

**DESERT TORTOISE RECOVERY IMPLEMENTATION
STATUS SUMMARY**

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DESERT TORTOISE MANAGEMENT OVERSIGHT GROUP RECOVERY PRIORITIES

- Restore habitat (incl. route restoration)
 - Reduce predator subsidies
 - Targeted predator control
 - Install and maintain tortoise barrier fencing
 - Fire management planning and implementation
 - Education (*lower priority than on-the-ground actions*)
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RIT PROJECTS IN NEED OF FUNDING

Desert tortoise population trends through 2014 are indicated for geographic areas covered by the range-wide monitoring program

Priority	Project #	Title	Budget
Rangewide			
	RW02	Seed Increases for Desert Tortoise Habitat Restoration in Southern Nevada	\$140,000
California RIT - Rangewide			
	CA09	Mojave Raven Watch - a desert tortoise rangewide human education program	\$126,500
	CA41	Removal of free-roaming burros on BLM managed land in excess of authorized population level.	\$2,465,000
	CA42	Identification of existing culverts and underpasses needing maintenance or modification to facilitate desert tortoise movement under highways and roads.	\$48,000
	Rd8	Fence I-40 north of Black Ridge, CA, both sides, 5.0 miles	TBD
	Rd11	Fence I-40 near Old Dad Mountains, both sides, 9.4 miles	TBD
	Rd13	Fence I-40 near Kalbaker Rd, 8.1 miles	TBD
California RIT - Northeast Mojave Workgroup			
Ivanpah Critical Habitat Unit (<i>see also CA41</i>) -7.4%/year			
	CA19	Increase law enforcement patrols for desert tortoise protection in Mojave National Preserve.	\$259,000

	CA26	Evaluation of raven food subsidy sites near the Mojave National Preserve	\$82,133
Fenner Critical Habitat Unit (see also CA19, CA26, and CA41) -7.3%/year			
	CA25. v2	Piosphere Restoration on the Fenner/Piute Valley Critical Habitat Unit in Mojave National Preserve (<i>in part</i>)	\$71,843
	Rd5	Fence I-40 west of Van Winkle Wash to east of Essex Road, both sides, 45.3 miles	TBD
	Rd14	Fence US 95, Nevada border south, both sides, 15.5 miles	TBD
Death Valley National Park			
	CA20	Install Desert Tortoise Road Signs along roads in Death Valley National Park in Desert Tortoise Habitat	\$7,100
California RIT - West Mojave Workgroup			
Fremont-Kramer Critical Habitat Unit (see also CA03/Rd5) -6.8%/year			
	CA34	Raven food subsidy reduction in California City- reduction methodology development	\$143,388
	CA36	Restoration of 460 acres of recently acquired habitat at the DTNRA_DTC & DTRNA	\$59,375
	CA13. v2	Develop and implement a Saharan mustard management plan for the West Mojave; include a suppression and removal program in and adjacent to critical habitats	\$38,400
Superior-Cronese Critical Habitat Unit -9.3%/year			
	Rd4	Fence I-15, Afton Road to near Cave Mountains, both sides, 7.3 miles	TBD
	Rd7	Fence 1-15 north of Barstow, north side, 5.0 miles	TBD
Ord-Rodman Critical Habitat Unit -8.2%/year			
	Rd1	Fence I-40, Daggett to Newberry Springs, south side, 14.6 miles	TBD
	Rd3	Fence I-40, National Trails West of Pisgah, south side, 5.2 miles	TBD
California RIT - Colorado Workgroup			
Colorado Recovery Unit-Rangewide			
	CA43	Restoring Desert Tortoise Habitat in the Colorado Desert Recovery Unit within each Tortoise Conservation Area	\$207,950
Chemehuevi Critical Habitat Unit (see also CA30 and CA41) -10.8%/year			
	Rd5	Fence I-40 west of Van Winkle Wash to east of Essex Road, both sides, 45.3 miles	TBD
	Rd10 (CA03)	Fence US-95, Chemehuevi Valley, both sides, 28.4 miles	TBD

Chuckwalla Critical Habitat Unit (see also CA41) -4.1%/year			
	CA37	Raven Reduce Raven Subsidies in Rural Colorado Recovery Unit Communities (May be leveraged with resources provided by the Living Desert to decrease proposed budget)	\$111,596
	Rd2	Fence I-10, Shavers Valley-Chuckwalla Valley, both sides, 88.6 miles	TBD
Joshua Tree National Park +6.2%/year			
Pinto Mountain Critical Habitat Unit -8.3%/year			
	Rd9	Fence SR-62 at Sheep Hole Mountains, both sides, 7.9 miles	TBD
	Rd12	Fence SR-62 east of Sheep Hole Mountains, both sides, 5.2 miles	TBD
North-East Mojave RIT - Southwest Nevada Workgroup			
	NE13	Installation of Desert Tortoise Fencing and Culverts on Nevada State Route 160, Nye County, Nevada	\$564,390
	NE12	Installation of Desert Tortoise Fencing and Culverts on U.S. Highway 95 from Tule Springs to Indian Springs, Clark County, Nevada	\$955,150
Desert National Wildlife Refuge			
North-East Mojave RIT - Southeast Nevada Workgroup			
	NE11	Installation of Desert Tortoise Fencing and Culverts on Nevada State Route 159 within Red Rock Canyon NCA	\$637,905
	NE14	Road Warriors: Citizen Scientist Monitoring for Mojave Desert Road Mortality and Live Encounters to Identify Priority Areas for Fence Installation; Phase 2	\$20,300
	NE18	Baseline Common Raven Density as well as Depredation Threat to the Mojave Desert Tortoise Mapping in Southern Nevada Common Raven Monitoring and Management Strata and Test of Exclusion Fence Effects on Common Raven Densities and Depredation Risk to the Mojave Desert Tortoise	\$279,000
Coyote Springs Critical Habitat Unit +10.2%/year			
	Rd6	Fence US 93, Lincoln County line to Evergreen Flat, both sides, 65.3 miles	TBD
Mormon Mesa Critical Habitat Unit +8.2%/year			
	NE16	Restoration within Desert Tortoise Habitat Using Artificial Water Catchments (Guzzlers) as Restoration Structures 2020	\$37,974
Beaver Dam Slope Critical Habitat Unit +22.2%/year			

