MONITORING THE DENSITY AND ABUNDANCE OF BLACK-TAILED DEER AND THEIR PRIMARY LIMITING FACTORS TO INTRODUCE EFFECTIVE CONSERVATION STRATEGIES IN THE MENDOCINO NATIONAL FOREST, CALIFORNIA

PROJECT PLAN – Starting 2024

MENDOCINO COUNTY BLACKTAIL ASSOCIATION

Principal Project Investigators:

David Casady, Retired California Department of Fish and Wildlife mule and black-tailed deer biologist
Paul Trouette, President and founder, Mendocino County Blacktail Association

EXECUTIVE SUMMARY

Black-tailed deer occupy the northwest portion of California and have traditionally received a large amount of interest from the public and resource management agencies both for their role as an essential element of healthy ecosystems, providing an important prey base for apex predators, and as a popular game species supporting local economies through important seasonal income. Current challenges to black-tailed deer population persistence in California include the negative effects of large-scale habitat degradation, habitat fragmentation, climate change, and predation pressures. Over the past several decades there has been an ongoing concern that black-tailed deer populations have been in decline prompting a call to action by the public to identify the causes and to take necessary measures to reverse the downward trend and stabilize the populations. As a crucial first step, the Mendocino County Blacktail Association and other conservation non-profit organizations requested that the California Department of Fish and Wildlife conduct a scientific field investigation to determine the rate and causes of the decline and to provide recommendations to reverse the trend. Results of the investigation revealed that the black-tailed deer in the Mendocino National Forest study area were indeed experiencing a steep decline as a result of low survival in all age classes due to the interaction of top-down (predation) and bottom-up (forage) effects negatively influencing population growth.

Following these findings and recommendations in a continued effort to reverse the substantiated downward trend and stabilize the populations, the Mendocino County Blacktail Association is initiating this current program with the goal of building a forest health and balanced wildlife model that will result in the best possible outcome for the California public and generations to follow. Steps to realize this goal consist of 1) identifying factors contributing to the alarming decline of the habitats and wildlife populations, 2) developing informed solutions and directions to address these declines, 3) implementing habitat enhancement projects and introducing conservation strategies in line with an ecosystem management approach, and 4) evaluating outcomes of these efforts to gauge success and guide adaptive management. The program will begin with the current project in the Mendocino National Forest with the effort continuing in all representative US Forest systems in northwestern California.

Objectives of the current project directly supporting this goal include:

1) Inventorying and monitoring the quantities, distributions, and conditions of deer ranges throughout the Forest,
2) Inventorying and monitoring the abundances, densities, and distributions of black-tailed deer, black bears, mountain lions, and coyotes,
3) Evaluating the gross body condition and sex and age class composition of deer in the Forest,
4) Monitoring deer fawn recruitment.

The successful completion of this project will require access to the public and private properties within the Mendocino National Forest, the purchase of 60 trail cameras and associated equipment, and time compensation and travel expenses for one Project Manager, one Wildlife Scientist, three Scientific Technicians, and one Volunteer Scientific Intern. The investment of time and funding to support the project will result in up-to-date information on the conditions of habitats and populations of deer, black bears, mountain lions, and coyotes in the Mendocino National Forest; information that is currently lacking but critical for informing and introducing effective conservation strategies to restore and maintain California black-tailed deer populations, apex predators, and their habitats into the future. The Mendocino Blacktail Association is actively seeking funding to support completion of this mission.

Background

Columbian black-tailed deer (*Odocoileus hemionus columbianus*) are one of the subspecies of mule deer (*O. hemionus*) native to the west coast of North America and range from northern California to southern Canada (Latch *et al.* 2014). In California, the subspecies occupies the northwestern portion of the state (Pease *et al*. 2009). Due to its limited distribution in California and the ongoing challenges to population persistence including large-scale habitat degradation, habitat fragmentation, climate change, and predation pressures, black-tailed deer continue to receive a large amount of interest from the public and resource management agencies both for their role as an essential element of healthy ecosystems and as an important game species. Deer promote diversity in plant communities through selective foraging and provide a critical prey base for apex predators including black bears (*Ursus americanus*), mountain lions (*Puma concolor*), and coyotes (*Canis latrans*) in addition to supporting local economies with an annual influx of hunters providing vital annual revenue to local small businesses. Black-tailed deer are an indigenous essential part of California wild lands. A direct and sustained conservation effort is required to maintain the viability of their populations and consequently, productive plant communities. Healthy and robust populations of black-tailed deer ensure a necessary healthy population of predators, ongoing hunting traditions, and seasonal income to local economies. To allow the continued precipitous decline of black-tailed deer in the future will result in the loss of an important prey base for apex predators.

