

FINAL REPORT

Executive Summary:

Road mortality has been identified as a significant issue relative to the recovery of the desert tortoise (*Gopherus agassizii*). Data regarding road mortality and tortoise sign are necessary to evaluate the effects to recovery of the species and to prioritize areas for installation of fencing. Tortoise Group utilized volunteer community scientists under the supervision of qualified staff biologist to conduct systematic surveys of tortoise fencing during inactive tortoise season. Desert tortoise road mortality, live tortoise observations, and tortoise sign surveys were conducted during active tortoise season. Throughout the fence inspections, there were a total of 93 reports 2022 and 199 reports in 2023 of incidents of damage submitted to Nevada Department of Transportation for evaluation over the two-year period. One live tortoise, one carcass and one tortoise burrow were observed in the spring total mileage in 2022. Two live tortoises and five tortoise burrows were observed in the total of fall surveys in 2022. Two tortoise burrows and one observation of tortoise scat were observed in the spring total mileage of 2023. Fifteen possible tortoise burrows were observed in total for fall surveys of 2023. Road mortality surveys will continue to be necessary to prioritize where future desert tortoise fencing should be installed. Fence inspection surveys with minor repairs are necessary to maintain the fence and report larger issues to Nevada Department of Transportation to ensure the fence remains intact.

Introduction:

The Clark County Desert Conservation Program has funded the installation of over 400 miles of desert tortoise exclusionary fencing along roadways in southern Nevada. The U.S. Fish and Wildlife Service (USFWS) requires that desert tortoise exclusionary fencing is inspected and maintained on a regular basis to ensure the fencing remains intact, but securing the necessary labor to conduct this work can be prohibitively costly. This project used community scientist volunteers with Tortoise Group to conduct systematic inspections of fencing and to conduct minor repairs and record locations where major repairs are needed. The fence inspections were conducted during the desert tortoise inactive season, whereas during the desert tortoise active season Tortoise Group conducted surveys for desert tortoise road mortality, live tortoise observations, and signs of tortoise presence under the guidance of authorized biologists. Road mortality data is used by the USFWS to identify priority areas for installation of additional fencing and to identify areas where tortoise abundance may be greater than expected.

Goals and Objectives of the Project:

The goals of this project were to:

- Maintain fencing along NDOT rights-of-way in good condition;
- Provide USFWS with data to evaluate effectiveness of fencing and to evaluate the

- impact of roads without exclusionary fencing; and
- Identify priority locations for installation of additional desert tortoise exclusionary fencing.

The objectives of this project were to:

- Conduct systematic surveys of desert tortoise exclusionary fencing;
- Conduct minor repairs of exclusionary fencing using hand tools where appropriate;
- Collect GPS coordinates for locations where major repairs are required and provide data to NDOT so that their maintenance crews can be scheduled to conduct the necessary repairs;
- Collect data on desert tortoise road mortality, live tortoise observations, and other signs of tortoise presence along roads.

Methods and Materials:

Tortoise Group used the ROaDS App designed for this project on Survey123 and data forms as appropriate, to document completed work and submitted forms to The Clark County Desert Conservation Program upon completion of surveys. Tortoise Group utilized qualified staff biologists and community scientist volunteers under the supervision of a qualified staff biologist to conduct surveys. Photos were taken using cell phones. Fence damage incidents were photographed and flagged using construction flagging.

Fence Inspection and Repair Surveys (desert tortoise inactive season)

Tortoise Group conducted inspections of existing tortoise exclusionary fencing in areas identified by The Clark County Desert Conservation Program and Nevada Department of Transportation (in coordination with USFWS). Tortoise Group identified locations needing major repairs and filled out the appropriate data forms. Observations of fence damage was reported to the Nevada Department of Transportation maintenance staff, who will be responsible for those repairs. Tortoise Group conducted minor repairs using hand tools and filled in small wash outs with nearby rocks and dirt.

Road Mortality Surveys (desert tortoise active season)

Tortoise Group conducted systematic surveys of areas identified by The Clark County Desert Conservation Program (in coordination with USFWS) to document observations of tortoise road mortality, live tortoise encounters, carcasses, tortoise burrows, and tortoise sign on or near roads. Tortoise Group also collected data of live observations and carcasses of other species to help indicate habitat quality. Photos, GPS location, date/time and condition of carcass or live tortoise were recorded in the ROaDs App. Other data, such as weather conditions, habitat quality and overall notes were documented as well.

Results and Evidence of the Results:

Fence Surveys 2022 (D01)

Tortoise Group completed a total of 42.04 miles on both sides of the roadways in areas identified by The Clark County Desert Conservation Program (in coordination with USFWS) for Fence Surveys 2022. Surveys conducted during this period focused on fence inspections to report damage incidents and conduct minor repairs. A total of 93 fence damage incidents were documented for the total mileage (see Table 1).

