

BCCE Desert Tortoise Telemetry and Health Assessments  
Clark County, Nevada

**Final Project Report**



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CONTRACT TITLE: BCCE Desert Tortoise Telemetry and Health Assessments  
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## EXECUTIVE SUMMARY

Project Number: 2021-GBI-2030A

Contract Title: BCCE Desert Tortoise Telemetry and Health Assessments

This report documents monitoring of Mojave desert tortoise (*Gopherus agassizii*) at the Boulder City Conservation Easement (BCCE) by the Great Basin Institute (GBI) from late 2018 through 2023. The Clark County Desert Conservation Program (DCP), U.S. Fish and Wildlife Service (FWS), and U.S. Geological Survey (USGS) translocated tortoises to monitor the effectiveness of translocation efforts. GBI coordinated with the DCP to conduct telemetry monitoring of radio-transmitted resident and translocated desert tortoises at BCCE after translocation.

In collaboration with DCP and FWS, GBI provided desert tortoise handling and telemetry training, field data collection, logistical support, quality assurance/quality control (QA/QC) data checks, and GIS mapping. GBI hired a support staff each year consisting of a data specialist responsible for data QA/QC and GIS mapping, and a field crew consisting of telemetry supervisor and a telemetry technician. Additional field staff associated with other projects occasionally assisted with telemetry data collection.

Transmitted tortoises were monitored year-round using a VHF receiver and directional antenna. Location data was collected on each individual at least once monthly November through February, and weekly March through October. The transmitters used have a lifespan of 30 months. To maintain functional transmitters, a two-year transmitter replacement schedule was established. Transmitters were replaced following established FWS protocol.

From 27 November 2018 through 10 November 2023, 32 resident and 42 translocated tortoises were monitored in the BCCE. Telemetry was conducted over 773 days with 8309 observations, for an average of 10.7 observations per day. Additionally, 33 health assessments were completed on transmitted tortoises in spring 2022.

## INTRODUCTION

### Project Background

The Mojave desert tortoise (*Gopherus agassizii*) is federally listed under the Endangered Species Act as a species threatened with extinction (USFWS 1990) and is a priority species for conservation under the Multiple Species Habitat Conservation Plan in Clark County, Nevada (Clark County 2000). In an effort to study the desert tortoise populations of Clark County, DCP contracted GBI to perform desert tortoise telemetry monitoring on tortoises in the Calcid alluvial fan zones in the northeast portion of BCCE. In 2014, 40 tortoises from the DTCC were translocated to BCCE and were tracked alongside 13 resident tortoises using radio-telemetry to evaluate behavior and survival for a 4-year monitoring period. This project continued the

tracking effort for an additional 5 years and also included health assessments of tortoises during the spring of 2022.

### Project Description

In 2014 translocated and resident tortoises were affixed with semi-permanent transmitters in BCCE. To make up for deceased and missing individuals, additional translocated and resident tortoises have been transmittered and added to the observation list in subsequent years, and may continue to be added in the future. The data collected provides information to assist in determining survivorship, habitat use, overall health, and movement patterns of translocated and native populations as detailed in the project scope of work.