Although black-tailed deer are an essential part of California wild lands, there is an ongoing concern by the public that their populations have been declining over the past several decades (Longhurst *et al.* 1976). Fueling this concern is the glaring lack of reliable and up-to-date population estimates for deer in California. As a result of the persistence of this decline, public concern has continued to increase prompting a call to action to identify the causes and to take necessary measures to reverse the trend and stabilize the populations. Growing out of this concern, the Mendocino County Blacktail Association (MCBA) was formed in 2005. The MCBA is a registered 501 C-3 non-profit organization focused on improving the condition of black-tailed deer populations in northwestern California, especially on public lands within the B-Zones deer hunting units. In order to fulfill its mission, the MCBA works cooperatively with Federal and State natural resource management agencies and other non-profit conservation organizations to support and conduct projects to directly enhance black-tailed deer populations, their habitats, the vital relationship of their predators, and the greater ecological community through science-based applications.

As a crucial first step to address the declining deer populations in northwestern California, the MCBA and other deer conservation non-profit organizations requested that the California Department of Fish and Wildlife (CDFW) conduct a scientific field investigation to determine the rate and causes of the decline and to provide recommendations to reverse the trend. As a result, CDFW made the investigation a priority and partnered with researchers from the University of California Davis to conduct the field study. The Mendocino National Forest and adjacent private properties were chosen as the study site because of the area's popularity and public enjoyment. Many groups, including residents, wildlife enthusiasts, hunters, and bird watchers, all depend on its varied opportunities, and its ease of public access from large urban areas including Sacramento, the San Francisco Bay Area, and Redding.

The goals of the investigation were to determine the magnitude and causes of the deer decline by simultaneously evaluating the roles of top-down (predation) and bottom-up (forage) factors on survival and population growth. The main project ran from 2009–2014 and incorporated a portion of the data from a previous investigation that ran from 2004–2007 (Casady, CDFW). During the project, 82 adult black-tailed deer does, and 7 adult mountain lions were followed with GPS collars and 137 fawns were followed with VHF radio ear-tags. Deer mortalities were investigated to determine the cause of death using systematic criteria (Atkinson and Jantz 1994, Mumma *et al.* 2014). Vegetation surveys were conducted to quantify deer forage cover and composition and deer diet analysis was conducted using fecal pellets. Specific details of the investigation can be found in the final project report: *Black-tailed deer population assessment in the Mendocino National Forest, California. Report to the California Department of Fish and Wildlife 2014* (Wittmer *et al.* 2014) and the associated peer-reviewed scientific journal articles including Casady and Allen 2013, Allen *et al*. 2014, Elbroch *et al.* 2014, Allen *et al*. 2015, Forrester *et al*. 2015, Marescot *et al*. 2015, Bose *et al.* 2017, and Bose *et al*. 2018.

Results of the investigation revealed that the black-tailed deer in the Mendocino National Forest were declining in abundance at a rate of 11–18% per year, which was the highest rate recorded to date in the scientific literature (Forrester and Wittmer 2013). Survival in all age classes was also significantly lower than typically reported for the species (Marescot *et al.* 2015) with survival of adult does older than one-year of age, in a population with no antlerless harvest, experiencing the lowest mean annual survival rates (0.71 ± 0.07) reported to date in the scientific literature (Forrester and Wittmer 2013). Predation accounted for at least 57% of adult mortalities, with 10% due to poaching, and 33% remaining unknown (Marescot *et al.* 2015). The majority of predation was by mountain lions with the observed kill rates among the highest reported in the literature, although interestingly the estimated population density of lions was comparatively low in the study area (Allen *et al.* 2015). Consistent with low doe survival, annual survival of fawns (0.24) was also lower than values typically reported in other studies (Forrester and Wittmer 2013). Predation accounted for 69% of fawn mortalities primarily by black bears and coyotes, most of which occurred during the first month of life (Wittmer *et al.* 2014). Overall, the results supported the interaction of both top-down and bottom-up effects jointly influencing growth of the deer population. Importantly, researchers found that adult does with access to greater amounts of forage within their small seasonal home ranges, as well as access to higher quality summer forage, less likely to leave their home range to use areas with a higher risk of predation from mountain lions (Forrester *et al.* 2015).

