

# ***Determining the habitat connectivity of tule elk in the Northern San Joaquin Valley, California***



Proposed Start and Completion Date:  
July 2014 through July 2020

## Executive Summary

The proposed project will provide the Department of Fish and Wildlife (DFW) with critical baseline information needed to effectively manage tule elk populations in the northern San Joaquin Valley and portions of the adjacent coast range. Outfitting elk with GPS/satellite collars will allow DFW to collect detailed spatial information on group home range attributes and core use areas; increasing the efficiency of future survey efforts. Connectivity and amount of movement between core use areas by subgroups will also be evaluated to guide future management decisions and land-use planning. This proposal requests funding to complete the identified tasks of determining elk distribution and habitat connectivity. The objective of this study is to obtain current spatial and demographic data to determine sizes and composition of groups, habitat selection, movement patterns, survival, mortality factors, and to obtain genetic diversity data (for future genetic diversity project).

## Statement of Need

Based on data from fixed-wing aircraft surveys, the numbers of groups and number of individuals within groups is highly variable (from 8-22 and 2-85 respectively); conservative estimates suggest there are at least 200 animals in the project area (2012 CDFW Survey Data).

It is suspected by CDFW that a substantial portion of groups are missed during aerial fixed-wing population surveys. Like most ungulates, tule elk exhibit a highly fluid population dynamic (Bowyer 2004) based on sexual segregation and resource need. At times various bull and cow subgroups will comingle and share resources but at other times are intolerant of each other so detailed current spatial and temporal data is needed on each of the individual subgroups in order to make informed management decisions. Currently DFW lacks detailed knowledge of elk subgroup information, movement patterns, connectivity, corridors, barriers, and detailed population information for elk in this area.

Information on movement corridors between habitat patches is needed to identify and model critical habitats, linkages, and barriers to movement. Without the information provided by this project, habitat planning and appropriate mitigation for anthropogenic development will not be adequate to maintain these subpopulations of tule elk in the future.

The information from this project will benefit current and future management and conservation practitioners by providing them with spatial and resource selection information which describe and delineate areas of important use such as home ranges, calving areas, habitat use, barriers, and metapopulation movement corridors.

## Introduction

Tule elk were nearly extirpated in the late 1880's but through a series of translocations, tule elk have been reintroduced to many parts of their former range and their numbers have risen to over 4,000 statewide (CDFW data). Starting in 1990, tule elk were initially reintroduced to the San Luis Reservoir area in Merced County. This area is within native elk range, but due to movement barriers (cities, roads, canals, and agriculture) the elk are relegated to the foothills and can no longer congregate and mingle down in the Central Valley as reported by

McCullough (1971); and are becoming increasingly fragmented into spatially as well as genetically isolated subpopulations

Through a series of reintroductions, approximately 4,300 tule elk now exist in 22 herds but most of these herds are spatially isolated. Better estimates of population and distribution are identified in the draft Statewide Elk Management Plan for elk in this area.

The elk subpopulations around San Luis Reservoir are grouped into the San Luis Tule Elk Hunt Zone. Three public tags are allocated to this hunt each year and one PLM (Private Lands Management) property receives 3 tags. Currently there are two potential applicants to the PLM program that are requesting to hunt elk as a means to alleviate depredation damage. Locational data provided by GPS collars can be used to assess whether survey flights are occurring at the optimal time to detect the highest number of animals. A better minimum population estimate will allow the DFW to assess current hunt tag allotments and make adjustments that can help alleviate depredation damage caused by elk. The proposed project is aimed at deploying GPS collars on elk in different subpopulations surrounding the reservoir to increase the efficiency and accuracy of population surveys, determine current home ranges, critical habitat, barriers to disbursement, and habitat linkage corridors. Remote cameras will be used to evaluate specific corridor use (e.g. underpasses, highways, fence lines, etc.). Skin samples will also be collected for a future genetic viability study. The information gathered from this project will be used to make informed management decisions regarding habitat preservation, mitigation measures for human development, hunting regulations, and the long-term genetic viability of elk. As California's human population continues to increase the need for detailed locational data to facilitate these types of management decisions is crucial.

