CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

Ten Years of Gray Wolf Conservation and Management in California

A summary of the status, distribution, conservation and management of gray wolves (Canis lupus) in California

2015-2024

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Cover photo by Axel Hunnicutt, CDFW

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Lassen pack adult drinking from a water guzzler in Lassen National Forest. Photo by T. Rickman, USFS.

Photo courtesy of UC Davis Wolf Project

EXECUTIVE SUMMARY

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This 10-year report summarizes the California Department of Fish and Wildlife's (CDFW) management and conservation activities for gray wolves (*Canis lupus*; hereafter, wolves) from 2015 through 2024. Starting in 2026, CDFW plans to produce an annual report summarizing wolf management and conservation activities.

Wolves were extirpated in California by 1924 and naturally returned to the state in 2011. California's first contemporary pack was established in 2015, and by the end of 2024 the state's population had grown to seven packs with at least 50 wolves. Consistent with the guidance of its 2016 Conservation Plan for Gray Wolves in California, CDFW has continued to monitor the wolf population and distribution, worked to mitigate wolf-livestock conflict, and conducted significant outreach to livestock producers and the public.

Collared wolf in the Harvey pack. Photo by Axel Hunnicutt

Lassen pack pups, 2017. Photo by CDFW.

BACKGROUND

BACKGROUND

HISTORY OF WOLVES IN CALIFORNIA

Gray wolves are native to California with anecdotal accounts documenting their presence from the 1700s to early 1900s. The final wolves known to be killed in California were an adult male in eastern San Bernardino County in 1922 and an adult male in Lassen County in 1924.

No wolves were subsequently confirmed in California until December 28, 2011, when a radio-collared wolf (OR7) entered California from Oregon. Wolves had been recolonizing northeastern Oregon since 2008, as descendants of the wolves reintroduced to central Idaho and Yellowstone National Park in 1995-1996 continued to expand wolf distribution in the Pacific Northwest. Although OR7 eventually returned to Oregon, a reproducing pack (Shasta Pack) was detected in 2015 in Siskiyou County. While that pack did not persist beyond 2015, another pack (Lassen Pack) was detected in 2016 in southern Lassen County and northern Plumas County. The Lassen Pack has had an annual litter since 2017 and wolves continued expanding their range in the state, primarily in the northeastern counties. In 2023, CDFW confirmed the Yowlumni Pack as the first pack in the southern Sierra Nevada, over 200 miles from the nearest known pack in northern California. A maximum of nine packs have been reported, with seven packs confirmed by CDFW at the end of 2024.

LEGAL STATUS OF GRAY WOLVES

The gray wolf was listed as endangered in most of the continental U.S. in 1978 under the federal Endangered Species Act (ESA). The status of wolves under the ESA has varied over the last 20 years. In 2011, wolf populations across the northern Rocky Mountains (Idaho, Montana, and Wyoming) were delisted. While the 2011 delisting was subsequently overturned by court decisions in Wyoming, after successful appeals wolves in Wyoming have not been listed since 2017. In 2021, wolves in the remainder of the contiguous U.S. were delisted. However, on February 10th, 2022, a district court decision relisted wolves in a portion of their range, including California. As of December 31st, 2024, wolves remain a federally endangered species in California.

In addition to federal listing status, wolves are subject to protections under state law. On June 4, 2014, prior to the establishment of any known breeding pairs or packs in the state, gray wolves were listed as endangered under the California Endangered Species Act (CESA) and remain so today.

A cooperative agreement with the U.S. Fish and Wildlife Service (USFWS) authorizes CDFW to manage and conserve federally listed species, including wolves, throughout the state. In December 2016, CDFW finalized the *Conservation Plan for Gray Wolves in California* to guide and inform current and future policy and actions to conserve and manage wolves in California.

DEFINING WOLF PACKS AND BREEDING PAIRS

California's Conservation Plan for Gray Wolves (2016; hereafter the 'Wolf Plan') defines a wolf pack as "two or more wolves traveling together and using a definable area". CDFW recognizes wolf groups as packs when they either detect 1) multiple wolves and evidence of reproduction, or 2) two or more wolves at least four times within a geographically congruent area within a six-month period. When two or more wolves are detected outside of a known pack territory but at least one of the pack criteria is not yet met, CDFW designates that area as an Area of Wolf Activity (AWA).

The Wolf Plan defines a breeding pair as "at least one adult female and at least one adult male and at least two pups that survive until December 31". Not all packs will qualify as breeding pairs in a given year. For example, a pair of wolves having a litter of one or only one surviving pup through the end of the year would still be a pack, but not a breeding pair. The distinction between breeding pairs and packs is important, because the Wolf Plan denotes three phases of wolf re-establishment and population growth, based solely on the number of confirmed breeding pairs over time. Additional information on these phases can be found in Part I of the Wolf Plan.

Wolf pups from the Shasta pack, Siskiyou County, 2015. Photo by Pete Figura, CDFW.

Shasta pack yearlings, Siskiyou County, 2015. Photo by Pete Figura, CDFW.

POPULATION MONITORING

POPULATION MONITORING

MONITORING TECHNIQUES

CDFW uses a variety of techniques to monitor wolf presence, pack size, reproductive status, territory size, survival, and dispersal events. Wolf monitoring activities occur year-round and include direct observation, camera trap surveys, audio (howl) surveys, track counts, and scat collection. CDFW also relies on and investigates credible Gray Wolf Sighting Reports from the public and agency partners.

Focused collection and analysis of genetic material from scat, hair, saliva, and other biological samples has been critical for wolf population monitoring in California. Results from these analyses have led to confirmation of wolf presence in novel areas, identification of dispersing individuals, estimates of litter sizes, and determining the origins and relatedness of individual wolves and breeding pairs. Genetic analysis is also used to confirm animal sex and coat color (gray vs. black). CDFW's Wildlife Forensic Laboratory has led these analyses.

Through 2024, 132 individual wolves had been detected in California since 2011, including OR7. 124 of those wolves were detected via field monitoring and genetic analysis, and 8 were wolves collared by Oregon Department of Fish and Wildlife that dispersed into California.

Because wolf populations fluctuate over the course of each year (due to the birth of pups in spring, followed by the deaths and/or dispersal of some pups and older wolves prior to winter), CDFW uses year-end minimum counts to estimate the minimum population size once each year. Minimum count estimates are calculated for each wolf group utilizing the techniques and methods described above as well as aerial surveillance.

POPULATION STATUS AND DISTRIBUTION

Since 2015, the gray wolf population in California has grown in number of packs, number of breeding pairs, year-end minimum population, and total area occupied within the state. As of December 31st, 2024, CDFW's minimum count was 50 individuals and seven known packs spanning portions of eight counties (Table 1 & Figure 1). Of the seven packs, five were successful breeding pairs in 2024 (Table 2).