The primary recommendations from the investigation include tracking deer population change annually until the population recovers, determining if a similar downward trend is apparent in populations adjacent to the study site, mapping and enhancing habitat conditions on seasonal ranges and fawning areas, quantifying the relationship between fawn survival and summer habitat use, and investigating the apparent differences in fawn survival between habitat types in terms of coyote predation (Wittmer *et al.* 2014). Further recommendations include habitat enhancements that promote high-energy new plant growth specifically on deer foraging areas, avoiding disturbing mature forest stands adjacent to foraging areas to maintain thermal and escape cover, and considering these enhancements at smaller scales than those of more traditional large scale homogenous treatments due to the high site fidelity (tendency to return to their previous home range area) and philopatry (tendency to return to where they were born) found in the study population (Bose *et al.* 2018).

Project Overview

Following these findings and recommendations in a continued effort to reverse the substantiated downward trend and stabilize the population, the MCBA is initiating this current program with the goal of building a forest health and balanced wildlife model that will result in the best possible outcome for the California public and generations to follow. Steps to realize this goal consist of 1) identifying factors contributing to the alarming decline of the habitats and wildlife populations, 2) developing informed solutions and directions to address these declines, 3) implementing habitat enhancement projects and introducing conservation strategies in line with an ecosystem management approach, and 4) evaluating outcomes of these efforts to gauge success and guide adaptive management. The program will begin with the current project in the Mendocino National Forest with the effort continuing in all representative US Forest systems in northwestern California.

The project is aimed, first at identifying negative trends that limit population objectives, and secondly, enhancing deer herd conditions in the Mendocino National Forest through up-to-date and ongoing monitoring of habitat conditions, along with deer, black bear, mountain lion, and coyote populations to inform current and future conservation strategies and identify where limited resources may be most effective. Specifically, the current states and trends in habitat conditions and the populations of these species will be used to evaluate effects of habitat enhancements, wildfire, management policy, and hunting regulations. Accepting that it is particularly challenging to establish causal relationships in natural systems without a formal scientific control for comparison, results will nonetheless substantially increase the level of information on which to base conservation strategies. The MCBA invites and encourages collaboration with natural resource and land managers including the California Department of Fish and Wildlife, US Forest Service, US Bureau of Land Management, and private landowners. All data and results will be made available to these parties upon request.

Objectives of the project directly supporting this goal include:

1) Inventorying and monitoring the quantities, distributions, and conditions of deer ranges throughout the Forest,
2) Inventorying and monitoring the abundances, densities, and distributions of black-tailed deer, black bears, mountain lions, and coyotes,
3) Evaluating the gross body condition and sex and age class composition of deer in the Forest,
4) Monitoring deer fawn recruitment.

The successful completion of this project will require access to the public and private properties within the Mendocino National Forest, the purchase of 60 trail cameras and associated equipment, and time compensation and travel expenses for one Project Manager, one Wildlife Scientist, three Scientific Technicians, and one Volunteer Scientific Intern. The investment of time and funding to support the project will result in up-to-date information on the conditions of habitats and populations of deer, black bears, mountain lions, and coyotes in the Mendocino National Forest; information that is currently lacking but critical for informing and introducing effective conservation strategies to restore and maintain California black-tailed deer populations, apex predators, and their habitats into the future.

Project Area Description

The project area is located in the northern Coast Range of California in the portion of the Mendocino National Forest north of the B-Zones deer hunting units' boundary (39.615° N latitude, -122.844° W longitude, Fig. 1).

