CDPH
California Department of Public Health

Rabies Surveillance in California

Annual Report 2023

Veterinary Public Health Section
Infectious Diseases Branch
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Center for Infectious Diseases
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Rabies Surveillance in California – Annual Report, 2023

Introduction

Rabies is a severe zoönotic encephalitis caused by a Rhabdovirus of the genus *Lyssavirus*. Following an incubation period that can range from a few days to several years, early clinical signs and symptoms of rabies—including headache, fever, chills, cough or sore throat, anorexia, nausea, vomiting, and malaise—are non-specific and can be mistaken for more common conditions. Symptoms progress rapidly (within 1-2 weeks) to central and peripheral neurologic manifestations including irritation at the site where the virus was introduced, altered mental status (e.g., hyperactivity and agitation), hydrophobia, excessive salivation, and difficulty swallowing due to laryngeal spasms. Ultimately, autonomic instability, coma, and death occur, due mainly to cardiac or respiratory failure. No treatment protocol has proven consistently effective for clinical rabies and reports of patients surviving are exceedingly rare. If a person is exposed to the virus, prompt post-exposure prophylaxis (PEP) by administration of rabies immune globulin and vaccine can prevent progression to clinical rabies.

Rabies virus variants (RVV) are maintained in certain mammalian species, but all rabies viruses are capable of infecting any mammal, including humans. In California, bat RVVs exist throughout the state, while the California skunk RVV is found mostly north of the Tehachapi mountain range. Domestic animals (dogs, cats, and livestock) can be infected with these RVVs through contact with rabid wildlife; but the rarity of domestic animal rabies in California limits the potential for the virus to evolve and sustain transmission in these species. Each year since 1957, the Director of the California Department of Public Health (CDPH) has identified counties in California where rabies constitutes a public health hazard. The Director has declared all 58 counties in California as rabies areas every year since 1987.

Since the early 20th century, CDPH has overseen a statewide rabies surveillance and control program. Local departments of public health and environmental health, animal control agencies and shelters, and medical and veterinary practitioners collaborate with CDPH to prevent rabies in California by:

- Providing reliable laboratory services for the diagnosis of rabies in humans and animals,
- Regulating and enforcing rabies vaccination of dogs to provide a protective “firewall” that reduces the potential for human exposure,
- Investigating reports of animals that bite humans,
- Evaluating animals for rabies by confinement and observation for a specified period, or by euthanasia and testing,
- Offering recommendations for PEP to persons following a known or suspected exposure to rabies,
- Developing and disseminating preventive education on rabies, and
- Collecting, collating, and reporting surveillance data on rabies in humans and animals.

Reporting and Analysis

The California Code of Regulations (17 CCR §2500) lists rabies that is diagnosed in either humans or animals as a reportable disease. Health care providers, including physicians and veterinarians, having knowledge of a confirmed or suspected case of rabies are required to report this knowledge immediately to the local health officer. Diagnostic testing of human patients who have signs and symptoms suggestive of rabies is challenging, and no single test can accurately diagnose rabies ante-mortem. Therefore, several tests on multiple tissue samples are typically pursued. Diagnosis can be made by detection of virus antigen in nuchal skin biopsy, brain biopsy, or saliva by direct fluorescent antibody assay (DFA) or polymerase chain reaction; or by demonstration of rabies-specific antibodies in blood or cerebrospinal fluid of previously unvaccinated patients by immunofluorescent antibody assay or Rapid Fluorescent Focus Inhibition Test (RFFIT). Infection with rabies is confirmed post-mortem in humans and animals by detection of rabies virus antigen, typically in central nervous system tissue, by DFA performed by a certified public health microbiologist**.** In 2023, 26 local public health laboratories in California employed trained microbiologists and maintained resources to perform rabies testing in animals. The CDPH Viral and Rickettsial Diseases Laboratory (VRDL) provides primary and confirmatory testing for rabies in animals, diagnostic testing of human patients suspected to have rabies, and characterization of rabies viruses to RVV type. Local public health departments report confirmed cases of rabies in humans and animals to CDPH. This surveillance report summarizes information on confirmed cases of rabies in humans and animals reported to CDPH in 2023.

Rabies in Animals

In 2023, specimens from 4,861 animals were tested for rabies in California – approximately 6 percent fewer than the annual average of 5,184 specimens tested during the previous ten years, 2013-2022. Of the 56 counties that submitted at least one animal for rabies testing, the number of animals tested per county ranged from 1 to 557.

In 2023, rabies was confirmed in California in 179 bats, 19 skunks, and 4 foxes.

Rabies was confirmed in 202 animals, roughly 16 percent fewer than the 241 cases confirmed in 2022 and 12 percent below the annual average of 230 cases in 2013-2022 (Table A). One or more rabid animals were identified in 38 counties, which reported between 1 and 42 rabid animals each.

