



Date of Issuance: June 2, 2022

DESERT CONSERVATION PROGRAM PROJECT COMPLETION SUMMARY:  
**EFFECTS OF EXOTIC FORAGE ON MOJAVE DESERT TORTOISES**  
**2017-USGS-1730J**

The work for the above referenced project has been completed. Below is a summary of project related information.

**The purpose of the above referenced project was:**

In the Mojave Desert, habitat disturbances have promoted the establishment of non-native plants, so that native grasses and forbs are now intermixed with, or have been replaced by invasive, nonnative Mediterranean grasses (Beatley 1966; Brooks 1999; Drake et al. 2015). This shift in plant composition has altered food availability for Mojave desert tortoises (Esque 1994). Several studies have documented that changes in native forage can negatively affect the nutrition and health of tortoises (Oftedal and Allen 1996; Nagy et al. 1997; Nagy et al. 1998; Hazard et al. 2009; Hazard et al. 2010; Drake et al. 2016). Furthermore, recent studies on diet of juvenile desert tortoises indicate that when diets are dominated by red brome (*Bromus rubens*), the tortoises respond with less growth, lower immune-competency, and reduced survivorship (Drake et al. 2016; Esque unpublished data). Considering these effects of brome grasses on juvenile tortoise health and that many places in the Mojave Desert are frequently dominated by red brome during desert tortoise feeding seasons, the potential exists for such conditions to seriously impair recovery efforts by the influence of the loss of juvenile tortoises on demographic processes. We hypothesize that the poor health and survivorship of juvenile tortoises was at least partially due to changes in the commensal microbial communities in the gastrointestinal tract (GIT) of the tortoises that may limit nutrient absorption and physiological performance. To address these questions, we conducted a small experiment with juvenile Mojave desert tortoises (*Gopherus agassizii*; hereafter tortoise) designed to provide data essential for understanding the negative consequences of altered diets by evaluating how potential changes in the gut microbiota of tortoises may influence the growth, health, and survival of tortoises.



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**The major accomplishments or findings of this project include:**

Growth differences were documented among diet groups in our study, as tortoises foraging on commercial diet grew nearly 3x the rate as other diet groups. We expected growth and survival in tortoises eating native forbs would be higher than those fed the *Bromus* diet each month (Drake et al. 2016; Drake and Esque unpublished data); however, performance (growth and physiological responses) were largely similar among these groups. We suspect that potential parasitism from *Ornithodoros* ticks, unknown pathogens, or underlying health or disease conditions may have confounded growth and performance in this study.

For more information about this project and/or for other Project Reports or Symposium Reports, please visit our [website](#)

If you have any questions about this project please contact DCP Project Manager Scott Cambrin at (702) 455-3859.

# DESERT CONSERVATION PROGRAM PROJECT COMPLETION NOTICE

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## General Project Information

Project Category	Conservation
Compliance Category	9d-Research/Inventory/Monitoring
Project Level	Level 4
Project Title	CLOSED Effects of Exotic Forage on Mojave DT
Project Number	2017-USGS-1730J
Contractor	US Geological Survey (USGS) -Western Eco Rsrch Ctr
DCP Project Manager	Scott Cambrin
DCP Contract Manager	Sara Carrizal
Contract Start Date	1/29/2019
Purchase Order Number	4800009127-012
Contract End Date	1/30/2021

## Financial Breakdown

Funding Source	S10 17-19
Original Contract Amount	\$49,881.49
Funds not used in Contract	\$0
Final Payout Amount	\$49,881.49

## Performance Information

Total Number of Change Requests	2
Total Number of Deliverables	5
Number of Deliverables Accepted	5
Number of Deliverables Rejected	0
Number of Delinquent Deliverables	3
Total Number of Milestones	5
Number of Delinquent Milestones	2
Number of Milestones Met on Time	3
Total Number of Invoices Submitted	3
Number of Rejected Invoices	0