, (3) upland, and (4) non-native vegetation. The dominant tree species in vireo territories was Goodding's black willow (*Salix gooddingii*). Most vireo territories (12) were in habitat with greater than 50-percent native vegetation. The most common exotic species in vireo territories was poison hemlock (*Conium maculatum*). No flycatchers or gnatcatchers were observed during surveys.

Introduction

The Least Bell's Vireo (*Vireo bellii pusillus*; vireo) is a small, migratory songbird that breeds in southern California and northwestern Baja California, Mexico, from April through July (Kus and others, 2022). Historically abundant within lowland riparian ecosystems, vireo populations began declining in the late 1900s as a result of multiple anthropogenic factors, including habitat loss and alteration associated with urbanization and agricultural conversion of land adjacent to rivers, the expansion in range of the brood-parasitic Brown-headed Cowbird (*Molothrus ater*; cowbird), and the introduction of invasive exotic plant species, such as giant reed (*Arundo donax*) into riparian systems (U.S. Fish and Wildlife Service 1986, 1998; Franzreb, 1989; Kus, 1998, 1999; Riparian Habitat Joint Venture, 2004; Kus and others, 2022). By 1986, the vireo population in California numbered just 300 territorial males (U.S. Fish and Wildlife Service, 1986).

In response to the dramatic numeric decline of vireos in California, the California Fish and Game Commission listed the species as endangered in 1980, and the U.S. Fish and Wildlife Service (USFWS) followed suit in 1986. Since listing, the vireo population in southern California has rebounded, largely in response to cowbird control and habitat restoration and preservation (Kus and Whitfield, 2005). As of 2006, the statewide vireo population was estimated to be approximately 2,500–3,000 territories (U.S. Fish and Wildlife Service, 2006).

Male vireos arrive on breeding grounds in southern California in mid-March. Male vireos are territorial and vocally conspicuous, frequently singing their diagnostic primary song from exposed perches throughout the breeding season. Females arrive about 1–2 weeks after males and are more secretive, but they are often seen early in the season traveling through habitat with the males. The female, with the male's help, builds an open cup nest in dense vegetation about 1 meter (m) above the ground. Nesting occurs from early April through July, but adult and juvenile birds remain on the breeding grounds into late September and early October before migrating to their wintering grounds in southern Baja California, Mexico (Kus and others, 2022).

Vireo breeding habitat consists of dense, shrubby vegetation characteristic of early stages of ecological succession, usually near river channels or other water (Kus and others, 2022). Nests are placed in a wide variety of small trees, shrubs, and less frequently, tall annual herbaceous vegetation (Houston and others, 2024).

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*; flycatcher) is one of four subspecies of Willow Flycatcher in the United States, with a breeding range that includes southern California, Arizona, New Mexico, extreme southern parts of Nevada and Utah, southwestern Colorado, and possibly western Texas (Hubbard, 1987; Unitt, 1987; Browning, 1993). Restricted to riparian habitat for breeding, the flycatcher has declined over the past five decades in response to widespread habitat loss throughout its range and, possibly, brood-parasitism by cowbirds (Wheelock, 1912; Willett, 1912, 1933; Grinnell and Miller, 1944; Remsen, 1978; Garrett and Dunn, 1981; Unitt, 1984, 1987; Gaines, 1988; Schlorff, 1990; Whitfield and Sogge, 1999). By 1993, the species was believed to number approximately 70 pairs in California (U.S. Fish and Wildlife Service, 1993) in small, disjunct populations. The flycatcher was listed as endangered by the State of California in 1992 and by the USFWS in 1995. After listing, population estimates for flycatchers in California increased to 256 territories, with the increase largely attributed to expanded survey efforts rather than population growth at known sites (U.S. Fish and Wildlife Service, 2002). In the 2014 5-year status review, estimates of California flycatcher territories decreased to 172, with declines occurring statewide (Durst and others, 2008; U.S. Fish and Wildlife Service, 2014).

