

CALIFORNIA WOLF PROJECT

2024 Annual Report





Science to Support California Wolf Recovery

2024 Annual Report

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Support from:



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Project Overview

California Wolf Project (CAWP) is a research initiative within University of California Berkeley's Wildlife Program aimed at advancing the science and management of gray wolves in California. The project integrates UC Berkeley's expertise in ecology, sociology, economics, and environmental policy while leveraging the university's extensive network of agency, non-profit, landowner, and Tribal relationships. Using innovative and interdisciplinary methods, the project gathers data on wolf spatial ecology, diet, predator-prey dynamics, and recolonization within California while contributing to conflict reduction strategies for rural communities and livestock producers.

The official launch of CAWP in 2024 formalized a new, long-term partnership between UC Berkeley researchers at Rausser College of Natural Resources and the California Department of Fish and Wildlife (CDFW). With additional support from the National Geographic Society, the project has assembled a multidisciplinary team of scientists, wildlife managers, and communicators to better understand the social and ecological factors that shape wolf populations and inform management decisions. The core team includes three postdoctoral researchers with expertise in socioeconomic and ecological sciences, a field manager with eight years of carnivore monitoring

experience, and a communications specialist funded by the National Geographic Society. All work has been guided by the CDFW Wolf Program Coordinator, Axel Hunnicutt.

The path of wolf recovery in California – the most populous and diverse U.S. state – has the potential to shape national, and even global, perspectives on wildlife restoration and large-scale conservation. CAWP seeks to develop a model for how to bring universities, government agencies, and local communities together around the science and practice of improving human-wildlife interactions on a shared landscape.



CAWP team from left to right: Dr. Arthur Middleton, Matthew Hyde, Christina Winters, Dr. Kaggie Orrick, Malia Byrtus, Dr. Mauriel Rodriguez Curras, and Dr. Justin Brashares

Research Objectives

With CDFW's support, CAWP began its first field season in June 2024 and launched its initial project outreach in October. The team's initial efforts were focused on establishing crucial research baselines for wolf ecology and wolf-human interactions in Northern California.

A variety of data and programmatic information was collected for seven major research objectives or tasks:

- 1 Wolf home range and habitat use
- 2 Prey, scavenging, and diet analysis
- 3 Wolf occupancy predictions
- 4 Ungulate resource selection, habitat use, and habitat quality
- 5 Native ungulate and carnivore densities within wolf areas
- 6 Livestock depredation patterns
- 7 Evaluation of conflict reduction and compensation programs

The data and analyses in this report for CAWP's various research tasks are preliminary and incomplete, reflecting current insights that are likely to evolve with additional data collection in 2025. Current findings should not be relied upon for decision-making but rather to highlight ongoing efforts, identify gaps, and guide future research goals. Comprehensive and validated analyses in future reports will be able to provide a stronger basis for management recommendations and decision-making.

Task 1.

HOME RANGE AND HABITAT USE

Utilizing GPS data collected from past, current, and future collared wolves, CAWP is in the process of developing rigorous estimates of home ranges and habitat selection patterns using contemporary methods to understand wolf space use. This includes calculating seasonal home ranges using weighted autocorrelated kernel density estimates (AKDEs), which explicitly model spatial and temporal autocorrelation. This method accounts for the dependency structure between observations, and compared to other estimators, provides more realistic representations of movement patterns or space use.

Annual home ranges were estimated for individuals based on the season (winter: October 16-May 15; summer: May 16-October 15) and data availability, resulting in 34 estimates. **Overall, home ranges were larger in winter compared to summer, consistent with findings from other wolf studies that report smaller home ranges during summer when pups are young and den-dependent.**

Limited telemetry data for some individuals in specific seasons suggests these results should be interpreted with caution, especially when the data do not cover an entire season.