Wild Animals

Rabies was diagnosed in 202 wild animals in 2023, accounting for 100 percent of all rabid animals reported to CDPH. Bats (179, 88.6%) were the wild animal most frequently reported rabid, followed by skunks (19, 9.4%), and foxes (4, 1.9%).

Bats

A total of 1,714 bats from 54 counties was tested for rabies in 2023 (Figure A). The 179 rabid bats reported in 2023 were 8 percent lower than the annual average of 195 reported in the preceding ten years, 2013-2022 (Figure B). The greatest number of rabid bats (42) was reported in Los Angeles County, which reported the most rabid bats in each of the past ten years (Table A, Figure C). The six southern California counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura collectively accounted for 88 (49%) of all rabid bats detected in California in 2023. Rabid bats were most frequently reported during the late summer and early autumn months; slightly over half (101, 56%) of all rabid bats were reported in the three months of August through October (Figure D). Species were identified for 174 rabid bats: 66 Mexican free-tailed bats (*Tadarida brasiliensis*), 61 western pipistrelle (*Parastrellus hesperus*), 11 California myotis (*Myotis californicus*), 1 Yuma myotis (*Myotis yumanensis*), 16 big brown bats (*Eptesicus fuscus*), 9 Hoary bats (*Laisurus cinereus*), and 1 Western red bat (*Lasiurus frantzii*). Three bats could not be distinguished between western small-footed bat (*Myotis ciliolabrum*) and *M. californicus*, and six bats could not be distinguished between little brown bat (*Myotis lucifugus*) and *M. yumanensis.*

Skunks

A total of 213 skunks (*Mephitis mephitis*) from 31 counties were tested for rabies in 2023, of which 19 from 5 counties were confirmed rabid (Figure A, B). The 19 rabid skunks in 2023 was fewer than the annual average of 29 in the preceding ten years, 2013-2022. The greatest number of rabid skunks (13; 68%) was reported in El Dorado County.

Foxes

A total of 32 foxes from 18 counties were tested for rabies in 2023. The four confirmed rabid foxes in 2023 were equal to the annual average of four foxes reported in the previous 10 years, 2013-2022 (Figure B). Rabies virus variants were characterized for all four foxes: *Myotis californicus* (3) and *Myotis yumanensis.*

Other wild animals

Rabies was not detected in other wild animals in 2023.

Domestic Animals

In 2023, 2,686 domestic animals (dogs, cats, horses, cattle, goats, sheep, and swine) were tested for rabies. Rabies was confirmed in no domestic animals in California in 2023.

Rabies in Humans

Rabies was not diagnosed in a California resident in 2023.

Rabies in the United States

A total of 3,760 cases of animal rabies were reported in the U.S. in 2023 [Boutelle et al 2025]. Wild animals accounted for 91.8 percent of all cases. Bats represented the largest proportion of cases (1,298, 34.5%), followed by raccoons (1,085, 28.9%), skunks (642, 17.1%), and foxes (299, 8.0%). Domestic animals accounted for 8.2 percent of all rabid animals and included 222 cats and 33 dogs. No cases of human rabies were identified in residents of the U.S. in 2023.

Discussion

Bats were the animals in which rabies was most frequently identified in 2023, constituting nearly 90 percent of all rabid animals. In each of the last 20 years, bats have accounted for 62 to 95 percent of all rabid animals identified in California. Approximately 24 species of bats are permanent or seasonal residents of California. Unique RVVs have been identified for at least 10 of these species, with RVVs occasionally passed between bat species. While some bat species are rare, reclusive, and have limited geographic distribution, others such as the Mexican free-tailed bat are abundant and are present throughout all of California. In addition, migratory species may be found in different parts of the state during different times of the year. Finally, some species may forage up to 50 miles around their roosts each night. It is because of the broad distribution of bat populations and expansive home ranges of individual bats, combined with the numerous RVVs adapted to efficient transmission between bats, that the CDPH Director has declared all of California endemic for rabies each year since 1987.

Rabid bats are the predominant cause of rare human rabies in the U.S. and have been the most frequently reported rabid animal in California since 2000.

Skunks continued in 2023 to be the second most frequently reported rabid mammal in California. In 2023, 642 rabid skunks were reported nationwide—second only to raccoons (1,085) as the most commonly identified terrestrial mammal with rabies [Boutelle 2025]. A RVV circulates in California skunks that is distinct from the North Central and South Central skunk RVVs present throughout the central U.S., from Texas to North Dakota. The California skunk RVV is maintained chiefly along the western Sierra Nevada foothills including Madera, Mariposa, Tuolumne, Calaveras, Amador, El Dorado, and Placer counties. These seven counties, plus neighboring Sacramento and San Joaquin counties, have accounted for 266 (89%) of 298 rabid skunks detected in the last ten years (2014-2023). Twelve rabid skunks were identified in Butte and Nevada counties in 2021-2023, following several years of no detections. As rabid skunks were common in these counties through the 1990s, continued surveillance may offer insight as to possible re-expansion of skunk rabies into these more northern areas.