Flycatchers in southern California co-occur with vireos. However, unlike the vireo, which has increased tenfold since the mid-1980s in response to management practices alleviating threats (U.S. Fish and Wildlife Service, 2006), the number of flycatchers has remained low. As of 2023, most of the flycatchers in California were concentrated at two known sites: (1) the Owens River valley in Inyo County (approximately 56 territories; M. Whitfield, Southern Sierra Research Station, written commun., 2023) and (2) the upper San Luis Rey River at Lake Henshaw in San Diego County (approximately 51 territories; Howell and Kus, 2024). Outside of these sites, flycatchers occur as small, isolated populations of one to half-dozen pairs.

Male flycatchers begin arriving in southern California in early to mid-May, and females arrive approximately 1 week later. While on the breeding grounds, males sing repeatedly from exposed perches. Once the pair bond is established, the female builds an open cup nest that is usually placed in a branch fork of a willow (*Salix* spp.) or plant with a similar branching structure, approximately 1–3 m above the ground. Adults usually leave their breeding territory in mid-August and early September to migrate to their wintering grounds in Central America and northern South America (U.S. Fish and Wildlife Service, 2002).

Flycatcher breeding habitat is characterized as patches of dense riparian vegetation along rivers and streams, interspersed with small openings, open water, or areas of sparse vegetation. Vegetation species composition varies across the range, but most breeding habitat includes tree or shrub cover that is at least 3 m tall, with patches of dense vegetation within 3–4 m of the ground. In addition, flycatchers typically nest near areas of standing water or saturated soil (U.S. Fish and Wildlife Service, 2002; Sogge and others, 2010).

The Coastal California Gnatcatcher (*Polioptila californica californica*; gnatcatcher) is a small gray songbird restricted to low stands of coastal and inland sage scrub on arid hillsides, mesas, and washes. Gnatcatchers are year-round residents throughout southern California from Ventura County southward into northern Baja California, Mexico (Vandergast and others, 2022). Limited naturally by the patchy distribution of its habitat, gnatcatcher populations have become further fragmented in recent decades by urbanization, habitat degradation, and stochastic events, such as wildfire (U.S. Fish and Wildlife Service, 2025b). As a result, gnatcatcher populations have diminished in size and distribution and occur largely as islands in a matrix of generally unsuitable habitat. The gnatcatcher was listed as federally threatened in 1993 (U.S. Fish and Wildlife Service, 2025b).

Gnatcatcher breeding season begins mid-February and lasts through the end of August, with peak nesting activity from mid-March through mid-May (U.S. Fish and Wildlife Service, 2019). Territorial males often sing or call from exposed perches (Atwood and Bontrager, 2020). Nest sites are selected by males and are typically 1 m above the ground in California sagebrush (*Artemisia californica*) or California buckwheat (*Eriogonum fasciculatum*). Both sexes participate in nest-building, although males initiate and perform most of the construction (Atwood and Bontrager, 2020). Like vireos and flycatchers, gnatcatchers are subject to brood parasitism by cowbirds (Braden and others, 1997).

Carbon Canyon Dam falls within the breeding range of all three species. Additionally, it is a USFWS-designated critical habitat of the gnatcatcher (U.S. Fish and Wildlife Service, 2025a). The Carbon Canyon Dam was built for flood control and completed in 1961. Managed by the U.S. Army Corps of Engineers, the dam requires regular operational maintenance, including debris, sediment, and vegetation removal and management. As mandated by the USFWS, the U.S. Army Corps of Engineers is required to perform surveys and assess activities that might have adverse effects on these federally listed bird species. The purpose of this report is to summarize the results of vireo, flycatcher, and gnatcatcher surveys completed by the U.S. Geological Survey (USGS) at the Carbon Canyon Dam in 2025. These data will inform natural resource managers about the status of these listed species at the Carbon Canyon Dam and guide land use and management practices as appropriate to support the species' survival.