Gold Butte Critical Habitat Unit +14.4%/year			
	NE16	See Mormon Mesa Critical Habitat Unit	
Lake Mead National Recreation Area			
Piute-Eldorado Critical Habitat Unit (Piute Valley: +4.4%/year; Eldorado Valley: -9.2%/year)			
A management plan for the Piute-Eldorado ACEC, funded by Dry Lake Solar Energy Zone mitigation, currently is being developed. Actions under consideration in the draft plan, which would also be funded by the mitigation account, include restoration and monitoring of linear disturbances, restoration of non-linear disturbances, weed management and monitoring, and addressing tortoise connectivity across Nipton Road and US 95.			
North-East Mojave RIT - Arizona/Utah Workgroup			
Beaver Dam Slope Critical Habitat Unit (see also NE01) +22.2%/year			
	NE10	Install fuel breaks in Beaver Dam Slope CHU (AZ), <i>incl. NEPA</i>	\$74,200
Virgin Slope ACEC +14.4%/year			
Grand Canyon-Parashant National Monument +14.4%/year			
	NE09	Install fuel breaks in Grand Canyon-Parashant NM Tortoise habitat, <i>incl. NEPA</i>	\$74,200
Lake Mead National Recreation Area			
Other Areas			
	NE01	Fine fuel reduction & native annual species diversity in burned tortoise habitat, <i>incl. NEPA</i>	\$495,600
Upper Virgin River RIT -3.2%/year			
	UVR00	Land acquisition in the Red Cliffs Desert Reserve (60K acres; ongoing; as funding and land exchanges become available)	\$ subject to parcel availability
	UVR04	Desert Tortoise education center at Red Hills Garden Complex	\$1,816,130
	UVR06	Tortoise fencing - Red Cliffs Desert Reserve	\$432,724
	UVR07	Gene flow study of Mojave desert tortoises between different populations within Washington County, including the Red Cliffs Desert Reserve, 'Zone 6' (proposed RCDR addition) Beaver Dam Slope, and Zion/Springdale populations	\$56,894
	UVR08	Measuring Desert Tortoise Recovery: Population Viability Analysis in the Red Cliffs Desert Reserve	\$14,000

	UVR09	Efficacy of the herbicide, Esplanade, in controlling exotic grasses (e.g., <i>Bromus rubens</i> , <i>Bromus tectorum</i>) within the Red Cliffs National Conservation Area and its impact on established native perennials	In kind, \$8,000; Long-term monitoring, \$5,000/ year
	UVR10	Desert Tortoise Habitat Restoration in burned areas within the Red Cliffs National Conservation Area, Utah	\$26,500
	UVR11	Identifying Mojave desert tortoise habitat corridors to facilitate partnership-based recovery	\$103,555

RIT PROJECT SUMMARIES

RW#02: Seed Increases for Desert Tortoise Habitat Restoration in Southern Nevada. The Southern Nevada District Office will use these funds to collect native seeds and work with partners at UNLV to increase native seeds for restoration and reclamation work within southern Nevada and the eastern Mojave Desert. This project is in response to the National Seed Strategy, the goal of which is to provide a more coordinated approach for stabilization, rehabilitation, and restoration treatments using native plant materials. The project will benefit the desert tortoise by providing a greater quantity of locally-adapted seed, which will result in more successful restoration of desert tortoise habitat post disturbance, fire, and other projects that occur across BLM land. The project budget reflects the balance of the original \$200,000 proposal.

CA#03: Desert Tortoise Barrier Fencing: Highway 95, Chemehuevi Critical Habitat Unit. Original project description modified according to “Top 10 Fencing Recommendations.”
Proposed lead agencies: California Department of Transportation, Bureau of Land Management; USFWS contact: Vincent James

CA#09: Mojave Raven Watch. A desert tortoise rangewide human education program. To engage as desert inhabitants (students, homeowners, ranchers, business owners, etc.) in observation of raven activity across the Mojave Desert range of the Desert Tortoise. To increase awareness of the scope and nature of the raven population explosion and its implications for the conservation of threatened desert tortoises and other wildlife. Having sparked this awareness we will engage participants in actions aimed at raven subsidy reduction. *Proponent: Tim Shields, Hardshell Labs; USFWS contact: Kerry Holcomb*