Table 1. Minimum (min) population counts, packs, and breeding pairs of gray wolves in California, 2015 - 2024.

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Year-End Min. Population Count	1	2	5	7	7	7	16	18	44	50
No. of Packs	1	1	1	1	1	2	3	3	7	7
No. of Breeding Pairs	0	0	1	1	1	1	2	2	4	5

Table 2. Known wolf groups in California by county, breeding pair status, and year-end minimum count, 2024.

WOLF PACK		COUNTY	BREEDING PAIR	2024 YEAR-END MINIMUM COUNT
PACKS	BEYEM SEYO	Sierra/Plumas	Yes	5
	DIAMOND	Plumas/Lassen	No	2
	HARVEY	Lassen/Shasta	Yes	8
	ICE CAVE	Lassen/Plumas/Shasta/Tehama	Yes	4
	LASSEN	Lassen/Plumas	No	4
	WHALEBACK	Siskiyou	Yes	9
	YOWLUMNI	Tulare	Yes	9
AREAS OF WOLF ACTIVITY	Central Lassen	Lassen	-	2
	Southern Plumas	Plumas	-	2
	Eastern Shasta	Shasta	-	2
	Eastern Tehama	Tehama	-	3
YEAR-END TOTAL			**5**	**50**

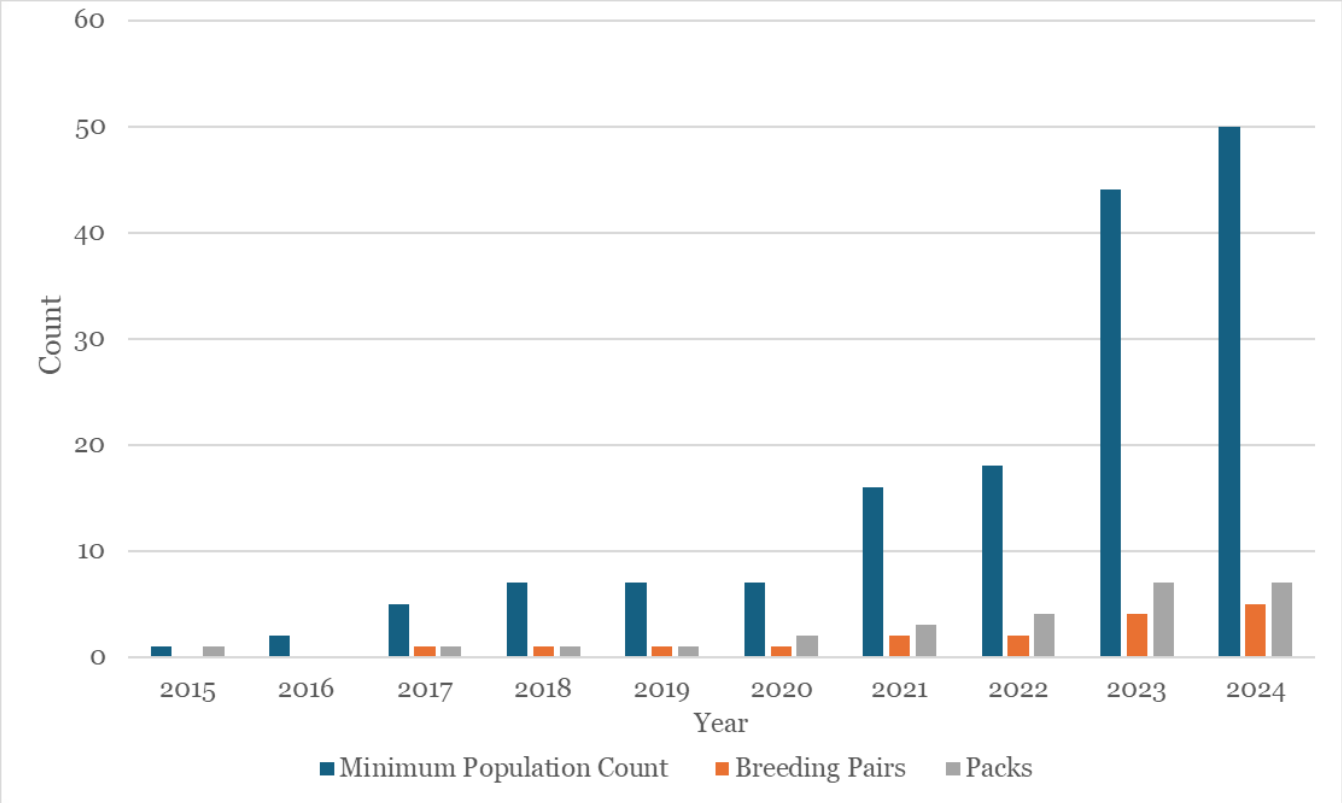

Figure 1. Gray wolf population minimum counts, known packs, and breeding pairs in California, 2015 - 2024.

Most of the known wolf activity and packs occur in the northeastern portion of the state, as the population began from dispersing wolves entering northernmost California from Oregon. The first contemporary pack to establish a territory in California was the Shasta pack (Siskiyou County) in 2015, with subsequent pack establishments in additional northeastern counties thereafter (Figures 2 and 3). The Yowlumni pack in the southern Sierra (Tulare County) was confirmed in 2023 and is the first known pack outside of northeastern California. It is thought to be the southernmost population of northwestern gray wolves (*C. l. occidentalis*) in North America (Figure 3). Additional information on each pack and its history can be found in California's Known Wolves – Past and Present.

