

Translocation Plan
NORTHEAST BOULDER CITY CONSERVATION EASEMENT

Clark County, Nevada

Progress Report and Addendum

September 2017

Prepared by

U.S. Fish and Wildlife Service and Clark County Desert Conservation Program

Purpose of translocation: Population Augmentation

Critical Habitat Unit: Piute-Eldorado

Recovery Unit: Eastern Mojave

Recipient site land ownership: Clark County

Action permitted by federal and state wildlife agencies? (list permits, BOs): Yes

federal: TE-034927-0 (Clark County MSHCP)

FWSDTRO-1 (Roy Averill-Murray, USFWS – Desert Tortoise Recovery Office)

state: 406732 (Susan Cooper, USFWS)

EA: NV-050-2005-173

BO: 2013-F-0273, 2013-F-0273.AMD1

Dates of proposed translocation: Fall 2017 through 2022

Source of translocatees: Former Desert Tortoise Conservation Center (most via the Nevada National Security Site; 2017 only); locations in the wild within the path of development, Clark County, Nevada; and privately held captive progeny

Number of translocatees: 39 adults in Fall 2017; up to 363 juveniles from captive and wild sources, subject to need and availability; additional adults to maintain population targets, subject to need and availability

Progress Report and Translocation Plan Narrative

Progress report

In fall 2014, 98 adult Mojave desert tortoises (*Gopherus agassizii*) were released to the Northeast Boulder City Conservation Easement (BCCE) translocation area according to the original translocation plan (USFWS and Clark County Desert Conservation Program 2014). A sample of 40 translocated tortoises and 13 resident tortoises had radio transmitters affixed to assess questions related to tortoise use within the habitat/soil types in the translocation area (Figure 1). As of summer 2017, 21 of the telemetered translocated tortoises are known to have died, seventeen of which are thought to be a direct result of predation (Table 1). Another three tortoises are currently missing and likely were killed by predators due to the presence of dropped transmitters and excavated burrows at their last known locations, although no remains have been located (for the purpose of analysis, these animals are treated as mortalities). Seven telemetered tortoises are missing (five translocated and two resident), which may be the result of predation, extreme movement out of the normal search range, or faulty transmitters. One translocated animal conducted two long-range movements out of the study area, the second of which was into nearby wilderness area. Due to restricted access within the wilderness area, the transmitter was removed from the tortoise and the tortoise was removed from the study. Of the original 13 telemetered resident tortoises, two died due to predation and another two are missing.

Table 1. Survivorship of adult tortoises at the Boulder City Conservation Easement						
	Telemetered Tortoises (original study animals)	Missing	Mortalities	Removed from Study	Survivorship (percent alive)*	Added after Initial Translocation
Translocated Tortoises	40	5	24	1	25.6% – 38.5%	4
Resident Tortoises	13	2	2	0	69.2% – 84.6%	9

**Calculation of survivorship rate varies based on whether missing tortoises are treated as a mortality or a live tortoise.*

Almost all mortality occurred in 2015, with only one (translocated) tortoise killed since spring 2016 (Table 2; Figure 2). Depending on how missing animals are treated, cumulative survival of translocated animals after 32 months ranges between 25.6% and 38.5%, whereas the survivorship of residents ranges between 69.2% and 84.6% (Figure 2). From the original telemetered sample, monitoring continues for 10 translocated and nine resident tortoises.

In September 2016 we decided to increase the number of tortoises being tracked and worked to find new tortoises to add to this study. We added nine resident tortoises, as well as one of the original (untelemetered) translocated tortoises. Three additional tortoises collected from construction sites on the east side of the Las Vegas Valley were translocated to the site in 2016 and added to the study. Currently, we are monitoring 14 translocated tortoises and 18 resident tortoises, with plans to continue at least through October 2018.



