

# RESTORING CALIFORNIA'S WILDLIFE CONNECTIVITY 2022



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California Department of Fish and  
Wildlife

2022 Priority Wildlife Connectivity Project Locations by Region.

# Restoring California's Wildlife Connectivity 2022

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

## EXECUTIVE SUMMARY

Habitat connectivity is critical for maintaining viable populations of wildlife species, particularly in the face of anthropogenic pressures and a changing climate. Barriers created by linear infrastructure such as roads, railways, and canals can influence wildlife movement, impede genetic exchange among populations, cause direct mortality, and ultimately reduce resilience of populations. Historically, efforts to identify and maintain important movement corridors (and conversely, remediate significant barriers to movement) have been somewhat limited and executed in a piecemeal fashion, but in recent years increased interest in a systematic approach to restoring, maintaining, and enhancing habitat connectivity for wildlife has emerged. Among other efforts, in 2018 the U.S. Secretary of the Interior issued Secretarial Order No. 3362 (SO 3362) directing the Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), and National Park Service (NPS) to work with western state wildlife agencies to enhance the quality of big-game winter habitat and migration corridors on and adjacent to federal lands.

The California Department of Fish and Wildlife (CDFW) and The California Department of Transportation (CalTrans) are committed to meaningfully address wildlife connectivity across the state. This report will highlight how and where we will do more together. Further, the State of California continues to lead in this space with the passage of AB 2344 which, among other things, added a requirement to the Streets and Highway Code Section 158 that CalTrans consider wildlife connectivity areas identified by CDFW. This report identifies and provides a roadmap on where we will solve these challenges together.

In 2020, CDFW conducted an initial assessment of priority barriers to wildlife movement throughout the state. Regional staff identified a total of 61 barriers that were considered high priorities for remediation ( $\approx 10$  barriers in each of the six terrestrial CDFW Regions). This report summarizes the first major update to the 2020 priority barrier dataset. In 2022, CDFW reviewed and re-evaluated each 2020 wildlife barrier segment, updated the list of priority wildlife barriers in each region, identified additional

wildlife barriers across the state, and identified the two top priority barriers in each region.

As of June 2022, approximately 150 segments of linear infrastructure have been identified as wildlife barriers, including 18 new segments added in 2022. Of those barrier segments, 62 were identified as priority wildlife barriers in 2022 and 12 were included on the statewide top priority list. Nearly all the known barriers are associated with the State Highway System, but railroads, canals, high-speed rail alignments, and local roads are also represented.

Bringing back these critically important movement pathways is part of CDFW's mission. Achieving meaningful progress will take time, funding, and effort. We look forward to working in close partnership with our colleagues at the federal, state, local levels, as well as tribal nations, and interested stakeholders to restore wildlife connectivity throughout the state. Together, we can make meaningful progress to restore wildlife connectivity throughout the state.

### Statewide Top Priority List

In 2022, each of the six terrestrial CDFW Regions identified two wildlife barriers that are top priorities for remediation based on impacts to wildlife populations, for a total of twelve top priorities statewide; four of these segments were identified as a top priority by more than one region (Table 1). Each top priority barrier was associated with at least one ungulate species (deer, elk, and/or bighorn sheep) and ten of the 12 top priority barriers were associated with mountain lions. (Figure 1). Five top priorities coincided with SO 3362 ungulate priority areas; four of the five SO 3362 priority areas contained at least one top priority barrier. Each of the top priority barriers was associated with the State Highway System, and two were also associated with high-speed rail (Table 1, Figure 2).

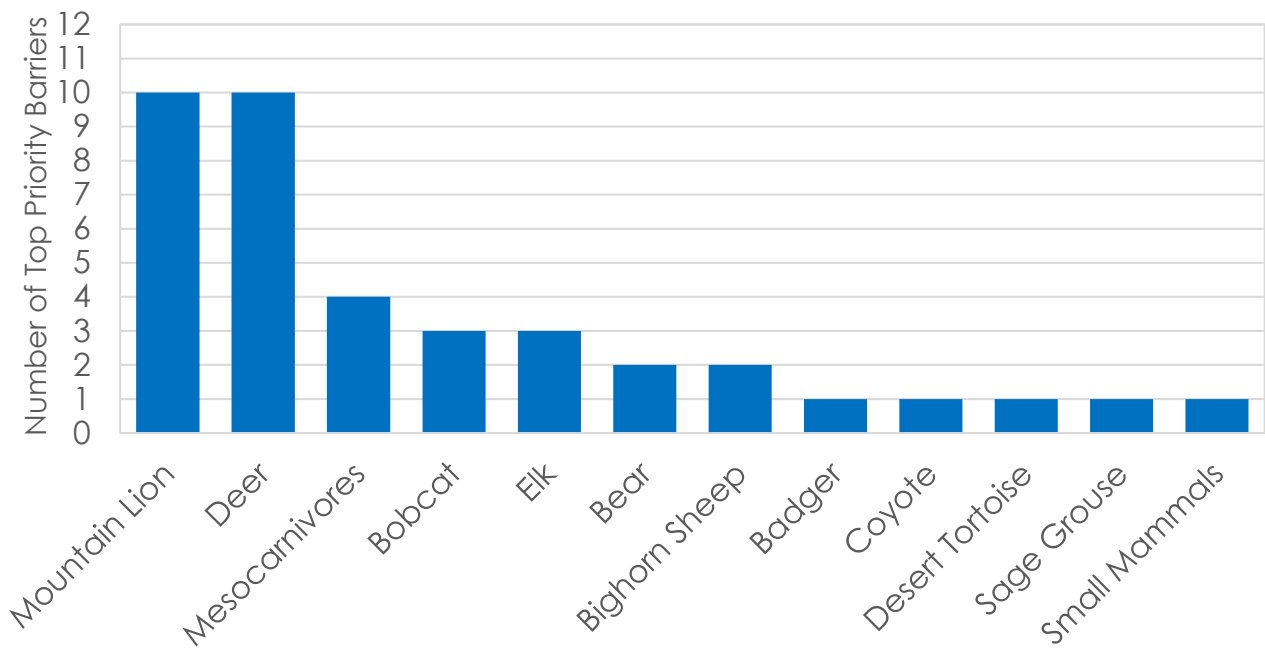


Figure 1. Target species for top priority connectivity projects identified by CDFW in 2022.

*Suggested citation: California Department of Fish and Wildlife. 2022. Restoring California's Wildlife Connectivity 2022. Biogeographic Data Branch, Sacramento, California.*

Table 1. Statewide top priority connectivity projects identified by CDFW in 2022.

Barrier ID	Region	County	Infrastructure Type	Route	Barrier/Segment Name	Focal Species
W007*	1	Humboldt	Highway	101	Hwy 101 Red School House, Big Lagoon, Orick	elk, mule deer, mesocarnivores
W008	1	Siskiyou	Highway	97	Hwy 97 Grass Lake	elk, mule deer, mountain lion
W001†	1,2	Lassen	Highway	395	Hwy 395 Janesville	mule deer, mountain lion
W002†	1,2	Lassen	Highway	395	Hwy 395 Doyle	mule deer, mountain lion
W023	3	Santa Cruz	Highway	17	Los Gatos to Scotts Valley	mountain lion, bobcat, coyote, mule deer, small mammals
W024	3	Santa Clara	Highway	101	Hwy 101 Old Monterey/Hwy 129	mule deer, mountain lion, mesocarnivores
W030†	3,4	Santa Clara/ Merced	Highway, Rail	152	Hwy 152 Pacheco Pass/San Luis Reservoir	Large & mesocarnivores, tule elk, mule deer, mountain lion, badger
W033	4	Kern	Highway	58	SR-58 Tehachapi Grade	mule deer, mountain lion, black bear
W046†	5,6	San Diego/ Riverside	Highway	15	I-15 Temecula to E Mission Rd	mountain lion, mule deer, bobcat, mesocarnivores
W061†	5,6	Imperial	Highway	8	I-8 Imperial Co.	Peninsular bighorn sheep
W054*	6	Mono	Highway	395	Hwy 395 Mono Co. PM 16-27	mule deer, mountain lion, black bear, sage grouse
W166	6	San Bernardino	Highway, Rail	15	Brightline/Cave Mtn, Soda Mtn., Clark Mtn	bighorn sheep, mountain lion, desert tortoise, Mojave ground squirrel, bobcat

\*within SO3362 priority area, †identified as a top priority by more than one region

Note: Barriers are not numbered in order of priority.