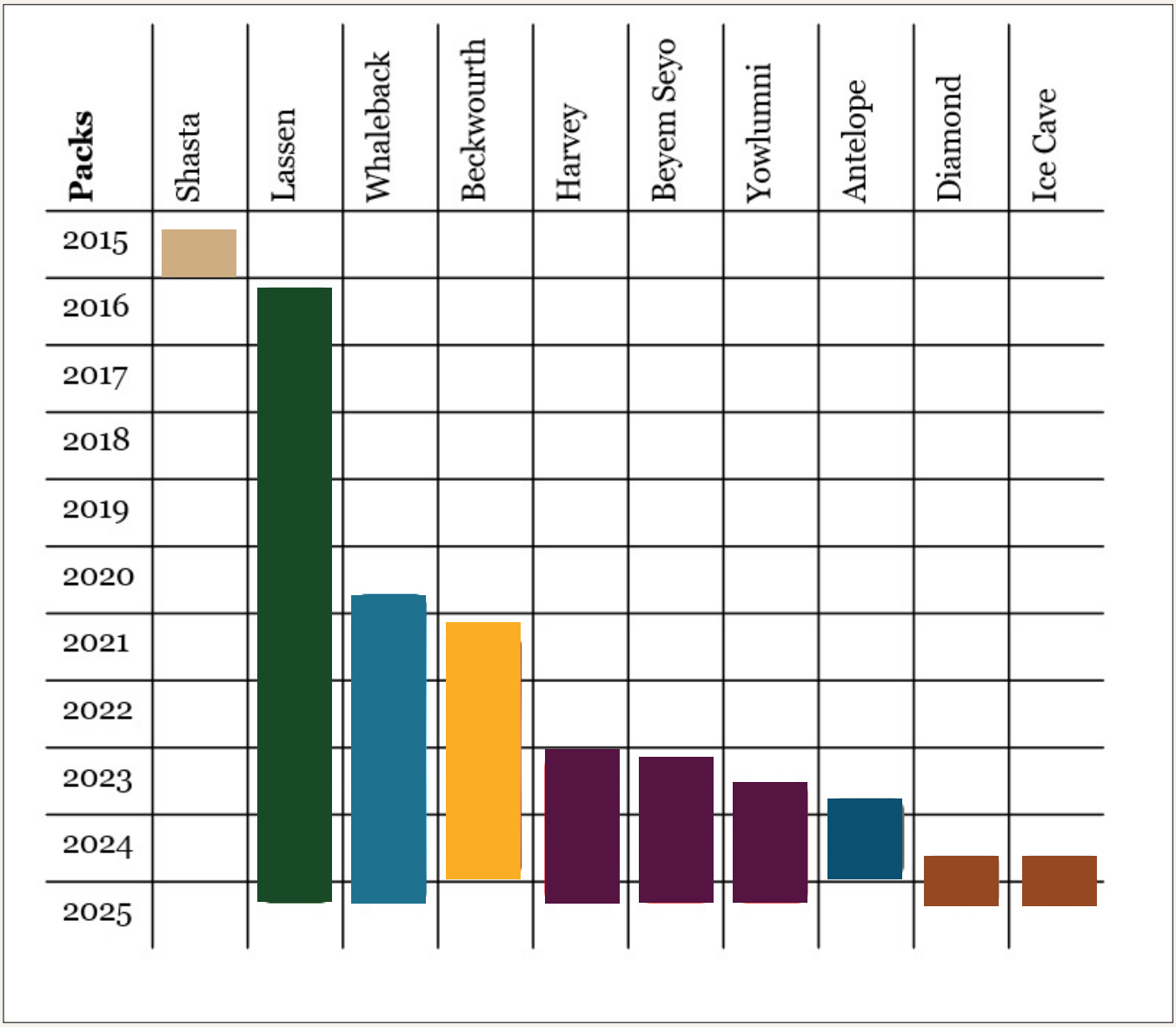

Figure 2. Persistence and propagation of wolf packs in California 2015-2024. Packs overlapping 2025 were active at the end of 2024.

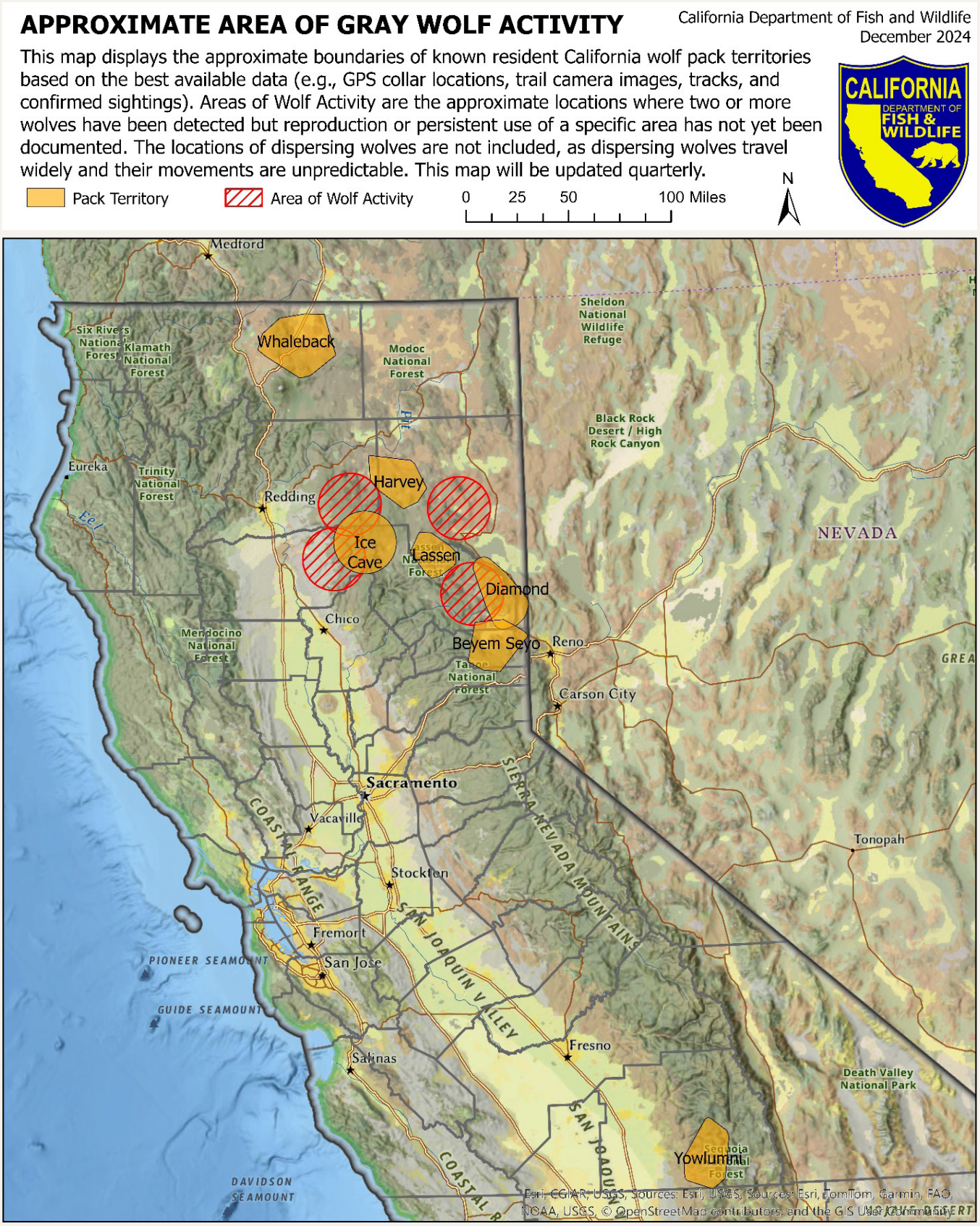

Figure 3. Approximate area of wolf activity as of December 2024 in California (note: Southern California not shown).