Results from this study can be used at the Regional level to identify real and potential physical barriers, and provide the information to preserve critical habitat. The population data will be used by Program for hunt tag quotas within the project area and statewide. DNA samples collected during the captures will be preserved to determine the level of genetic diversity among metapopulations statewide.

### Goals and Objectives

The primary goals are to obtain detailed spatial and population data and to identify barriers to movement through habitat linkage corridors.

Objective 1: Distribution and Movement– To determine the distribution of subgroups within the study area. Data received from GPS collars will be analyzed to accomplish the following:

- 1) Determine the locations and attributes of core use areas including calving areas.
- 2) Identify when and where bachelor groups of bulls disperse from the subgroups.
- 3) Identify potential barriers to movement including anthropogenic and natural physical barriers, and assess the functional connectivity of these routes.
- 4) Determine patterns of habitat use (e.g., home range) within primary core areas

Objective 2: Population Assessment – To estimate sizes of subgroups, age and sex composition, and total abundance within the project area. Spatial data from GPS collars will be analyzed to further refine timing and location for future aerial surveys. Remote cameras will be used to evaluate attributes of barriers to movement.

Objective 3: Additional data collection

- 1) Collect DNA samples for a genetic viability study being proposed by Wildlife Branch.
- 2) Determine survival rates of adult radio-collared tule elk.

## Methods

The study area is focused around the San Luis Reservoir in Merced County (figure 1) but captures will also occur in areas adjacent to the reservoir in western Stanislaus and eastern Santa Clara counties. Tule elk will be captured using a helicopter and net gun to attach GPS collars and collect biological samples. Ground darting or trapping may be used in areas where access for the helicopter is restricted and/or too dangerous.

### Objective 1: Distribution and Movement

The initial goal is to put collars on 20% of the estimated 200 animals surrounding the reservoir. Collars will be deployed on bulls and/or cows depending on the composition of the group. Biological samples required by WIL (blood, hair, and parasites) will be collected during the capture as well as a skin biopsy for future DNA analysis. Animals will be released on site.

The majority of captures will occur in the second year of the project and the collars are scheduled to remain on animals for 3 years. Collars retrieved from expired animals will be redeployed as soon as helicopter time or ground captures can be scheduled. The collars will be programmed to collect fine scale habitat usage and movement information and have the ability to be remotely downloaded to facilitate early and timely data analysis

Data from the collars will be downloaded and analyzed using ArcGIS. Distribution, critical habitat and usage, barriers, and corridors will be identified from movement patterns and confirmed through a site visit if access allows or through GIS habitat data layers.

In addition remote cameras will be utilized to assist in evaluating barriers to movement through and between habitat patches. Remote cameras have been found to be a reliable cost-effective means of monitoring wildlife in other studies (Ford Et al. 2009).

### Objective 2: Population Assessment

Home ranges and distribution will be analyzed using ArcGIS. Areas and timing of use will be evaluated to identify core use areas to concentrate abundance surveys.

### Objective 3: Survival and DNA collections

Survival will be estimated via weekly collar downloads.

DNA will be collected and stored as part of a future project examining DNA and genetic variability in tule elk across California.

### Equipment needed:

GPS collars (x 40)

Capture and processing supplies (immobilization drugs, syringes, blood tubes, etc.)

Genetic sampling equipment (desiccant beads, ear punches, paper bags) etc.

Remote cameras (x 20)

This study is designed to run for 6 years. Year 1 will entail capture plan preparation and materials acquisition. Year 2 is when the bulk of the captures are scheduled to occur. Year 3 and 4 will involve preliminary data analysis to determine if additional samples are needed and the captures to redeploy collars. Year 5 and 6 will focus on detailed data analysis and project write-ups.

Data will be stored in an Access® database created by the project lead and in various spreadsheet and text file applications housed in the Central Region with copies available for use in BIOS (wildlife critical habitat linkage database) and on a DFW secure network drive.