Methods

Study Area

The study area is in the Puente and Chino Hills along Carbon Canyon Creek and Telegraph Canyon Creek upstream from the Carbon Canyon Dam (fig. 1). The Carbon Canyon Dam is in the city of Brea, south of Carbon Canyon Road and east of State Route 57 in Orange County, California. Aside from an artificial lake and some seasonally wet catch basins, the reservoir behind the dam usually is dry and includes Carbon Canyon Creek and Telegraph Canyon Creek. Below the dam, Carbon Canyon Creek flows through a concrete flood control channel. The reservoir encompasses the 50-hectare (ha; 124-acre) Carbon Canyon Regional Park, which includes 24.3 ha (60 acres) of developed land, including grassy areas for picnicking, sports facilities, and a 1.6-ha (4-acre) lake. The undeveloped areas of the park are accessed by trails and include riparian and disturbed coastal sage scrub habitats and a 1.2-ha (3-acre) coast redwood (*Sequoia sempervirens*) grove. The eastern extent of the study area includes approximately 9.5 ha (23.5 acres) of Chino Hills State Park.

The area surveyed included 2.1 kilometers (km; 1.3 miles [mi]) of Carbon Canyon Creek, 0.5 km (0.3 mi) of Telegraph Canyon Creek, and 26.3 ha (65 acres) of coastal sage scrub in the uplands. The narrow riparian corridors that weave through the site are dominated by willows and mule fat (*Baccharis salicifolia*). In 2025, Carbon Canyon Creek and Telegraph Canyon Creek had some water in the easternmost part of the survey area but were mostly dry. Water was present in the artificial lake, but the catch ponds above the dam were dry in April when surveys began. The coastal sage scrub is mostly disturbed and consists of non-native annuals such as non-native grasses, poison hemlock (*Conium maculatum*), and black mustard (*Brassica nigra*), with a scattering of native sage scrub shrubs such as California sagebrush and California buckwheat. Limited higher-quality sage scrub habitat exists on the hilltops.

Surveys

Surveys were done during the breeding season (April–July) and followed standard survey techniques for vireos (U.S. Fish and Wildlife Service, 2001), flycatchers (Sogge and others, 2010), and gnatcatchers (U.S. Fish and Wildlife Service, 2019). Four surveys each for gnatcatchers and vireos were completed throughout the study area between April 22 and June 25, 2025, and three surveys for flycatchers were completed between May 15 and June 25, 2025. Observers walked slowly through or adjacent to suitable riparian (for vireos and flycatchers) or coastal sage scrub (for gnatcatchers) habitat, listening and searching for vireos, flycatchers, and gnatcatchers. If individuals were not detected passively, observers broadcasted a recording of a vireo, flycatcher, or gnatcatcher song to elicit a territorial response. Surveys typically began at sunrise and were completed by late morning, avoiding conditions of high winds and extreme heat that can reduce bird activity and detectability. Surveys were completed by USGS biologists Lisa Allen and Scarlett Howell under Federal 10(a)1(A) Recovery Permit ESPER0004080_0.3 and a protocol approved by the Western Ecological Research Center (WERC) Institutional Animal Care and Use Committee for conformance with the Animal Welfare Act.

For each vireo, flycatcher, or gnatcatcher encountered, observers recorded age (adult or juvenile), sex, breeding status (paired, undetermined, or transient), and if the bird was banded. A male was considered paired if a female also was visually detected, by hearing vocalizations unique to mated birds, or by observing breeding behavior (for example, food carry, a nest, or dependent juveniles in the territory). Both male and female flycatchers can sing the diagnostic song, so the sex of flycatchers was not determined unless breeding behavior unique to each sex was observed (for instance, females incubate eggs, and males do not). An individual vireo or flycatcher was considered transient if detected on only one survey date. Because gnatcatchers are not migratory, we assumed that all detections were residents and therefore did not consider any gnatcatchers transient. Vireo, flycatcher, and gnatcatcher locations were mapped using Esri Field Maps (Esri, 2025) on Samsung Galaxy XCover6 Pro mobile phones with Android operating systems and built-in Global Positioning System to determine geographic coordinates (World Geodetic System of 1984).