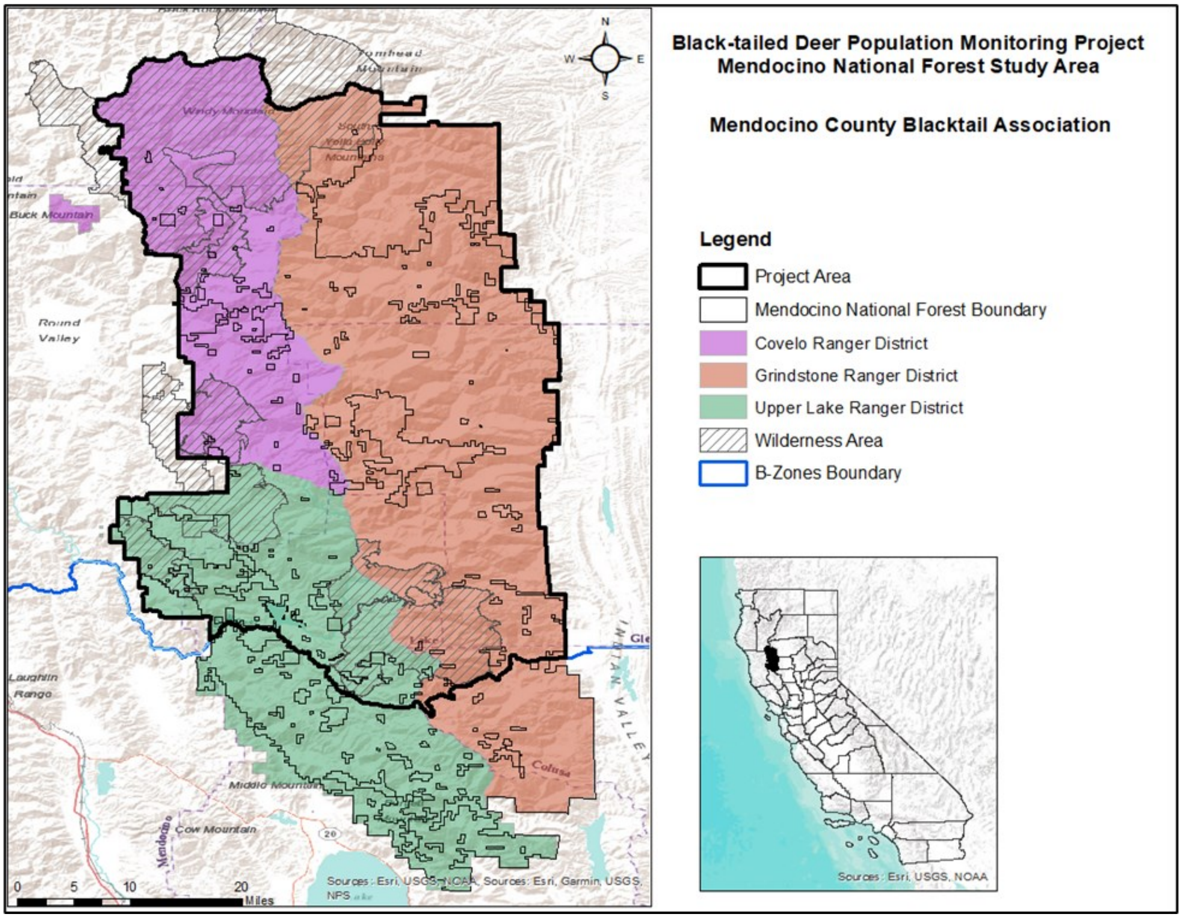

Fig. 1 Project area in the Mendocino National Forest, California

The area encompasses approximately 847,360 acres (1,324 mi^2) and includes portions of Mendocino, Trinity, Tehama, Glenn, Lake, and Colusa counties. The Mendocino National Forest is divided into the Covelo, Grindstone, and Upper Lake Ranger Districts, and partly or wholly manages the Snow Mountain Wilderness, the Yolla Bolly-Middle Eel Wilderness, the Yuki Wilderness, and the Sanhedrin Wilderness areas. No mechanized equipment of any kind is allowed within these wilderness areas. Approximately 80% of the Forest is public land and the remainder is privately owned. The peak use by the public occurs during deer hunting season which runs from mid-August through late October and black bear hunting season that opens with the deer season and continues through the end of December.

Methods

Habitat conditions

The quantities and distributions of deer ranges throughout the Mendocino National Forest will be mapped and evaluated using a geographic information system (ESRI ArcMap) and map layers including Western Association of Fish and Wildlife Agencies (WAFWA) deer ranges and GPS collar location data from collared adult does collected by Principal Project Investigator D. Casady and co-investigators (Wittmer *et al.* 2014) during the Mendocino Deer Project. Additional location data may also be used from current CDFW deer collaring efforts if available. Conditions of the ranges will be obtained through satellite imagery layers and/or on-the-ground habitat evaluations.

Densities, abundances, and distributions of black-tailed deer, black bears, mountain lions, and coyotes