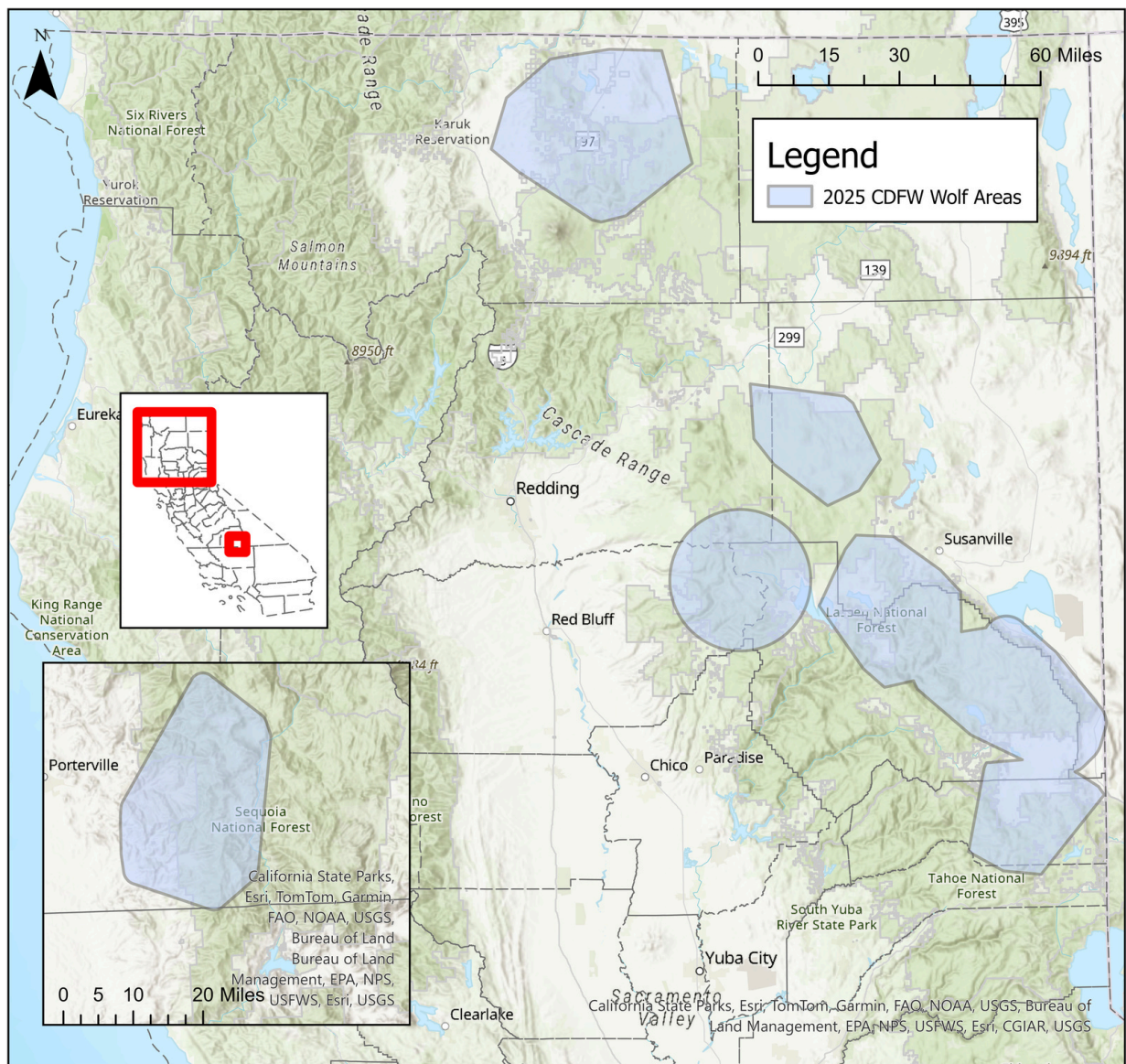
In future analyses, if sufficient data are available, monthly weighted AKDEs may better capture the differences in wolf home ranges between early and late summer.

In 2025, CAWP will continue to examine drivers of wolf land use and daily movements. Wolf home ranges can be driven by a number of different available resources and habitat, including terrain ruggedness, prey density, human infrastructure and presence, snowpack, and vegetation.



Figure 1. Areas of gray wolf pack use in December 2024, per the California Department of Fish and Wildlife

Displayed are known areas of wolf activity based on best available data (e.g., GPS collar locations, trail camera images, tracks, and confirmed sightings). These include known resident wolf pack territories and approximate areas of wolf activity, where two or more wolves have been detected but reproduction or persistent use of a specific area has not yet been documented. This map is updated quarterly by CDFW. CAWP estimates are forthcoming.



Task 2.