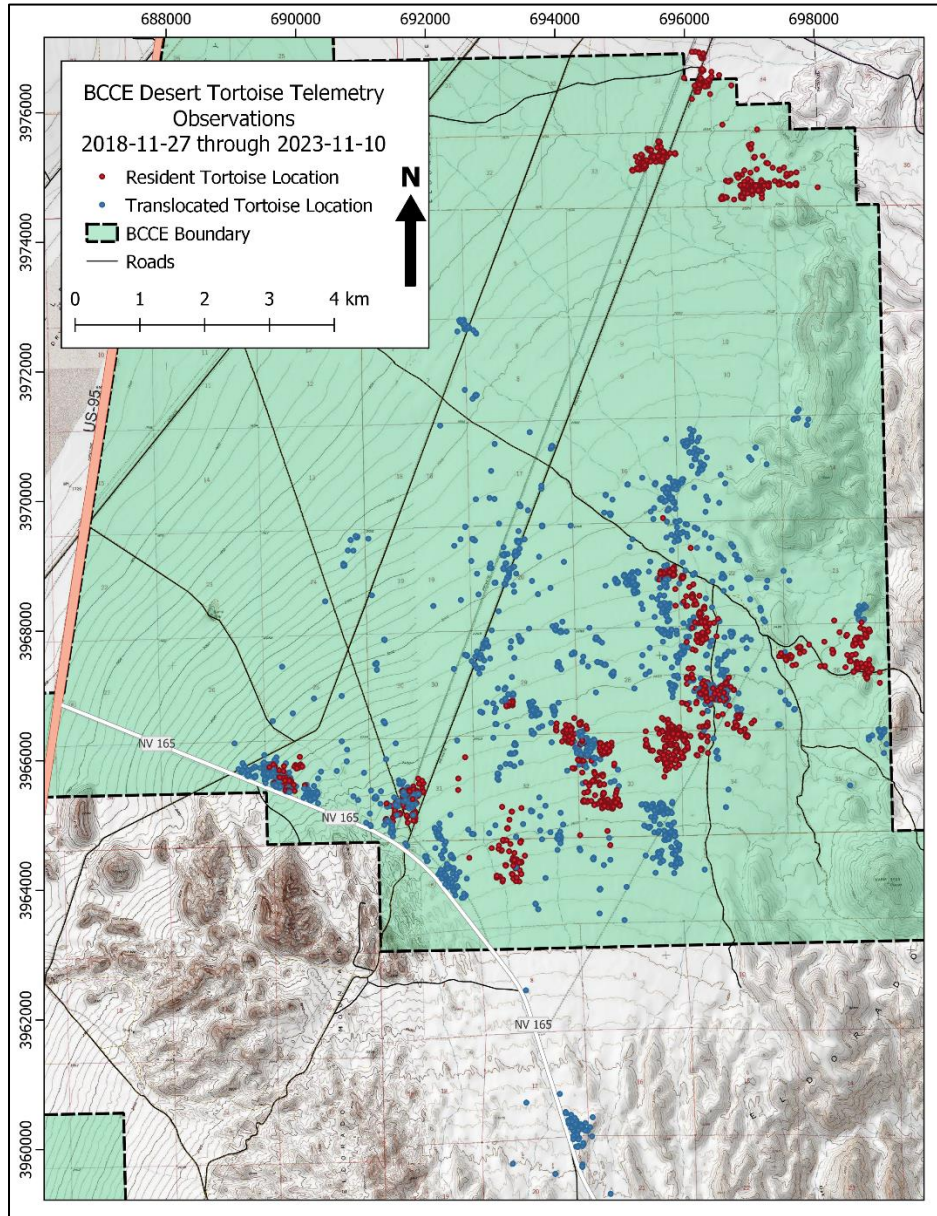


Figure 1. Observations of transmittered tortoises in BCCE 27 November 2018 through 10 November 2023.

### Project Goals and Objectives

The overarching objectives of BCCE Desert Tortoise Telemetry and Health Assessments (Years 1-5) are to:

- Continue monitoring of resident and translocated desert tortoise started in 2014
- Collect telemetry data on up to 60 adult tortoises

- Acquire information regarding home range size, settling rates, survival, and habitat use for resident and translocated populations of desert tortoise
- Improve the effectiveness of translocation methods and monitoring procedures
- Collect health data on all transmittered tortoises

## METHODS AND MATERIALS

### Telemetry

Telemetered tortoises were monitored year-round in order to track movement patterns and survival, using a VHF receiver and directional antenna. Location data were collected once per month from November through February, and once per week during the active season from March through October. All data were collected in both hardcopy and electronic format, starting with Trimble Juno SB Handhelds and transitioning to Esri Survey123 on smartphones or tablets in April 2021. In late February 2022, the data collection forms were updated by USFWS and some of the field names were corrected to better match the original field names from the Juno database. Table 1 below shows the 2 versions of the field names separated by a “/” when relevant.

Table 1. Observation data collected in the Juno and Survey123 collection forms these fields.

<b>Metric Categories</b>	<b>General Metric <i>Fields/Entries</i></b>
Site	<i>tracking_site/GO_site</i> = <u>BCCE</u> (distinguishes BCCE data from other projects)
Observer and Date	Telemetry surveyor name ( <i>observer</i> ) and date of data collection ( <i>tracking_date/date_</i> )*
GPS Coordinates	Coordinates recorded in UTM zone 11 using internal gps ( <i>gps_easting, gps_northing</i> ), with Garmin gps for verification and backup (when <i>gps_grab_valid</i> = <u>no</u> , use <i>manual_easting, and manual_northing</i> )
Time	User-entered time ( <i>time_</i> ) and automatic time stamp ( <i>TimeStamp_</i> )
Tortoise Identification	Tortoise number ( <i>tort_num</i> ) and transmitter frequency ( <i>trans_freq/transmitter_freq</i> )
Habitat data	Fields for <i>tort_location</i> (e.g., <u>SoilBurrow</u> ) and <i>tort_environment</i> (e.g., <u>OpenScrub</u> ) with dropdown menus
Visibility Data	Field for binary <u>yes/no</u> visibility of tortoise ( <i>visible</i> ), plus <i>burrow_visibility, tort_in_burrow_visibility, and tort_visibility</i> (for use when tortoise is outside of burrow) that use dropdown menus with options for <u>NotVisible, Low, Medium, and High</u>
Distance to Burrow	<i>dist_to_burrow_m</i> = 0-15m radius searched for burrows, if there are none within this radius then 100m is recorded.
Behavior	<i>behavior</i> = drop down menu with multiple options
photos	Two photo fields are provided in the Survey123 form
comments	General <i>comments</i> field and fields for photo comments ( <i>photo1_comment, photo2_comment</i> ) in the Survey123 form

\*Note that in the old version of the Survey123 database (prior to March 2022), in the parent table *tracking\_date* was the timestamp and *date\_* was the user-entered time, while in the child tables *tracking\_date* was the user-entered time and *TimeStamp\_* was properly labeled. In the new database, *TimeStamp\_* is properly labeled in all tables and *date\_* refers to the user-entered date.