The densities, abundances, and distributions of black-tailed deer, black bears, mountain lions, and coyotes will be estimated using remote camera traps following the space-to-event (STE) approach presented by Moeller *et al.* (2018) and Moeller and Lukacs (2021). This approach is applicable to common species that potentially produce an abundance of images. STE modeling estimates animal density from observations of the space between target species detections by the camera array under the assumption of perfect detection within a camera's viewshed. Data collection will utilize instantaneous time-lapse sampling occasions and therefore will not depend on animal movement rate or motion-trigger sensitivity, both of which are exceedingly difficult to accurately measure in the field. Time-lapse photography will be used to meet the assumption of instantaneous sampling occasions and eliminate the impact of variable detection on estimates of density, and as such, the cameras will be synchronized to collect photos at even intervals across the study area for the duration of the data collection period. Assumptions of the sampling design and data collection include (not inclusive): 1) camera sites are representative of the project area and are randomly or systematically deployed across the sampling frame while practices to increase photos of target species, such as selecting trails or water sources, will be avoided as they can bias the abundance estimates, 2) target animals have no behavioral response to the cameras or camera sites, this includes items that either increase or deter attraction (e.g., bait, water, equipment noises), 3) animals have sufficient time to redistribute themselves between image collection episodes in relation to the camera's viewshed, and 4) the area viewed is known across time and is measured accurately – if the camera area is not measured accurately the abundance estimates will be biased. The resulting encounter data from all memory cards will be copied to external hard drives for storage and processing. Data will then be organized and analyzed following the approaches and workflow presented in Moeller and Lukacs (2021). Results of the effort will include densities and abundances of black-tailed deer, black bears, mountain lions, and coyotes across the study area. Habitat attributes will also be collected at camera locations to investigate differences in densities across the landscape, given sample sizes are adequate.

A power analysis was performed to estimate the number of camera traps and data collection schedule required to achieve a target level of precision (CV < 0.2) using utilities in the R Statistical Software (v4.3.1; R Core Team 2023) package spaceNtime (Moeller and Lukacs 2021) under the following conditions (Fig. 2): 1) the project area for which the estimates are to be applied equals 847,360 acres (Fig. 1), 2) the average deer and black bear densities across the project area equals 8 each per square mile (based on local knowledge and expert opinion), 3) the average camera viewshed equals 129 m^2 (1,388 ft^2), 4) the sampling intensity equals 1 photo capture episode per hour for 61 days from 1 June – 31 July, and 5) the number of camera traps deployed ranged from 30 – 60 units.

Based on these assumptions, the sampling plan requires a minimum of approximately 50 camera traps assuming a target animal density of 8 per square mile and that all units remain functional over the entire sampling period. Lower actual densities will require additional cameras to maintain the same level of precision, and having no prior knowledge of the actual densities, it is advised to include additional cameras above the minimum estimate in the event that densities are slightly lower than the initial assumption. Additional units are also required to maintain the minimum in the event of camera failure (e.g., equipment malfunction, cameras knocked down by bears, and theft). It is therefore recommended that 60 cameras be deployed to accommodate lower than anticipated animal densities, camera malfunction and theft, and to maintain or increase the desired level of precision.

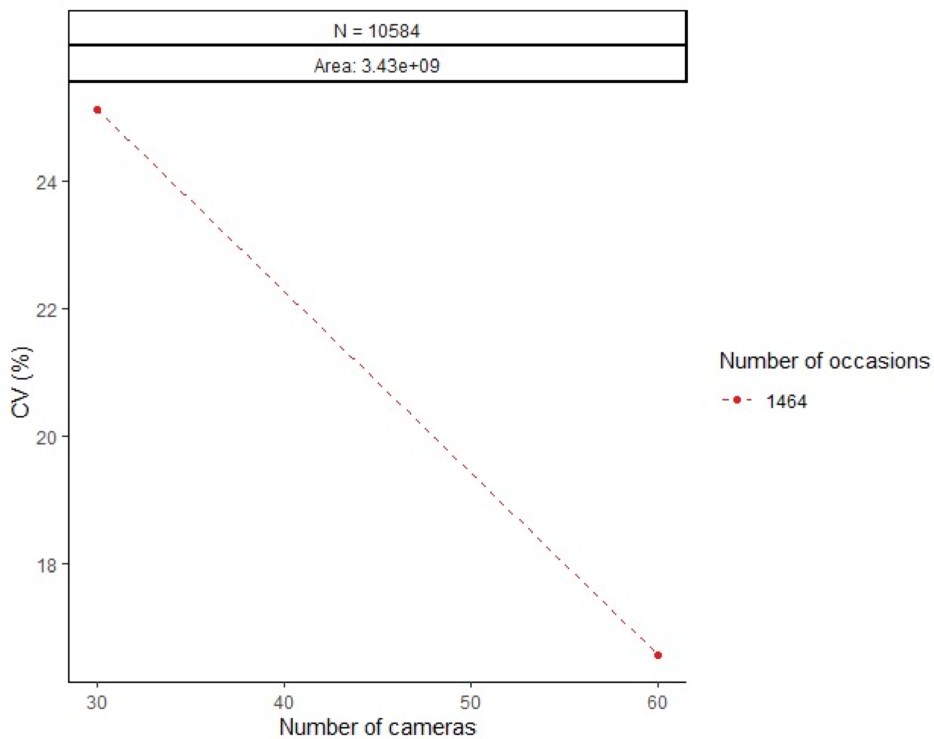

Fig. 2 Space-to-event power analysis with assumed black-tailed deer and black bear densities equal to 8 animals each per square mile across the approximately 847,360 acre study area with the number of sampling occasions set to 1 per hour for 61 days, the camera viewshed area equal to 129 m^2, and the number of cameras ranging from 30 – 60, run over 100 iterations.