Northeast Boulder City Conservation Easement Translocation Area

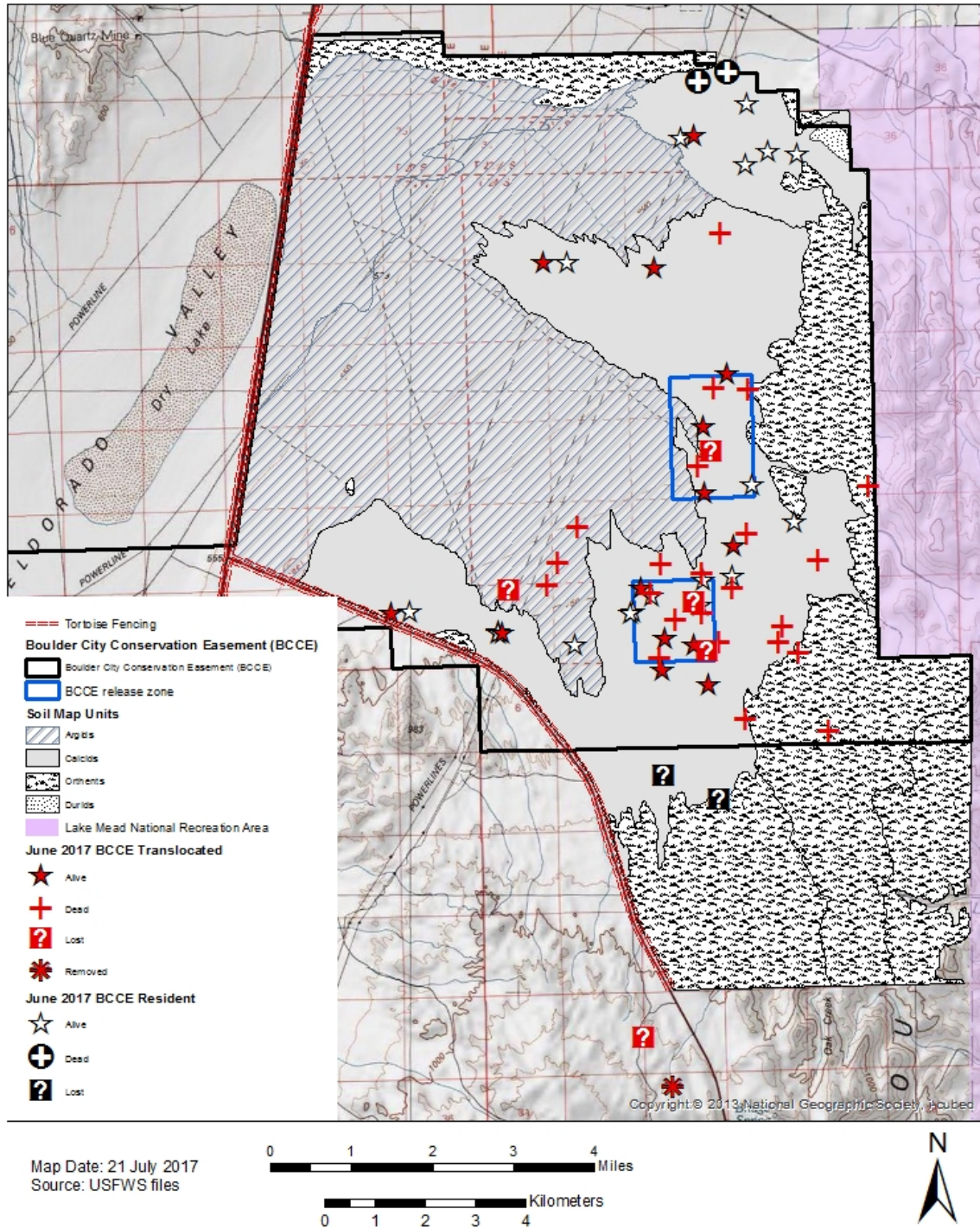


Figure 1. Locations of telemetered tortoises at the Northeast Boulder City Conservation Easement translocation area as of June 2017.

Table 2. Annual mortality of telemetered translocated and resident tortoises at the Boulder City Conservation Easement. Missing or removed tortoises are subtracted from those known to be “Alive at Start”.			
	Alive at Start	Mortalities	Mortality Rate
2014, Sep–Dec			
Translocated	40	2	5%
Resident	13	0	0%
2015, Jan–Dec			
Translocated	37	21	57%
Resident	13	2	15%
2016, Jan–Aug (Sep–Dec)			
Translocated	11 (15)*	1 (0)	9% (0%)
Resident	11 (20)*	0 (0)	0% (0%)
2017, Jan–Jul			
Translocated	14	0	0%
Resident	18	0	0%