Figure 2. Location of statewide top priority barriers identified by CDFW in 2022. Shorter segments that are not easily visible at the statewide scale are enclosed in red circles.

## INTRODUCTION

California is home to extraordinary biodiversity, as well as over 39 million people and a booming economy. Maintaining habitat connectivity across a matrix of developed areas is critical to conserving California's biodiversity and ecosystem resilience now and into the future. Threats to habitat connectivity and wildlife movement across the landscape include habitat loss and fragmentation from development, as well as barriers created by linear infrastructure, such as roads, highways, dams, canals, and railroads. Not only do these impede wildlife movement, but they often result in mortality and affect population demographics, gene flow, resilience and ultimately persistence of California's wildlife.

Wildlife must navigate thousands of miles of linear infrastructure that crisscross California's landscape as they go about their daily and seasonal movements to secure the resources they need, such as food, mates, and shelter. The State Highway System alone consists of 16,662 miles of paved roads of varying widths. Historically, identifying important wildlife movement locations has been piecemeal and based on local information and interest. However, increasing attention is being directed toward wildlife habitat connectivity as a mechanism of maintaining biodiversity in the face of population growth and climate change. Listing priority wildlife barrier locations helps focus limited resources where the greatest needs to improve wildlife movement have been identified. This report summarizes information on terrestrial wildlife barrier priorities compiled by the California Department of Fish and Wildlife (CDFW). This dataset is complementary to CDFW's fish passage barrier priorities identified for anadromous fish (most recently, [2021 Fish Passage Priorities List](#))<sup>1</sup>. Like the fish passage priorities, the wildlife barriers list will be periodically updated to reflect new information and barrier removal successes.

In February 2018, the U.S. Secretary of the Interior issued [Secretarial Order No. 3362 \(SO3362\)](#)<sup>2</sup>, directing BLM, USFWS, and NPS to work with western state wildlife agencies to improve the quality and condition of priority big-game winter and migration corridor habitat on and adjacent to federal lands. To achieve the objectives of SO3362, the Department of Interior asked states to identify between three and five priority migration corridors or winter range habitats for big game species in each of their respective states. CDFW identified three priority focus areas for deer, and two for elk in response to SO3362.

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<sup>1</sup> California Department of Fish and Wildlife. 2021. Fish Passage Priorities (Top Priorities). <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=195827>

<sup>2</sup> [https://www.doi.gov/sites/doi.gov/files/uploads/so\\_3362\\_migration.pdf](https://www.doi.gov/sites/doi.gov/files/uploads/so_3362_migration.pdf)

This report represents the first update to the CDFW's [Wildlife Barriers 2020 Report](#)<sup>3</sup>, an initial suite of 61 priority wildlife movement barriers across the state, including eight barriers that fell within the SO3362 focus areas. The purpose of the 2022 update was to provide the opportunity to 1) remove barriers from the priority barriers list that have been remediated, 2) update the priority barriers identified for each region if new, high priority barriers have emerged since the list was last developed, and 3) collect new and updated information about each barrier segment. CDFW also took the opportunity to identify additional barriers to include in a larger dataset and work toward building a comprehensive dataset of wildlife barriers throughout the state. Each CDFW Region was asked to identify ten priority barriers, two of which would be included on a statewide top priority list, as well as to identify the level of planning that has been done for remediation at each location.

## METHODOLOGY

The CDFW divides the state into six terrestrial administrative Regions plus one marine region (Figure 3). Staff in each of the six terrestrial CDFW Regions identified linear segments of infrastructure that currently present barriers to wildlife populations in their jurisdiction. In doing so, the Regions used all available empirical information in their possession, including existing connectivity and road crossing studies, collared-animal movement data, roadkill observations, and professional expertise.



Figure 3. CDFW Region Boundaries

<sup>3</sup> California Department of Fish and Wildlife. 2020. California Wildlife Barriers 2020. 14 pp. <http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=178511>



Each linear segment was then evaluated using criteria based on information collected at a [Northeastern California Wildlife Connectivity Symposium](#)<sup>4</sup> and input from CDFW Scientists. All segments were mapped.

Barriers were defined as: Infrastructure or incompatible land uses that impede wildlife movement or population connectivity between habitat areas. Barriers are frequently long, linear segments of infrastructure such as roads, railways, and canals, as well as fencing. Barriers are also often land conversions between habitat areas; e.g., development or agricultural conversion between patches of natural lands.

The criteria used to evaluate the potential impact of barriers to wildlife populations include:

1. Important habitat or landscape linkage identified in a species movement or regional connectivity study, or necessary for connectivity between or within important habitat blocks.
2. Known ungulate migration routes, including those identified in response to SO 3362.
3. Movement corridors for sensitive, keystone, or other high priority species according to species-specific studies, genetic studies, or published recovery plans.
4. Known areas of high wildlife mortality due to infrastructure use (e.g., roadkill, drowning).
5. Areas suggested by available data to be important or functionally significant crossing locations where barrier improvement would benefit wildlife populations, as identified by cameras or GPS data, or by the presence of landscape features where animals are known to cross more frequently than other areas (e.g., riparian corridors, canyon bottoms, ridges, and open space corridors).
6. Areas where animals actively approach but are unable or refuse to cross.
7. Quality of adjacent habitat surrounding the barrier within a landscape context.
8. Durability of conservation status of adjacent lands (public lands, conservation easements, or lands with committed partners/landowners) and patch size.
9. Linkages that could facilitate range shifts due to climate change (e.g., connects lower to higher elevations or habitats latitudinally).
10. Areas also identified as fish passage barrier priorities.

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<sup>4</sup> Penrod, K. 2020. Northeast California Connectivity Symposium Summary Report. Prepared for California Department of Fish and Wildlife and Pew Charitable Trusts. Prepared by Science & Collaboration for Connected Wildlands. 87 pp. plus appendices. <http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=180664&inline>

Each Region then identified ten segments representing high priorities for remediation within their region, and the two top priority segments within each Region. Each barrier was placed into one of three groups based on remediation priority evaluated using the above criteria. The data developed for each of these three groups is discussed in this report.

- 1) Wildlife barriers:** The full list of wildlife barrier locations identified to date where infrastructure or incompatible land uses impede wildlife movement or population connectivity between habitat areas.
- 2) Priority wildlife barriers:** The ten wildlife barrier segments with the highest priority for remediation in each of the six terrestrial CDFW Regions ( $\approx$  60 barrier segments).
- 3) Statewide top priorities:** The two wildlife barrier segments with the highest priority for remediation in each of the six terrestrial CDFW Regions ( $\approx$  12 barrier segments).

## RESULTS

Approximately **150 segments** of linear infrastructure **have been identified as wildlife barriers**, or locations where wildlife movement is known to be negatively impacted, including 18 new segments added in 2022. Of those barrier segments, **62 were identified as priority barriers** in 2022 and **12 are included on the statewide top priority list**. Information on all barriers identified in 2020 was reviewed and re-evaluated, and additional information was collected for each barrier segment. One priority barrier identified in 2020 was removed from the list because remediation has been completed (W011, I-80 at Donner Summit, a fenced underpass has been constructed by Caltrans).

Each Region was asked to identify ten high priority barrier locations. In a few instances, two adjacent Regions identified overlapping or adjacent segments, a single location is represented by two segments, or a segment was identified as a top priority in two adjacent regions. As a result, a total of 62 individual segments throughout the state were identified as priority barriers (Table 2). Of these 62 priority barriers, five were segments added in 2022 (one each in Regions 1, 3, and 5; two in Region 6) and five were previously identified as barrier segments in 2020 and increased in priority in 2022 (one in Region 2, four in Region 5). Average length of priority barriers across all regions was approximately 12.1 miles, varying from short segments (minimum 116 feet) representing a single known barrier feature (i.e., a culvert) to long stretches (maximum 146.5 miles) representing areas of concentrated wildlife impediment or mortality where multiple

solutions will likely be necessary for effective barrier remediation. These areas will require additional focused studies to determine the exact combination of type(s) and location(s) of remediation features necessary to effectively improve permeability to wildlife (e.g., fence, underpass, jump out, bridge).