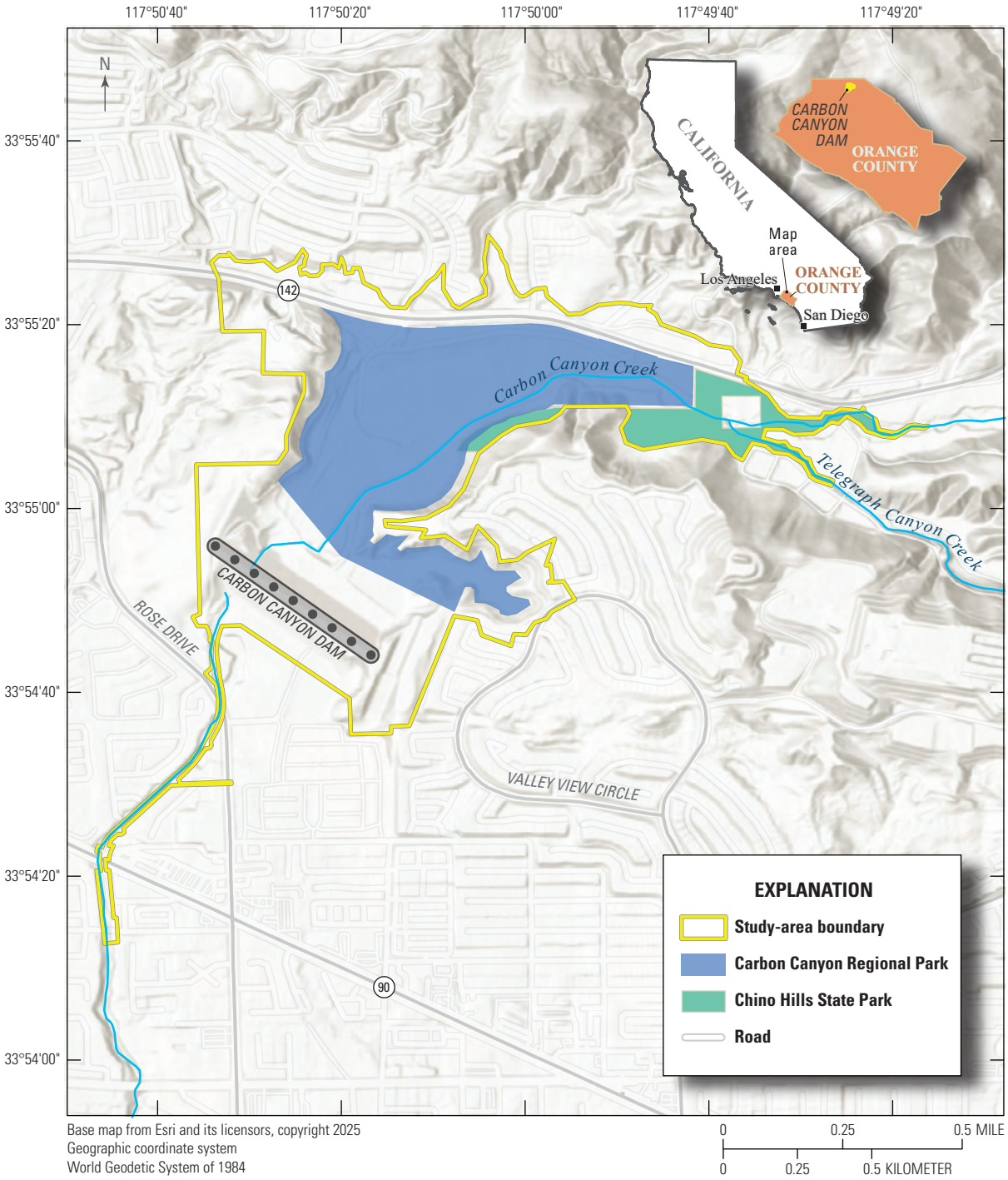

Figure 1. The location of Least Bell's Vireo (*Vireo bellii pusillus*), Southwestern Willow Flycatcher (*Empidonax traillii extimus*), and Coastal California Gnatcatcher (*Polioptila californica californica*) study area at the Carbon Canyon Dam, Orange County, California, 2025.