Foxes are the most commonly identified rabid animal species in California for which there is not an adapted RVV. Rabies cases in California foxes represent transmission of

virus from other maintenance species, most likely via oral mucous membrane during predation. The four rabid foxes in California in 2023 were infected with three different bat RVVs.

References

Boutelle C, Bonaparte S, Orciari LA, et al. Rabies surveillance in the United States during 2023. *J Am Vet Med Assoc* 2025; 263:1310-1317. http://doi.org/10.2460/javma.25.05.0344

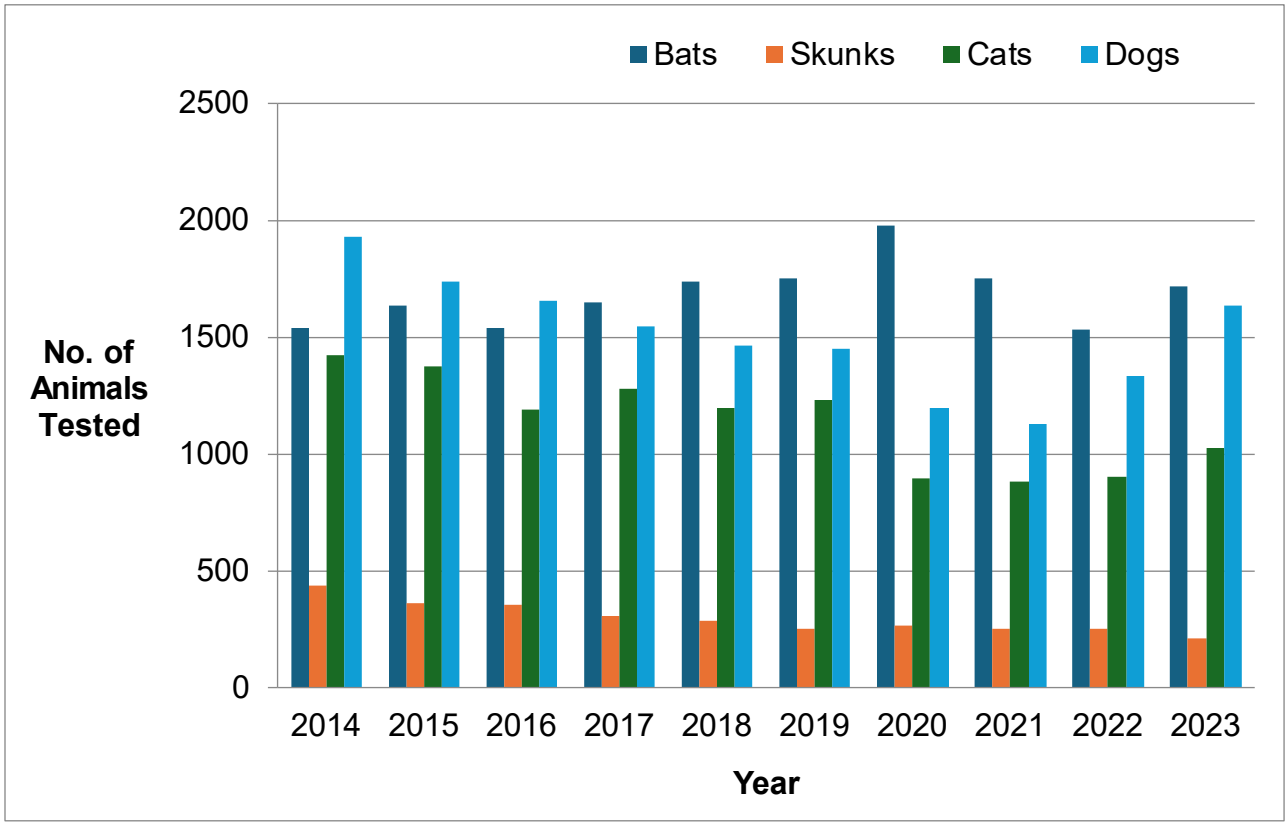
Table A. Reported cases of rabies in animals, California, 2023.