Of the 2022 priority barriers, 59 involve the State Highway System (e.g., interstate, highway, or state route); two represent local roads, and three are associated with high-speed rail alignments. Some segments may be impacted by more than one infrastructure type (i.e., a high-speed rail alignment along a highway). Collectively, the 62 priority segments comprise a total of 751.8 linear miles. Eight of the identified priority wildlife barrier segments occur within SO 3362 focus areas. Outside these areas, CDFW identified an additional 44 priority barriers to ungulates including deer, elk, pronghorn, and bighorn sheep. Other species associated with barrier segments included large carnivores (mountain lion, black bear, gray wolf), mesocarnivores (e.g., bobcat, fox, kit fox, fisher, badger, ringtail), small mammals (e.g., Tipton kangaroo rat, San Joaquin antelope squirrel), birds (California gnatcatcher, sage grouse), reptiles (e.g., Alameda striped racer, western pond turtle, giant garter snake, blunt-nosed leopard lizard), amphibians (e.g., California tiger salamander, Santa Cruz long-toed salamander, California red-legged frog, arroyo toad), and one invertebrate (Quino checkerspot butterfly).

Table 2. CDFW list of priority wildlife connectivity projects, 2022.

Barrier ID	CDFW Region	County	Barrier/Segment Name	Target Species	Segment Length (miles)
W003	1	Tehama	Hwy 36E Mill Creek to Chester	mule deer	21.2
W004	1	Modoc	Hwy 299/395 Cedarville Y	pronghorn	1.2
W005	1	Siskiyou	I-5 Yreka to Oregon Border	mule deer, mountain lion, gray wolf	23.3
W006	1	Shasta	Hwy 44 East: Redding East to Lake McCumber Rd.	mule deer	33.9
W007	1	Humboldt	Hwy 101 Red School House, Big Lagoon, Orick	elk, mule deer, mesocarnivores	12.8

Barrier ID	CDFW Region	County	Barrier/Segment Name	Target Species	Segment Length (miles)
W008	1	Siskiyou	Hwy 97 Grass Lake	elk, mule deer, mountain lion	16.7
W009	1	Modoc	Hwy 139 Perez to jump scales	mule deer, pronghorn	10.0
W010	1	Shasta, Siskiyou	I-5/299 intersection north to I-5/89 intersection	mule deer, black bear	61.7
W150	1	Del Norte	Hwy 101 and Humboldt Road east of Endert's Beach	Elk, mule deer, mountain lion, black bear	3.7
W001	1, 2	Lassen	Hwy 395 Janesville	mule deer, mountain lion	9.0
W002	1, 2	Lassen	Hwy 395 Doyle	mule deer, mountain lion	16.0
W012	2	Sierra, Nevada	I-80 Truckee River Canyon, bisects Sierra Nevada	mule deer, black bear, mountain lion, gray wolf, elk	11.4
W013	2	Colusa	Hwy 20 Salt Creek, west of Williams	tule elk	2.2
W014	2	Colusa	Hwy 20 junction with Hwy 16	tule elk	0.8
W015	2	Colusa	Hwy 16 Cache Creek to Hwy 20	tule elk	3.5
W016	2	Lake	Hwy 20 Cache Creek	tule elk	2.6
W017	2	Sierra	Hwy 395 Sierra County	mule deer, mountain lion, pronghorn	3.1
W018	2	Alpine	Hwy 89 junction with Hwy 88	mule deer, mountain lion, black bear	0.5
W019	2	Alpine	Hwy 4 Alpine County	mule deer, mountain lion, black bear	17.6

Barrier ID	CDFW Region	County	Barrier/Segment Name	Target Species	Segment Length (miles)
W020	2	El Dorado	Hwy 50 Cameron Park to Shingle Springs, bisects Sierra Nevada	mule deer, mountain lion, black bear	3.7
W087	2	Plumas	Hwy 70	Mule deer, gray wolf	2.9
W021	3	Santa Cruz	Hwy 1 SCLTS Rio Del Mar/Buena Vista	Santa Cruz long-toed salamander	5.2
W022	3	Santa Clara	Hwy 101 Metcalf/Burnett	mule deer, mountain lion, mesocarnivores, California tiger salamander, California red-legged frog, western pond turtle	7.0
W023	3	Santa Cruz	Hwy 17 Los Gatos (Lexington Reservoir) to Scotts Valley (Carbonera Creek undercrossing)	mountain lion, bobcat, coyote, mule deer, small mammals	11.6
W024	3	Santa Clara	Hwy 101 Old Monterey/Hwy 129	mule deer, mountain lion, mesocarnivores	6.7
W025	3	Sonoma	Santa Rosa Plain -Todd Road	California tiger salamander (Sonoma dps)	1.5
W026	3	Sonoma	Hwy 12 near Glen Ellen	mule deer, mountain lion, mesocarnivores	12.4
W028	3	Alameda	Hwy 680 Sunol Ridge to Nilas Canyon	California tiger salamander, California red-legged frog, Alameda striped racer, mountain lion	6.5

Barrier ID	CDFW Region	County	Barrier/Segment Name	Target Species	Segment Length (miles)
W029	3	Alameda	SR-84 and Calaveras Rd., Sunol Ridge to Niles Canyon	California tiger salamander, California red-legged frog, Alameda striped racer, mountain lion, elk	11.7
W031	3	San Joaquin	Culvert on Hwy 12	giant garter snake, Pacific pond turtle, mink, river otter, beaver, all other reptiles and mammals in the area.	0.02
W158	3	Alameda	Hwy 580 Livermore to Tracy	California tiger salamander, California red-legged frog, small mammals	8.1
W030	3,4	Santa Clara, Merced	Hwy 152 Pacheco Pass/San Luis Reservoir	Large carnivores, mesocarnivores, tule elk, mule deer, mountain lion, badger	35.5
W033	4	Kern	SR-58 Tehachapi Grade	mule deer, mountain lion, black bear	15.1
W034	4	San Luis Obispo	Hwy 101 - Cuesta Grade	mountain lion, mule deer, black bear	10.0
W035	4	Kern	High-Speed Rail Alpaugh	kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, San Joaquin antelope squirrel	9.1
W036	4	Kern	I-5 Grapevine	mountain lion, mule deer,	19.6

Barrier ID	CDFW Region	County	Barrier/Segment Name	Target Species	Segment Length (miles)
				black bear, kit fox	
W037	4	Kern	SR-178 Canebrake	mule deer, mountain lion, black bear	19.4
W038	4	Tuolumne	SR-108 Strawberry - Donnell Vista	mule deer, mountain lion, black bear, fisher	11.9
W039	4	Fresno	SR-180 Kings Canyon Foothills	mule deer, mountain lion, black bear, badger	13.8
W041	4	Monterey	Hwy 101 Prunedale	mule deer, mountain lion, bobcat	10.9
W099	4	Madera/Mariposa	Oakhurst – Wawona	mule deer, mountain lion, black bear	16.9
W044	5	San Diego	SR-67 Mapleview St to Etcheverry Street	mule deer, bobcat, mountain lion, western toad, badger	16.5
W045	5	San Diego	MSCP wildlife infrastructure plan for SR-94	mountain lion, badger, mule deer, bobcat	14.7
W047	5	Los Angeles	I-5 North of Sylmar	mountain lion, mule deer	5.0
W103	5	Ventura	Simi Hills to Santa Susanna Mountains	mountain lion, mule deer, bobcat, kit fox, mesocarnivores (skunk, possum, raccoon, grey fox)	2.7
W107	5	San Diego	I-8 East of San Diego/El Cajon	mountain lion, mule deer, California Gnatcatcher	5.2

Barrier ID	CDFW Region	County	Barrier/Segment Name	Target Species	Segment Length (miles)
W110	5	San Diego	County Road S22	peninsular bighorn sheep	5.6
W113	5	Orange	SR-133 Coastal Newport Beach	mountain lion, mule deer	6.5
W163	5	Santa Barbara	Gaviota Pass	mountain lion, mule deer, black bear, mesocarnivores	6.3
W046	5,6	San Diego, Riverside	I-15 Temecula to E Mission Rd, mountain lion E-W movement barrier	mountain lion, mule deer, bobcat, mesocarnivores	6.7
W059	5,6	Riverside	SR-74/Pines to Palms Hwy - through the Santa Rosa Mountains	peninsular bighorn sheep	8.3
W061	5,6	Imperial, San Diego	I-8 Imperial Co.	peninsular bighorn sheep	13.1
W052	6	Orange, Riverside	SR-91, N-S Mountain lion movement barrier ("B Canyon")	mountain lion, bobcat, coyote	3.3
W053	6	Riverside	I-15 Temecula Creek Undercrossing	western pond turtle, arroyo chub, arroyo toad, mountain lion, quino checkerspot butterfly, bobcat, mesocarnivores, mule deer, ringtail, California Gnatcatcher, badger	0.1