**4 translocated and 9 resident tortoises added in September 2016;*

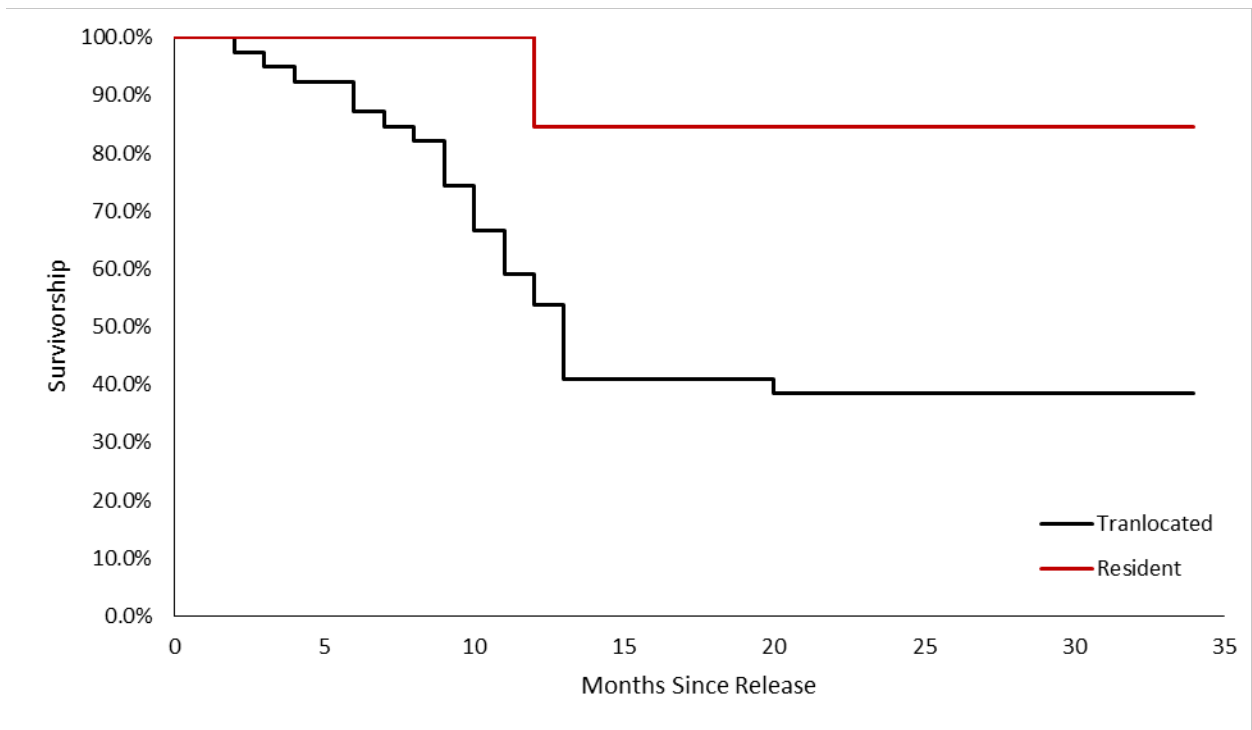


Figure 2. Survivorship curves for adult tortoises during the ongoing telemetry study. This figure assumes that the 7 missing tortoises (5 translocated, 2 residents) are still living.

Between spring 2015 and spring 2016, the San Diego Zoo conducted a separate but related study in which they released 20 juvenile tortoises with transmitters onto the BCCE. After one year, six tortoises had died. Of the six mortalities, none have been attributed to predation. Transmitters fell off of five tortoises, and 9 tortoises survived to the end of the study. Juvenile tortoise survivorship one year post-release ranged between 45% and 75%.

Analysis of the Searchlight Soil Type

Over the course of this study, nine tortoises were found at least once on the Searchlight soil type (Argids in Figure 1), which was described in the original translocation plan as being apparently less suitable for tortoise habitation. Of those nine tortoises, three ultimately died; however, the likelihood that the soil type played any role in that outcome is low since one of those tortoises died within the first two months of release and a second one appears to have been moved there by a predator after it was killed.¹ One of the nine tortoises went missing during the course of this study.