CA13.v2: Develop and implement a multi-year Saharan mustard management plan for the West Mojave; include a suppression and removal program in and adjacent to critical habitats. This is a project with multiple phases, starting with areas in the initial phases of invasion (northwestern Mojave, western Mojave Desert). The objectives are to 1) develop a brief Saharan mustard management plan; 2) implement the plan to halt the spread and reduce the invasion of this noxious species to critical habitats of the tortoise in California and to collect baseline data; and 3) start the surveys, data collection, and treatment in the West Mojave. The project would be implemented desert-wide, with emphasis in Years 1 and 2 on the Western Mojave. For this project, Saharan mustard is the major target. The species is invading from south (Colorado Desert) to north and from east (East Mojave) to the west into the West Mojave. To stop this advance, the best approach is to start in the north and west, where the plants are beginning to appear along major roads, and move south and east, covering all paved and major dirt roads, axial valley washes and where washes intersect with roads. Camping areas and where vehicles congregate and where water pools along roads are other target areas for attention.
Proponent: Kristin Berry, USGS; USFWS contact: Scott Hoffmann

CA#19: Increase law enforcement patrols for desert tortoise protection in Mojave National Preserve. Provide increased law enforcement patrols in desert tortoise critical habitat in Mojave National Preserve. These patrols would focus on reducing traffic speeds to reduce road mortality of tortoises, as well as preventing poaching and other activities harmful to the species. The additional ranger staff would focus on high-priority paved road segments through areas of high

tortoise density within critical habitat. *Proponent: Joh Piastuk, Mojave National Preserve, NPS; USFWS contact: Flo Deffner*

CA#20: Install Desert Tortoise Road Signs along roads in Death Valley National Park in Desert Tortoise Habitat. The majority of desert tortoise sightings reported in Death Valley are from staff and visitors seeing tortoise on roadways. Installation of highway signs will help to make travelers aware of the potential for tortoises to be present in the roadways and will encourage them to drive carefully and watch for tortoises. This project may reduce tortoise road mortality by increasing awareness of the potential for tortoises to be present on roadways. *Proponent: Josh Hoines, Death Valley National Park, NPS; USFWS contact: Flo Deffner*

CA#25.v2: Piosphere Restoration on the Fenner/Piute Valley Critical Habitat Unit in Mojave National Preserve. The goal of this project is to complete restoration of 17 piospheres (3 were funded in 2019), totaling approximately 14 acres (*in addition to the 7 acres completed in 2019*), to a condition conducive for microclimate conditions and soil properties that favor establishment of native herbaceous plants and control of exotic annuals in Mojave National Preserve (MNP). MNP undertook a piosphere restoration project in the Ivanpah/Shadow Valley Critical Habitat Unit from 2012 through 2015. This proposed project attempts to take what was learned from the Ivanpah/Shadow Valley CHU and apply altered actions on piospheres in the Fenner/Piute Valley CHU. Twelve locations are in the Fenner Valley along Fenner Wash, Northwest and east of Goffs, CA. Eight are located in the southernmost edge of Lanfair Valley just outside of the Fenner Valley CHU and one site is located near Old Dad wash in the southwest corner of the MNP. One site is located tortoise habitat outside of the CHU. *Proponent: Neal Darby, Mojave National Preserve; USFWS contact: Flo Deffner*

CA#26: Evaluation of raven food subsidy sites in and near the Mojave National Preserve. Reduce raven food subsidies from dumpsters and trash cans at 18 sites bordering and within 5 miles of the Mojave National Preserve: Baker, Baker transfer station, Cima Road travel stop (Shell Station), Nipton, Halloran Springs, Valley Wells rest areas on I-15, Valley Wells Shell station, John Wilkie rest areas on I-40, I-40 and Kelbaker Road, Goffs, Fenner. We have also selected the 5 highest raven food-subsidy areas within the Preserve located by biologists conducting surveys in 2016 (most NPS subsidy sites are water only): Black Canyon Road corrals, Black Canyon Road tank, Kelso visitor center, Deer Spring corral, corral near T/L road. *Proponent: Neal Darby, Mojave National Preserve; USFWS contact: Kerry Holcomb*

CA#30: Desert Tortoise Barrier Fencing: Interstate 40 near Kelbaker Road. Reduce vehicle-related mortalities associated with Interstate Highway 40 (I-40) and depletion of the tortoise population in the Fenner and Chemehuevi critical habitat units. Desert tortoise mortality in the Milepost 73-89 vicinity (Old Dad to Clipper Mountains) reach of I-40 has been occurring for a long period of time, based on 2014 field survey data. Reducing road mortality would promote tortoise recovery within two adjacent critical habitat units, which have both experienced a significant decline in adult tortoises in the last 10 years. *Proposed lead agencies: California Department of Transportation, Bureau of Land Management; USFWS contact: Kerry Holcomb*

CA#34: Raven food subsidy reduction in California City- reduction methodology development. The goal is a long-term, sustainable reduction of the human subsidies and associated raven population growth in California City and surrounding areas. The overarching

objective of the California City project is to develop and execute a comprehensive (end to end) human subsidy reduction methodology and plan which can be duplicated in other geographies throughout the state of California and beyond. *Proponent: Lawrence Alioto, Coalition for a Balanced Environment; USFWS contact: Scott Hoffman*