Barrier ID	CDFW Region	County	Barrier/Segment Name	Target Species	Segment Length (miles)
W054	6	Mono	Hwy 395 Mono Co. PM 16-27	mule deer, mountain lion, black bear, sage grouse	10.4
W055	6	Mono	Hwy 395 Mono Co. PM 80-87	mule deer, mountain lion, black bear	7.0
W056	6	Mono	Hwy 395 Mono Co. PM 90-97	mule deer, mountain lion, black bear	7.0
W057	6	Riverside	I-10, San Gorgonio River	mountain lion, black bear, bobcat, birds, bats	2.2
W058	6	Riverside	I-10 Banning Pass	mule deer, mountain lion, black bear, bighorn sheep	15.1
W060	6	San Bernardino	I-15 Cajon Pass	mule deer, mountain lion, bear, bighorn sheep	2.7
W166	6	San Bernardino	Brightline/Cave Mtn, Soda Mtn, Clark Mtn; 3 wildlife overpasses	bighorn sheep, mountain lion, desert tortoise, Mojave ground squirrel, bobcat	146.5
W167	6	Riverside	I-10 El Casco Bridge #56-0370/Cherry Valley	mountain lion, bobcat, coyote	0.1
<i>In SO3362 Priority Areas: W001, W002, W007, W012, W017, W030, W054, W150</i>					

## REGIONAL SUMMARIES AND MAPS

The following maps show priority barrier locations in each Region. The complete barrier dataset can also be found in the [Habitat Connectivity Viewer](#)<sup>5</sup> in CDFW's Biogeographic Information and Observation System ([BIOS](#))<sup>6</sup>. The Viewer allows users to visualize the barriers relative to other data layers available in BIOS for use in conservation planning.

**Statewide Top Priorities.** – In addition to identifying regional priorities, CDFW staff also selected the two highest-priority barriers in each region for inclusion on a list of statewide top priorities (Figure 2, Table 1). Each of the 12 statewide top priority barriers was associated with the State Highway System, and two were also associated with high-speed rail. These segments ranged from 6.7-146.5 miles in length (mean = 25.0 miles) and collectively represent 300.0 miles of linear infrastructure. Five of the 12 segments (42%) coincided with SO 3362 priority areas and each of the top priority segments were specifically associated with at least one ungulate (Table 1). Carnivores were also strongly represented as focal species: mountain lions were associated with ten of 12 top priority segments (83%; Figure 1), and eight of 12 top priority segments (67%) were associated with at least one other carnivore (e.g., black bear, bobcat, coyote, mesocarnivores).

### **Priority Wildlife Barriers by CDFW Region**

**Region 1.** – CDFW staff identified a total of 33 wildlife barrier segments in Region 1, two of which were added to the list in 2022. Eleven of these segments were identified as priority wildlife barriers (Figures 4 and 5). In addition to the ten priority segments identified in 2020, one newly identified barrier (W150, Hwy 101 and Humboldt Road east of Endert's Beach) was added to the priority list in 2022 (Figure 5). Two priority barrier segments, W001 (Hwy 395 Janesville) and W002 (Hwy 395 Doyle), were also identified as high priority by Region 2 staff as these barriers also affect animals that spend time in Region 2 (Table 2). Priority barriers ranged in length from 1.2 to 61.7 miles (mean = 19.0 miles) and collectively represented 209.5 miles of the State Highway System.

All priority barriers in Region 1 were associated with ungulate and/or carnivore species and four segments coincided with SO 3362 priority areas (W001, W002, W007, W150; 36% of total). Mule deer were overwhelmingly the most common focal species among priority barriers in

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<sup>5</sup> <https://apps.wildlife.ca.gov/bios6/?bookmark=648>

<sup>6</sup> <https://wildlife.ca.gov/Data/BIOS>

Region 1 and were associated with ten of 11 (91%) priority segments (Figure 4). Mountain lions were associated with five of 11 priority segments (46%), elk were associated with three of 11 priority segments (27%), black bear and pronghorn were each associated with two priority segments (18%), and gray wolf and mesocarnivores were associated with one priority segment each (9%). Segment W008 (Hwy 97 Grass Lake) has a working group in place and W009 (Hwy 139 Perez to jump scales) is noted in a Caltrans Transportation Concept Report for Highway 139.

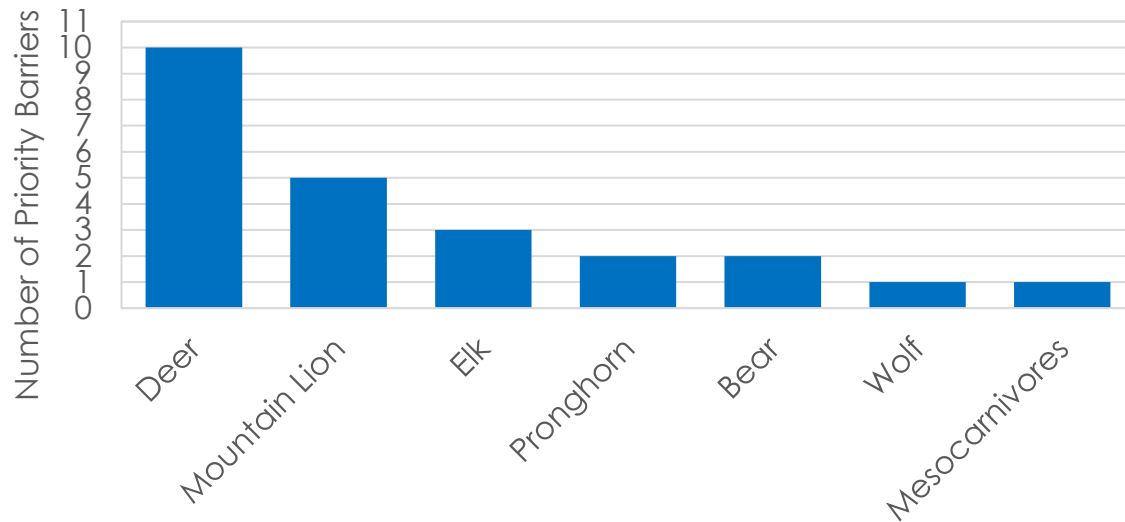


Figure 4. Target species for priority wildlife connectivity projects in Region 1 (Northern Region) identified by CDFW in 2022.