## Health Assessments

Health assessments began on 22 April 2022 and continued through 16 May 2022. Thirty-three tortoises were examined following USFWS guidelines. One tortoise (FW9995) was never above ground during exam attempts and so could not be assessed. The remaining transmittered tortoises had either died or been lost before health assessments could be completed.

Blood and oral samples were collected for all 33 tortoises. Oral swabs were sent to the San Diego Zoo Institute for Conservation Research Molecular Diagnostics Laboratory for qPCR testing for *Mycoplasma agassizii*, *Mycoplasma testudineum*, and Testudinid herpesvirus 2. Blood samples were sent to the Mycoplasma Laboratory of the Department of Infectious Disease and Pathology at University of Florida for ELISA serology tests for *Mycoplasma agassizii* and *Mycoplasma testudineum*. Oral, blood, and tick samples were also sent to the Department of Ecology and Evolutionary Biology at University of California Los Angeles for sample banking.

## Data Processing

Survey123 data were uploaded from the phones/tablets to ESRI ArcGIS Online servers, then downloaded to a Microsoft Access database. Once data were transferred to Access they were loaded into a “correction” database, examined for errors using automated QA/QC scripts (telemetry data only) and visual checks (telemetry and health assessment data), and corrected.

## RESULTS

### Objectives Completed

From 27 November 2018 through 10 November 2023 (Year 1-5):

- Monitored 32 resident and 42 translocated transmittered tortoises
  - 74 tortoises tracked
  - 8,309 observations
- Conducted health assessments on all tortoise available for assessment in spring 2022
  - 33 health assessments completed

Beginning 27 November 2018, 32 resident and 42 translocated tortoises were monitored in the BCCE (Table 2). Telemetry monitoring was conducted over 773 days with 8,309 observations (Figure 1), averaging 10.7 observations per day and 112.3 observations per tortoise. Over the course of the project 105 radio transmitters were replaced. Additionally, 31 tortoises were found dead (12 resident, 19 translocated), 3 could not be relocated, 3 were separated from their transmitters (possibly by predation), and 1 was removed from the study after it left the project area boundaries. To help replace lost and deceased tortoises, 28 individuals were added to the observation list throughout the project period (15 resident, 13 translocated). As of 10 November 2023, there were 36 tortoise with active transmitters in the study (17 resident, 19 translocated).

Health assessments were completed in spring 2022, and of the 33 tortoises available to be assessed there were 23 rated as a “4” on the Body Condition Score scale (considered lean), and the remaining 10 were rated “3” (thin). University of Florida ELISA serology tests showed that 12 individuals were negative, 15 suspect, and 6 positive for *Mycoplasma agassizii*, while *Mycoplasma testudineum* test results showed 27 negative and 6 suspect cases.

Deliverables from the project period included 58 monthly data submissions, a health assessment progress report, 20 quarterly progress reports, and 4 annual reports, among others.

Table 2. BCCE observations of tortoises by telemetry from 27 November 2018 through 10 November 2023

Status	Total Tortoises Transmitted	Tortoises added	Tortoises subtracted (deceased, lost, removed)	Number of Days	Total Observations	Average Observations per Day	Average Observations per Tortoise
Resident	32	15	15	737	3636	4.9	113.6
Translocated	42	13	23	755	4673	6.2	111.3
<b>TOTAL</b>	<b>74</b>	<b>28</b>	<b>38</b>	<b>773</b>	<b>8309</b>	<b>10.7</b>	<b>112.3</b>

## DISCUSSION

GBI successfully carried out telemetry tracking of resident and translocated tortoises throughout the 5-year project period. A relatively high rate of mortality, particularly in 2022, resulted in the need to add 28 tortoises to the study in order to maintain useful sample sizes. Preliminary interpretation of the data suggests that translocated tortoises had greater mortality rates than resident tortoises (45.2% mortality among translocated tortoises vs. 37.5% mortality among residents). However, a more in-depth analysis taking into account length of time in the study for each individual must be conducted in order to properly analyze mortality rates. Translocated tortoises also appeared to move much greater distances than resident tortoises, although further analysis is needed to separate movements made during initial post-release settling periods from long-term home ranges.

## CONCLUSION

These data will help DCP, FWS, and other researchers to analyze differences between resident and translocated tortoises with regards to home range size, settling rates, survival, and habitat use as well as inform future translocation, monitoring, and conservation efforts.

## RECOMMENDATIONS

- Monitoring of the remaining resident and translocated tortoises should continue.
- Additional tortoises should be added to the study to improve sample size.

## LITERATURE CITED

- Clark County. 2000. Final Clark County Multiple Species Habitat Conservation Plan and Environmental Impact Statement for Issuance of a Permit to Allow Incidental Take of 79 Species in Clark County, Nevada. September 2000.
- USFWS (U.S. Fish and Wildlife Service). 1990. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Mojave Population of the Desert Tortoise. Federal Register 55:12178–12191.