Products (and estimated dates of completion)

<b>Product</b>	<b>Date of completion</b>	<b>Recipients</b>
Project Plan	1 July 2015	LMAC, Region, Program
Capture Plan	1 July 2015	LMAC, Region, WIL, Program, Directorate
Quarterly reports*	Quarterly	
Progress reports*	1 July 2015	LMAC/Region/Program/Funding NGOs
	1 July 2016	"
	1 July 2017	"
	1 July 2018	"
Final report	1 January 2020	LMAC/Regions/Program, State Parks, SWRCB, Funding NGOs, RAP Scientific community at large

\* Annual progress reports will include preliminary evaluation of project towards meeting initial objectives and provide feedback to management (adaptive management design/context).

Summary of data archived at Wildlife and Habitat Data Analysis Branch

<b>Data</b>	<b>Description</b>
Habitat use areas	Areas used and occupied by subgroups for vital functions
Movement corridors	Areas used to move between subgroups and/or habitat areas
Critical habitat area	Areas deemed critical to protect from development/degradation

Collaborators

Project lead -Cristen Langner – Central Region  
 Joe Hobbs – Wildlife Branch  
 Jack Harper – Sector Superintendent II, California State Parks  
 Jim Thomas – Chief of Field Division, CA State Water Resources Control Board, Fisk Dam  
 Chris Eaton – Defrancesco/Eaton Ranch, current PLM  
 Joseph Rubino – Harris Ranch, potential PLM  
 Mitt French – French Ranch, potential PLM

Program Planning

The Central Region and Wildlife Branch will coordinate and review the progress of the project after the completion of each annual report and evaluate future needs and priorities. Subsequent project proposals will be submitted as future project needs are identified.

Other Resources requested from CDFW

Previous elk survey data may be requested from Wildlife Branch to assist in locating possible subgroup locations.

Issues to be Resolved

Issues to be resolved include formalizing the capture plan. Additional private land access may be needed for the captures and to assess habitat features.

Purchase of telemetry equipment (collars)  
 Permits from CA State Parks and CA SWRCB for capture and monitoring work performed on their respective properties.  
 Coordination for the outside funding request from the Rocky Mountain Elk Foundation.

Required Products

Product	Date of completion
Quarterly progress reports	Quarterly after project initiation
Annual progress reports	1 July of each project year
Final report	1 January 2020
Publications	1 July 2020
Data delivery date	1 July 2020