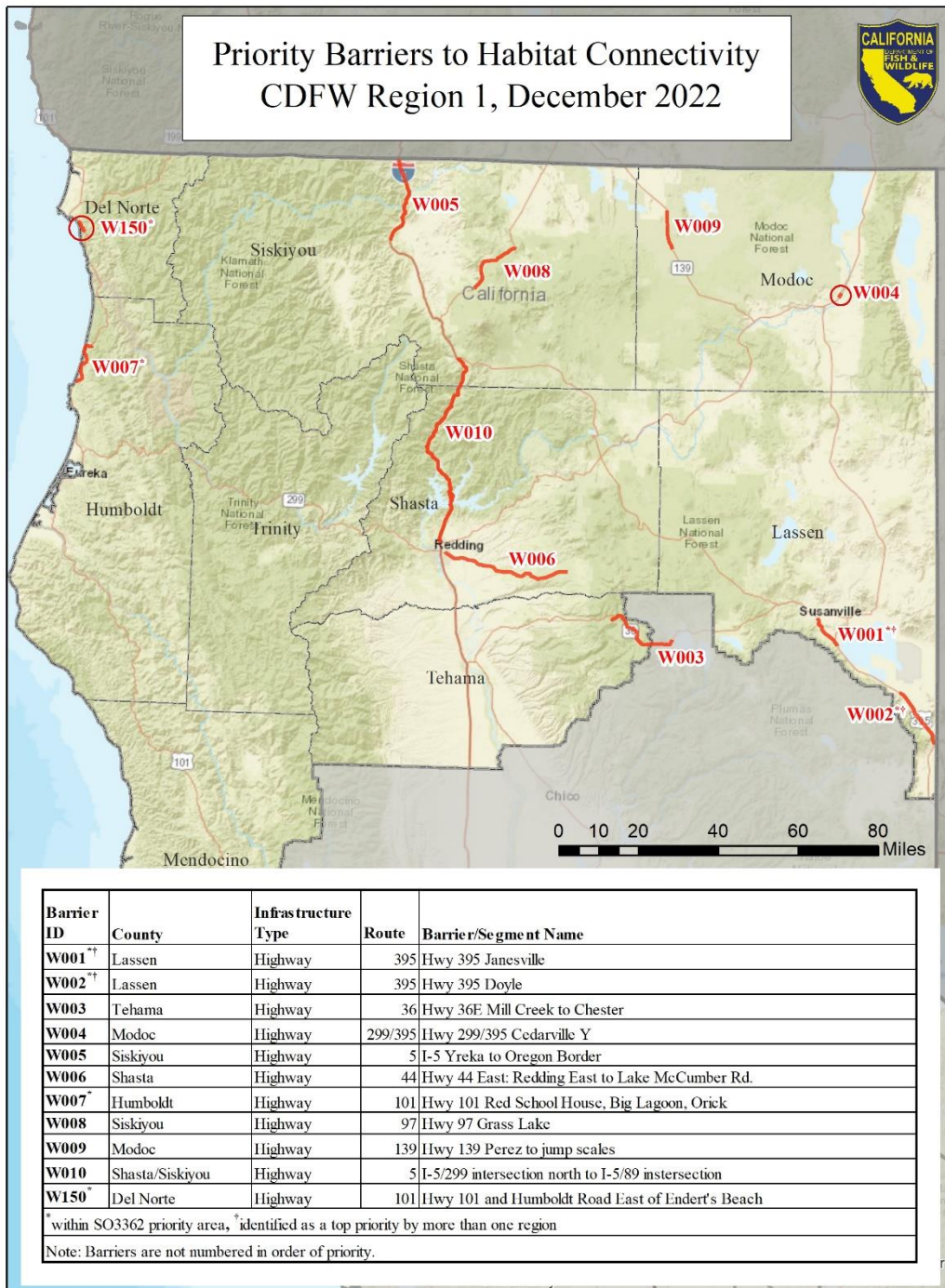


Figure 5. Locations of priority wildlife barriers in Region 1 (Northern Region) identified by CDFW in 2022. Shorter segments that are not easily visible at the regional scale are enclosed in red circles.

**Region 2.** – CDFW staff identified a total of 24 wildlife barrier segments in Region 2. Twelve of these segments were identified as priority wildlife barriers (Figures 6 and 7), and two of these are shared with Region 1 as noted above (Table 2). One priority segment identified in 2020 (W011, I-80 at Donner Summit) was removed from the wildlife barrier list in 2022 because a fenced underpass has been constructed by Caltrans near the summit; this segment was replaced in the priority list by W087 (Hwy 70 in Plumas Co.). Priority barriers in Region 2 ranged in length from 0.5 to 17.5 miles (mean = 6.1 miles) and collectively represented 73.3 miles of the State Highway System.

Four priority barriers in Region 2 coincided with SO 3362 priority areas (W001, W002, W012, W017; 33% of total) and, as in Region 1, all priority barriers in Region 2 were associated with ungulate and/or carnivore species. Mule deer were associated with eight of 12 (67%) priority segments, whereas elk were associated with seven of 12 (58%) priority segments and pronghorn were identified as a focal species for one priority segment (8%; Figure 6). Black bears were associated with four priority segments (33%) and gray wolves were associated with two priority segments (17%). Because all priority segments were associated with large mammal species, regional staff indicated that an overpass or underpass, fencing, and jumpouts would be necessary for remediation of each of these barriers.

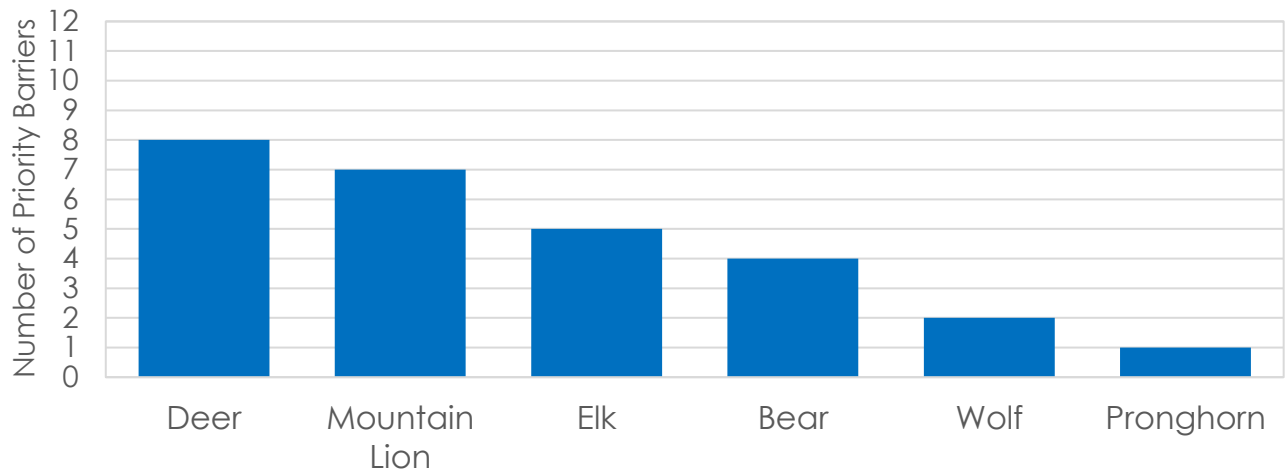


Figure 6. Target species for priority wildlife connectivity projects in Region 2 (North Central Region) identified by CDFW in 2022.