County	Bat	Skunk	Cat	Dog	Coyote	Fox	Horse	Sheep	Cattle	Raccoon	Total
Total	**179**	**19**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**202**
Alameda	2	0	0	0	0	0	0	0	0	0	2
-Berkeley City	2	0	0	0	0	0	0	0	0	0	2
Alpine	0	0	0	0	0	0	0	0	0	0	0
Amador	0	1	0	0	0	0	0	0	0	0	1
Butte	6	1	0	0	0	0	0	0	0	0	7
Calaveras	1	0	0	0	0	0	0	0	0	0	1
Colusa	0	0	0	0	0	0	0	0	0	0	0
Contra Costa	3	0	0	0	0	0	0	0	0	0	3
Del Norte	1	0	0	0	0	0	0	0	0	0	1
El Dorado	1	13	0	0	0	0	0	0	0	0	14
Fresno	0	0	0	0	0	0	0	0	0	0	0
Glenn	0	0	0	0	0	0	0	0	0	0	0
Humboldt	0	0	0	0	0	1	0	0	0	0	1
Imperial	0	0	0	0	0	0	0	0	0	0	0
Inyo	5	0	0	0	0	0	0	0	0	0	5
Kern	0	0	0	0	0	0	0	0	0	0	0
Kings	1	0	0	0	0	0	0	0	0	0	1
Lake	0	0	0	0	0	0	0	0	0	0	0
Lassen	0	0	0	0	0	0	0	0	0	0	0
Los Angeles	42	0	0	0	0	0	0	0	0	0	42
-Long Beach City	0	0	0	0	0	0	0	0	0	0	0
-Pasadena City	0	0	0	0	0	0	0	0	0	0	0
Madera	0	0	0	0	0	0	0	0	0	0	0
Marin	14	0	0	0	0	0	0	0	0	0	14
Mariposa	0	0	0	0	0	0	0	0	0	0	0
Mendocino	0	0	0	0	0	0	0	0	0	0	0
Merced	0	0	0	0	0	0	0	0	0	0	0
Modoc	0	0	0	0	0	0	0	0	0	0	0
Mono	0	0	0	0	0	0	0	0	0	0	0
Monterey	2	0	0	0	0	0	0	0	0	0	2
Napa	0	0	0	0	0	0	0	0	0	0	0

County	Bat	Skunk	Cat	Dog	Coyote	Fox	Horse	Sheep	Cattle	Raccoon	Total
Nevada	0	2	0	0	0	1	0	0	0	0	3
Orange	9	0	0	0	0	0	0	0	0	0	9
Placer	1	0	0	0	0	0	0	0	0	0	1
Plumas	1	0	0	0	0	0	0	0	0	0	1
Riverside	14	0	0	0	0	0	0	0	0	0	14
Sacramento	10	2	0	0	0	0	0	0	0	0	12
San Benito	0	0	0	0	0	0	0	0	0	0	0
San Bernardino	11	0	0	0	0	0	0	0	0	0	11
San Diego	8	0	0	0	0	0	0	0	0	0	8
San Francisco	6	0	0	0	0	0	0	0	0	0	6
San Joaquin	4	0	0	0	0	0	0	0	0	0	4
San Luis Obispo	1	0	0	0	0	0	0	0	0	0	1
San Mateo	1	0	0	0	0	0	0	0	0	0	1
Santa Barbara	3	0	0	0	0	0	0	0	0	0	3
Santa Clara	7	0	0	0	0	0	0	0	0	0	7
Santa Cruz	1	0	0	0	0	0	0	0	0	0	1
Shasta	1	0	0	0	0	0	0	0	0	0	1
Sierra	0	0	0	0	0	0	0	0	0	0	0
Siskiyou	1	0	0	0	0	0	0	0	0	0	1
Solano	1	0	0	0	0	0	0	0	0	0	1
Sonoma	6	0	0	0	0	1	0	0	0	0	7
Stanislaus	1	0	0	0	0	0	0	0	0	0	1
Sutter	0	0	0	0	0	0	0	0	0	0	0
Tehama	1	0	0	0	0	1	0	0	0	0	2
Trinity	0	0	0	0	0	0	0	0	0	0	0
Tulare	1	0	0	0	0	0	0	0	0	0	1
Tuolumne	0	0	0	0	0	0	0	0	0	0	0
Ventura	4	0	0	0	0	0	0	0	0	0	4
Yolo	4	0	0	0	0	0	0	0	0	0	4
Yuba	2	0	0	0	0	0	0	0	0	0	2