Of the nine tortoises observed on the Searchlight soil type, 15–94% of all observations (\bar{X} = 39%) occurred on this soil type. Depending on how missing animals are treated (*e.g.*, as mortalities) in the analysis, survival of tortoises observed on the Searchlight soil type ranged between 71% and 86%. Since this is a higher survival rate than that for translocated individuals as a whole, it can be inferred that there may not be any perceivable detrimental effects of utilizing that soil type, at least for short periods of time. Furthermore, the one individual that spent 94% of its time in this soil type was a resident tortoise, indicating that some of this area may be utilized by tortoises, at least occasionally, but just were not located during the initial pre-translocation surveys.

The lack of tortoises in the Searchlight soil type may be the partial result of proximity of this soil type to Highway 95 (Figure 1) and a residual road-effect zone that has not been repopulated completely since fence installation. Alternatively, a potential habitat gradient may exist across the landscape, where the suitability of habitat decreases as it gets closer to the road/dry lake bed. The addition of more tortoises to the study may help determine the answer to these questions. We will continue to monitor this as well as estimating settling rates and home range sizes as the project progresses.

¹ These two tortoises were removed from calculations of rate of occurrence on Searchlight soil types and survivorship rates.

Translocation plan addendum

The goal for translocation to the BCCE was to increase the population in this portion of the Eldorado Valley (USFWS and Clark County Desert Conservation Program 2014). However, the 2014 release cohort is at a minimum deficit of 21 tortoises based on known mortality, removal, and subsequent releases (Table 1). If mortality of non-telemetered tortoises occurred at the same rate as telemetered tortoises (62% in the best-case scenario in Table 1), approximately 40 translocated tortoises remain alive, including the 3 tortoises added in 2016 (Table 2). Therefore, we plan to translocate 36 adult tortoises from two research projects nearing completion by the the U.S. Geological Survey, as well as two tortoises removed from urban development sites in Clark County.

Maximum post-translocation abundance	$4/\text{km}^2 * 114 \text{ km}^2 = 456$ adult tortoises
– 2014 abundance	335 adult tortoises
= Maximum number of new adult tortoises	121 adult tortoises
– (2014 releases – estimated net loss to date)	$98 - 61 + 3 = 40$ adult tortoises
Potential numbers to release	81 adult tortoises
Planned 2017 release	38 adult tortoises
<i>Remaining number of potential releases</i>	<i>43 adult tortoises</i>

The largest group of former research tortoises ($n = 31$) currently reside in three 9-ha pens at the Nevada National Security Site (NNSS) and have been the subject of research on social interactions and individual contact rates. These tortoises were transferred to pens at the NNSS from the Desert Tortoise Conservation Center (DTCC) in 2013. The second group of former research tortoises ($n = 5$) are housed in individual pens at the former DTCC and were part of an experimental infection study of *Mycoplasma agassizii*. As noted below under Health Considerations, one of these tortoises never showed signs of infection, and all five tested negative for *M. agassizii* via qPCR earlier this year. Additional tortoises that are removed from non-federal lands developed under the Clark County Multiple Species Habitat Conservation Plan, or progeny of privately held tortoises in the Las Vegas Valley, also may be released as tortoises become available. Currently, Clark County has two tortoises at their holding facility awaiting final health assessments that may be added to this translocation.

The previous translocation plan limited the maximum post-translocation density to 3.8 adults/km². However, the most recent population viability analyses indicated that populations at densities lower than 3.9 adult tortoises/km² are not viable in the long term (USFWS 1994:C25). Therefore, the maximum number of tortoises to be released will be based on that needed to increase the BCCE population to a density of at least 4 adults/km² (Table 2).

Approximately 74% to 88% of a wild population consists of tortoises <180 mm carapace length (Turner *et al.* 1987; Karl 1998), but juvenile desert tortoises (defined here as <180 mm carapace length) have naturally higher mortality rates than adults (Bjurlin and Bissonette 2004). Individuals released in this size category are expected to ultimately add less to the population

than, and compete minimally for resources with, adult tortoises. As a conservative limit, the number of juvenile tortoises released will not exceed three times the adult limit (*i.e.*, $\leq 75\%$ of the ultimate translocated population could be juveniles = 363 juveniles).

Health Considerations

During surveys of the resident population in 2014, 11 health assessments were conducted following protocols described in USFWS (2013). A single animal had a suspect titer of *Mycoplasma testudineum*. No serious clinical signs were observed, although three tortoises did have body condition scores of 3. While no standardized health assessments have been conducted since the initial release, no obvious signs of ill health have been noted among the translocated or resident tortoises during routine monitoring.