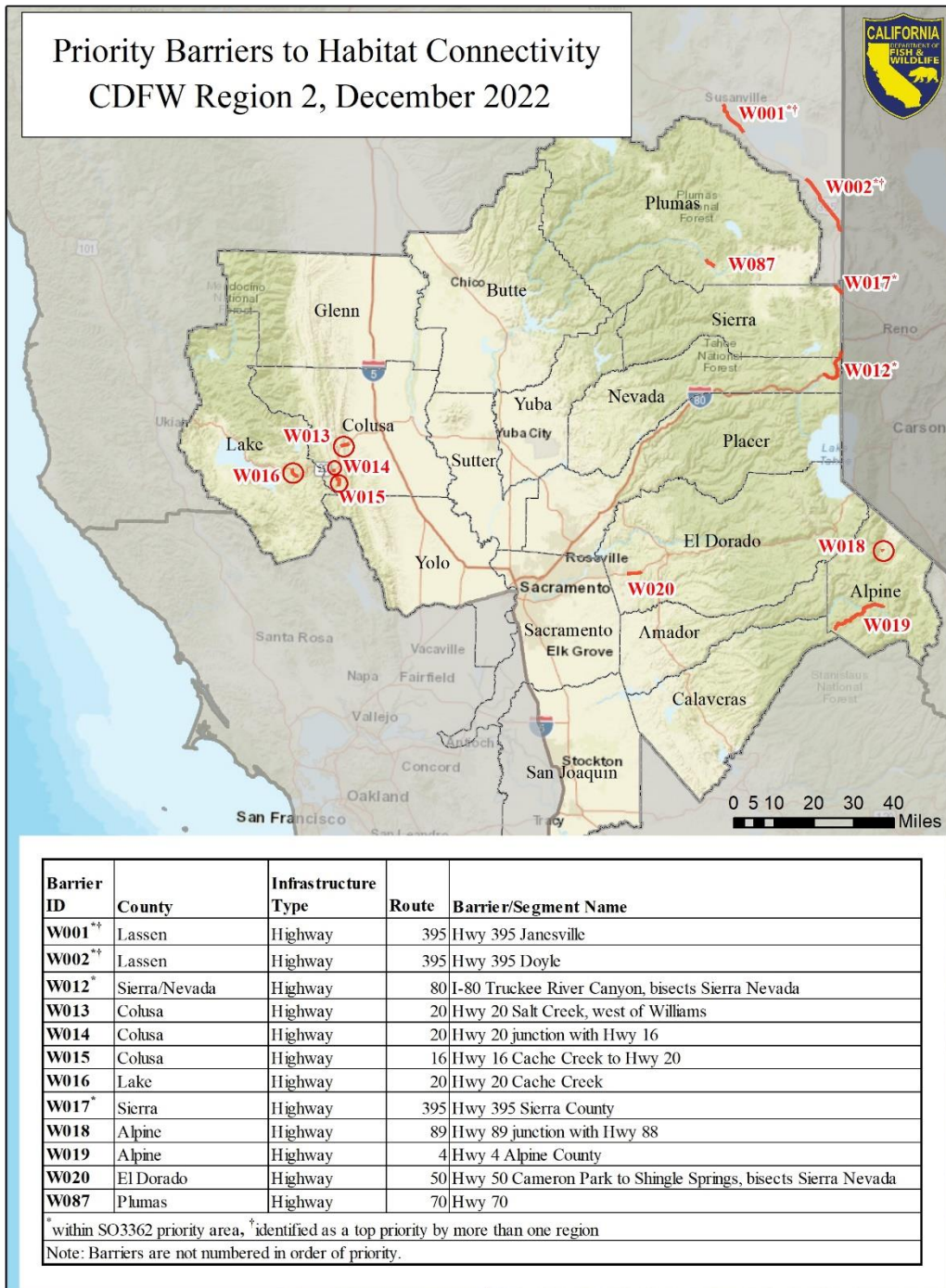


Figure 7. Locations of priority wildlife barriers in Region 2 (North Central Region) identified by CDFW in 2022. Shorter segments that are not easily visible at the regional scale are enclosed in red circles.

**Region 3.** – CDFW staff identified a total of 21 wildlife barrier segments in Region 3, including ten segments that were added to the list in 2022. Eleven of these segments were identified as priority wildlife barriers (Figures 8 and 9). Ten of the 11 priority segments identified in 2020 remained as high priorities in 2022, but newly added segment W158 (Hwy 580 Livermore to Tracy) replaced W027 (Hwy 580 Castro Valley to Dublin) in the priority list (Table 2, Figure 9). Additionally, existing priority segment W024 (Hwy 101 Old Monterey/Hwy 129) was extended westward along Hwy 129 to milepost SCR 9.97. One priority barrier (W030, Hwy 152 Pacheco Pass/San Luis Reservoir) was shared with Region 4. Priority barriers in Region 3 ranged in length from 116 feet to 35.5 miles (mean = 9.7 miles) and collectively represented 106.3 miles of linear infrastructure.

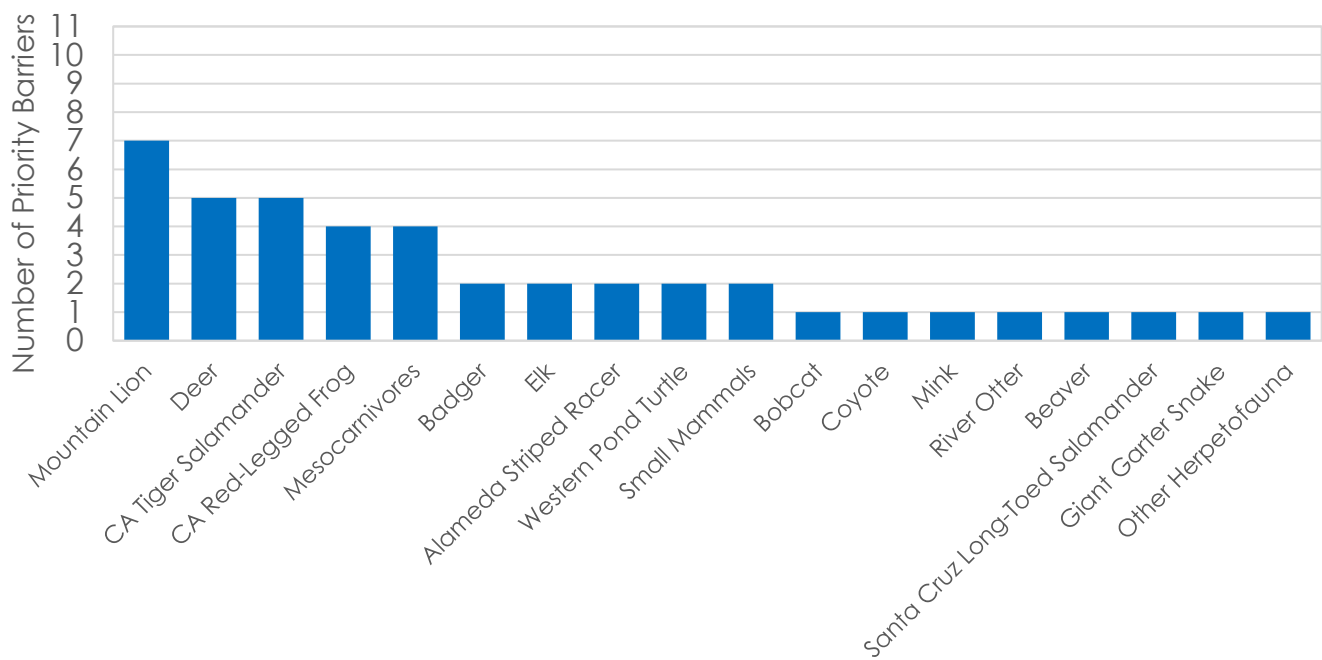


Figure 8. Target species for priority wildlife connectivity projects in Region 3 (Bay Delta Region) identified by CDFW in 2022.

Six of the 11 (55%) priority segments were associated with ungulate species (mule deer: five of 11, 45%; tule elk: two of 11, 18%; Figure 8) and one priority segment (W030, Hwy 152 Pacheco Pass/San Luis Reservoir) coincided with a SO 3362 priority area. Carnivore species were associated with 73% (eight of 11) of priority barriers in Region 3; a wide variety of carnivores including badger, bobcat, coyote, mink, river otter, and mountain lion were included as focal species for one or more priority barriers. Smaller species were more frequently associated with priority barriers in Region 3 relative to other regions, and three priority barriers (W021, Hwy 1 Rio Del Mar/Buena Vista; W025, Santa Rosa Plain -Todd Road; W158, Hwy 580 Livermore to Tracy) were associated exclusively with

herpetofauna and small mammals. Seven of the 11 (64%) priority segments were identified as significant barriers for at least one herptile species, several of which are rare, threatened, endemic, or otherwise sensitive; these focal species included California tiger salamander (45% of segments), California red-legged frog (36%), western pond turtle (18%), Alameda striped racer (18%), Santa Cruz long-toed salamander (9%), and giant garter snake (9%). Camera studies are underway at several priority barriers in Region 3 and several other priority segments are in various stages of planning/implementation.





Figure 9. Locations of priority wildlife barriers in Region 3 (Bay Delta Region) identified by CDFW in 2022. Shorter segments that are not easily visible at the regional scale are enclosed in red circles; the inset map (yellow box) depicts the location of W031.

**Region 4.** – CDFW staff identified a total of 15 wildlife barrier segments in Region 4, including one segment (W162, SR 101 “Bottleneck” / Prunedale split off) that was added to the list in 2022. Ten of these segments were identified as priority wildlife barriers (Figures 10 and 11). Nine of the ten segments identified as priority barriers in 2020 remained as high priorities in 2022, but segment W099 (Oakhurst – Wawona) replaced W040 (Concrete Canal – Los Banos) on the priority list (Table 2, Figure 11). Priority barriers ranged in length from 9.1 to 35.5 miles (mean = 16.2 miles) and collectively represented 162.2 miles of linear infrastructure.