PREY, SCAVENGING, AND DIET ANALYSIS

Scat collection

To understand the summer diets of wolves, **CAWP collected 394 scats** (see Table 1 on next page) in 2024 and sent them to the SEFS Genetics Lab at University of Washington for diet metabarcoding. The project anticipates having the metabarcoding results in mid-Spring/early-Summer 2025. CAWP will also share all genetic extracts with the CDFW Wildlife Forensics Lab for their continued efforts on genetic identification of individual wolves.

Cluster Investigations

To understand the frequency in which wolves are eating, either by killing prey or scavenging, CAWP investigated wolf cluster locations (two or more GPS locations within close proximity to each other with 30-minute intervals) throughout the month of August. Using the wildlife conservation software platform EarthRanger, **CAWP identified a total of 219 clusters (excluding rendezvous sites), of which nearly half were on public land**—and therefore accessible to our field team. CAWP visited 60% of the accessible clusters (n=59), where the team identified wolf kills and scavenging of elk, deer, and livestock. **At 34% of the clusters investigated, CAWP found evidence of wolf kills or scavenging (i.e. a carcass; note that cattle depredations were only investigated by CDFW or county personnel). Of these 20 carcasses, the majority were cattle. The team is awaiting the results of the metabarcoding study to more definitively address this question.** In 2025, the team hopes to deploy camera traps at carcasses to gain a better understanding of scavenging behaviors and the impact on other scavengers within the carnivore guild.

CAWP is building a predictive tool to better classify clusters as feeding sites (where animals hunt or scavenge), rendezvous sites (where animals gather) or resting sites. This predictive tool will aid in the deployment of field teams, more accurately quantify wolf diet, and better quantify the impacts of wolf predation to the various stakeholders across California.

A principal challenge encountered in the first few months of fieldwork was access to private lands to investigate wolf clusters. Field crews were unable to conduct approximately 90 (roughly 50% of all clusters) investigations as a result of not yet having land access agreements in place. The team is making an effort to develop relationships with landowners and thereby exploring access opportunities to additional areas (also see Outreach and Communications section on page 14).

Table 1.

Total number of scats collected across our study area separated by wolf pack

| WOLF PACK | SCAT SAMPLES COLLECTED |
|------------------|-------------------------------|
| BEYEM SEYO | 97 |
| HARVEY | 49 |
| LASSEN | 38 |
| WHALEBACK | 91 |
| YOWLUMNI | 119 |
| TOTAL | 394 |



Photo of cluster investigation taken by Malia Byrtus

Task 3.

WOLF OCCUPANCY PREDICTIONS

A primary goal of CAWP is to improve predictions of future wolf occupancy in Northern California. **In June of 2024, CAWP began deploying a grid of 189 camera traps throughout northern and northeastern California (see Figure 2 on next page) – the largest camera trap grid in the state.** The cameras are spaced at approximately 5 km and are primarily located on federal and state (public) lands within a 10 km buffer of known wolf pack territories. Camera trap photos collected from June to September of 2024 are currently being uploaded to Wildlife Insights - a platform used by CDFW to manage camera trap projects. CAWP estimates that upload will be complete by early 2025. Starting in September, field crews worked to elevate cameras in preparation for winter snowfall. The team is additionally supplementing our grid with camera trap information from other agency partners, including the University of California-Davis and partners within CDFW (e.g., mountain lion program) to collect more data on wolf habitat use. To date, CAWP cameras have obtained detections of wolves (including images which helped identify the newly established Diamond pack), black bears, mountain lions, deer, elk, pronghorn, and coyotes. The team will use these data for understanding temporal and spatial behaviors of wolves, their competitors, and their prey.