The tortoises to be translocated from the NNSS have undergone repeated health assessments during their four years of study (Appendix). All are healthy, and only one has a potentially disqualifying clinical signs (USFWS 2016); the latter tortoise (#20351) has had a relatively low body condition score (3) since acquisition from the DTCC, but it has maintained this condition despite eating consistently, has shown appropriate attitude and behavior, and thus was deemed suitable for release. All of the NNSS tortoises have histories of negative results for *Mycoplasma*, as determined by ELISA and qPCR, although one tortoise (#21655) had a positive qPCR result for *M. agassizii* in 2016. However, this tortoise had an abnormally low estimated load of the bacterium.

The tortoises to be translocated from the infection study at the former DTCC also have undergone repeated health assessments during their four years of study (Appendix). All are healthy, and none has disqualifying clinical signs (USFWS 2015). One of these tortoises (#22404) has never shown signs of infection, and in 2017 the other four tested negative for *M. testudineum* and three of the four tested negative for *M. agassizii* via qPCR .

Tortoises translocated to the BCCE from lands covered by Clark County's MSHCP have undergone (and any future tortoises will undergo) screening by a qualified biologist according to USFWS and Clark County Desert Conservation Program (2014) and the USFWS translocation guidance (Appendix). Tortoises that do not pass their health assessments will not be translocated.

Monitoring

Sixteen of the tortoises to be released in 2017 will have radio transmitters affixed, bringing the total to 30 translocated and 18 resident tortoises being monitored, according to the plan described in USFWS and Clark County Desert Conservation Program (2014). The newly telemetered tortoises will include all five of the tortoises from the infection study to facilitate future health assessments relative to their experimental history (in addition to assessments of the other telemetered tortoises). The remaining 11 transmitters will be assigned to tortoises to balance the overall sex ratio among translocated tortoises. Additional residents also may be added.

In 2015, Clark County began a project with Conservation Science Research and Consulting to survey subsidized predators (coyotes and ravens) on the BCCE to determine if a problem may exist relative to desert tortoises and what whether any associated management actions need to be considered. The results of that project should be available in 2018. Clark County also plans to partner with the U.S. Geological Survey to study predator-prey dynamics of coyotes and their main prey jackrabbits beginning in late 2017. This project will use radio telemetry of coyote and jackrabbits, as well as camera trap arrays, to look at demography, mortality rates and causes, and reliable methods for density estimates. We plan to use the data from the post-translocation monitoring study combined with other studies such as the USGS telemetry study to gain new insight into the interactions between all of these species. This project is scheduled to last 4 years from the kickoff date.

Literature Cited

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Karl, E.A. 1998. Reproductive strategies, growth patterns, and survivorship of a long-lived herbivore inhabiting a temporally variable environment. Ph.D. Thesis, University of California, Davis.

Turner, F.B., *et al.* 1987. Population ecology of the desert tortoise at Goffs, California, 1983-1986. Report to Southern California Edison Co., Rosemead, California.

USFWS. 1994. Desert Tortoise (Mojave Population) Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon.

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U.S. Fish and Wildlife Service and Clark County Desert Conservation Program. 2014. Translocation plan: Northeast Boulder City Conservation Easement. 1 October 2014. Available at https://www.fws.gov/nevada/desert_tortoise/dtro/dtro_trans.html.

Appendix. Health records for tortoises to be translocated to the Boulder City Conservation Easement in fall 2017.²

MCL = midline carapace length; BCS = body condition score; Mag = *Mycoplasma agassizii*; Mte = *M. testudineum*.