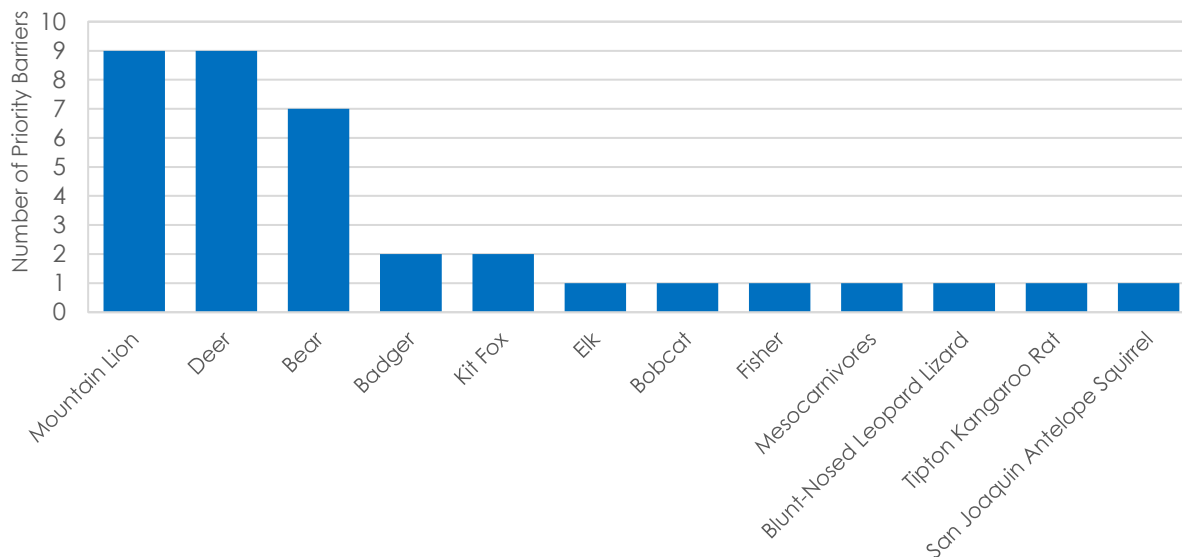


Figure 10. Target species for priority wildlife connectivity projects in Region 4 (Central Region) identified by CDFW in 2022.

Nine of the ten priority segments (90%) were characterized as barriers for large mammals, and each identified both mule deer and mountain lions as focal species (Figure 10); seven of these segments (70% of total) were also identified as barriers for black bears. W030 (Hwy 152 Pacheco Pass/San Luis Reservoir) coincided with a SO 3362 priority area and included both deer and elk as focal species. One priority segment (W035, High-Speed Rail Alpaugh) was identified as a barrier for primarily smaller species including kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin antelope squirrel. Kit foxes were also associated with a second priority segment (W036, I-5 Grapevine), badgers were listed as an additional focal species for two priority segments, and bobcats and fishers were identified as additional focal species for one priority segment each. Five of the ten priority segments (50%) bisect the primary connections within or between ecologically important mountain ranges within Region 4. Additionally, segment W035 bisects important conservation lands, and W039, the main road into Kings Canyon National

Park, splits the winter range for deer in the vicinity. Notably, segment W036 includes the location where collared wolf OR-93 was killed by a vehicle strike in November 2021.



Figure 11. Locations of priority wildlife barriers in Region 4 (Central Region) identified by CDFW in 2022.

**Region 5.** – CDFW staff identified a total of 25 wildlife barrier segments in Region 5, including three segments that were added to the list in 2022. Eleven of these segments were identified as priority wildlife barriers (Figures 12 and 13). The greatest number of changes to the regional priority wildlife barrier list occurred in Region 5: five segments that were not listed as high priority in 2020, including newly added segment W163 (Gaviota Pass), were identified as high priorities in 2022 (Table 2, Figure 13). Notably, segment W042 (Hwy 101 at Liberty Canyon) was shifted to a lower priority because construction of a large overcrossing structure is in progress. Following these changes, Region 5 included a total of 11 segments on their 2022 priority wildlife barrier list, three of which were also identified as high priorities by Region 6 (W046, I-15 Temecula to E Mission Rd; W059, SR-74/Pines to Palms Hwy through the Santa Rosa Mountains; W061, I-8 in Imperial County). Priority barriers in Region 5 ranged in length from 2.7 to 16.5 miles (mean = 8.2 miles) and collectively represented 90.4 miles of linear infrastructure.

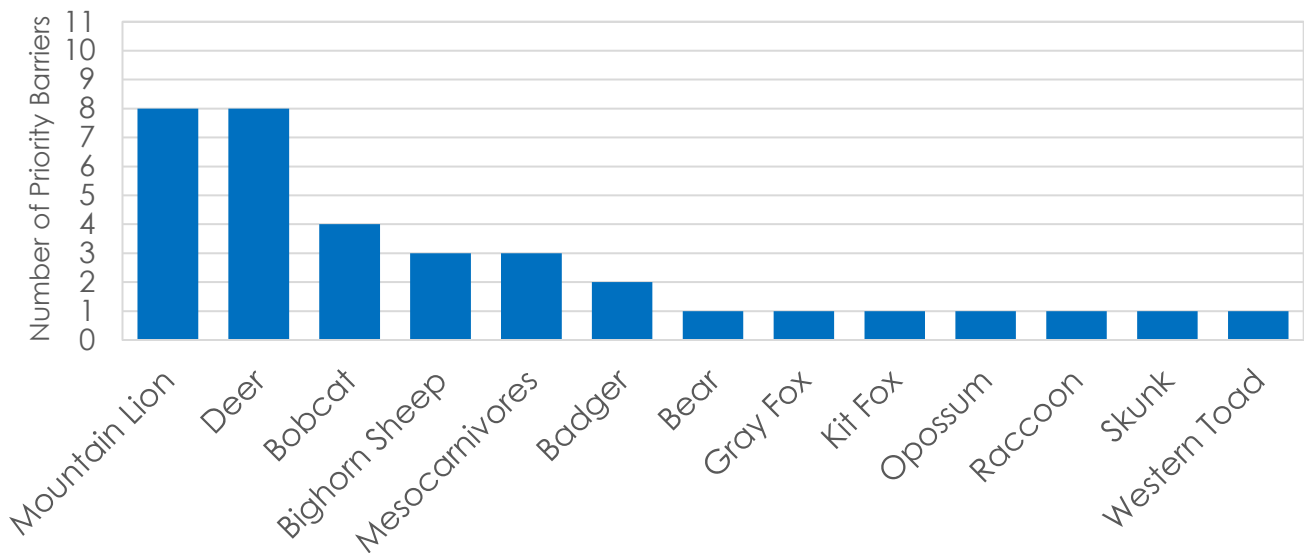


Figure 12. Target species for priority wildlife connectivity projects in Region 5 (South Coast Region) identified by CDFW in 2022.

Although Region 5 does not contain SO 3362 priority areas, each of the priority segments included an ungulate as a focal species (mule deer = 73%, peninsular bighorn sheep = 27%; Figure 12). Felids were also well-represented as focal species, with eight of 11 priority segments (73%) including mountain lions and four of 11 priority segments (36%) including bobcats. Other focal carnivores included mesocarnivores (27%), badgers (18%), kit foxes (9%), and black bears (9%). Region 5 was one of two regions to identify a passerine as a focal species: priority segment W107 (I-8 East of San Diego/El Cajon) was identified as a barrier for California

gnatcatchers. The list of focal species for Region 5 also included western toad, which was associated with priority segment W044 (SR-67 Mapleview St to Etcheverry St). A diverse suite of remediation methods will likely be necessary to accommodate all focal species across Region 5, including new and/or improved culvert crossings, undercrossings, overcrossings, fencing, elevated infrastructure, curtailing illegal activities, and securing additional parcels to facilitate connectivity.