CA#36: Restoration of 460 acres of recently acquired habitat at the DTNRA_DTC & DTRNA. Provide the first example of comprehensively implementing a suite of habitat improvements in a particular area for the benefit of desert tortoise. Specifically, the project would implement the first of two restoration phases at a 460-acre site in the expansion lands at the DTRNA, lands recently acquired and fenced by the Desert Tortoise Preserve Committee, Inc (DTPC). This site is located immediately south of the southern boundary of the Fremont-Kramer Critical Habitat Unit and was acquired by the DTPC so that (1) a better connection between the DTRNA and the Fremont-Kramer Critical Habitat Unit could be made, (2) edge effects could be reduced, and (3) area size would be increased. As such, the project would take place in a high priority area to promote the recovery of tortoises within the DTRNA and adjacent critical habitat. *Proponent: Chris Noddings, Desert Tortoise Council; USFWS contact: Scott Hoffmann*

CA#37: Reduce Raven Subsidies in Rural Colorado Recovery Unit Communities. Reduce raven access to human subsidies within the Colorado Recovery Unit. The project will identify problem locations with a focus on communities along I-10 (Desert Center, Chiriaco Summit, and Lake Tamarisk), coordinate with local landowners, and provide raven proof dumpsters and signs to those landowners to reduce potential raven subsidies. *Proponent: Michael Vamstad, Joshua Tree National Park; USFWS contact: Vincent James*

CA#41: Removal of free-roaming burros on BLM managed land in excess of authorized population level. The 1,000 burros have been identified by BLM as more than the allowable population in each geographic location identified above. The project cost includes live-capture, transport to BLM holding corrals, veterinary services, care and feeding, adoption and health certificates. The project's goal would be to minimize wild burro impacts through live-capture of 1,000 free-roaming burros from BLM-managed land in the Ivanpah, Piute-Fenner, Chemehuevi and Chuckwalla Critical Habitat Units.

CA#42: Identification of existing culverts and underpasses needing maintenance or modification to facilitate desert tortoise movement under highways and roads. Identify culverts and underpasses under highways and roads that require maintenance or modification to allow for movement of desert tortoises under these linear features. Once identified, a maintenance and modification plan and schedule, funding required and responsible entities can be identified, such as the Federal Highway Administration, Caltrans and County road departments.

CA#43: The main goal of this project is to restore degraded desert tortoise habitat sites within the Colorado Desert Recovery Unit due to invasive plants that reduce available foraging sources to the tortoise. The secondary goal would be to implement the strategy, defined by this proposal, across the entire desert tortoise recovery unit to manage invasive plant species, and increase native plant cover, thereby improving the overall habitat conditions for the species. The project aims to restore desert tortoise habitat that has been degraded due to invasive plants that are crowding out desirable forage species. The project will analyze the impacts of manually removing invasive plants and planting of native species. Specifically, the project will identify five locations within the Colorado Desert recovery unit and then implement project activities in one-acre plots in each location. Then, the project will monitor the plots for invasive and native plant cover, and the survival of the planted native forage species for approximately two years or duration of funding. *USFWS contact: Vincent James*

NE#01: Fine Fuel Reduction and Native Annual Species Diversity in Burned Tortoise Habitat. Preemptive actions to identify areas of high exotic annual plant production and to control such fine fuels are expected to accelerate the recovery of burned desert tortoise habitat. Recent research has shown that herbicides containing the active ingredient imazapic, such as Plateau® (pre-emergent) and Journey® (post-emergent) are effective at controlling exotic annual grasses in burned areas, and repeated applications continue to suppress exotics while promoting the production of native annual species still in the seed bank. The goal of this project is to prioritize and treat one-time burned areas of high annual-grass fuels to conserve tortoise critical habitat. The objectives are to: 1) use a predictive-model approach based on remote sensing and available spatial information for prioritizing areas for herbicide treatment, and 2) implement herbicide treatments and monitor invasive fuels and native species production in tortoise habitat. Proponent: *Leslie DeFalco, USGS, Las Vegas, NV; USFWS contact: Flo Deffner*

NE#09: Install Fuel Breaks in Grand Canyon-Parashant National Monument Tortoise Habitat. Reduce the spread of fire in unburned and/or once-burned tortoise habitat to help maintain existing native habitat and promote the recovery of once-burned habitat. The proposed project would occur throughout tortoise habitat in the Grand Canyon-Parashant National Monument. Wildfires in the Grand Canyon-Parashant National Monument (GCPNM) have been responsible for thousands of acres of desert tortoise habitat being removed completely or drastically diminished to the point of the habitat not being viable for the species. An interdisciplinary team from GCPNM, Arizona Strip Bureau of Land Management Fire, FWS, Arizona Game and Fish Department, and other interested stakeholders would be convened to explore and plan best approaches for installation of fuel breaks while minimizing damage to current tortoise habitat. *Proponent: Brian Wooldridge, Arizona Ecological Services Office, USFWS, Flagstaff, AZ; USFWS contact: Flo Deffner*

NE#10: Install Fuel Breaks in Beaver Dam Slope Critical Habitat Unit. Reduce the spread of fire in unburned and/or once-burned tortoise habitat to help maintain existing native habitat and promote the recovery of once-burned habitat. Wildfires in the Beaver Dam Slope Critical Habitat Unit have been relatively infrequent; however, because of the abundance of both native and nonnative vegetation, a wildfire occurring in this area could be responsible for thousands of acres of desert tortoise habitat being removed completely or drastically diminished to the point of the habitat not being viable for the species. An interdisciplinary team from GCPNM, Arizona Strip