Species Distribution Model

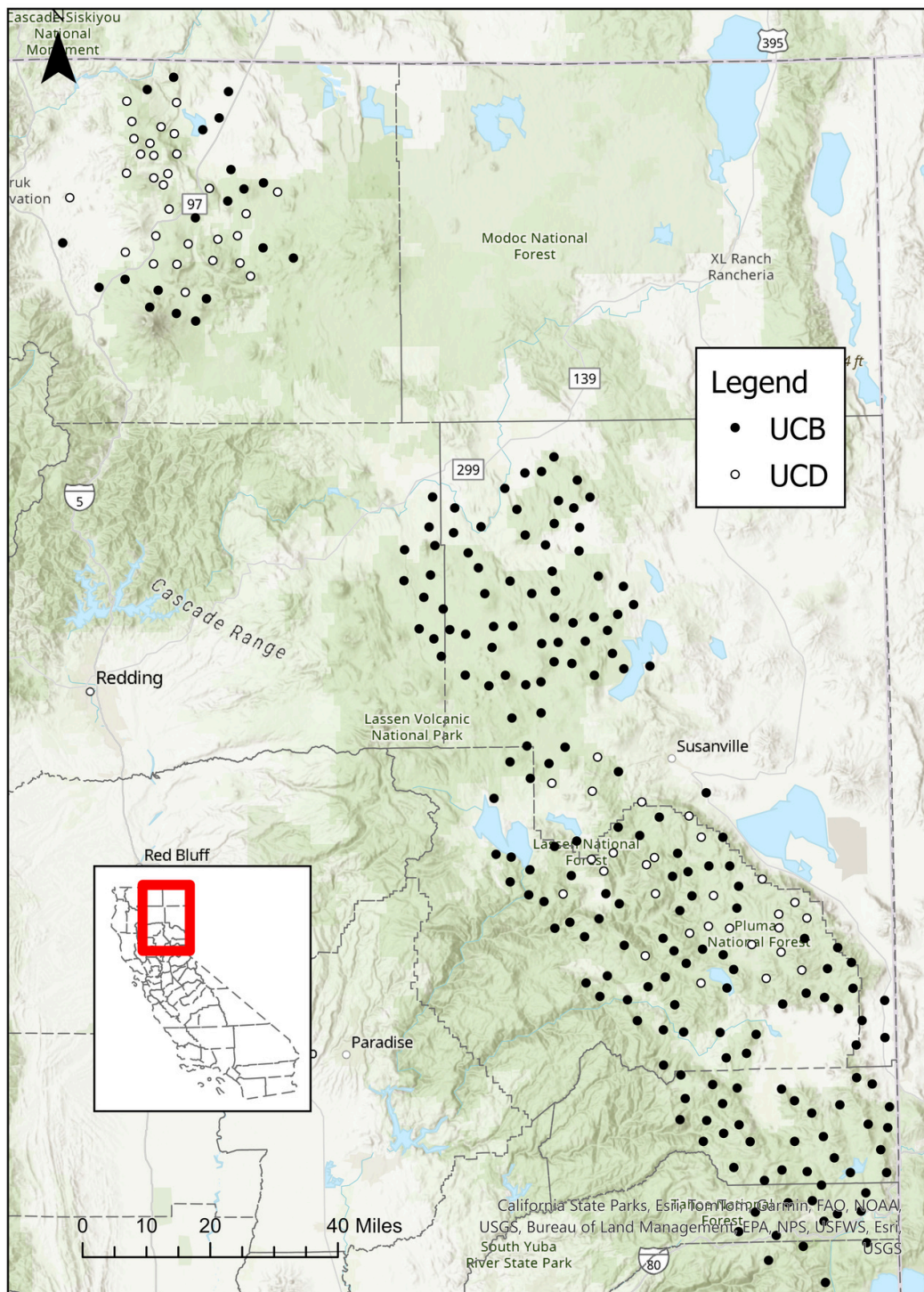
Identifying suitable areas for wolves is crucial to current and future monitoring efforts. To update and advance predictions of areas suitable for wolves in California, CAWP is currently creating a species distribution model (SDM) based on data from over 3,000 wolf observations from open sources including GBIF and iNaturalist. Our goal was to capture variation in wolf habitats across the Western US in order to estimate the most suitable areas for wolves in California. The team used an ensemble modeling approach and then evaluated how the models performed. The team is currently working with CDFW biologists to refine this model and provide accurate estimates of where wolves will occupy in the future.



Photo by CAWP of newly established Diamond Pack

Figure 2.

UC Berkeley (n=189) and UC Davis camera trap locations across Northern California



Task 4.

UNGULATE RESOURCE SELECTION, HABITAT USE, AND HABITAT QUALITY

CAWP is using available CDFW GPS collar data and field investigations on native ungulates to determine ungulate resource selection in and near areas occupied or expected to be occupied by wolves. The team hopes to develop habitat improvement recommendations in 2025 for native ungulates in wolf occupied areas.

The team intends to study habitat selection to examine how resource selection changes before and after wolf recolonization. This information will be used to inform prioritization of habitat types for habitat improvement in wolf areas to sustain and grow healthy ungulate populations.