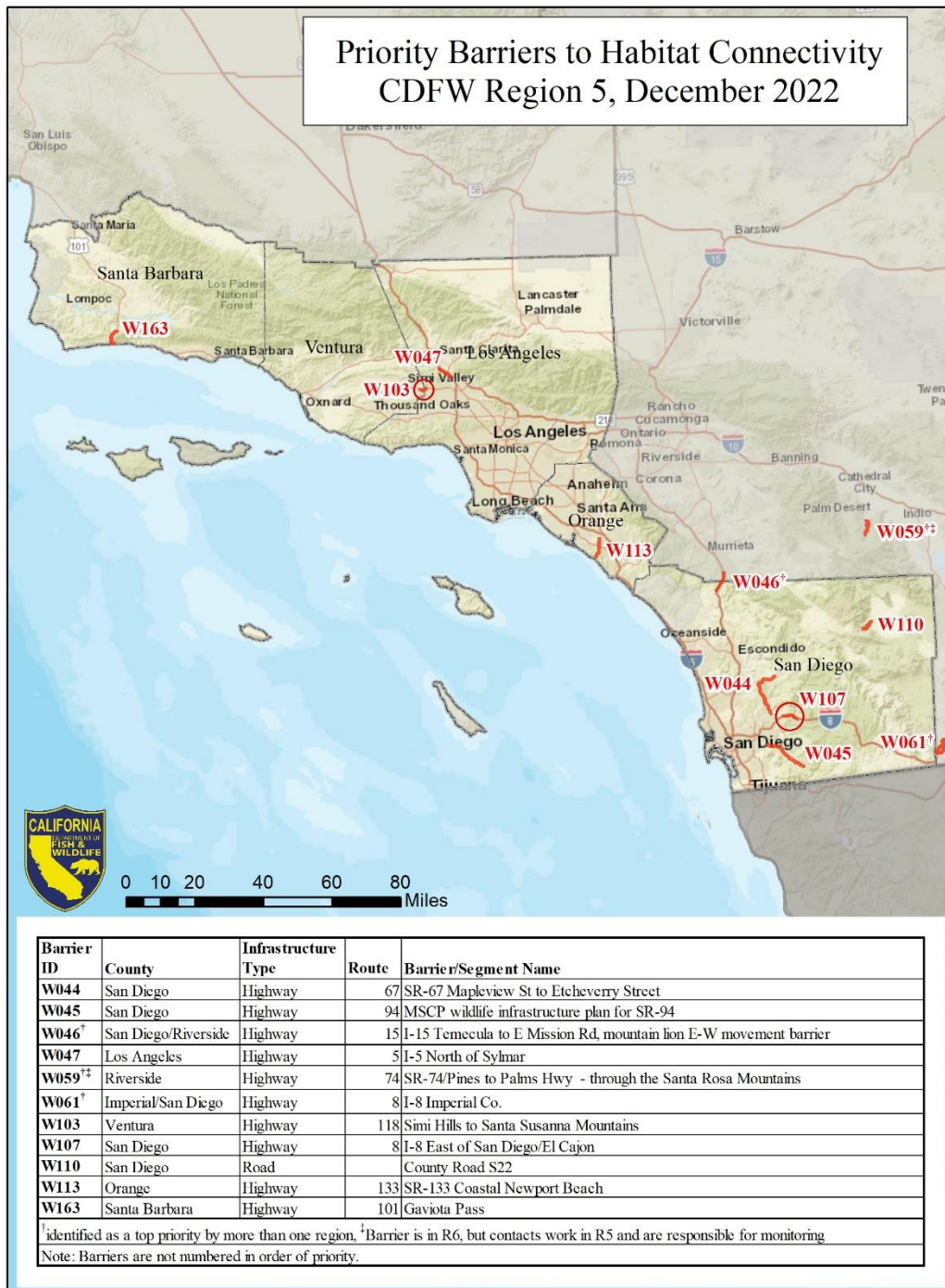


Figure 13. Locations of priority wildlife barriers in Region 5 (South Coast Region) identified by CDFW in 2022. Shorter segments that are not easily visible at the regional scale are enclosed in red circles.

**Region 6.** – CDFW staff identified a total of 33 segments in Region 6, including two segments that were added to the list in 2022. Thirteen of these segments were identified as priority wildlife barriers (Figures 14 and 15), three of which are shared with Region 5. All eleven segments that were identified as high priority in 2020 remained as priorities in 2022; two newly added segments (W166, Brightline/Cave Mtn, Soda Mtn, Clark Mtn; W167, I-10 El Casco Bridge #56-0370/Cherry Valley) were also included in the priority list (Table 2, Figure 15). Priority barriers in Region 6 ranged in length from 0.1 to 146.5 miles (mean = 17.1 miles) and collectively represented 222.5 miles of the State Highway System.

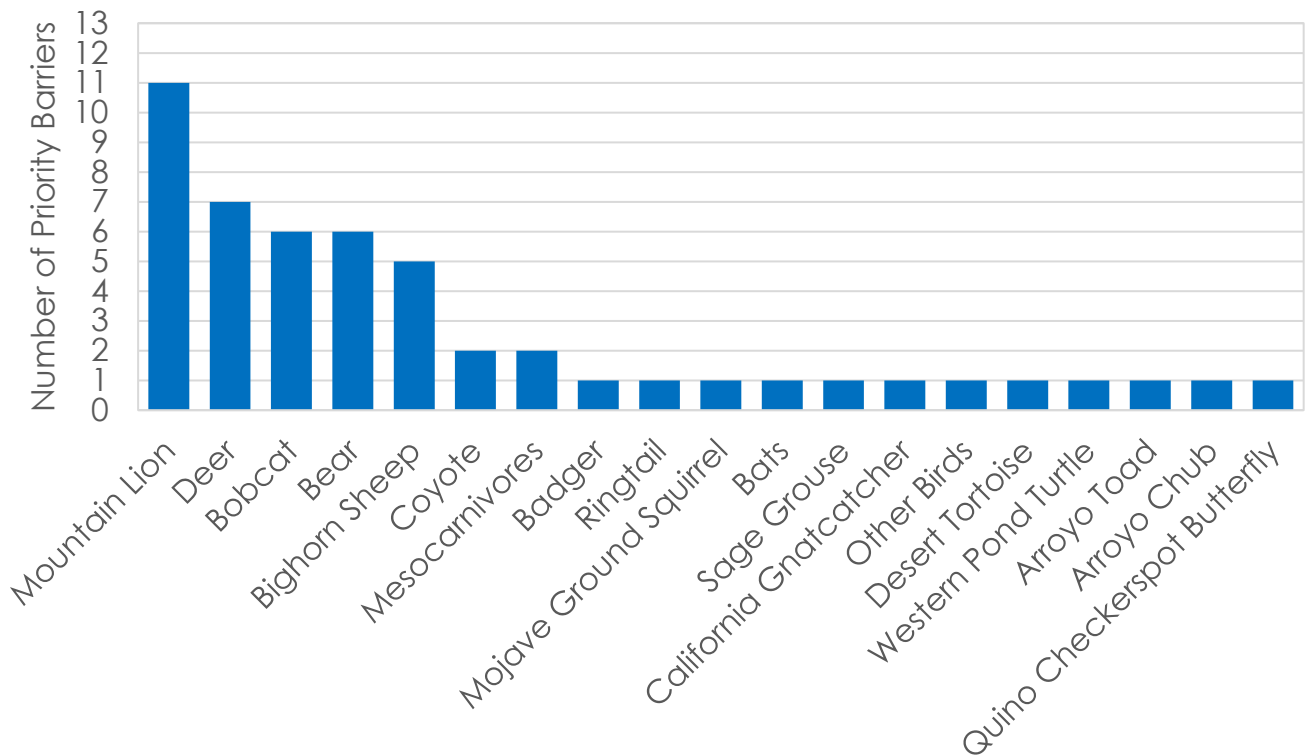


Figure 14. Target species for priority wildlife connectivity projects in Region 6 (Inland Desert Region) identified by CDFW in 2022.

Segment W054 (Hwy 395 Mono Co. PM 16-27) coincided with a SO 3362 priority area, and 77% (ten of 13) of priority segments identified at least one ungulate as a focal species (mule deer = 54%, bighorn sheep = 38%; Figure 14). Mountain lion was identified as a focal species for 85% (11 of 13) of priority segments; bobcat was associated with six priority segments (46%), and black bear was associated with five priority segments (38%). Less common focal carnivores included coyote, badger, mesocarnivores, and ringtail, which were each associated with two priority segments (15% of total). Moreover, bats were identified as a focal species for priority

segment W057 (I-10, San Geronio River). Focal bird species included California gnatcatcher (8%) and sage grouse (8%). Priority segment W166 (Brightline/Cave Mtn, Soda Mtn, Clark Mtn) also included two small, special-status focal species: desert tortoise and Mojave ground squirrel. Region 6 contained the segment with the greatest diversity of focal species: in addition to several species noted above, priority segment W053 (I-15 Temecula Creek undercrossing) was also associated with western pond turtle, arroyo chub, and the federally-listed arroyo toad and Quino checkerspot butterfly. Several priority barriers in Region 6 bisect critical landscape linkages, and elevated rates of wildlife-vehicle collisions have been documented at three priority barrier segments in Mono County along Hwy 395.





Figure 15. Locations of priority wildlife barriers in Region 6 (Inland Desert Region) identified by CDFW in 2022. Shorter segments that are not easily visible at the regional scale are enclosed in red circles.