Camera traps will be placed at 60 predetermined locations based on a random systematic sampling design with locations spaced approximately 4 km (2.5 miles) apart to maximize coverage and representativeness of the project area (Fig. 3). Although no cameras will be deployed in designated wilderness areas, several of the random locations occur near the boundaries and are presumed to be representative of the surrounding area. A list of specific camera locations will be available on request.

The camera array will be synchronized to collect simultaneous time-lapse images every hour during the first project year from 1 June – 31 July. Based on the results of the first year, adjusted determinative changes in protocols will occur based on findings. This is the optimal time frame because the deer will have completed their annual shift between seasonal ranges and constitute a relatively settled and closed population, it is prior to the onset of hunting season which experiences the highest density of humans in the Forest which may confound the results (e.g., deer may be less active due to hiding or may leave the project area), but also greatly increases the risk of camera tampering and theft, and it is post snow melt facilitating access to the camera locations, especially those at higher elevations. It is anticipated that initial camera deployment will begin in early May 2024 and continue until 1 June at the latest. Cameras deployed prior to the beginning of the sampling period will be set on a time delay and will not begin collecting images until 12:00AM on 1 June. Camera removal will begin 1 August and be completed prior to the onset of B- Zone archery season which opens the third Saturday of the month, again to minimize the risk of camera tampering and theft.