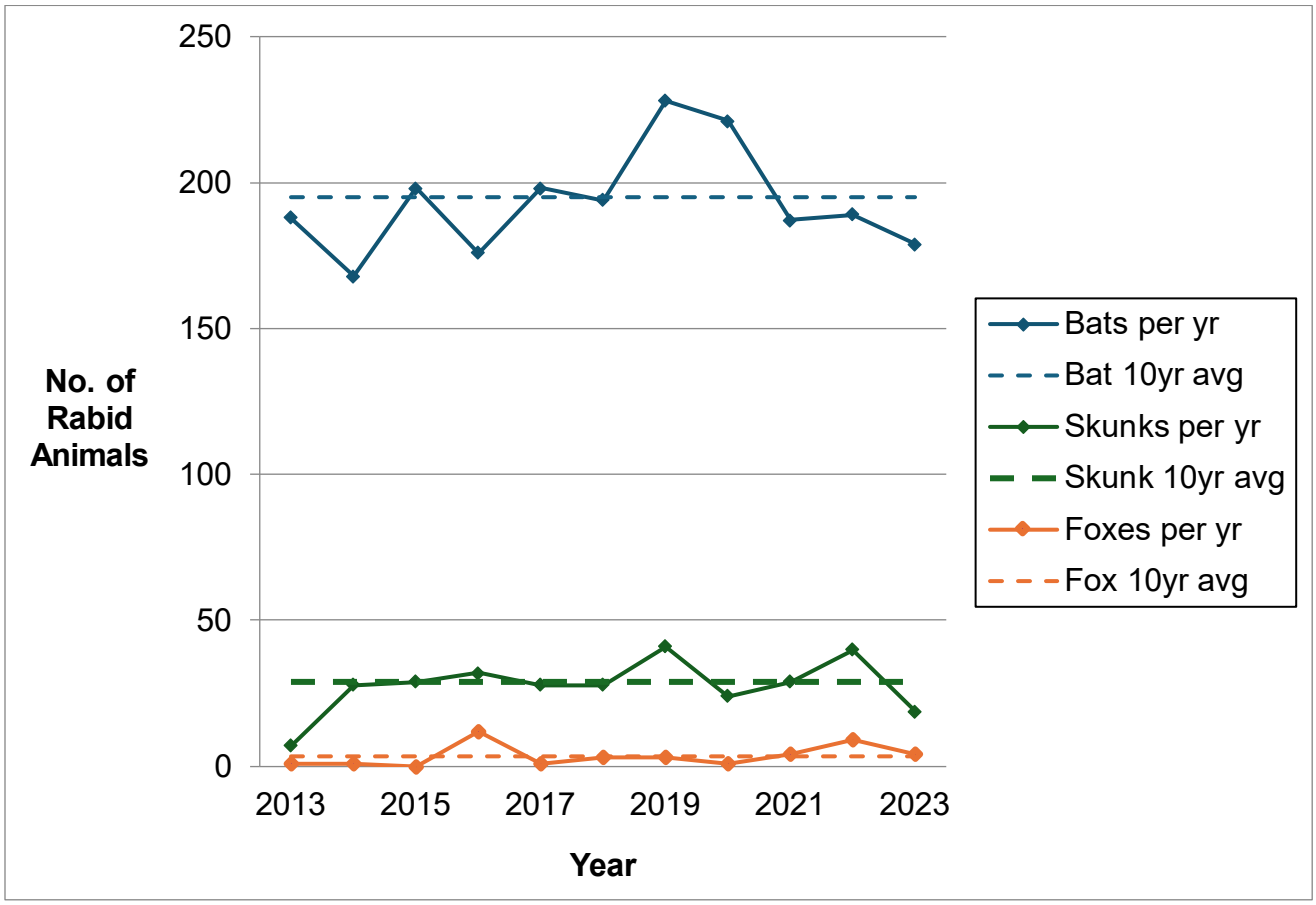
Source: California Department of Public Health, Veterinary Public Health Section

Figure A. Selected wild and domestic animals tested for rabies in California, 2014-2023.



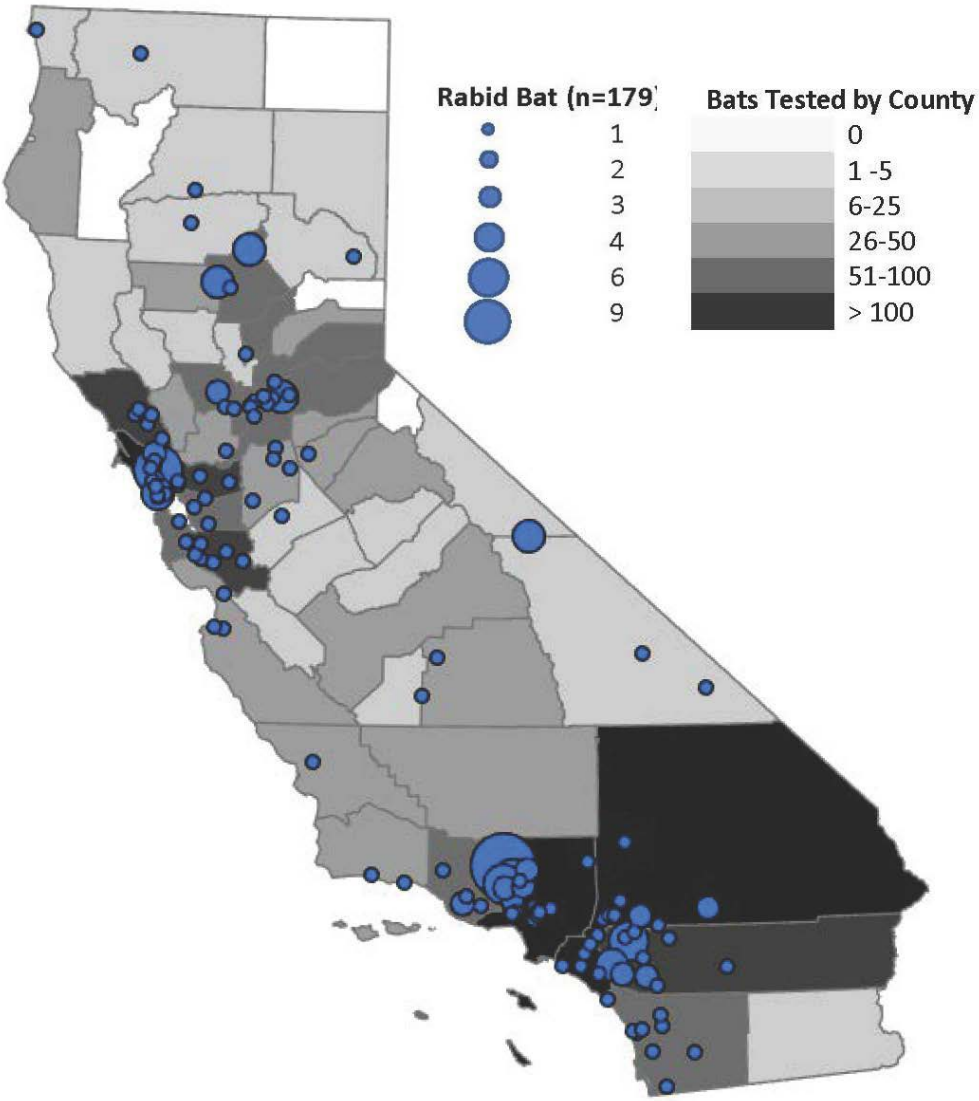
Source: California Department of Public Health, Veterinary Public Health Section

