## G Proposal Format: Large Mammal Advisory Committee

Bay Delta Region (R3)/ North Central Region (R2)

**GREATER MONTICELLO DEER ABUNDANCE PROJECT (GMDA)**
**BAY DELTA AND NORTH CENTRAL REGIONS**

Project Leaders: Brett Furnas, Stacy Martinelli

Proposed Start and Completion Date: September 2016 to December 2018

### Executive Summary

Management of deer in California requires knowledge of population parameters at the local scale in order to provide planning guidance, direct habitat enhancement activities and support regulatory actions.

Survey routes to assess deer numbers and herd composition have recently been expanded to provide greater coverage of the Bay Delta Region (BDR) portion of the North Central Coast DCU. While these counts may provide biologists with a general indication of trends they do not allow statistically rigorous population estimation. In addition, aerial flights have been discontinued within the North Central Coast DCU because of sightability issues related to structurally complex habitats such as oak woodland, dense scrub and forest types which prevail there. For these reasons, reliable deer population estimates have not been obtained for the North Central Coast Deer Conservation Unit (DCU) of Regions 2 and 3 and population estimates for deer are either lacking or of questionable utility.

We propose to utilize non-invasive DNA techniques to obtain rigorous estimates of abundance and density with moderate precision for several deer herds within the non-migratory deer herds found in the North Coast DCU within the Bay Delta and North Central Regions over the next two years.

This multi-year, multi-herd project will include the Monticello, Capay, Santa Rosa, and Clear Lake Herds (Figure 2).

### Introduction

Estimating populations of deer in densely vegetated environments has been problematic. Aerial surveys to ascertain population estimates of deer in densely vegetated habitats are not practical due to poor visibility through canopies.

Road surveys are also unreliable in densely vegetated environments since surveys are limited to accessible roads (Brinkman et al. 2011). Road surveys rarely provide unbiased estimates, nor do they provide a representative sample of habitats, and are therefore statistically less reliable (Garton et al. 2004). Road surveys also are limited by visibility issues and access is often limited due to weather related road conditions or ownership.

Population indices derived from pellet counts have been used to monitor trends in deer populations. In principle, mark-recapture approaches are the most reliable and accurate way to estimate population abundance (Lukacs and Burnham 2005). However, physically marking and re-capturing or re-sighting deer on a large scale is prohibitively expensive. Consequently, non-

invasive DNA-based mark-recapture techniques are the most feasible way to conduct such surveys and are necessary to establish robust population estimates for deer within the BDR. In particular, DNA from deer fecal pellets would be used. This method has been successfully used to estimate population density of ungulates and black bears (Brinkman et al. 2011, Harris et al. 2010, and Bellemain et al. 2005) and deer (Brinkman et al. 2010, Lounsberry et al. 2015). This methodology has proven to be effective in estimating abundance for deer in the North Central Region (Brazeal et al., 2016, Report to CDFW).

Objective

The purpose of the project is to estimate abundance of non-migratory black-tailed deer in the study area through stratified random sampling using fecal DNA transects, and camera traps across a large geographic area. Plots will be stratified based on land ownership (public vs private) then randomly selected. Abundance will be modeled using a closed, mark-recapture model of the DNA data and an N-mixture model of the camera trap data. Home range estimates of adult male and adult female deer are needed to calculate density estimates from the above methods. Specific field methods are presented in the "North Central Coastal Deer Abundance 2016-2018" study plan (attached).

Study Area

The study area is comprised of 4 deer herds within the North Central Coast Deer Conservation Unit (DCU) in Regions 2 and 3 (Figure 2 and Table 1).