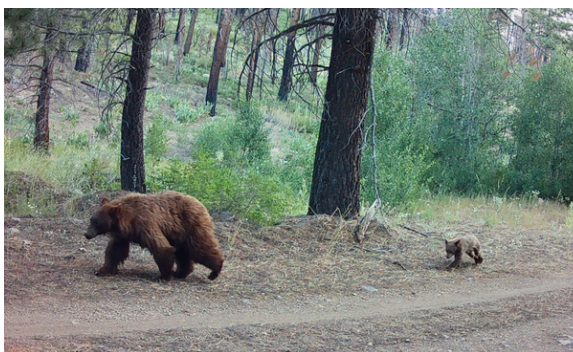
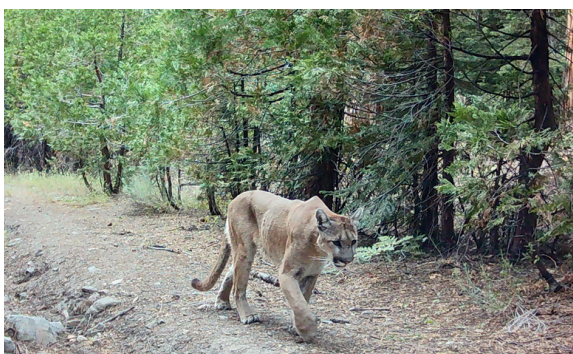
Photo of CAWP field team by Malia Byrtus

Task 5.

NATIVE UNGULATES AND CARNIVORE DENSITIES WITHIN WOLF AREAS

CAWP has used its network of trail cameras (see Figure 2) and cameras deployed by CDFW to better understand the ecological niche of wolves in California by documenting densities of ungulate prey and potential competitors (mountain lions, black bears, coyotes) within wolf-occupied areas, and where feasible, in unoccupied areas.

The team is currently collaborating with CDFW's Big Game Unit to extract deer, elk, mountain lion, black bear, and coyote density information from products created for management of those species. These data will be an invaluable resource for understanding density of these species throughout areas inhabited by wolves. CAWP plans to use multi-species occupancy and other models to examine how wolves impact co-occurrence of competitor species, and how their presence may affect habitat use by prey species. These analyses require camera photos to be processed and identified in Wildlife Insights. The team expects preliminary models in June of 2025.



Photos from CAWP camera trap grid in Northern California

Task 6.

LIVESTOCK DEPREDATION PATTERNS

CAWP is using verified livestock depredation events to understand the distribution and contribution of ecological variables to livestock loss. The team hopes to conduct interviews or focus groups with livestock producers in 2025 to understand what factors may be leading to depredations on their operations and what tools can be used to prevent losses.

Once data validation is complete in early 2025, CAWP will be able to employ a three-pronged approach to this component: a regression to understand predictors of livestock depredation, a hotspot map of where livestock depredation risk is highest, and qualitative interviews with livestock producers to understand what tools are being used and where depredations are taking place.

Task 7.

EVALUATION OF CONFLICT REDUCTION AND COMPENSATION PROGRAMS

UCB and CDFW seek to understand producers' perspectives on CDFW's Wolf-Livestock Compensation Pilot Program. This program consisted of three prongs to reduce conflict between livestock and wolves: 1) payments for direct loss, 2) payments for non-lethal deterrents, and 3) payments for presence. UCB personnel worked closely with CDFW's Wildlife Health Lab scientists to develop an approach to evaluating CDFW's Wolf-Livestock Compensation Pilot Program. **The team developed a questionnaire to examine program participants' perceived effectiveness of the program, trust in CDFW, attitudes and norms around applying for compensation, tolerance for wolves, and the acceptability of certain management actions.** This questionnaire is currently being piloted within UCB and seeking Internal Review Board approval to be distributed via electronic and mail copies.

Outreach and Communications

In addition to data collection, CAWP made significant progress toward its communication and outreach goals in 2024. Partner engagement and communication efforts directly address the need to build local buy-in, which is essential for the long-term success of conflict reduction programs and overall wolf conservation in California.

Over the summer, CAWP developed a **project website** which includes contact information and an email sign-up form for various stakeholders and students. In October, the project was able to officially launch on social media across multiple platforms including **Instagram**, **Facebook**, and **LinkedIn**. Creating an online presence to raise awareness among local partners and the general public fulfills a key short-term outcome of ensuring that target audiences are more informed about wolf management efforts.