Figure B. Cases of rabies in wild animals in California, 2013-2023. (Ten-year averages represent 2013-2022 data.)



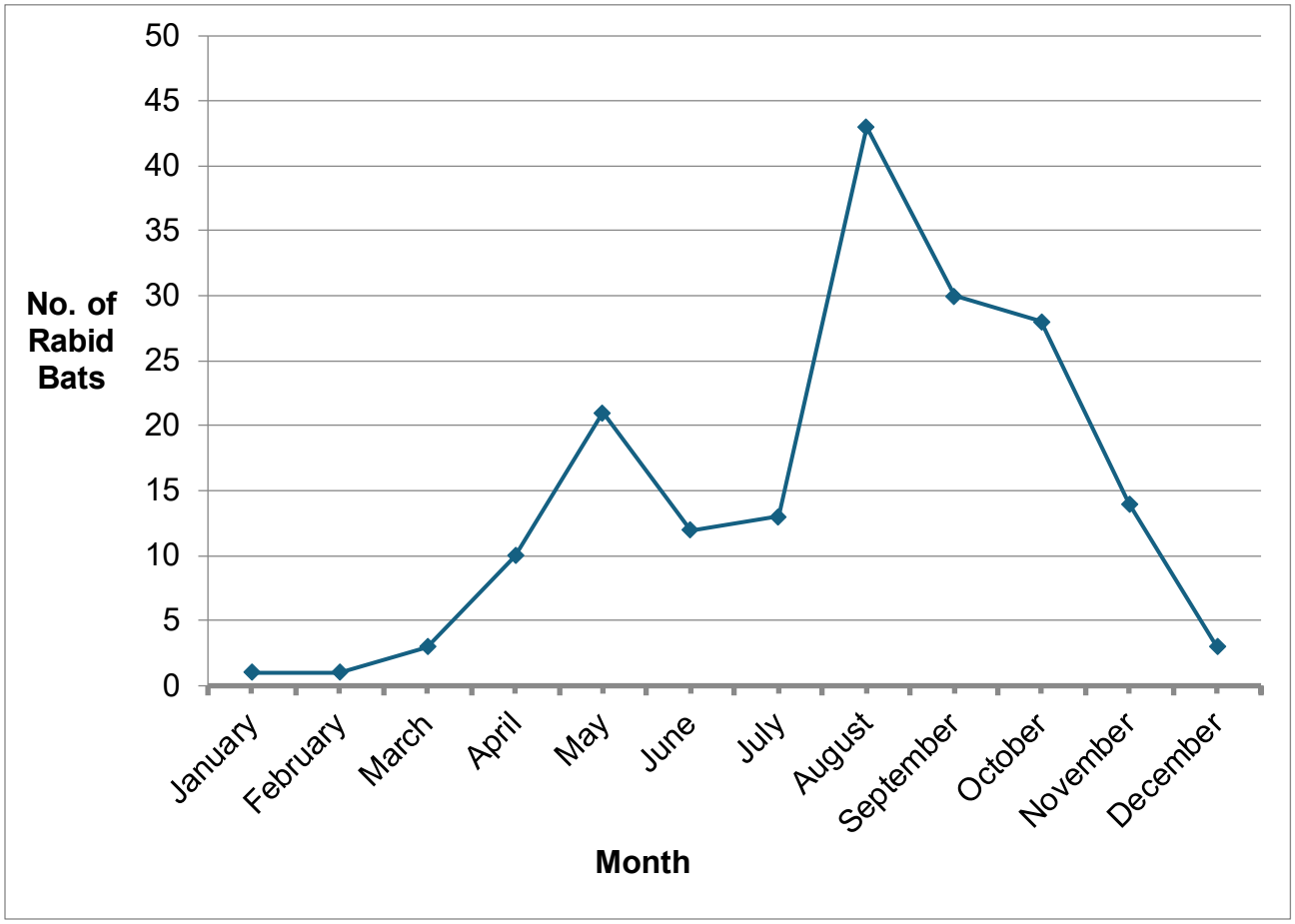
Source: California Department of Public Health, Veterinary Public Health Section