Tortoise	Sex	2013 MCL (mm)	2013 Mass (g)	2017 Mass (g)	Δ mass (g)	2017 BCS	Total Nasal Discharge Observations	2017 Nasal Discharge	ELISA 2013 (Mag/Mte)	ELISA 2017 (Mag/Mte)	qPCR 2013 (Mag/Mte)	qPCR 2015 (Mag/Mte)	qPCR 2016 (Mag/Mte)
Nevada National Security Site													
14564	M	268	3335	5140	1805	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
14783	F	246	3205	3282	77	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
17478	M	248	3060	3236	176	5	1	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
17890	M	254	3090	4954	1864	5	1	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
18195	F	270	3745	3578	-167	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
18205	F	252	3165	3076	-89	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
1833	F	303	5555	5310	-245	5	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
18553	M	296	5265	5155	-110	4	1	serous 1	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
18723	F	266	4130	4094	-36	4	3	serous 2	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
18777	M	290	4910	4634	-276	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
19341	F	297	4610	4428	-182	4	1	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
19342	F	258	2725	3360	635	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
19977	F	267	3595	3554	-41	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
20351	M	321	6000	6000	-200	3	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
20544	M	272	3215	4240	1025	4	1	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
20801	M	238	2680	3994	1314	5	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
20820	F	331	5675	5920	245	4	1	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
20821	F	291	4640	4570	-70	4	5	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
20849	F	283	4000	4290	290	5	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
20907	M	248	2720	3412	692	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
21622	M	258	3075	4602	1527	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
21625	M	243	2245	3774	1529	5	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
21655	M	240	2540	4146	1606	4	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Pos/Neg
21945	M	266	3965	4228	263	5	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg

²All show appropriate attitude and activity, and oral plaques have not been observed on any tortoise. Negative (Neg) ELISA titer values <32; suspect (Sus) = 32.

Appendix. Continued.

Tortoise	Sex	MCL (mm)	2013 Mass (g)	2017 Mass (g)	Δ mass (g)	2017 BCS	Total Nasal Discharge Observations	2017 Nasal Discharge	ELISA 2013 (Mag/Mte)	ELISA 2017 (Mag/Mte)	qPCR 2013 (Mag/Mte)	qPCR 2015 (Mag/Mte)	qPCR 2016 (Mag/Mte)
21972	M	250	2945	3752	807	5	0	none	Neg/Neg	pending	Neg/Neg	Neg/Neg	Neg/Neg
21975	F	240	1965	3294	1329	4	0	none	Neg/Neg	Pending	Neg/Neg	Neg/Neg	Neg/Neg
22004	F	251	2840	3012	172	4	0	none	Neg/Neg	Pending	Neg/Neg	Neg/Neg	Neg/Neg
22140	M	206	1590	3726	2136	4	0	none	Neg/Neg	Pending	Neg/Neg	Neg/Neg	Neg/Neg
22192	M	262	3360	3350	-10	5	0	none	Neg/Neg	Pending	Neg/Neg	Neg/Neg	Neg/Neg
22217	M	245	2780	3268	488	4	1	serous 1	Neg/Neg	Pending	Neg/Neg	Neg/Neg	Neg/Neg
22221	M	287	4445	5575	1130	5	0	none	Neg/Neg	Pending	Neg/Neg	Neg/Neg	Neg/Neg

Former Desert Tortoise Conservation Center

Tortoise	Sex	MCL (mm)	2013 Mass (g)	2017 Mass (g)	Δ mass (g)	2017 BCS	Last Discharge Observations	2017 Nasal Discharge	ELISA 2016 (Mag)	ELISA 2017 (Mag/Mte)	Last positive qPCR (Mag)	qPCR 2016 (Mte)	qPCR 2017 (Mag)
22404	F	268	3535	3828	293	5	NA	none	Neg (2)	Neg/Neg	NA	all Neg	Eq/Neg
22335	F	222	2376	3056	680	4	Aug-15	none	Pos (3)	Sus/Sus	Jun-16	all Neg	Eq/Neg
22409	M	295	4730	5000	270	4	Apr-16	none	Pos (3)	Sus/64	Apr-16	all Neg	Pos/Neg
22314	M	198	1945	3016	1071	4	Oct-16	none	Neg (3)	Neg/Neg	Apr-15	all Neg	Neg/Neg
22417	F	219	2160	2988	828	4	Sep-15	none	Pos (3)	64/Neg	Jun-16	all Neg	Neg/Neg

Clark County Development

Tortoise	Sex	MCL (mm)	2017 Mass (g)	2017 BCS	2017 Nasal Discharge	ELISA 2017 (Mag/Mte)	qPCR 2017 (Mag/Mte)
CC0045	M	274	3600	4	None	Neg/Neg	NA
CC0046	M	228	2300	5	None	Sus/Sus	Neg/Neg