Translocation Monitoring Proposal

FROM: Ann M. McLuckie, Utah Division of Wildlife Resources
TO: Technical Committee members
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SUBJECT: DRAFT Proposal on Post-Release Monitoring of Translocated Tortoises

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INTRODUCTION

Translocation has become an increasingly important conservation strategy for desert tortoises to reestablish populations in formerly occupied habitat (Tuberville et al. 2005), augment low-density areas (Field et al. 2007; Nafus et al. 2017), reduce human-wildlife interactions (Heaton et al. 2008; Esque et al. 2010) and relocate individuals threatened by encroaching development (Ashton and Burke 2007; Nussear et al. 2012; Dickson et al. 2019). For long-lived, slow-reproducing reptiles such as the Mojave Desert Tortoise (*Gopherus agassizii*), effective translocation programs allow displaced individuals to survive, reproduce, and ultimately contribute to species recovery. Monitoring post-release movement, habitat use, site fidelity, dispersal, and survivorship will provide vital information and insight into how translocated tortoises acclimate to new environments and contribute to population recovery (Nussear et al. 2012).

Post release tortoise movement patterns are influenced by environmental and individual variables, and translocation may result in altered site fidelity, home-range behavior and increased movement (Tuberville et al. 2005; Nussear et al. 2012). Over a 26-year period (1999 to 2023) the Utah Division of Wildlife Resources translocated 587 Mojave Desert Tortoises into the Sandstone Mountain area, within the Red Cliffs National Conservation Area. Subsequent translocation monitoring detected an increase in sheltersites and population density, limited movements relative to other translocated populations, and annual survival rates similar to adjacent native populations (e.g., City Creek area). Due to the success of our program, we expanded translocation in the fall of 2024 to the Grapevine area, within the Cottonwood Canyon Wilderness Area, Red Cliffs National Conservation Area (McLuckie and Fridell 2023). To date, we have released 50 tortoises (14 males, 7 females, 11 immatures, 18 juveniles) in and adjacent to Grapevine Wash. Unfortunately, recent reports (i.e., June 6 and August 8, 2025) identified mortality of two translocated adult male tortoises, both from the Grapevine release site. These tortoises were released in fall 2024 and spring 2025 and traveled over 3.7 km to the Grapevine Trailhead where they died from vehicle collisions due to compromised fencing.

During a recent Washington County Technical Committee (TC) meeting, members proposed releasing tortoises in the Cottonwood Wash area within the Red Cliffs National Conservation Area. To assess these locations as future translocation sites, we propose tracking translocated tortoises immediately following their release. Monitoring translocated tortoises can allow managers and researchers to: quantify dispersal distances and rates, assess and compare habitat selection and suitability of release sites, determine when individuals settle into “home-ranges” or continue exploratory behaviors, detect high-risk behaviors (e.g., long-distance wandering, pacing fence line) that may increase mortality, and evaluate differences among individuals (age, sex,

condition). A deeper understanding of these parameters will allow refinement of translocation protocols and ultimately improve conservation success.

Traditional telemetry methods (e.g., VHF) have limitations in coverage, resolution and effort. Satellite GPS telemetry offers a powerful alternative to obtain high-resolution spatial data across broader scales with lower field effort. We propose using satellite GPS radios to track post-release movements of displaced Mojave Desert Tortoises focusing on the following objectives:

1) **Quantify post-release dispersal and movement** – Determine the distance and pattern of initial movement by translocated tortoises, including rate and direction of movement away from release sites, net displacement, cumulative distance, and time to settlement into a stable home-range.
2) **Assess habitat selection after release** – Identify which habitat features (e.g., vegetation structure, terrain, shelter use) are used by translocated tortoises.
3) **Evaluate site fidelity and settlement dynamics** – Investigate how and when translocated individuals establish home-ranges, whether they show homing behavior (moving in direction of original capture location), and compare home-range size and movement stability with resident animals (i.e., Area 31).
4) **Monitor survivorship and risk behaviors** – Use telemetry and movement metrics to detect behaviors associated with elevated mortality risk (e.g., extensive wandering, barrier/road crossing, failure to shelter) and estimate survival rates of translocated individuals.
5) **Inform and refine translocation protocols** – Use empirical data on movement, habitat use and settlement to improve protocols for release site selection (e.g., Cottonwood Wash versus Grapevine Wash), refine methods, timing and ultimately enhance long-term conservation outcomes for displaced tortoise populations.

METHODS

We propose to monitor up to ten translocated Mojave Desert Tortoises (*Gopherus agassizii*) during the spring and fall, post-release, at the Grapevine and Cottonwood Wash release sites within the Red Cliffs Desert Reserve and Red Cliffs National Conservation Area. These release sites represent typical habitat for the species and include variation in structural features (e.g., vegetation, topography, cover availability) to evaluate habitat effects.