Figure C. Bats tested for rabies by county with positive cases by zip code of collection site, California, 2023.



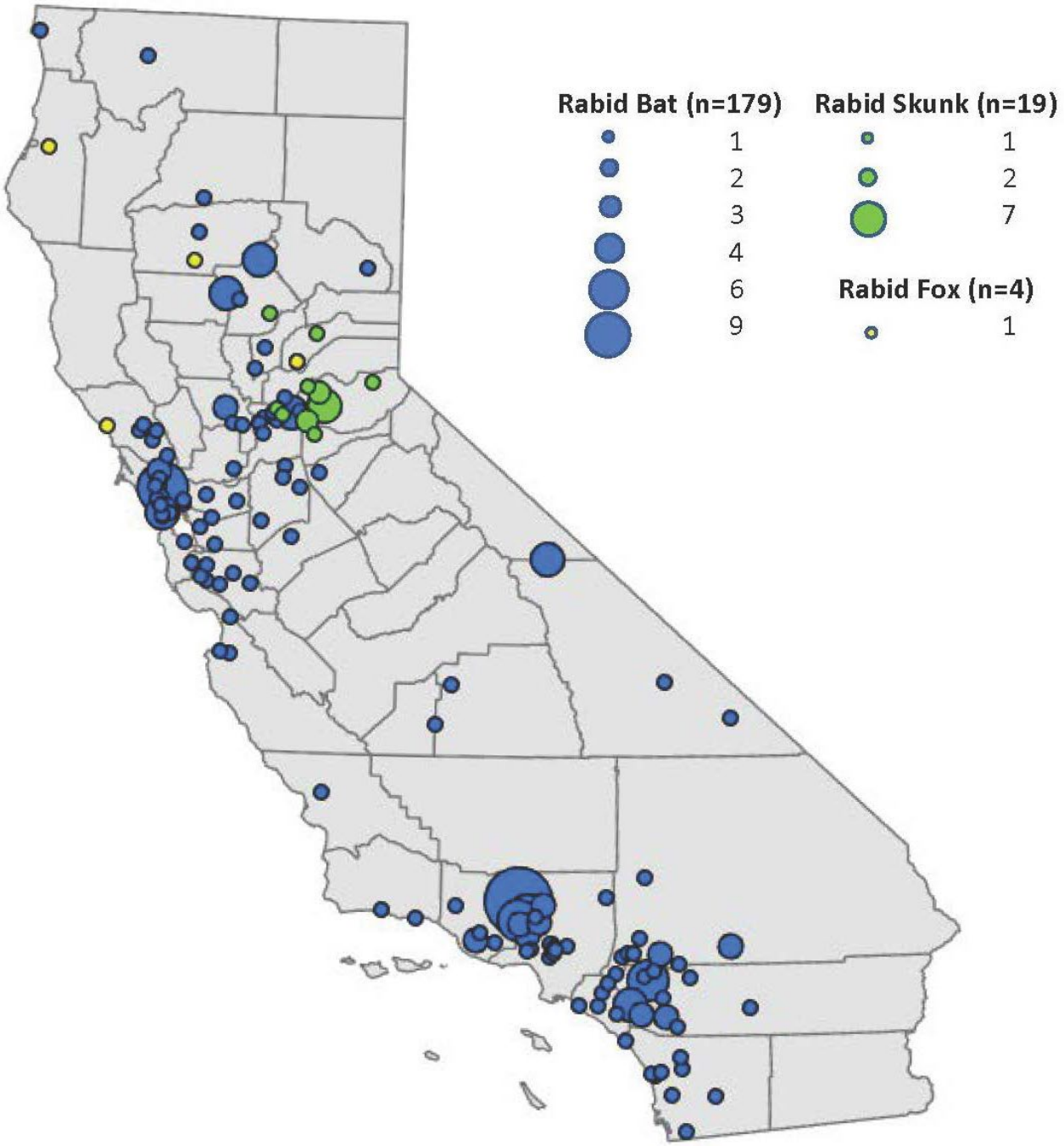
Source: California Department of Public Health, Veterinary Public Health Sectio

Figure D. Cases of rabies in bats by month of testing, California, 2023.