CAPTURE EFFORTS

The placement of satellite GPS-collars on wolves helps CDFW determine pack territories, locate den and rendezvous sites, guide scat and camera trap survey design and implementation, monitor survival, track dispersal events, and help mitigate potential conflicts with livestock. GPS collar data also helped CDFW calculate territories for its 2022-2024 Pay for Presence compensation program. From 2017 to 2024, CDFW successfully captured 14 wolves and deployed 12 GPS collars across five packs (Table 3).

Table 3. Gray wolves captured and collared in California, 2017 - 2024

CAPTURE DATE	WOLF ID	PACK NAME	AGE CLASS	SEX
6/30/2017	**LAS01F**	Lassen	Adult	Female
9/15/2019	**LAS14F**	Lassen	Pup	Female
5/25/2020	**LAS13M**	Lassen	Yearling	Male
6/27/2020	**LAS09F**	Lassen	Adult	Female
8/4/2022	**LAS34M***	Lassen	Pup	Male
3/17/2023	**OR85**	Whaleback	Adult	Male
3/17/2023	**WHA12M**	Whaleback	Yearling	Male
5/30/2023	**LAS32F**	Lassen	Yearling	Female
7/26/2023	**LAS23F**	Beyem Seyo	Adult	Female
8/13/2023	**WHA05F**	Harvey	Adult	Female
12/5/2023	**YOW01F**	Yowlumni	Adult	Female
6/04/2024	**YOW03F**	Yowlumni	Yearling	Female
7/23/24	**LAS42M***	Lassen	Pup	Male
9/21/2024	**YOW06M**	Yowlumni	Yearling	Male

**Collar not deployed due to the size of the animal not meeting collaring criteria.*

KNOWN DISPERSAL EVENTS

Dispersal behavior, where individuals reaching sexual maturity leave their natal pack in search of a mate, is common in wolves. Individual wolves observed in areas outside of pack territories are likely dispersing wolves. Over ten years (2015 – 2024), CDFW detected or monitored 33 wolf dispersal events throughout California. These events included collared wolves and uncollared wolves detected through genetic samples. Dispersals included immigration into and emigration out of California. Collared dispersing wolves traveled extensively across California, most notably, OR93 who dispersed from northern Oregon to southern California (Figure 4).

2015

OR25 (GPS collared) – Dispersed from northeastern Oregon's Imnaha pack and made four trips into California in late 2015 before returning to Oregon.

SHA02M & SHA01F – Breeding pair of the Shasta pack dispersed from northeastern Oregon's Imnaha pack, confirmed through genetic analysis.

2016

LAS01F – Dispersed from an unknown location to form the Lassen pack, confirmed through genetic analysis.

LAS02M – Born into southwestern Oregon's Rogue pack in 2014. First recorded in California in 2016; founded the Lassen pack.

SHA07M – Dispersed from the Shasta pack territory, likely in early 2016, and was confirmed by genetic evidence in northwestern Nevada.

2017

DIS01F – Dispersed from southwestern Oregon's Rogue pack and was detected through genetic analysis in California in January 2017 with no further detections.

DIS02M – Dispersed from northeastern Oregon's Meacham pack and was detected through genetic analysis in California in October 2017 with no further detections.

2018

OR44 (GPS collared) – Dispersed from northeastern Oregon's Chesnimnus pack and crossed into California in March 2018. His collar failed in May 2018, with no further detections.

OR54 (GPS collared) – Dispersed from southwestern Oregon's Rogue pack and crossed into California in January 2018. She traveled widely throughout northeastern California before being found dead in Shasta County in February 2020.

OR59 (GPS collared) – Dispersed from northeastern Oregon and crossed into California in December 2018. He was found dead in December 2018.

2019

No dispersing events recorded.

2020

DIS03M – Related to northeastern Oregon's Walla Walla pack, detected through genetic analysis in California in May 2020, with no further detections.

LAS13M – Dispersed from the Lassen pack, entering Oregon in October 2020. Formed the Gearhart Mountain pack in southern Oregon.

LAS16M – Dispersed from an unknown location to the Lassen pack and became the new breeding male in 2020, confirmed through genetic analysis.

OR85 (GPS collared) –Dispersed from northeastern Oregon's Mt. Emily pack and entered California in November 2020. He was the founding male and remained the breeding male in the Whaleback pack through 2024.

2021

LAS12F – From the 2019 Lassen pack litter, confirmed through genetic analysis to have dispersed from the Lassen pack to form the Beckwourth pack in May 2021.

OR93 (GPS collared) – Dispersed from northern Oregon's White River pack and crossed into California in January 2021. He traveled widely through California before being killed by a vehicle collision in November 2021.

OR103 (GPS collared) – Dispersed from an unknown origin in Oregon and entered California in May 2021. He traveled across portions of Siskiyou and Trinity counties before returning to Oregon in July 2022 where he was subsequently illegally killed in October 2022.

2022

No dispersing events recorded.

2023

HAR01M – Dispersed from an unknown location to form the Harvey pack in 2023, confirmed through genetic analysis.

LAS19M – From the 2020 Lassen pack litter #1, confirmed through genetic analysis to have dispersed from the Lassen pack to form the Beyem Seyo pack in 2022.

LAS23F - From the 2020 Lassen pack litter #2 (different mother than LAS19M), confirmed through genetic analysis in 2023 to have dispersed from the Lassen pack to form the Beyem Seyo pack.

LAS24M – From the 2020 Lassen pack litter #2, confirmed through genetic analysis in 2023 to have dispersed from the Lassen pack to form the Yowlumni pack.

WHA05F - From the 2021 Whaleback pack litter, confirmed through genetic analysis in 2023 to have dispersed from the Whaleback pack to form the Harvey pack.

WHA06M – From the 2021 Whaleback pack litter, was detected in Oregon through genetic analysis in 2023.

YOW01F- Confirmed through genetic analysis in 2023 to have originated from the Rogue pack in southwestern Oregon, dispersing to form the Yowlumni pack.

Oregon-born wolf OR93, who traveled extensively through California in 2021. Photo by Oregon Department of Fish and Wildlife.

2024

WHA07M – From the 2021 Whaleback pack litter, confirmed through genetic analysis to have dispersed from the Whaleback pack and has been detected multiple times in Modoc, Plumas, and Shasta counties.

WHA09F - From the 2022 Whaleback pack litter, confirmed through genetic analysis to have dispersed from the Whaleback pack and has been detected in Modoc and Plumas counties.

WHA04F – From the 2021 Whaleback pack litter, confirmed through genetic analysis to have dispersed from the Whaleback pack and has been detected in Plumas County.

LAS28F - From the 2021 Lassen pack litter, confirmed through genetic analysis to have dispersed from the Lassen pack and formed the Diamond pack in 2024.