Dominant native and exotic plants were recorded at each vireo, flycatcher, or gnatcatcher location, and percent cover of native vegetation was estimated using categories of less than 5 percent, 5–50 percent, 51–95 percent, and greater than 95 percent. Overall habitat type was specified according to the following categories:

Mixed willow riparian: Habitat dominated by one or more willow species, including Goodding's black willow (*S. gooddingii*), arroyo willow (*S. lasiolepis*), and red willow (*S. laevigata*), with mule fat as a frequent co-dominant. Arroyo and red willow were functionally similar and difficult to distinguish; therefore, the two species were combined as "arroyo or red willow."

Willow-cottonwood: Willow riparian habitat in which Fremont cottonwood (*Populus fremontii*) is a co-dominant.

Willow-sycamore: Willow riparian habitat in which California sycamore (*Platanus racemosa*) is a co-dominant.

Sycamore-oak: Woodlands in which California sycamore and coast live oak (*Quercus agrifolia*) occur as co-dominants.

Riparian scrub: Dry or sandy habitat dominated by sandbar willow (*S. exigua*) or mule fat, with few other woody species.

Upland: Coastal sage scrub or oak woodland habitat, dominated by shrubby or woody species including California sagebrush, California buckwheat, laurel sumac (*Malosma laurina*), blue elderberry (*Sambucus nigra* ssp. *cerulea*), or coast live oak (*Quercus agrifolia*).

Non-native: Areas vegetated primarily with non-native species, including annuals such as black mustard and poison hemlock, or woody species such as Peruvian pepper tree (*Schinus molle*) or red gum (*Eucalyptus camaldulensis*).

Results

A total of 14 territorial male vireos were detected at the Carbon Canyon Dam in 2025, 12 of which were confirmed as paired (tables 1, 2; fig. 2). In addition, one transient vireo (CY14) was detected on May 15, 2025, but was not present on subsequent surveys. Five vireo nests were incidentally observed during surveys; three of these nests were parasitized by cowbirds, and cowbirds were observed throughout the study area. Juvenile vireos were confirmed in two territories (table 1). No banded vireos were observed in 2025 (table 2). No flycatchers or gnatcatchers were detected on surveys (table 1).

Vireos used four habitat types within the study area: (1) mixed willow, (2) riparian scrub, (3) non-native, and (4) upland. Mixed willow was the most commonly used habitat type (table 3). Dominant plant species found at vireo locations included Goodding's black willow and mule fat. Most vireo locations (12) had greater than 50-percent native vegetation. The most common exotic plant species at vireo locations was poison hemlock (table 3).

Table 1. Survey dates and results of Least Bell's Vireo (*Vireo bellii pusillus*), Southwestern Willow Flycatcher (*Empidonax traillii extimus*), and Coastal California Gnatcatcher (*Polioptila californica californica*) surveys at the Carbon Canyon Dam, Orange County, California, 2025.

[The number of birds detected on individual survey dates does not sum to the total number of territorial birds. **Abbreviations**: F, female; J, juvenile; M, male; —, no data]

Survey date	Number of								
	Least Bell's Vireo			Southwestern Willow Flycatcher			Coastal California Gnatcatcher		
	M	F	J	M	F	J	M	F	J
April 22, 2025	11	4	0	—	—	—	0	0	0
May 15, 2025	14	10	0	0	0	0	1	0	0
June 3, 2025	14	10	2	0	0	0	0	0	0
June 25, 2025	13	11	2	0	0	0	0	0	0
Total number of territorial birds	**14**	**12**	**—**	**0**	**0**	**—**	**0**	**0**	**—**

Table 2. Locations, breeding status, and band status of Least Bell's Vireos (*Vireo bellii pusillus*) detected at the Carbon Canyon Dam, Orange County, California, 2025.