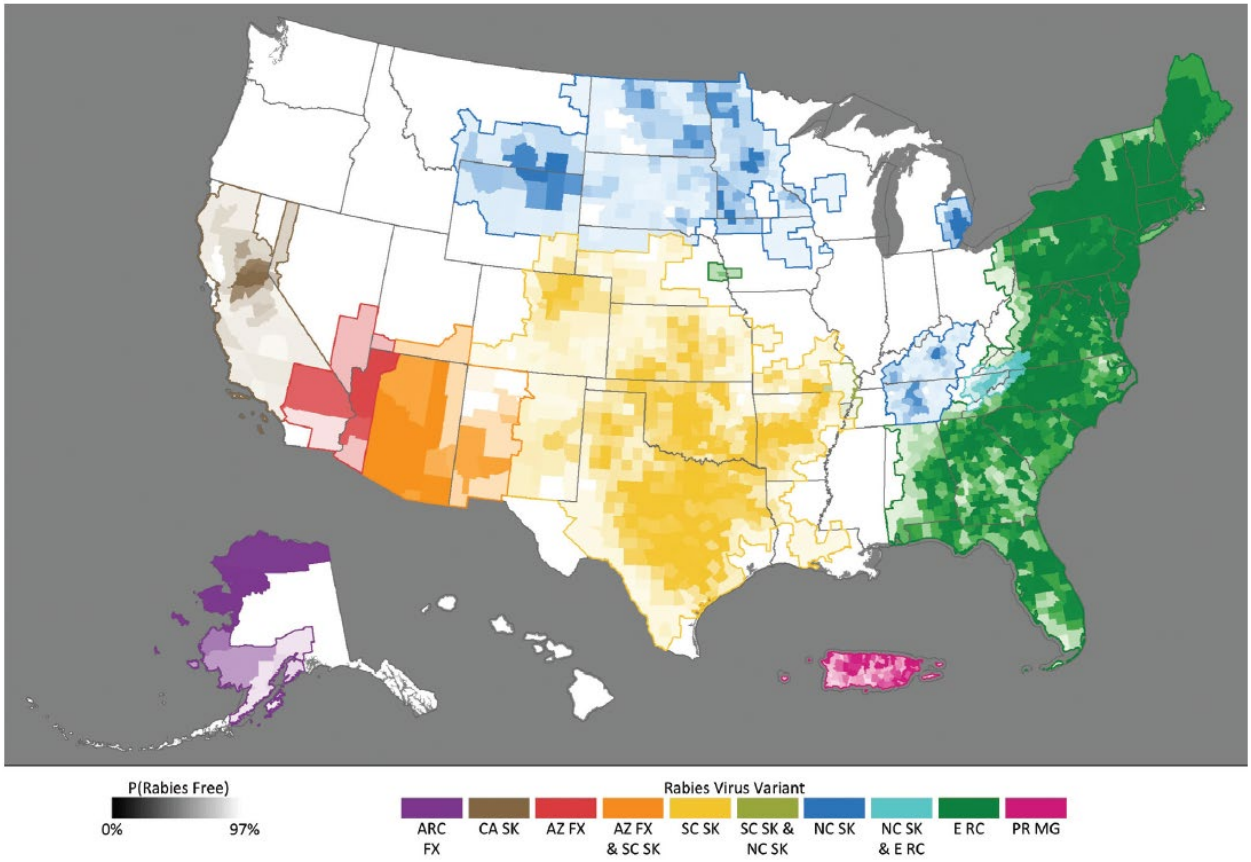
Source: California Department of Public Health, Veterinary Public Health Section

Figure E. Reported cases of rabies in wild animals by zip code of collection site, California, 2023.



Source: California Department of Public Health, Veterinary Public Health Section

Figure F. Distribution of major rabies virus variants (RVVs) among mesocarnivores in the U.S., including Puerto Rico. Lighter shading indicates a higher probability of terrestrial rabies freedom as determined by a county-level terrestrial rabies freedom model. Counties with a probability of ≥ 97% are considered terrestrial rabies free (no color). ARC FX = Arctic Fox RVV. AZ FX = Arizona Gray Fox RVV. CA SK = California Skunk RVV. E RC = Eastern Raccoon RVV. PR MG = Puerto Rico Mongoose RVV. NC SK = North Central Skunk RVV. SC SK = South Central Skunk RVV.



Source: Boutelle C, Bonaparte S, Orciari LA, et al. Rabies surveillance in the United States during 2023. *J Am Vet Med Assoc* 2025; 263:1310-1317. http://doi.org/10.2460/javma.25.05.0344