WHA08M - From the 2021 Whaleback pack litter, confirmed through genetic analysis to have dispersed from the Whaleback pack and formed the Antelope pack in 2024.

LAS32F - From the 2021 Lassen pack litter, confirmed through genetic analysis to have dispersed from the Lassen pack and established an AWA in Lassen County with DIS04M in 2024.

DIS04M – From an unknown Oregon origin, he is genetically a relative of OR103. His presence was confirmed through genetic analysis in 2024 where he established an AWA in Lassen County with LAS32F.

OR158 (GPS collared) – Dispersed from an unknown origin in Oregon and crossed into California in December 2024. He spent a week in Modoc County before returning to Oregon, where he was subsequently lethally taken by the USFWS.

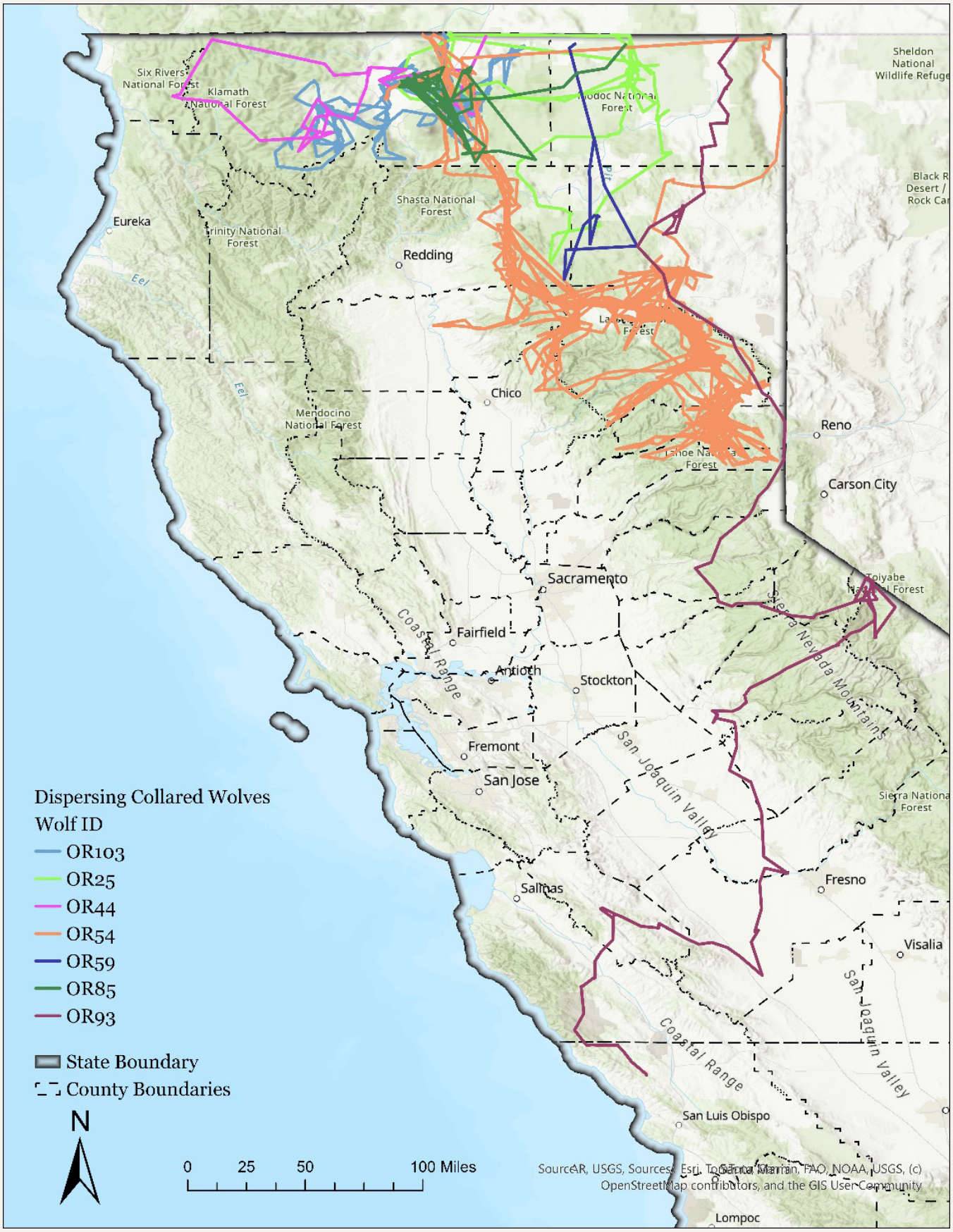

Figure 4. Dispersing collared wolves within California, 2015 - 2024.

REPRODUCTION

Wolves breed once a year, in late winter, allowing pups to be born in dens during the spring. When a GPS collar is present in a pack, the location of the den (and any subsequent home sites) can be determined and later visited by CDFW biologists once vacated. The collection of biological samples such as scat and hair at den sites allows for a minimum number of pups to be determined through genetic identification. From 2015 through 2024, we documented a total of 21 known litters and a minimum of 115 pups produced within the state (Table 4).

Table 4. Minimum count of pups produced in each pack known to be reproductive in California, 2015 - 2024. *In 2020 the Lassen pack had a double litter.

BREEDING PACKS	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	No. of Pups Total	No. of Litters
Shasta	5										**5**	**1**
Lassen			4	5	4	9*	5	5	4	5	**41**	**9**
Whaleback							7	8	8	8	**31**	**4**
Harvey									2	8	**10**	**2**
Beyem Seyo									6	5	**11**	**2**
Yowlumni									6	7	**15**	**2**
Ice Cave										2	**2**	**1**
Total	**5**	**0**	**4**	**5**	**4**	**9**	**13**	**13**	**24**	**35**	**115**	**21**

MORTALITIES

Due to their federally protected status, USFWS leads the investigations of known and potential wolf mortalities in California, although CDFW's Law Enforcement Division (LED) plays a critical collaborative role. Reported wolf mortalities are directed to LED and USFWS. As of December 31, 2024, nine wolf mortalities have been confirmed in California since 2015. Vehicle collisions have been the most common known cause of death (Table 5).

Table 5. Known wolf mortalities in California, 2015 – 2024.