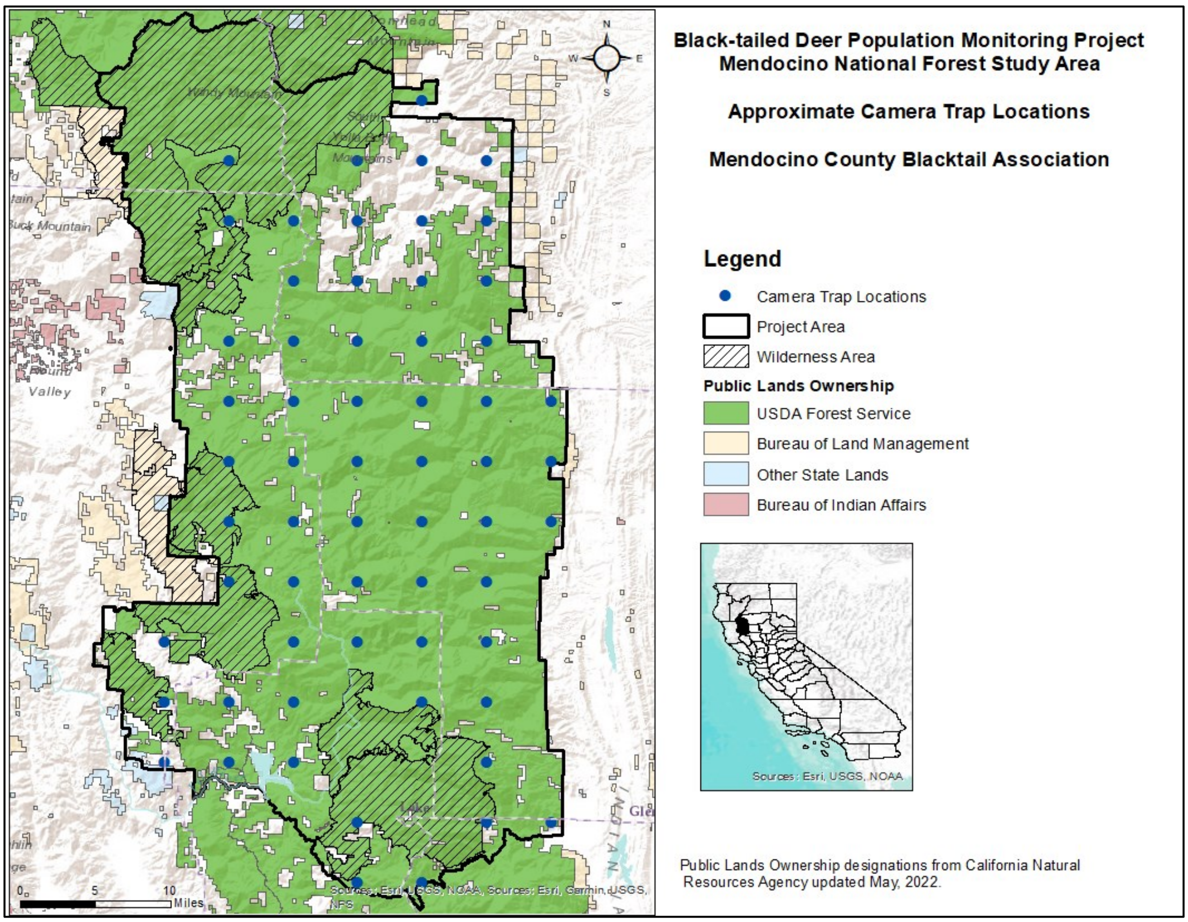

Fig. 3 Approximate camera trap locations within the project area in the Mendocino National Forest, California.

Camera traps will be placed at predefined coordinates on a tree or bush nearest to the random location. Cameras will be angled parallel to the slope of the ground at the site and set at a height of approximately 1m (3ft) facing north to minimize sun glare. It is imperative that the viewable camera area be measured accurately and therefore the distance from the lens to the nearest obstruction will be collected in the field. Because the method assumes perfect detection of the target species, distances out from the camera will be truncated at 50m (164ft) as this is the maximum distance for thermal night images and ensures accurate target animal (deer, black bear, mountain lion, and coyote) detection and identification. A small piece of flagging or other nonintrusive marker will be set at the 50m line to ensure targets are within the designated distance during image processing. The total camera viewshed will be calculated by combining the perpendicular distance from the camera lens with the camera lens angle obtained from the manufacturer specifications and reconfirmed with field measurements. Detailed camera set-up protocols will be developed prior to large scale deployment.

Minimum requirements for camera traps include: 1) the capability to collect time-lapse photos at specified times and intervals, 2) the capability to program a delayed start, that is, the ability to specify the date and time cameras begin collecting images, 3) the ability to consistently collect high-quality images during high and low light conditions, 4) high shutter speeds to minimize blurring for species and attributes identification, and 6) motion-triggered image collection capabilities.

Body condition, sex, and age class composition of black-tailed deer

Gross body condition, adult sex, and age class (i.e., fawn, yearling, prime age, old age) of black-tailed deer will be obtained from camera trap images collected during abundance sampling efforts and during efforts to estimate fawn recruitment (see below).

Fawn recruitment

Black-tailed deer fawn recruitment will be estimated by deploying camera traps in known fawning areas during the fawning periods from September through November. Detailed camera set-up protocols will be developed prior to large scale deployment.

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Personnel Position Duties

Project Manager
Responsible for all aspects of project oversight and coordination. Primary areas of responsibility include: 1) coordinating with US Forest Service, Bureau of Land Management, private property owners, and other land holders for access to properties to conduct project field components, 2) coordinating with project partners including non-profit conservation organizations, 3) project budget management and expenditure tracking, 4) coordinating with volunteer support if needed, and 5) purchasing required equipment. Project Manager will also conduct field equipment deployment and retrieval and image processing.

Wildlife Scientist
Responsible for scientific oversight of project components. Primary areas of responsibility include: 1) project development including study plan preparation, study design, data collection protocols, 2) data organization and analyses including data download and storage, computer mapping, and statistical coding, 3) preparing and maintaining field equipment including camera trap programming, deployment, and retrieval, and 4) preparing reports which include detailed methods, results, and recommendations.

Scientific Technician
Assists Project Manager and Wildlife Scientist with project components including field equipment deployment and retrieval, collecting specified site data following established protocols, and data processing including photo images from camera traps.

Volunteer Scientific Intern
Assists Scientific Technicians with field equipment maintenance, deployment, and retrieval, collecting specified field data following established protocols, and data processing including photo images from camera traps.