Bureau of Land Management Fire, FWS, Arizona Game and Fish Department, and other interested stakeholders would be convened to explore and plan best approaches for installation of fuel breaks while minimizing damage to current tortoise habitat. *Proponent: Brian Wooldridge, Arizona Ecological Services Office, USFWS, Flagstaff, AZ; USFWS contact: Flo Deffner*

NE#11: Installation of Desert Tortoise Fencing and Culverts on Nevada State Route 159 within Red Rock Canyon National Conservation Area. Install ~10.5 miles of permanent desert tortoise fencing along both sides of Route 159 to reduce mortality and illegal capture of desert tortoises, encourage recolonization of habitat within proximity to the road, and increase population viability by providing for connectivity of habitats across the road via drainage culverts. The proposed project could be completed in two phases to accommodate installation during the inactive season (30-60-days installation time) and potential funding opportunities. *USFWS contact: Flo Deffner*

NE#12: Installation of Desert Tortoise Fencing and Culverts on U.S. Highway 95 from Tule Springs to Indian Springs. Install ~18.55 miles of permanent desert tortoise fencing along US 95 to reduce mortality and illegal capture of desert tortoises, encourage recolonization of habitat within proximity to the road, and increase population viability by providing for connectivity of habitats across the road via drainage culverts. The proposed project could be completed in three phases to accommodate installation during the inactive season (30-60-days installation time) and potential funding opportunities. *USFWS contact: Flo Deffner*

NE#13: Installation of Desert Tortoise Fencing and Culverts on Nevada State Route 160, Nye County, Nevada. Install ~17.7 miles of permanent desert tortoise fencing along SR 160 to reduce mortality and illegal capture of desert tortoises, encourage recolonization of habitat within proximity to the road, and increase population viability by providing for connectivity of habitats across the road via drainage culverts. The proposed project could be completed in three phases to accommodate installation during the inactive season (30-60-days installation time) and potential funding opportunities. *USFWS contact: Flo Deffner*

NE#14: Road Warriors: Citizen Scientist Monitoring for Mojave Desert Road Mortality and Live Encounters to Identify Priority Areas for Fence Installation. The pilot project phase to evaluate the potential use of citizen scientist volunteers to conduct systematic surveys under the guidance of qualified biologists has been funded. Additional funding is needed to continue collection of road survey data beyond the pilot phase. Volunteers will document observations of tortoise road mortality, live tortoise encounters, carcasses, tortoise burrows, and tortoise sign on or near roads. The citizen scientist volunteers will also collect data regarding road mortality of other species observed during surveys. Road surveys may also be conducted prior to and after installation of desert tortoise fencing to help collect data regarding potential net benefits to other species monitored by the NDOW. During the inactive season, volunteers will be trained by Nevada Department of Transportation maintenance staff to conduct inspections of existing tortoise fencing, fill out reports, and make minor repairs. This project will provide a cost-effective template for the use of citizen scientists to collect data that will assist the USFWS and transportation agencies in identifying high-risk areas that should be prioritized for installation of desert tortoise exclusion fencing. *USFWS contact: Flo Deffner*

NE#16: Restoration within Desert Tortoise Habitat Using Artificial Water Catchments (Guzzlers) as Restoration Structures 2020. The project will focus on desert tortoise habitat restoration at selected sites affected by wildfire in the Gold Butte (Clark County, n = 4) and Mormon Mesa (Lincoln County, n = 6) critical habitat units. Restoration efforts will occur at 10 artificial water catchments. Efforts will be focused around these guzzlers, with native plants planted within a 100m radius from the center point of the guzzler collection apron. NDOW crews will plant ~200 plants grown from hyper-local source stock at each of the ten restoration sites in observance of the USGS's seed transition zones. These plants will be native perennial species selected for their habit benefits to desert tortoise, and their ability to compete with non-native grasses. *Proponent: Matt Flores and Jason Jones, NDOW; USFWS contact: Flo Deffner*

NE#17: Pilot Study-Evaluation of Common Raven Density and Depredation Threat to the Mojave Desert Tortoise in Southern Nevada. Observations of increased raven nesting activity and depredated Mojave desert tortoise carcasses within close proximity to Tule Springs Fossil Beds National Monument (TUSK) and surrounding BLM lands have been reported within the last three years. This pilot study will employ the combined approach of conducting raven point counts and deployment of Techno-Tort camera stations to estimate raven densities and raven predation rates, respectively. Techno-Tortoise stations will be only be installed within areas of suitable habitat and connectivity outside of designated archaeological sites within TUSK.

NE#18: Baseline Common Raven Density as well as Depredation Threat to the Mojave Desert Tortoise Mapping in Southern Nevada Common Raven Monitoring and Management Strata and Test of Exclusion Fence Effects on Common Raven Densities and Depredation Risk to the Mojave Desert Tortoise. Observations of increased raven nesting activity and depredated Mojave desert tortoise carcasses within Southern Nevada. This study will cover two seasons, spring and fall, over three years, and will employ the combined approach of conducting raven point counts and deployment of Techno-Tort camera stations to estimate raven densities and raven predation rates, respectively. We will evaluate potential effect of raven predation risk on recruitment and tortoise population viability in southern Nevada (via point counts, bait stations, and modeled depredations rates, where depredation pressure is estimated as a function of Common Raven density).