No.	Year	Wolf ID	Sex	Age Class	Cause of Death
1	2018	OR59	Male	Yearling	Unlawful take
2	2018	LAS03F	Female	Yearling	Undetermined*
3	2020	OR54	Female	Adult	Undetermined*
4	2021	LAS22F	Female	Yearling	Undetermined*
5	2021	OR93	Male	Adult	Vehicle collision
6	2023	LAS38F	Female	Pup	Undetermined*
7	2023	WHA10F	Female	Yearling	Under Investigation
8	2023	WHA14M	Male	Pup	Vehicle collision
9	2024	BEY04F	Female	Pup	Vehicle collision

DISEASE & RODENTICIDE EXPOSURE MONITORING

The CDFW Wildlife Health Laboratory (WHL) has conducted opportunistic disease and toxicological surveillance as part of gray wolf mortality investigations since 2018. Although wolves are susceptible to several diseases as outlined in the Wolf Plan, CDFW has not documented direct disease-related mortalities to date. For animals in sufficient post-mortem condition, a complete post-mortem examination (necropsy) is performed at the WHL and ancillary disease testing is conducted at the California Animal Health and Food Safety (CAHFS) Laboratory.

From 2018-2024, six wolves were presented to the WHL in adequate condition for post-mortem evaluation, microscopic examination of tissues, and ancillary disease testing if indicated. Three wolves were in an advanced state of post-mortem decomposition that precluded complete examination and sampling. Routine rabies and canine distemper virus testing in one wolf with gunshot trauma and evidence of inflammation in the tongue were both negative. This animal also incidentally had cestodes (tapeworms) in the small intestine identified as *Taenia* sp., a parasite commonly reported in wolves and other canids. Testing for canine distemper virus was also negative in a wolf with no significant microscopic tissue abnormalities and an undetermined cause of death. Two wolves tested negative for influenza A virus during routine surveillance following the discovery of avian influenza H5N1 in California birds and mammals. One wolf also tested negative for SARS-CoV-2, the virus that causes COVID-19. Two wolves that died due to vehicular trauma had incidental infections: one had a skin infection with possible fungal (e.g. ringworm) etiology, but fungal culture results were negative, the second had cysts of a protozoal parasite (*Sarcocystis* sp.) causing muscle damage in multiple muscles. Gray wolves are typically definitive hosts for *Sarcocystis* spp., meaning that the parasite can produce an infective life stage in the gray wolves' intestines that are shed in feces. As in this case, gray wolves can also serve as intermediate host, where they develop clinical disease in the muscles, but don't shed the parasite. Although many infections don't produce clinical signs, some *Sarcocystis* spp. may cause disease and result in muscle inflammation and damage (Gupta et. al, 2024).

Dr. Claire Butkus, CDFW veterinarian, taking blood samples from a Whaleback pack wolf, 2023. Photo by CDFW.

Winter 2023 helicopter captures Siskiyou County. Photo by CDFW.

Tissue samples from six wolves were tested for exposure to anticoagulant and neurotoxic rodenticides. The liver of one wolf had trace detections (below the reporting limit) of the first-generation anticoagulant rodenticides, chlorophacinone and diphacinone. Fat or brain tissue from six wolves tested negative for desmethylbromethalin, the toxic metabolite of bromethalin, a non-anticoagulant, neurotoxic rodenticide. Cholinesterase levels were tested in two wolves to rule out organophosphate and carbamate pesticide exposure and results were within normal limits.

As California's wolf population grows and their range expands, continued monitoring through mortality investigations and surveillance testing of biological samples will enable us to monitor potential health impacts. Diagnostic tools such as DNA metabarcoding and PCR testing for pathogens and infections, and serologic surveillance (testing blood serum to determine antibody levels against infectious diseases) may be useful to assess active pathogen shedding and population immunity due to prior infections or exposures. The WHL also conducts disease surveillance in other wildlife species living in areas inhabited by wolves to monitor disease spillover risks among species throughout the state. Continued toxicology surveillance is part of the WHL's statewide monitoring aimed at reducing risks from non-target rodenticide exposure in wildlife and evaluating the effect of legislation to reduce impacts on non-target wildlife.

Gupta, A., de Araujo, L.S., Calero-Bernal, R., Humpal, C., Schrage, M., Carstensen, M., Rosenthal, B.M. and Dubey, J.P., 2024. Molecular and morphological characterization of Sarcocystis infections in the muscles of gray wolves (*Canis lupus*) from Minnesota suggest they may serve as reservoirs for infection in domesticated dogs. *The Journal of Parasitology*, 110(5), pp. 471-485.

Photo courtesy of Malia Brytus; California Wolf Project, UC Berkeley.

MANAGEMENT AND CONSERVATION

MANAGEMENT & CONSERVATION

WOLF CONSERVATION PLAN

Following the arrival of wolf OR7 in 2011, CDFW convened a Wolf Stakeholder Working Group (SWG) composed of representatives from diverse interests across the state. The purpose of the SWG was to help guide the development of the Wolf Plan. The first SWG meeting was held February 5th, 2013. At that time, the SWG formed three subgroups focused on key concerns regarding potential wolf recolonization: the Wolf Conservation Subgroup, Wolf-Livestock Interactions Subgroup, and Wolf-Ungulate Interactions Subgroup. These SWG groups engaged in joint fact-finding efforts to inform recommendations and development of the Wolf Plan. The SWG and its subgroups met 14 times between 2013 and 2014. In December 2014, CDFW provided the first comprehensive draft Wolf Plan to the SWG for review. Following public review, the plan was finalized in December 2016.

The Wolf Plan has two main components: Part I summarizes plan development, key issues, goals, objectives, and strategies to achieve goals. Part II contains a detailed analysis of multiple aspects of wolf conservation and potential management actions.

THE THREE PHASES OF WOLF RECOVERY IN CALIFORNIA

The Wolf Plan denotes three phases of wolf re-establishment and population growth, based on the number of confirmed breeding pairs over time. Phase 1 concludes when CDFW has documented four breeding pairs for two consecutive years. The criterion for advancing beyond Phase I have been met for both 2023 and 2024. As a result, the wolf population across California has transitioned into Phase 2 of recovery as of January 2025. Phase 3 will commence when eight breeding pairs are recorded for two consecutive years.

The Wolf Plan outlines planned or potential conservation actions/options for consideration during Phase 2 which include:

- *Conducting a status review to examine California wolf populations, prospects for the future of wolves in California, evaluate appropriate CESA status and report to the Commission.*
- *Injurious harassment – will be considered if consistent with State and Federal laws.*
- *An operational framework for lethal control of wolves depredating livestock – will be considered if consistent with State and Federal laws.*

COMMUNITY ENGAGEMENT

CDFW actively engages with California's communities where wolves have become present or could soon be present. CDFW proactively provides updates and communications about wolf activities through posting updates and informative reports on the CDFW gray wolf webpage, offers subscription options for updates via email, and regularly engages with livestock producers, partner agencies, elected board officials, non-profit organizations, and academic institutions (colleges, schools, etc.).

LIVESTOCK DEPREDATIONS

CDFW investigates and reports alleged wolf attacks on livestock with the help of USDA Wildlife Services and county officials. After careful review of data collected during field investigations, CDFW biologists make a final determination for each wolf-livestock depredation investigation. Determinations are classified into the following categories: confirmed, probable, possible, non-wolf depredation, non-depredation, or unknown. Definitions of each determination category can be found at: Considerations for Classification of Reported Wolf Depredation Incidents (Table 7).