Prior to release, each individual will receive a visual health assessment (e.g., body condition, weight, clinical signs of URTD) and translocation standard protocols will be followed (McLuckie and Fridell 2023). Individuals will be fitted with satellite GPS radio transmitters (e.g., ATS, Track Tag) affixed to the carapace using epoxy/fiberglass resin. Data will be collected via satellite hourly (GPS fix schedule: e.g., 1 fix/h) during active seasons and roughly 4 h intervals during dormancy or low-activity periods (e.g., winter). In addition, we will track tortoises weekly during the active season to collect shelter and habitat data and check body condition, if possible. Depending on funding, we will monitor animals up to 36 months post-release to capture both immediate and longer-term settlement to account for annual variation from environmental variables.

We will collect data on movement metrics (e.g., hourly/daily displacement, cumulative distance, maximum displacement from release site), habitat use (GIS overlay of telemetry points with habitat covariates such as vegetation type, terrain, cover). We will analyze site fidelity and home-range by comparing movement patterns over time (e.g., initial dispersal phase vs settlement phase) using metrics such as 95% kernel density estimates, minimum convex polygon, and site fidelity analysis. We will compare movement patterns of translocated individuals to resident tortoises and the potential for mortality, specifically assessing long-distance wandering, homing towards capture location, proximity to roads, and failure to shelter/climate regulate.

We propose to use a mixed-effect model to evaluate how individual covariates (sex, age/size, body condition), and environmental covariates (terrain, vegetation, water availability, season) influence movement, dispersal, settlement and survival. Data will be analyzed using a survival analysis model (Kaplan–Meier, Cox proportional hazards). Home-range estimation (e.g., KDE, MCP) and comparison of movement metrics between translocated and resident cohorts using non-parametric tests or generalized least squares if appropriate. All animal handling and attachment of transmitters will follow approved animal care protocols and USFWS permit requirements. Transmitter mass will not exceed 10% of body mass to minimize behavioral effects. In addition, we will ensure that post-release monitoring includes welfare checks and mortality investigations when appropriate. If a translocated tortoise exhibits unsafe behavior (e.g., pacing boundary fence, low body condition score, emaciated) we will respond to ensure the safety and well-being of the tortoise.

DELIVERABLES AND CONCLUSION

We will finalize the project proposal by January 2026, initiate the project by April 2026, and provide biannual progress reports (e.g., June 30, January 15). Data will be submitted to agency partners by the end of each calendar year, and a final technical report will be completed by the end of the project.

This study will provide insights into the post-release ecology of translocated tortoises. Using satellite GPS telemetry, we will collect high-resolution spatial data to assess whether translocated individuals successfully integrate into the Cottonwood and Grapevine Wash habitats. The resulting findings will evaluate the suitability of potential release sites, identify key post-release movement behaviors, and contribute to risk assessment by linking specific behaviors to potential mortality factors. Ultimately, this research will refine release protocols to help recover the federally threatened Mojave Desert Tortoise.

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Table 1. Project deliverables for post-release monitoring of translocated tortoises in the Grapevine and Cottonwood Wash sites, Red Cliffs National Conservation Area, Washington County, Utah.

Deliverables	Description	Due Date
Final Project Proposal	Total project costs, study objectives, methods (e.g., transmitter installation) and release protocols	1/31/26
Release of translocated tortoises for study	Track translocated tortoises post release	4/1/26 to 9/30/27
Biannual Progress Report	Updates on tracking data, movement patterns, and preliminary findings	6/30/26, 1/15/27, 6/30/27, 1/15/28
Dataset Submission	GPS dataset with metadata	12/30/28
Final Technical Report	Full analysis of movement, habitat use, settlement, survivorship, and management recommendations	1/15/29

Table 2. Estimated annual project budget including workdays and total funds requested to complete project proposal within the Red Cliffs National Conservation Area and Red Cliffs Desert Reserve, 2026, Washington County, Utah.

Project Budget	Workdays	Total Cost	HCP Funds	Species Protection Account
Personnel Services:				
Project Leader	1	435	435	
Project Biologist	45	19,527		19,527
Biological Technician	45	7,785	7,785	
Subtotal		**27,747**	**8,220**	**19,527**
Current Expense:				
Vehicle Expense		2,400	1,200	1,200
Equipment[1]		13,181	10,181	3,000
Office Expense, Supplies		800	400	400
Subtotal		**16,381**	**11,781**	**4,600**
Total		**44,128**	**20,000**	**24,128**

[1]Includes up to 10 GPS satellite telemetry units.