UVR#00: Land Acquisition in the Red Cliffs Desert Reserve. Ongoing effort to acquire remaining State Institutional Lands Administration (SITLA) and private properties in the Red Cliffs Desert Reserve for transfer to BLM, Utah Division of Wildlife Resources, or Snow Canyon State Park. The largest tract of land that needs to be acquired is 6,500 acres owned by SITLA in Zone 3 of the Reserve. There are also 1,288 acres of private property, the majority of which are in Zone 3 of the Reserve. This proposal aims to complete the remaining land acquisitions within the Reserve either through land exchange or purchase. The BLM has acquired many acres through Land and Water Conservation Fund and continues to apply for funds each year. However, funds are limited, and only small portions of land can be purchased at a time. Washington County and Utah Department of Natural Resources have also applied for funding through the Cooperative Endangered Species Conservation Fund and Endangered Species Mitigation Fund. These programs and matching funds from our partners have been useful for small-scale purchases of private property and will continue to be used in the future.

Proponent: Cameron Rognan, Washington County HCP Administrator, St. George, UT; USFWS contact: Flo Deffner

UVR#04: Desert Tortoise Education Center at Red Hills Garden Complex. Construct an education center in the Red Hills Desert Garden complex to support higher public use and greater outreach opportunities. The center will focus on educating the public regarding desert ecology and conservation. The education facility would be located near 350 E Red Hills Parkway - south of the Red Cliffs Desert Reserve and west of the Red Hills Desert Garden and stream. This location is perfect for public outreach since it is adjacent to the Red Cliffs Desert Reserve with immediate access to hiking trails, and it is also within the confines of Pioneer Park - the most visited City park in Southern Utah. The facilities would include a self-guided interpretive area, a gift shop, classroom, conference room, office/administrative space, equipment storage, and an outside exhibit with live desert tortoises. The creation of this education center in the Red Hills Desert Garden complex would fulfill the original intent of the HCP objective “to provide opportunity for people of all ages and background to gain a greater understanding of the unique and varied ecosystems found in Washington County.” *Proponent: Cameron Rognan, Washington County HCP Administrator, St. George, UT; USFWS contact: Flo Deffner*

UVR#06: Tortoise Fencing - Red Cliffs Desert Reserve. Add tortoise fencing where needed along Red Cliffs Desert Reserve boundary and interior roads and upgrade old mesh to new 1 x 2 inch standard. Due to the proximity of the Reserve to paved high-density roads, tortoise fencing is critical to reduce tortoise mortality on roadways within and adjacent to the Reserve. This project would fill in gaps and complete the fencing throughout all areas of the Reserve where it is still lacking. *Proponent: Cameron Rognan, Washington County HCP Administrator, St. George, UT; USFWS contact: Flo Deffner*

UVR#07: Gene flow study of Mojave desert tortoises between different populations within Washington County, including the Red Cliffs Desert Reserve, ‘Zone 6’ (proposed RCDR addition) Beaver Dam Slope, and Zion/Springdale populations. Connecting habitat is one of the recovery action types identified in the Recovery Action Plan for the Upper Virgin River Recovery Unit. Habitat fragmentation can increase isolation among populations, and isolation can increase extinction risk (Crooks and Sanjayan 2006; Fischer and Lindenmeyer 2007, as cited in Haggerty, Nussear, Esque, and Tracy 2010) due to demographic stochasticity, increased numbers of deterministic threats, and loss of genetic variation (Lande 1988; Saunders et al. 2001; Fahrig 2003; Henle et al. 2004; Reed 2004; Fischer and Lindenmeyer 2007, as cited in Haggerty et al. 2010). This study will evaluate gene flow between populations of tortoises in the Upper Virgin River and Northeast Mojave Recovery units. The results of this study may help identify critical areas to maintain habitat connectivity, and reduce risk of extirpation and other setbacks towards recovery of the Mojave desert tortoise. *Proponent: Mike Schijf, Washington County HCP Biologist, St. George, UT; USFWS contact: Flo Deffner*

UVR#08: Measuring Desert Tortoise Recovery: Population Viability Analysis in the Red Cliffs Desert Reserve. The desert tortoise population in the Red Cliffs Desert Reserve is estimated at 2,250 adult desert tortoises (McLuckie 2018), and the entire Reserve is approximately 250 km². The 1994 Recovery Plan determined that intensive management may be able to sustain populations of 2,000 individuals, but it did not robustly account for stochastic events on long-term persistence. The Revised Recovery Plan (USFWS 2011) recommends

updating predictive models, such as PVAs, with new data to accurately reflect the status of desert tortoise populations. In addition, improved understanding of viable desert tortoise population sizes is fundamental to calculating habitat connectivity needs. Habitat connectivity drives recommendations on how best to minimize impacts from habitat fragmentation. Thus, the results from this project will better inform desert tortoise recovery in the face of inevitably increasing habitat fragmentation in Utah. The UDWR has collected 13 years of data (1998 to 2017) in the Reserve to estimate density and abundance of adult desert tortoises. We propose to analyze data collected from previous monitoring efforts (McLuckie et al. 2018) to develop a predictive population model (Staples et al. 2004). *Proponent: Hilary Whitcomb, Fish and Wildlife Biologist, USFWS, Salt Lake City, UT; USFWS contact: Flo Deffner*