Table 1: Fence Surveys 2022 (D01)

Date	General Area	Mile Markers Covered	Total Miles	Fence Damage Reports
14-Dec	I-93 (Mormon Mesa)	56.8-62 (NB)	5.2	3
15-Dec	I-93 (Mormon Mesa)	62-70 (NB)	8	3
8-Jan	I-93 (Mormon Mesa)	70-72 (NB)	2	13
9-Jan	1-93 (Mormon Mesa)	72-75.2 (NB/SB)	6.4	2
22-Jan	I-93 (Mormon Mesa)	72-56.8 (SB)	15.2	2
23-Jan	I-11 (Boulder City Bypass)	13.6-4.2 (SB)	8.6	20
5-Feb	I-11 (Boulder City Bypass)	2.73-2.24 (EB/NB)	0.98	0
6-Feb	I-11 (Boulder City Bypass)	4.2-13.6 (NB)	8.6	3
13-Feb	SR160 (Blue Diamond)	12.1-16.7 (EB/WB)	9.2	17
20-Feb	SR161 (Goodsprings)	3.3-7 (EB)	3.7	19
5-Apr	SR 165 (Nelson's Landing)	0-8.1 (EB/WB)	16.2	11

Road Mortality Surveys Spring & Fall 2022 (D02 & D03)

Tortoise Group completed a total of 20 miles on both sides of the roadways in areas identified by The Clark County Desert Conservation Program (in coordination with USFWS) for Road Mortality Surveys Spring 2022 and 20.5 miles on both sides of the roadways for Road Mortality Surveys Fall 2022. Surveys conducted for both spring and fall road mortality surveys focused on live tortoise sightings, tortoise carcasses and tortoise sign (see Table 2 & 3). One live tortoise, one carcass and one tortoise burrow were observed in the spring total mileage. Two live tortoises and five tortoise burrows were observed in the total of fall surveys. Observations of

carcasses of other species were also documented and submitted to The Clark County Desert Conservation Program. Live observations of other species were noted to indicate habitat quality as well as a description of the surroundings.

Table 2: Road Mortality Surveys Spring 2022 (D02)

Date	General Area	Total Miles	Road Mortality and Tortoise Sign Observations
19-Mar	US93 (Coyote Springs)	4.5	1 Tortoise carcass
27-Mar	US93 (Coyote Springs)	3	1 live lizard
17-Apr	US93 (Coyote Springs)	6	20 live lizards
24-Apr	US93 (Coyote Springs)	3	4 live lizards, 1 live ground squirrel, 4 kitfox size burrows
7-May	US93 (Coyote Springs)	3.5	1 live ground squirrel, 4 live lizards, 1 tortoise burrow
9-May	US95 (Indian Springs)	12	14 live lizards, 4 live ground squirrels, 1 live jack rabbit
10-May	US95 (Indian Springs)	8	1 live tortoise, 13 live lizards

Table 3: Road Mortality Surveys Fall 2022 (D03)

Date	General Area	Total Miles	Road Mortality and Tortoise Sign Observations
14-Sep	US95 (Indian Springs)	6	1 Live tortoise, 4 lizards
4-Oct	US95 (Indian Springs)	6	Mammal bones, 1 live lizard, 3 live ground squirrels
5-Oct	US95 (Indian Springs)	2	No observations
15-Oct	US93 (Coyote Springs)	3	1 kitfox burrow
16-Oct	US93 (Coyote Springs)	4	1 live lizard, 1 inactive tortoise burrow
17-Oct	US95 (Indian Springs)	6	1 live tortoise in burrow, 3 live lizards, mammal bones
22-Oct	US93 (Coyote Springs)	2	1 live lizard
25-Oct	US93 (Coyote Springs)	4	Numerous ravens flying and perched
26-Oct	US93 (Coyote Springs)	8	3 tortoise burrows, 2 live lizards, numerous live ravens

Fence Surveys 2023 (D04)

Tortoise Group completed a total of 57.8 miles on both sides of the roadways in areas identified by The Clark County Desert Conservation Program (in coordination with USFWS) for Fence Surveys 2023. Two emergency fence survey dates were scheduled in November 2022 to assist Nevada Department of Transportation (NDOT) with fence surveys along major wash outs due to heavy rains along SR160/Pahrump. Surveys conducted focused on fence inspections to report damage incidents and conduct minor repairs. A total of 199 fence damage incidents were documented for the total mileage (see Table 4). One desert tortoise carcass was observed

within the right-of-way. A large section of desert tortoise fencing next to the observed tortoise carcass was reported due to sand accumulation over the height of the desert tortoise fencing.