Project Budget - 2024						
Item	**Cost/unit**	**Units**	**Extension**	**CA Sales Tax (0.725%)**	**Total**	**Notes**
Equipment						
HP2X Camera (Reconyx)	$ 459.99	60	$ 27,599.40	$ 2,000.96	$ 29,600.36	
HP2 Security Enclosure (bear box)	$ 49.99	60	$ 2,999.40	$ 217.46	$ 3,216.86	
Python Cable Locks	$ 19.99	60	$ 1,199.40	$ 86.96	$ 1,286.36	
Lithium AA Batteries (12 pack)	$ 49.99	60	$ 2,999.40	$ 217.46	$ 3,216.86	
SD Memory Cards(64 GB)	$ 15.99	120	$ 1,918.80	$ 139.11	$ 2,057.91	
External hard-drive 12 TB	$ 300.00	2	$ 600.00	$ 43.50	$ 643.50	
Laptops for Scientific Technicians	$ 1,000.00	3 hp laptops	$ 3,000.00	$ 2,175.00	$ 5,175.00	
Vehicle rental for Scientific Technicians	$100/day	1 4WD	$ 2,000.00		$ 2,000.00	Assumes 20 days
Fuel for rental vehicle	$5.00/gal	80 gallons	$ 400.00		$ 400.00	Assumes 60 miles for 20 days at 15 mi/gal
Subtotal					***$ 47,596.84***	
Added in-kind value (provided at no additional cost)						
Computer hardware	$ 1,500.00				$ 1,500.00	
Computer software	$ 500.00				$ 500.00	
ATV	$ 75/day	2	$ 6,000.00		$ 6,000.00	Assumes 20 days
4WD pickups	$ 100/day	2	$ 4,000.00		$ 4,000.00	Assumes 20 days
Satellite phones	$ 1200/yr	3	$ 600.00		$ 600.00	Assumes 2 months
Misc. field Equipment (gps,backpacks, tents)	$ 35/day	6	$ 8,400.00		$ 8,400.00	Assumes 20 days
Surveillance equipment	$ 75/day		$ 5,250.00		$ 5,250.00	Assumes 70 days
Safety equipment	$ 300.00				$ 300.00	
Subtotal in-kind value					***$ 26,550.00***	
Subtotal Equipment					***$ 74,146.84***	
Subtotal Equipment (less in-kind items)					**$ 47,596.84**	Does not include shipping costs
Salary						
Project Manager (1 position)	$ 80/hr					
> Project oversight, coordination, and budget		10 hrs/week for 48 wks	480 hrs		$ 38,400.00	
> Field work (camera trap deployment)		20 days @ 10 hrs/day	200 hrs		$ 16,000.00	
> Photo image processing		5 hrs/wk for 5 weeks	25 hrs		$ 2,000.00	
Project Manager Subtotal					$ 56,400.00	
Wildlife Scientist (1 position)	$ 90/hr					
> Project development & field prep		8 hrs/day for 2 wks	80 hrs		$ 7,200.00	
> Field work (camera trap deployment)		20 days @ 10 hrs/day	200 hrs		$ 18,000.00	
> Photo image processing		10 hrs/wk for 5 weeks	50 hrs		$ 4,500.00	
> Data analyses & reporting		30 hrs/wk for 5 weeks	150 hrs		$ 13,500.00	
Wildlife Scientist Subtotal					$ 43,200.00	
Scientific Technician (3 positions)	$ 55/hr					
> Field work (camera trap deployment)		20 days @ 10 hrs/day	600 hrs		$ 33,000.00	
> Photo image processing		20 hrs/wk for 5 weeks	300 hrs		$ 16,500.00	
Scientific Technician Subtotal					$ 49,500.00	
Volunteer Scientific Intern (1 position)	$ 0/hr					
> Field work (camera trap deployment)		20 days @ 10 hrs/day	600 hrs		$ -	
> Photo image processing		10 hrs/wk for 5 weeks	50 hrs		$ -	
Scientific Technician Subtotal					$ -	
Subtotal Salary					**$ 149,100.00**	
Travel Expenses						
Project Manager (1)	$ 0.655/mi					
> Travel to project site		4 days @ 100 miles	400 miles		$ 262.00	Assumes 100 miles to project area
> Onsite travel		20 days @ 60 miles	1200 miles		$ 786.00	Assumes 60 miles per day for 20 days
Wildlife Scientist (1)	$ 0.655/mi					
> Travel to project site		4 days @ 250 miles	1000 miles	NA	$ 655.00	Assumes 250 miles to project area
> Onsite travel		20 days @ 60 miles	1200 miles	NA	$ 786.00	Assumes 60 miles per day for 20 days
Scientific Technicians (3)	$ 0.655/mi					
> Travel to project site		4 days @ 100 miles	400 miles		$ 262.00	Assumes 100 miles to project area
> Per diem	$ 40/day	24 days	72 days		$ 2,880.00	
Volunteer Scientific Intern (1)	$ 0.655/mi					
> Travel to project site		4 days @ 100 miles	400 miles		$ 262.00	Assumes 100 miles to project area
> Per diem	$ 40/day	24 days	24 days		$ 960.00	
Subtotal Travel Expenses					**$ 6,853.00**	
Grand Total					**$ 203,549.84**	