UVR#09: Efficacy of the herbicide, Esplanade, in controlling exotic grasses (e.g., *Bromus rubens*, *Bromus tectorum*) within the Red Cliffs National Conservation Area and its impact on established native perennials. The goal of this project is to test the long-term efficacy of the new herbicide, Indaziflam (© Esplanade, Bayer CropScience), in controlling exotic grasses within a study plot in the Mojave Desert. The objectives of the project is to determine the long-term impacts of: 1) the tolerance level of established perennials in the desert southwest to Esplanade 200 SC, 2) the Esplanade rate response in terms of efficacy on annual grasses and other annual weeds, and 3) the effect of application timing on *Bromus* control and annual grasses and desirable species tolerance. *Proponent: Ann McLuckie, Utah Division of Wildlife Resources, Hurricane, UT; USFWS contact: Flo Deffner*

UVR#10: Desert Tortoise Habitat Restoration in burned areas within the Red Cliffs National Conservation Area, Utah. Actively rehabilitate burned areas in suitable, previously occupied, Mojave desert tortoise critical habitat. Within burned habitat, 1-acre plots will be established that together total 5 acres. The plots will create "fertile islands" which act as seed banks from which native plants can disperse. Implementation of the project will give the burned areas potential to recover and reduce the abundance of annual brome grasses that foster destructive wildfires. Without active management, non-native grasses and forbs are projected to increase at the expense of native shrublands. Landscape-level restoration efforts will increase desert tortoise survivorship and fecundity in burned areas and help recover desert tortoise populations. *Proponent: John Kellam, BLM, St. George, UT and Ann McLuckie, Utah Division of Wildlife Resources, Hurricane, UT; USFWS contact: Flo Deffner*

UVR#11: Identifying Mojave desert tortoise habitat corridors to facilitate partnership-based recovery. The goal of this project is to identify important Mojave desert tortoise habitat corridors so that this information would be available to support decision-makers in land use planning and recovery of the species. The objective of the project is to acquire, analyze, and interpret spatial data which would identify the potential habitat corridor areas. Final work products would include a single raster layer map of the landscape with each 50 centimeter (cm) pixel classified by vegetation and habitat quality as well as ground-truthing data, which would include field notes, photos, and shapefiles of the ground-truthed survey areas. *Proponent: Hilary Whitcomb, USFWS, Salt Lake City, UT and John Kellam, BLM, St. George, UT; USFWS contact: Flo Deffner*

TOP PRIORITY FENCING RECOMMENDATIONS
Generated by the
Recovery Importance Index

January 9, 2019
Kerry L. Holcomb
Palm Springs Fish and Wildlife Office
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Rank	RIT ID	Name	RII Score	Side	Roads Included	Miles	Km	Total Miles	Comments
1	RD 1	I-40 Daggett to Newberry Springs, CA	120	South	Pendleton Rd to I-40 to Quarry Rd	14.6	23.6	14.6	Includes private land in right of way, could stop short of Newberry if habitat is the suspected cause observation dearth
2	RD 2	I-10 Shavers Valley-Chuckwalla Valley, CA	115	Both	I-10	44.3	71.3	88.6	Includes private land in right of way
3	RD 3	I-40 National Trails West of Pisgah, CA	110	South	National Trails HWY	5.2	8.4	5.2	Includes private land in right of way
4	RD 4	I-15 Afton Rd to Near Cave Mts,	110	no	I-15	3.7	5.9	7.3	Includes private land in right of way
5	RD 5	I-40 West of Van Winkle Wash to E of Essex Rd, CA	100	no	I-40	26.6	42.8	53.1	Includes private land in right of way
6	RD 6	US-93 Lincoln County line to Evergreen Flat, NV	96	no	US-93	32.7	52.6	65.3	n/a
7	RD 7	I-15 North of Barstow, CA	90	North	I-15	5.0	8.0	5.0	North side of I-15 only
8	RD 8	I-40 North of Black Ridge, CA	85	no	I-40	2.5	4.0	5.0	n/a
9	RD 9	SR-62 at Sheep Hole Mountains,	84	no	SR-62	3.9	6.3	7.9	n/a
10	RD 10	US-95 Chemehuevi Valley, CA	84	no	US-95	14.2	22.8	28.4	n/a
11	RD 11	I-40 Old Dad Mountains, CA	82	no	I-40	4.7	7.5	9.4	n/a
12	RD 12	SR-62 East of Sheep Hole Mountains, CA	81	no	SR-62	2.6	4.2	5.2	n/a
13	RD 13	I-40 Kalbaker Rd., CA	80	no	I-40	4.0	6.5	8.1	n/a
14	RD 14	US-95 From Nevada-boarder South	77	no	US-95	7.8	12.5	15.5	at grade but low gradient

Table 1 – Based on the rangewide Mojave desert tortoise Recovery Importance Index for Exclusion Fence Installation the fourteen exclusion fence installation projects listed above are the most critical to tortoise recovery in terms of our current understanding of road-effect zone area, relative habitat potential, current disturbances, and the locations of extant meta-populations.