Table 4: Fence Surveys 2023 (D04)

Date	General Area	Mile Markers Covered	Total Miles	Fence Damage Reports	Notes
11/9/2022	SR160/Pahrump	33.6-38	4.4	61	
11/16/2023	SR160/Pahrump	38-42	4	17	
1/25/2023	I-15/Mormon Mesa	95-96	1	0	
1/26/2023	I-15/Mormon Mesa	93-95	2	12	1 tortoise carcass
1/27/2023	I-15/Mormon Mesa	91-93	2	15	
1/28/2023	I-15/Mormon Mesa	88-91	3	2	
1/31/2023	I-15/Mormon Mesa	87-88	1	5	
2/4/2023	I-15/Mormon Mesa	82-87	5	32	
5-Feb	I-15/Mormon Mesa	80-82	2	3	
2/7/2023	I-15/Mormon Mesa	78-80	2	8	
2/18/2023	I-15/Mormon Mesa	74-78	4	15	
2/19/2023	I-15/Mormon Mesa	68-74	6	10	
2/21/2023	I-15/Mormon Mesa	65-68	3	11	
2/28/2023	I-15/Mormon Mesa	56.8-65	8.2	0	
3/5/2023	US 93/ Mormon Mesa	65-68	3	0	
3/7/2023	US 93/ Mormon Mesa	68-70	2	0	
3/19/2023	US 93/ Mormon Mesa	70-75.2	5.2	8	

Road Mortality Surveys Spring & Fall 2023 (D05 & D06)

Tortoise Group completed a total of 20 miles on both sides of the roadways in areas identified by The Clark County Desert Conservation Program (in coordination with USFWS) for both Road Mortality Surveys in Spring and Fall 2023. Surveys conducted for both spring and fall road mortality surveys focused on live tortoise sightings, tortoise carcasses and tortoise sign (see Table 5 & 6). Two tortoise burrows and one observation of tortoise scat were observed in the spring total mileage. Parts of the Indian Springs segment was undergoing initial preparation for fence installation in the spring. Fifteen possible tortoise burrows were observed in the total of fall surveys. Observations of carcasses of other species were also documented and submitted to The Clark County Desert Conservation Program. Live observations of other species were noted to indicate habitat quality as well as a description of the surroundings.

Table 5: Road Mortality Surveys Spring 2023 (D05)

Date	General Area	Total Miles	Road Mortality and Tortoise Sign Observations
08-April	Coyote Springs	2.5	1 tortoise burrow, 1 live ground squirrel, 2 live lizards
4/13/2023	Coyote Springs	2	2 live lizards
4/14/2023	Coyote Springs	5.5	1 live raven, 7 live lizards, 1 live ground squirrel
5/7/2023	Indian Springs	2	5 live lizards, 1 domestic dog carcass, large mammal vertebrae pieces
5/17/2023	Indian Springs	1.5	3 live lizards, 1 live raven, unknown mammal bones
5/25/2023	Indian Springs	2	11 live lizards, 1 live jack rabbit
5/27/2023	Indian Springs	1.5	3 live lizards, 2 live jack rabbits, horse/burro skull, 1 tortoise burrow, 1 tortoise scat observation
5/28/2023	Indian Springs	3	11 live lizards

Table 6: Road Mortality Surveys Fall 2023 (D06)

Date	General Area	Total Miles	Road Mortality and Tortoise Sign Observations
11-October	Coyote Springs	1.5	3 live lizards
10/22/2023	Coyote Springs	4	15 live lizards
10/25/2023	Coyote Springs	4.5	2 tortoise burrows, 9 live lizards, 5 live ravens
10/27/2023	Lake Mead-Priority 2	4	7 tortoise burrows, 9 live lizards, 1 live jack rabbit
11/1/2023	Lake Mead-Priority 2	3	6 tortoise burrows, 3 live lizards, 2 live ravens
11/4/2023	Lake Mead-Priority 2	3	10 live lizards, 1 big horn sheep skull & vertebrae, large mammal vertebrae

Evaluation/ Discussion of Results:

Fence Surveys 2022-2023

In fence surveys, areas of highest priority for repair of fence damage incidents occurred where adult tortoises may breach the tortoise fencing. Most of these occurrences seemed to be due to wash outs caused by heavy rains and fencing being cut in certain areas with speculation for OHV access. The use of human tools can be inferred by some of the observations made to the abused fencing and the size of cut fences with tire tracks. Increased law enforcement in these areas may be utilized to decrease human interference. Several areas not reported also showed evidence of vehicle access areas where fencing had been cut and reattached using hog ties.