From January 1st, 2015, to December 31st, 2024, CDFW and its partners conducted 274 wolf-livestock depredation investigations. 128 (46.7%) were confirmed wolf depredation events, totaling 152 livestock killed or injured (Table 6). Across the ten-year period, the Whaleback pack accounted for the most confirmed livestock depredation events (70), followed by non-pack designated wolves (25) and the Lassen pack (23) (Table 7). From 2015 to 2023 all confirmed wolf depredations were on cattle; however, in 2024, CDFW confirmed wolf depredation of four sheep and one llama. Across all packs, the Whaleback pack averages 14 depredation events per year, followed by the Harvey pack (4.5) and the Beyem Seyo pack (4) (Figure 5).

Table 6. Summary of recorded wolf-livestock depredation investigations and determinations, and year-end wolf populations for context, 2015 - 2024.

YEAR	YEAR-END WOLF POPULATION	INVESTIGATIONS BY YEAR	CONFIRMED	PROBABLE	POSSIBLE	NON-WOLF DEPREDATION	NON-DEPREDATION	UNKNOWN
2015	1	0	0	0	0	0	0	0
2016	2	0	0	0	0	0	0	0
2017	5	10	1	1	1	1	4	2
2018	7	18	5	1	0	0	8	4
2019	7	15	5	1	1	1	3	4
2020	7	19	8	0	0	2	7	3
2021	17	14	7	2	0	2	3	0
2022	18	51	18	1	0	9	21	4
2023	44	73	32	6	1	9	11	23
2024	50	74	52	2	1	1	6	10
Total	-	**274**	**128**	**14**	**4**	**25**	**63**	**50**

Antelope pack adult captured on a trail camera, Sierra County. Photo by CDFW.

Table 7. Confirmed depredation events by pack and non-pack wolves, 2015 - 2024 (no depredations were confirmed prior to 2017). Confirmed loss total in parentheses if different from the depredation event count.

Packs	2017	2018	2019	2020	2021	2022	2023	2024	Total
Whaleback				0	1	16	27 (33)	26 (27)	**70 (77)**
Lassen	1	5	3 (6)	7 (8)	1 (2)	2	4	0	**23 (28)**
Harvey							1	8	**9**
Beyem Seyo							0	8	**8**
Antelope								1	**1**
Beckwourth					1	0	0		**1**
Diamond								1	**1**
Yowlumni								2	**2**
Non-Pack	0	0	2 (4)	0	4 (9)	12	1	6 (7)	**25 (33)**

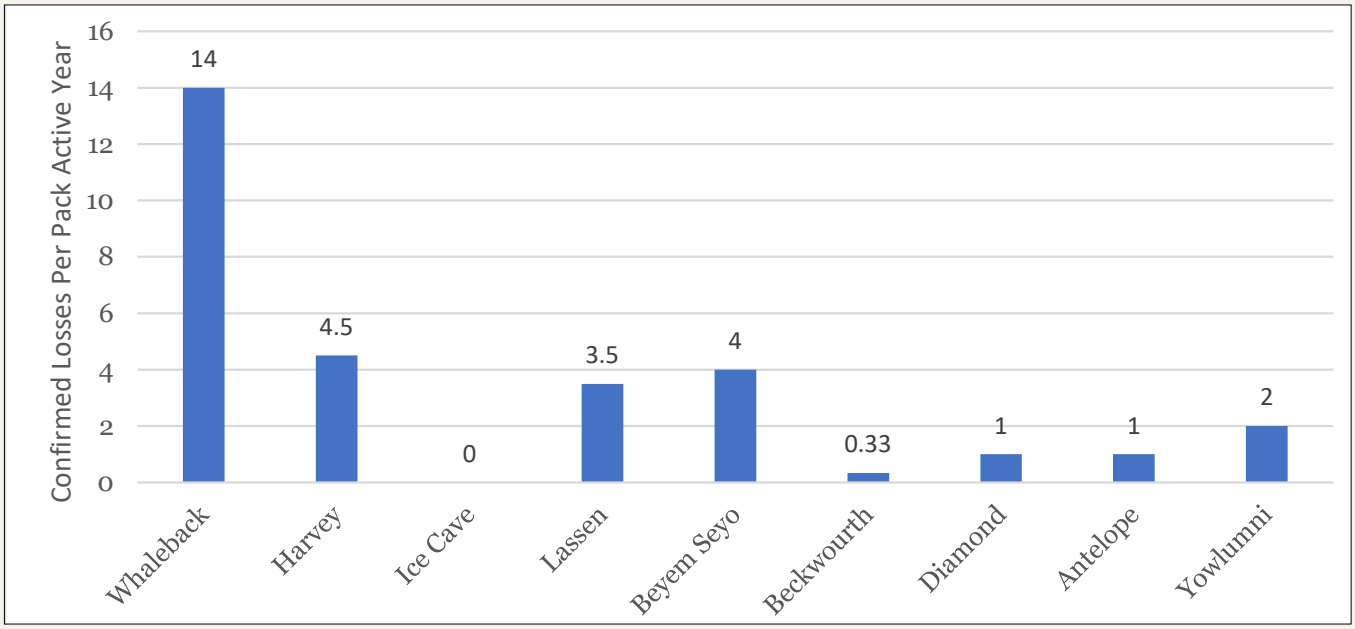

Figure 5. Average annual confirmed depredation events grouped by pack across California (2017 – 2024). Average calculated by the number of years each pack was known to be active (see Table 7).

NON-LETHAL DETERRENTS

CDFW has endeavored to provide livestock producers with non-lethal deterrent tools and services to reduce wolf-livestock conflict. Since 2017, non-lethal deterrence tools including range riders, radio-activated guard devices, turbo fladry and foxlights have been deployed both by CDFW staff and in coordination with USDA Wildlife Services and county officials. From 2021 - 2024, additional funding for developing a statewide human-wildlife conflict program facilitated both additional staff and equipment to be deployed for wolf and other wildlife-livestock conflict deterrence.

In addition to the deployment of its own non-lethal deterrents, CDFW staff continue to promote and share husbandry recommendations, livestock protection tools, community networking, and other best management practice ideas with producers to reduce livestock conflicts with wolves and other carnivores such as black bears (*Ursus americanus)*, mountain lions (*Puma concolor)*, and coyotes (*Canis latrans)*.