[ID, identification; —, no data]

Bird ID	Latitude	Longitude	Breeding status	Male banded	Female banded
CY01	33.91356	−117.83729	Pair	No	No
CY02	33.91843	−117.83864	Pair	No	No
CY03	33.91497	−117.83796	Pair	No	No
CY04	33.91790	−117.83927	Pair	No	No
CY05	33.91582	−117.83858	Pair	No	No
CY06	33.91945	−117.83917	Undetermined	No	—
CY07	33.91734	−117.83977	Undetermined	No	—
CY08	33.92114	−117.82914	Pair	No	No
CY09	33.91994	−117.83308	Pair	No	No
CY10	33.91975	−117.82713	Pair	No	No
CY11	33.91679	−117.83758	Pair	No	No
CY12	33.91932	−117.82395	Pair	No	No
CY13	33.91843	−117.83531	Pair	No	No
CY14	33.92076	−117.83929	Transient	No	—
CY15	33.91450	−117.83681	Pair	No	No

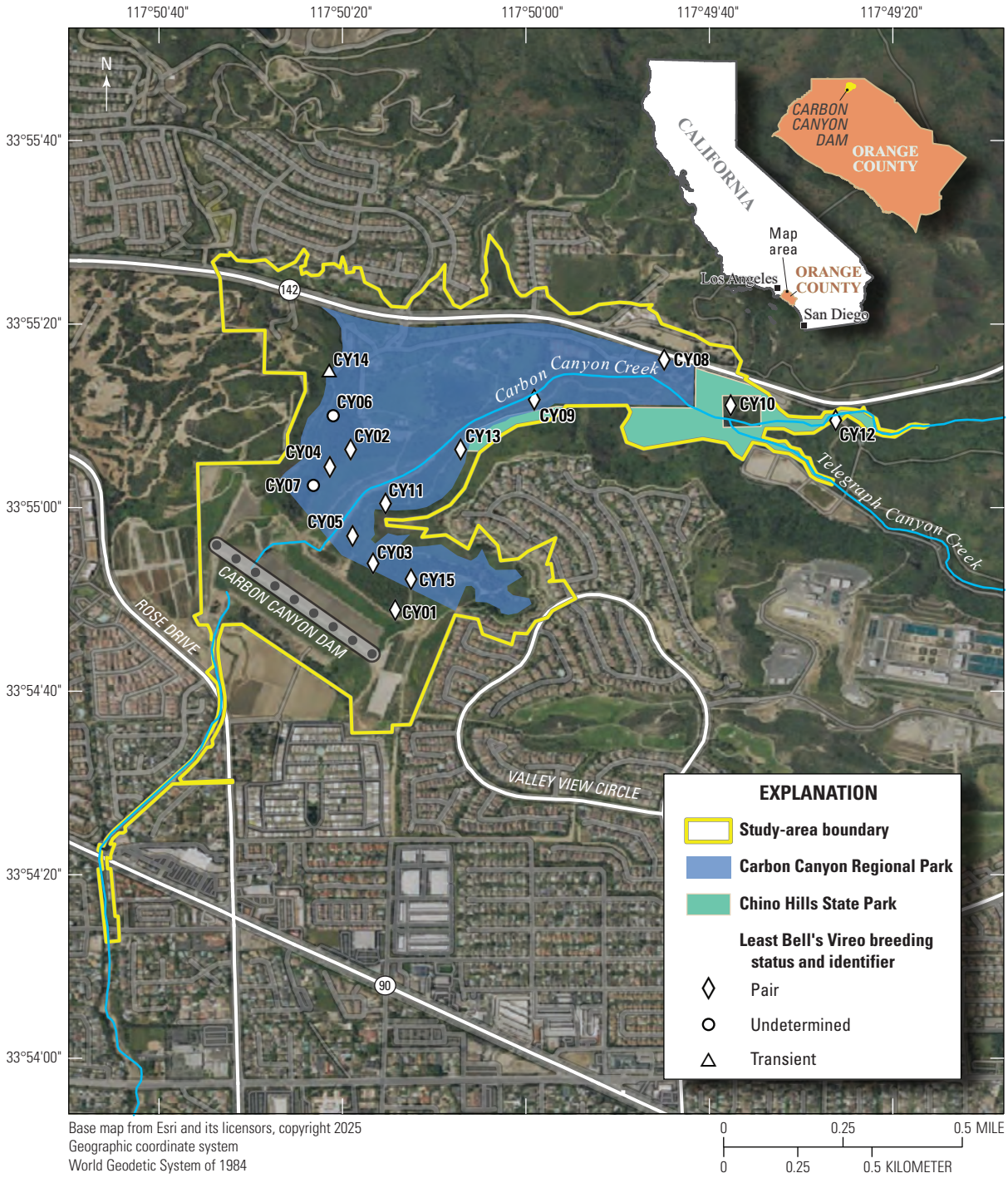

Figure 2. Least Bell's Vireo (*Vireo bellii pusillus*) detections and breeding status at the Carbon Canyon Dam, Orange County, California, 2025.

Table 3. Habitat characteristics of Least Bell's Vireo (*Vireo bellii pusillus*) locations at the Carbon Canyon Dam, Orange County, California, 2025.

[Mixed willow: Habitat dominated by one or more willow species, including Goodding's black willow and arroyo or red willow, with mule fat as a frequent co-dominant. Non-native: Areas vegetated primarily with non-native species, including annuals such as black mustard and poison hemlock, or woody species such as Peruvian pepper tree or red gum. Riparian scrub: Dry or sandy habitat dominated by sandbar willow or mule fat, with few other woody species. Upland: Coastal sage scrub or oak woodland habitat, dominated by shrubby or woody species including California sagebrush, California buckwheat, laurel sumac, blue elderberry, or coast live oak. **Abbreviations**: ID, Identification; >, greater than; —, no data]

Territory ID	Habitat type	Dominant plant species	Percent native cover	Dominant exotic species
CY01	Mixed willow	Goodding's black willow	>95	—
CY02	Mixed willow	Goodding's black willow	51–95	Milk thistle (*Silybum marianum*)
CY03	Riparian scrub	Mule fat	51–95	Poison hemlock
CY04	Mixed willow	Goodding's black willow	51–95	Milk thistle