Different designs continue to be investigated to avoid wash outs when installing tortoise fencing in the future but otherwise is a part of regular maintenance. Tortoise Group continues to work with Nevada Department of Transportation (NDOT) to assist with the most prioritized road segments. In the fall of 2022, southern Nevada experienced substantial rainfall that led to major wash outs of fencing and roadways. Tortoise Group assisted with emergency surveys in the area to ensure the fencing was fixed in a quicker time frame. It may be necessary in the future to have crews ready for these specific occasions.

One desert tortoise carcass was observed in January 2023 in the right of way. The segment where the tortoise may have breached the fence is unknown. However, a large fencing segment with sand accumulated over the height of it was reported within 100m. Areas prone to issues with accumulation of sand/dirt may be addressed by extending the height of the fence specific to that area. There were no reports of tortoise fencing being installed incorrectly. Overall, the tortoise fencing was sturdy and up to the standards provided by NDOT.

Road Mortality Surveys 2022-2023

Road mortality surveys focused on live tortoise sightings, tortoise carcasses and tortoise sign. Data on other live species and carcasses were collected to indicate habitat quality. Road mortality surveys are conducted when desert tortoises are most likely to be active within a temperature range of 75-90 degrees Fahrenheit. Observations of live lizards may indicate conditions suitable for tortoise activity.

In 2022, one live tortoise, one carcass and one tortoise burrow were observed in the spring total mileage. Two live tortoises and five tortoise burrows were observed in the total of fall surveys. Both spring and fall segments in 2022 were conducted along assigned repeat road segments in Indian Springs and Coyote Springs for standardization of these Priority 1 segments. The amount of traffic and the overall habitat were comparable to prior years. However, the amount of annual rainfall increased in 2023.

In 2023, two tortoise burrows and one observation of tortoise scat were observed in the spring total mileage. There was disturbance to the area in the Indian Springs segment for spring. Initial preparation for fence installation was being performed which may have affected data collection for the season. In 2023, the Indian Springs segment was undergoing active construction which

led to the survey of the next prioritized road segment (Lake Mead- Priority 2). Coyote Springs was surveyed once again and 2 tortoise burrows were recorded within that segment. The Lake Mead- Priority 2 segment had a total of 13 possible tortoise burrows. Live sightings and carcasses of tortoises were not observed during Spring or Fall in 2023. Conditions were suitable for desert tortoise activities while surveys were conducted, however, the survey of the Priority 2 segment may indicate that it is not an area of concern. The Lake Mead- Priority 2 segment is a highly trafficked two-lane road leading to the entrance of the Valley of Fire. However, the Indian Springs and Coyote Springs segments are two-lane highways that experience higher amounts of traffic daily. Upon completion of the fence installation in Indian Springs further data collection post-installation may help inform how fence installation impacts road mortality.

Conclusion:

Transportation infrastructure has fragmented previously contiguous habitat and reduced connectivity among tortoise populations. Road mortality has been identified as a significant issue relative to the recovery of the desert tortoise. Data regarding road mortality and tortoise sign are necessary to evaluate the effects to recovery of the species and to prioritize areas for installation of fencing. Installation of permanent desert tortoise exclusion fencing is expensive, ranging from \$15,000-\$25,000 per mile, depending on terrain and other factors, resulting in increased costs to state and federal transportation agencies for road repair and construction project within areas of desert tortoise habitat. Survey conducted to inspect tortoise fencing is necessary to keep tortoises off the roadways where tortoise fencing has been installed. Minor repairs using hand tools is an effective way to ensure holes in fences are adjusted in a faster time frame. Breaches in the fence allow for access to the roadways by tortoises resulting in lower populations in these long-lived animals and potentially other species of concern. Road mortality surveys will continue to be necessary to prioritize where future desert tortoise fencing should be installed. Fence inspections performed by mainly community scientist volunteers prove to be an asset for helping off-set the cost of what it would take to compensate Nevada Department of Transportation personnel.

Recommendations:

Tortoises and many other species in the desert are most active when temperatures are between 75-90 degrees. It seems most effective to perform mortality surveys when other species activity may indicate tortoise activity. This is a key factor when it comes to planning surveys in the field for road mortalities and live observations. Tortoise Group has experimented with different platforms when it comes to data collection. Road mortality data and incidental data was collected via ROaDS-Survey123 app- an Esri phone application using Survey123. This platform is utilized to streamline data directly into a database that can be analyzed or shared. Tortoise Group underwent some technological issues with the ROaDS- Survey123 application with software updates. However, collected surveys are still saved as drafts within the application and can be manually entered if the software update does not allow for it to be

submitted at a later date/time. Raven predation has been noted as a contributing factor to desert tortoise population declines. The ROaDS-Survey123 app started to include data collection points for raven behavior in 2022.