WOLF-LIVESTOCK COMPENSATION PILOT PROGRAM

In 2021, the California State Legislature appropriated $3 million in funding to CDFW to develop a wolf-livestock compensation pilot program (compensation program) to help compensate livestock producers for economic losses resulting from wolf predation on livestock. Additionally, the legislature authorized CDFW to "develop a grant process to allocate funds to pay for the deterrence of wolf presence near livestock, the impacts of wolf presence on livestock, and for verified loss of livestock for participating ranchers" occurring on or after September 23, 2021. To that end, CDFW convened a group of interested parties with diverse perspectives, experience, and expertise to participate in a wolf compensation working group to assist with developing and maintaining the compensation program. Through this process, CDFW and the working group agreed the compensation program should provide three "prongs" of compensation:

1. **'Prong 1' = Direct Loss:** Compensation for verified livestock losses (confirmed/probable wolf) incurred on or after September 23, 2021.
2. **'Prong 2' = The Use of Non-lethal Deterrents:** Compensation for the use of nonlethal deterrence methods to deter wolf presence near livestock.
3. **'Prong 3' = Pay for Presence:** Compensation for indirect losses associated with impacts on livestock within known wolf pack territories.

An interim compensation program was initiated for the first two prongs: Prong 1, direct loss, in February 2022, and Prong 2, deterrent compensation, in May 2022. In the final phases of compensation program development, CDFW established the eligibility criteria and mechanism for compensation for indirect losses to livestock due to wolf presence (Prong 3) and implemented the full 3-prong compensation program in May 2023. As of March 8, 2024, all $3 million of the compensation program funds had been distributed to 109 grantees. In April 2024, CDFW released a Summary Report of the WLCPP.

WOLF-LIVESTOCK COMPENSATION PROGRAM - 2024

In 2024, the California state legislature appropriated $600,000 to CDFW to continue funding the Wolf-Livestock Compensation Program (WLCP). Due to the limited funds available to support the WLCP, CDFW prioritized compensation for direct losses (Prong 1), with all confirmed and probable livestock losses from wolves occurring on or after July 1, 2024 eligible for compensation. Applications for compensation have been reviewed and accepted since October 28, 2024. As of December 31, 2024, CDFW has received WLCP applications for 15 losses totaling $54,911.

Photo Courtesy of M. Heim, National Geographic

Wolf track from the Diamond pack, Plumas County.
Photo by Axel Hunnicutt, CDFW.

RESEARCH

RESEARCH

INTERNAL AND EXTERNAL RESEARCH

From 2015 through 2024, CDFW has engaged in internal and external research efforts to increase our understanding of gray wolf ecology, management and conservation across California. The Gray Wolf Program continues to conduct research independently and in cooperation with other department programs and external partners to advance our knowledge of gray wolves across the state.

EARLY RESEARCH

Assessment of Stakeholder Working Group Meetings

In the early stages of wolf presence in California, CDFW undertook a "Gray Wolf Stakeholder Working Group Analysis" to better understand the outcomes of the wolf stakeholder meetings conducted from 2012 to 2014. The goals of the research were:

1. Provide a summary of the working group discussions;
2. Examine which stakeholder groups made up the different working group sub-meetings;
3. Identify the major themes and concerns discussed in the working groups;
4. Identify any patterns in how the themes were brought up between the different subgroup meetings;
5. Identify ways in which these working group meetings can inform future discussions about gray wolf management in California.

There were a total of 44 working group meetings. The full stakeholder group met 13 times, and they divided themselves into three different subgroups based on their interests and concerns: The Wolf-Livestock Subgroup focused on wolf impacts on livestock and agriculture, the Wolf-Ungulates Subgroup focused on wolf impacts on deer and elk populations, and the Wolf Conservation Subgroup focused on wolf sustainability and health issues.

A range of topics were discussed at these working group meetings. Most prevalent were topics relating to the importance of and need for data on wolves in California, including their impact on livestock, wild prey and natural ecological communities; identifying wolf population recovery goals and whether a sustainable population can be maintained over time; how the California Endangered Species Act affects wolf management options; and where lethal controls would fit into wolf management. Other topics, such as better understanding wolf ecology and improving public communication about wolf management, underlay the working group but were explicitly discussed in only a few meetings. Topics such as public safety concerns and animal welfare issues were not discussed in depth by the stakeholders but may be important topics when discussing wolf management with the broader public.

INITIAL DIETARY ANALYSIS OF GRAY WOLVES

Preliminary Dietary Analysis

From 2017 to 2019, CDFW conducted an initial assessment of the diet of the Lassen Pack, the only wolf pack known in California at the time. Biologists collected a total of 92 wolf scats opportunistically along dirt roads, game trails, and at feeding sites within the pack's summer range. Prey species were identified via manual identification of hairs and other indigestible remains in the scats. Overall, the frequency of occurrence of black-tail deer, cattle, and small mammals was 51%, 32% and 17%, respectively. However, accounting for biomass indicated that black-tailed deer, cattle, and small mammals accounted for 29%, 59%, and 12% of the Lassen Pack's diet during the study period.

Dellinger JA, K Laudon, P Figura. 2021. Summer diet of California's recolonizing gray wolves. California Fish and Wildlife 107(3):140-146 (PDF)

GENETICS OF CALIFORNIA WOLVES

CDFW's Wildlife Forensics Lab has an ongoing project to better understand the population genetics of California's recovering wolf population. Samples are collected from confirmed livestock depredations, scats, urine, hair, blood from captured individuals, and environmental DNA (eDNA) collected in the field. Additional samples are contributed by various researchers studying wolves in California. As a result, the Lab now has a valuable reference library of wolf genetic samples which allows us to determine the origins and relatedness of wolves in various populations, differentiate scats and depredations by coyotes and dogs, identify the genetic "fingerprints" of individual wolves, and even determine the coat color of wolves detected only by their DNA.

UC DAVIS "THE WOLF PROJECT"

In 2022, researchers from the University of California, Davis' Wildlife Health Center began a wolf project funded by the Wildlife Conservation Network. 'The Wolf Project' aims to understand the efficacy of non-invasive monitoring techniques to determine pack size and reproductive status, investigate community interactions with the surrounding ecosystem, and better understand wolf demographics and foraging ecology. This project will continue through 2025, and more information is available at: The Wolf Project | Wildlife Health Center / School of Veterinary Medicine.

UC BERKELEY "CALIFORNIA WOLF PROJECT"

In 2023, CDFW began a multi-year collaboration with researchers at the University of California, Berkeley to address many of the key questions about wolf ecology and management in California. The project will document wolf habitat use and home range size, diet composition and depredation rates upon livestock and wild prey, interactions with other large predators such as mountain lions and bears, and impacts upon native ungulate such as deer and elk. The project will also conduct a critical evaluation of CDFW's wolf-livestock conflict reduction and compensation programs. The results of these investigations will inform CDFW's future management of wolves statewide. (For more details on the project and its results to date, see California Wolf Project)