CY05	Mixed willow	Goodding's black willow	>95	—
CY06	Upland	Laurel sumac	5–50	Red gum
CY07	Mixed willow	Goodding's black willow	>95	—
CY08	Non-native	Peruvian pepper tree	5–50	Peruvian pepper tree
CY09	Riparian scrub	Mule fat	51–95	Red gum
CY10	Riparian scrub	Mule fat	51–95	Black mustard
CY11	Mixed willow	Arroyo or red willow	51–95	Poison hemlock
CY12	Riparian scrub	Mule fat	51–95	Poison hemlock
CY13	Non-native	Black mustard	5–50	Black mustard
CY14	Upland	Blue elderberry	51–95	Peruvian pepper tree
CY15	Mixed willow	Goodding's black willow	51–95	Poison hemlock

Summary

In 2025, we documented 14 vireo territories and one transient bird at the Carbon Canyon Dam study area. The population of vireos within the study area at the Carbon Canyon Dam declined slightly since biologists from the U.S. Geological Survey last performed protocol surveys in 2019 (16 territories; R. Fisher, U.S. Geological Survey, unpub. data, 2019). Cowbirds were observed throughout the survey area, and parasitism was documented at Carbon Canyon Dam in 2025, despite the observation of cowbird trapping at the eastern extent of the study area in Chino Hills State Park.

Although no territorial flycatchers were detected in 2025, transient flycatchers have been detected in previous years, which may indicate that the habitat at the Carbon Canyon Dam provides value as stopover habitat during migration (R. Fisher, U.S. Geological Survey, unpub. data, 2019).

Gnatcatcher territories were absent from Carbon Canyon Dam in 2025, a reduction from two territories in 2018 and four territories in 2019 (R. Fisher, U.S. Geological Survey, unpub. data, 2018, 2019). It is possible that gnatcatchers shifted to coastal sage scrub on surrounding private lands, which was out of detection range for our surveys in 2025.

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Publishing support provided by the USGS Science Publishing Network, Sacramento Publishing Service Center

ISSN 2771-9448 (online)
https://doi.org/10.3133/dr1221