CAWP also conducted various outreach activities with a variety of interest groups across the state, where outreach materials including factsheets and brochures were distributed. Below is a brief list of events and media engagements:

- Kaggie Orrick and Malia Byrtus attended the LA Natural History Museum Wolf Awareness Week event with Axel Hunnicutt and Kirk Wilbur (CCA) in October 2024.
- Christina Winters attended the November Lassen County Fish and Game Commission meeting to discuss our research, specifically kill cluster investigations to happen in February.
- Arthur Middleton met with producers in northeastern California in November of 2024 on research priorities.
- Arthur Middleton and Matt Hyde attended the California Cattlemen's Association annual conference to discuss our work in December 2024.
- Christina Winters, Arthur Middleton and Matt Hyde attended the Plumas County Fish and Game Commission meeting in December 2024 to discuss our ongoing research and access to private lands for cluster investigations.

Please contact californiawolfproject@berkeley.edu if you would like to suggest other events that CAWP should attend.

Press and Media

| DATE | SOURCE | TITLE |
|----------|---|---|
| 10/13/24 | San Francisco Chronicle | <u>A new wolf pack, irate ranchers, and the astonishing comeback of California's most celebrated predator</u> |
| 10/20/24 | Natural History Museum of Los Angeles County | <u>Welcome Day: Wolves</u> |
| 10/29/24 | Berkeley Rausser College of Natural Resources | <u>California Wolf Project will advance science and management of gray wolves</u> |
| 10/29/24 | California Department of Fish and Wildlife | <u>California Wolf Project Will Advance Science and Management of Gray Wolves</u> |
| 10/30/24 | Lake County News | <u>California Wolf Project Will Advance Science and Management of Gray Wolves</u> |
| 10/31/24 | Berkeley Side Berkeley Wire | <u>California Wolf Project Will Advance Science and Management of Gray Wolves</u> |
| 10/31/24 | Sierra Daily News | <u>California Wolf Project: New Initiative to Shape the Future of Wolves in California's Changing Landscape</u> |
| 10/31/24 | Mammoth Times | <u>California Wolf Project Will Advance Science and Management of Gray Wolves</u> |
| 10/31/24 | The Sun Gazette | <u>California project to advance gray wolf science, management</u> |

| DATE | SOURCE | TITLE |
|----------|--------------------------|---|
| 11/1/24 | The Porterville Recorder | <u>CDFW, UC Berkeley launch Gray Wolf Project</u> |
| 11/06/24 | The Plumas Sun | <u>California Wolf Project aims to gather data on the state's gray wolf packs</u> |
| 11/07/24 | The Escalon Times | <u>Wolf Project aims to advance science, management practices</u> |
| 11/30/24 | Los Angeles Times | <u>Two new wolf packs confirmed in California amid population boom</u> |
| 12/13/24 | Wolf Connection Podcast | <u>Episode #204</u> |

Please contact californiawolfproject@berkeley.edu for media inquiries.

Looking Ahead

As CAWP continues into 2025, the field team will be collecting scat samples in the first week of January, February, March and April, will check a subset of camera traps (Task 2 & Task 3), and investigate wolf GPS clusters in February. For scat collection in March and April, CAWP will not sample in sites with known wolf activity to ensure that we do not disturb mating or denning. In February 2025, the team will conduct a second month of intensive cluster investigations. Additionally, the team anticipates deploying the compensation questionnaires for Task 7 in early 2025.

Based on discussions with livestock producers and local interest groups, CAWP has identified several ways to enhance trust and engagement among CAWP, CDFW, and the California public. The project has begun and will continue to prioritize outreach efforts and we plan to systematically expand these efforts moving forward as initial analyses yield more actionable insights. A recurring theme from these initial conversations with livestock producers has been the critical importance of information sharing. Additionally, widespread interest in ungulate population dynamics and livestock depredation further highlights the importance of project tasks focused on monitoring prey species and mitigating conflicts. By addressing these priorities, CAWP aims to strengthen relationships, foster trust, and support more effective collaboration.



Photo of CAWP field team by Malia Byrtus

Get Involved

To get involved with California Wolf Project, please check out our website wildlife.berkeley.edu/cawolfproject. There you will find seasonal job postings, volunteer opportunities for students, and future resources for livestock producers.

If you would like to receive periodic project updates, you can also visit the CAWP website to sign up for our e-newsletter.

Contact Us

For general inquiries, please email: californiawolfproject@berkeley.edu

For research inquiries, please email: wolffieldteam@berkeley.edu