Personnel Requirements and commitments from CDFW

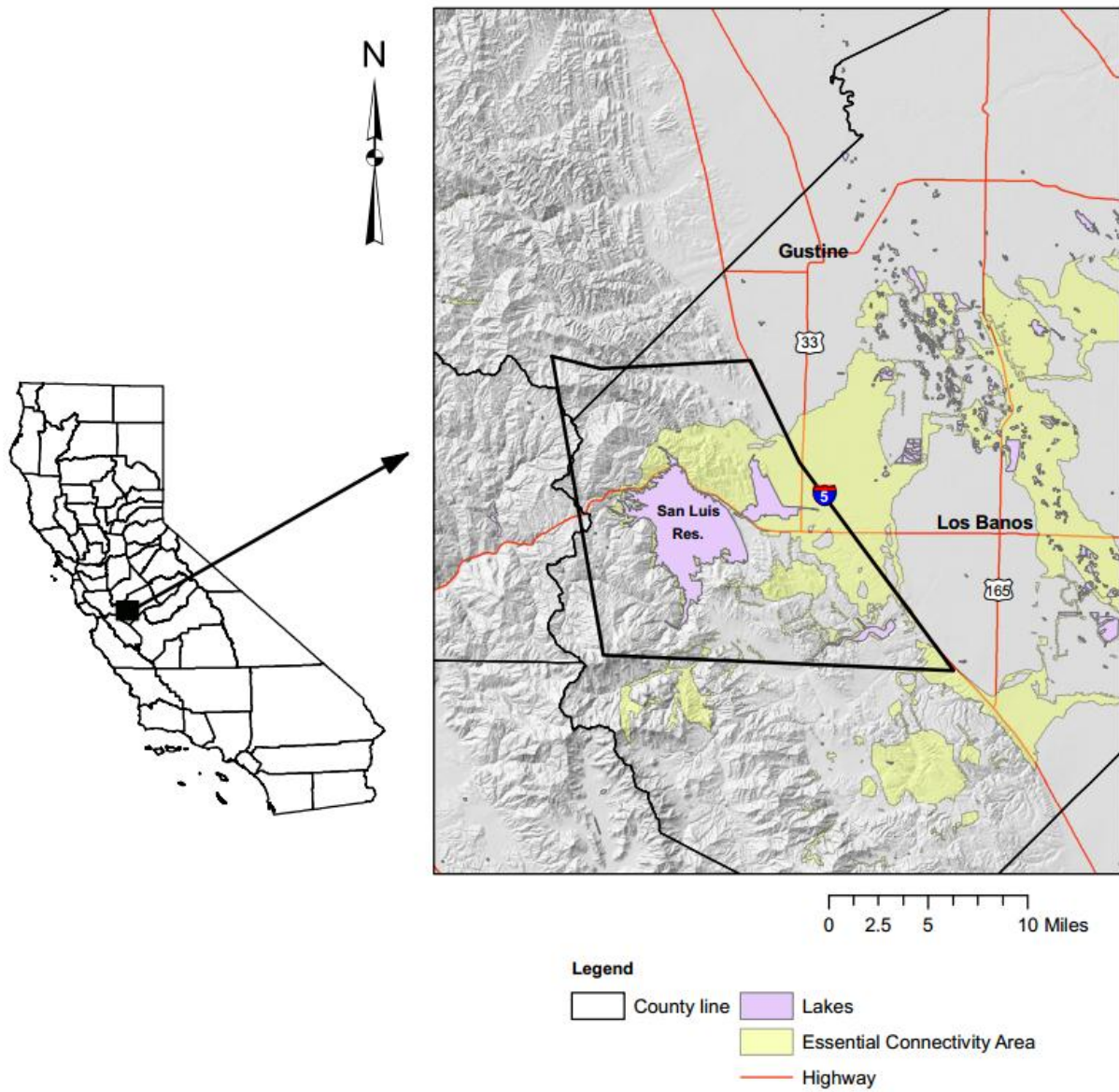
Regional Biologist (x 1)	15%
Regional Biologist (x 1)	5%
HQ Biologist (x 1)	3%
Scientific Aide	100%
WIL for Capture	2 staff @ 100% for 2 day capture
GIS analysis (Regional staff)	100% for approximately 10 days

Budget Detail - per year budget detail by activity/task and broken down by:

Item	Year 1 (14/15)	Year 2 (15/16)	Year 3 (16/17)	Year 4* (17/18)	Total
<i>Internal Staff Time</i>					
1. <i>Sci Aide Time</i>		25,000	25,000	25,000	75,000
<i>Operating</i>					
<i>Helicopter captures</i>		34,000	7,000	7,000	50,000
<i>GPS Collars (x35)</i>	143,500				143,500
<i>Receiver</i>	2,000				2,000
<i>Trail cameras (x 20)</i>	3,000				3,000
<i>Biological sampling equipment</i>	400	200	100		700
<i>Additional ground captures</i>		2,000	2,000	1,000	5,000
<i>Misc. equipment/batteries</i>	4,000				4,000
<b>Totals</b>					279,200
<i>Funding Sources</i>					
1. <i>Big Game Mgmt Account</i>					277,200
2. <i>Rocky Mountain Elk Foundation†</i>		GPS collars (x5)			20,500
<b>Totals</b>					<b>299,700</b>

\* No funds are requested for years 5 and 6

† Anticipated



**Figure 1. Tule elk habitat connectivity study area, Merced county, California**

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