

# RESPONSES OF MULE DEER TO EXPERIMENTAL MANIPULATION OF WATER SOURCES

Progress Report  
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31 December 2014

## Executive Summary

The last of the collars that will be used for this round of analyses have dropped off the animals; 16 of the 25 collars were retrieved, and efforts are underway to retrieve the remainder. Two collars failed to release from the animals and these individuals will have to be recaptured during the annual capture in February. Tony Bush, the graduate student working on this phase of the project currently is in the process of downloading and formatting collar data for upload into our access database, and then complete subsequent analyses. Additionally, he is currently investigating possible covariates to include in the known fates analysis, as well as GIS layers for use in the birth site selection analysis.



## Accomplishments as of 31 December 2014:

- All weather data from 2008-Dec 2014 (average temperatures, precipitation, PDSI) has been compiled, organized, and Z-standardized by month, season, and annually
- Known Fate input file has been completed and is ready to upload into Program MARK, pending inclusion of appropriate covariates.
- 86 birth sites from previous collar data have been identified.
- Pregnancy and fetal rates compiled for 2009-2014 were compiled
- All fawn survival data from 2013-2014 has been compiled and formatted

## *Demographic Analyses:*

- During the next report period, we will be doing a Known Fates analysis in Program MARK.
- Data from 132 individuals will be included in that analysis
- The fates of those individuals over a period of 71 months will be analyzed.
- Potential covariates to be included in the Known Fates analysis include the following:

- Body fat/Body condition indices, investment costs (pregnancy, twinning etc), study area, home range size, distance to water, distance high traffic roadways, environmental factors (average temperature, precipitation, drought severity, etc)
- Additionally, we also will be attempting to run a known fates analysis on fawn survival
  - We will use weeks as the occasion
  - A total of 46 fawns will be included in the analysis
- Will also be examining pregnancy rates ( $n = 137$  individuals) and fetal rates ( $n = 83$  individuals) relative to body condition and other covariates.

*Birth site selection analyses:*

- We currently have 86 birth sites estimated from movement using GPS location data, and anticipate that up to 25 additional sites will be included in the analyses
- Ten birth sites have been identified via GPS from 2013, and also estimated using the movement data.
  - Twenty-three paired samples will be available from 2014, for a total of 33 GPS-location and VIT location comparisons.
  - These will be used to assess the level of error associated with the process of estimating birth site location and characteristics determined using each of these techniques.
- As of 31 December 2014, the following tasks have been accomplished.
  - We have obtained coarse scale USGS habitat type GIS layer of the study area (Thomas et al. 2002)
  - Digital Elevation Models (DEMs) have been obtained and will be used to calculate elevation, slope, and aspect associated with animal locations.
  - Point coverages of all permanent water sources, roads, and birth sites have been created.
- Additional needs
  - A metric for landscape heterogeneity
  - A metric for ruggedness still must be developed
  - A finer vegetation classification coverage could be necessary

**Tentative schedule of activities 1 January–30 June 2015**

- January
  - Retrieve the rest of the dropped collars
  - Finish estimating all birth sites
  - Finish creating home range files for all individuals
  - Finalize list of covariates for Known Fate analysis
  - Western Section of the Wildlife Society Meeting (Jan 26-30)
    - Oral presentation will be made
- February
  - Nevada Chapter of The Wildlife Society Meeting (Feb 11-12)
    - Oral Presentation will be made
  - Run Known Fates Analysis and begin writing
  - Complete annual capture in Mojave National Preserve (Feb 23-28)
  - Initiate birth site selection analysis

- March–June
  - Finish birth site selection and begin habitat selection analyses
  - Finalize all other analyses
  - Complete M.S. Thesis, and submit chapters for publication
  - Initiate fawn capture and collaring effort for next project year
  - Complete and submit annual report to CDFW Wildlife Branch

### **Financial Accounting 1 July–December 2014**

Personal Services	\$ 4,380
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### **Anticipated Expenditures 1 January–30 June 2015**

Telemetry equipment	\$30,000
Capture Services	\$30,000
Personal Services	\$ 8,000

### **Products to Date**

Bleich, V. C. 2010. Deer capture activities in Mojave National Preserve, 25–30 April 2010. *California Wild Sheep*, Summer 2010:8–9.

Darby, N., J. Dungan, K. Stewart, V. Bleich, and D. Hughson. 2009. Responses of mule deer to experimental manipulation of water sources: preliminary results from the first year.

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Horner, M. 2009. Park staff assist at Mojave National Preserve with deer capture. *The Midden* (Summer 2009):7 [available at

<http://www.nps.gov/grba/parknews/upload/2009summersmall.pdf>]

McKee, C. J. 2012. Spatial patterns and population performance of mule deer: responses to water provisioning in Mojave National Preserve, California. M. S. Thesis, University of Nevada, Reno, USA.

McKee, C. J., K. M. Stewart, V. C. Bleich, N. Darby, and D. Hughson. 2010. Effects of water manipulation on mule deer in Mojave National Preserve, California. Poster presented at the 17th Annual Meeting of The Wildlife Society, Snowbird, Utah (*abstract published*).

McKee, C. J., K. M. Stewart, and V. C. Bleich. 2011. Survival patterns of mule deer in an ongoing habitat manipulation study in Mojave National Preserve. Annual Meeting of the Nevada Chapter of The Wildlife Society Symposium, Reno, Nevada (*abstract published*).

McKee, C. J., A. P. Bush, K. M. Stewart, V. C. Bleich, J. S. Sedinger, N. W. Darby, and D. L. Hughson. *In review*. Space use patterns of mule deer: responses to provision of water and effects of wildfire. *Journal of Arid Environments*.

Simpson, N. O., K. M. Stewart, and V. C. Bleich. 2011. What have we learned about water developments for wildlife? Not enough! *California Fish and Game* 97:190–209.

Stewart, K. M. 2012. Responses of mule deer to experimental manipulation of water sources. Project final project report to the California Mule Deer Association. University of Nevada, Reno.

Stewart, K. M. 2012. Use of artificial water sources by mule deer in Mojave National Preserve. A report to the California Deer Association. University of Nevada, Reno.

- Stewart, K. M., and A. Bush. 2014. Use of artificial water sources by mule deer in Mojave National Preserve. Unpublished report to the California Deer Association. University of Nevada, Reno.
- Stewart, K. M., J. S. Sedinger, V. C. Bleich, and D. L. Hughson. 2007. Responses of mule deer to experimental manipulation of water in Mojave National Preserve. Unpublished research proposal submitted to the National Park Service and California Department of Fish and Game. University of Nevada, Reno.
- Willers, J. 2013. Mojave deer project (video). Nine Caribou Productions, Minden, Nevada. [Available at <http://9caribou.com/Projects/MojaveDeer.html>].