Table 1 Composition of Study Area made up of the 4 Deer Herds (12,840 sq. km.)

| DEER HERD | SQ. KM. WITHIN STUDY AREA |
|---|---|
| Monticello | 2,485 |
| Capay-East Park | 1,880 |
| Santa Rosa | 5,015 |
| Clear Lake | 3,460 |

Methods:

Given the types of information which are required in order to develop a population density estimate and the differing means by which they must be derived, two phases are planned for this project. In the first phase, collaring of deer will commence starting in the fall of 2016 after the A Zone deer hunting season has closed. Capture methods will follow CDFW *Departmental Policy on the Use of Pharmaceuticals in Wildlife* (WIL Restraint Handbook) and the "Capture Plan for the Greater Monticello Deer Abundance Project". Efforts will entail the placement of up to 30 GPS collars on deer depending on availability of lands within the DCU. The goal is to collar fifteen does and fifteen bucks in the late fall of 2016 through spring of 2018 in order to assess average annual home range size.

In phase two, 30 fecal DNA transects will be established during the late spring through fall 2017.. 30 additional transects will be established in 2018. . Methods will follow Brinkman (2011) (Lounsberry et al. 2015; Brazeal et al. 2016; Furnas 2015). Stratified, random sampling will be used to select thirty sampling hexagons. One transect, 1.2 km by 2 meter wide will be

established in each hexagon. Transect starting points will be randomly selected, marked and existing fecal pellets cleared. Each transect will be revisited three times. Iridium/GPS collars and unbaited camera stations will be used to estimate home range size and effective area of the transect surveys. A total of 30 collars will be deployed (15 doe, 15 buck) and a camera placed at each end of the transect. (Royle 2004).

Each transect will be revisited every 7 days after establishment for a total of four visits. including the initial visit which will clear pellets, mark routes and set cameras . If no pellets are collected from a transect after two visits, the transect will be discontinued. Pellets collected will be preserved in 95-100 % ethanol and analyzed by the genetics laboratory at UC Davis to identify individuals and gender to create a four period detection history for each animal (Furnas, 2015). This protocol has already been initiated and is in its second year within the Marin county portion of the Santa Rosa Deer Herd (Figure 3). Expansion of this effort to include the proposed project boundary will provide information relative to a substantial portion of the North Central Coast DCU.

Vegetation data will be collected for each transect per Furnas (2015). Data includes estimation for percent tree, shrub and ground cover and photo points to capture vegetation structure.

October 2016-October 2017

We will deploy up to 30 iridium satellite collars onto deer within the Monticello Deer Herd portion of the study area to ascertain average home range size. If we are unable to collar this number during this period the capture period may be extended through the fall of 2018. Fecal DNA collection will occur in 2017 and 2018 concurrent with home range and seasonal use determination.

2018

May through August: Revisit pellet transects established in the Study Area for year two.

Products and due dates:

Progress reports will be submitted to the Wildlife Branch per the LMAC reporting process.

Data will be delivered to the Wildlife and Habitat Data Analysis Branch and will contain the following:

Quarterly progress reports will be submitted by:

- January 15, 2017
- April 15, 2017
- July 15, 2017
- October 15, 2017
- January 15, 2018
- April 15, 2018
- July 15, 2018
- October 15, 2018

A Final report containing the following items will be submitted by December 31, 2018:

- Data including range maps and average home range size with sample locations, numbers of individuals b:

upon genotypes, habitats, etc)
- Results (population estimates and confidence intervals)

Collaborators

CDFW Project Leads:
Bay Delta Region : Conrad Jones, Stacy Martinelli
North Central Region: Joshua Bush, Terri Weist

Wildlife Branch Deer Program: Stuart Itoga, Brett Furnas

Personnel Requirements and Funding from CDFW
Regional and Branch personnel will be used to assist in data collection. Data will also be collected by CDFW scientific aids.

CDFW funding sources:
Funding for satellite collars (Big Game Account), two scientific aids and DNA testing will be provided by Big Game funds.

Personnel Requirements and commitments from CDFW
Two Unit biologists (Environmental Scientists) will be involved with this study. Four scientific aids will collect and process fecal pellets. Two scientific aids will be funded by the Big Game Management Account .

All deer captures will be led by Environmental Scientists.

Budget Detail.
The proposed budget is found in Table 2. A total of 30 collars is included in this table.

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White, G.C. 2008. Closed population estimation models and their extensions in program MARK. Environmental and Ecological Statistics. 15: 89-99.