Total Miles Summary Statistics

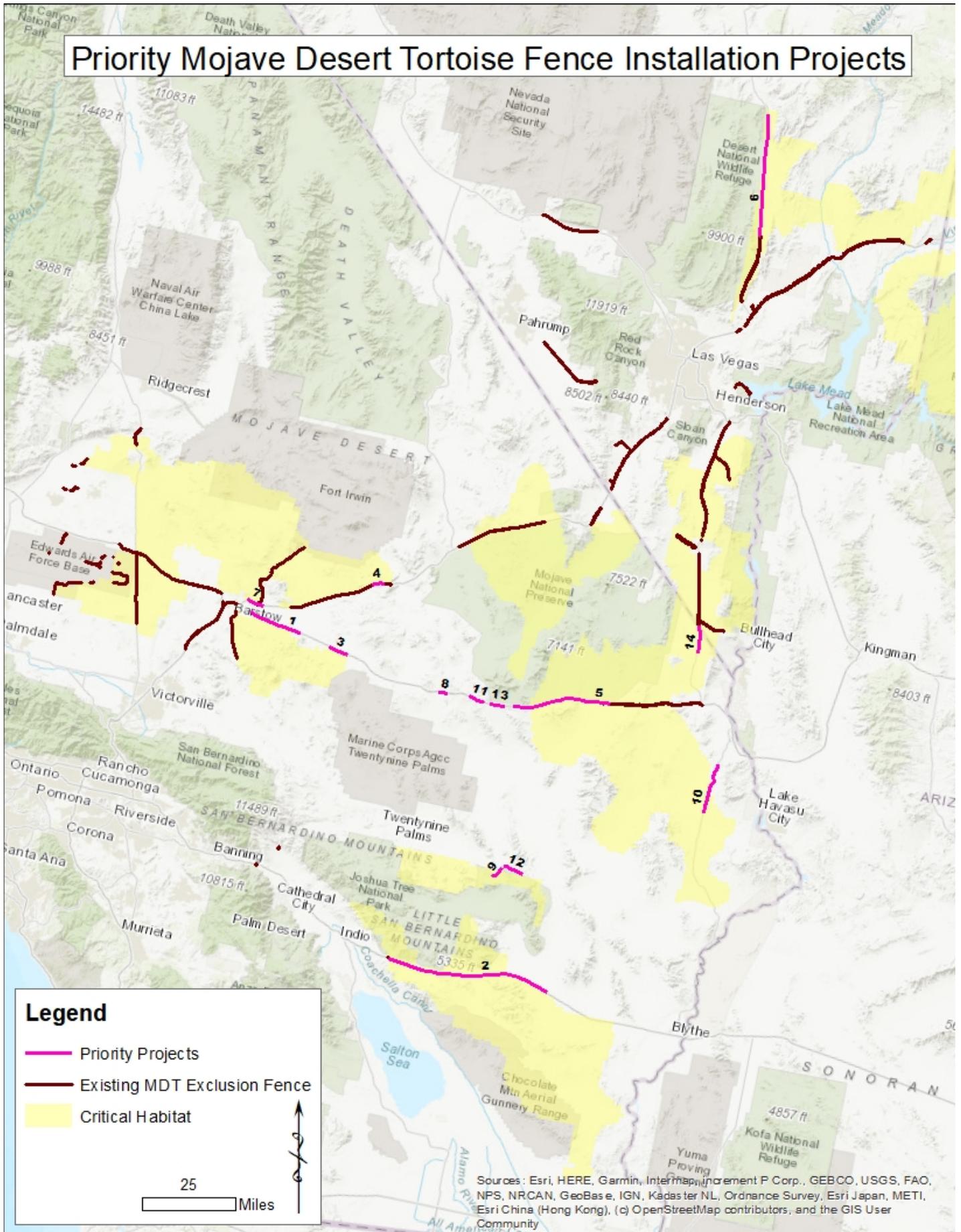
Smallest project: ~5.0 miles

Largest project: ~88.6 miles

Total miles of desired shovel ready fencing projects: ~318.5 miles

Average miles of fence per project: ~22.7 miles

Priority Mojave Desert Tortoise Fence Installation Projects



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBas e, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

FUNDED RIT PROJECTS

Year Funded	Project #	Title	Budget
Rangewide			
2018	RW01	Completed: Genomic and biogeographic analysis of <i>Mycoplasma agassizii</i> and <i>Mycoplasma testudineum</i> -Year 1	\$143,680 NV BLM
California RIT - Rangewide			
2016		Completed: Repelling Ravens from Desert Tortoise Habitat with a Laser	\$75,500 xxx
2016		Completed: A High-Tech Raven Lure for Predation Effectiveness Monitoring and Management through Predator Aversion	\$12,000 xxx
2017	CA14	Completed: Desert tortoise education and information program (2017-19)	\$100,000 DMG
2017	CA08	In Progress: Restore habitat in the northern Fremont-Kramer and western edge of the Superior-Cronese critical habitats by removing toxic mining wastes	\$70,000 CA BLM
2019		In Progress: Desert tortoise education and information program (2019-21)	~\$120,000 DMG
California RIT - Northeast Mojave Workgroup			
Ivanpah Critical Habitat Unit -7.4%/year			
2016-18		Completed: Phase 1 raven monitoring	REAT
Fenner Critical Habitat Unit -7.3%/year			
2016-18		Completed: Phase 1 raven monitoring	REAT
2019	CA25. v2	Completed: Piosphere Restoration on the Fenner/Piute Valley Critical Habitat Unit in Mojave National Preserve (<i>in part: 3 sites</i>)	\$34,875 MOJA
Death Valley National Park			
Other			
2019	CA22	Completed: Development and refinement of an aversive training device for raven predation reduction	\$150,000 DOD SBIR
California RIT - West Mojave Workgroup			
Fremont-Kramer Critical Habitat Unit -6.8%/year			
2017-18		Completed: Phase 1 raven monitoring	REAT
Superior-Cronese Critical Habitat Unit -9.3%/year			
2014-16		Completed: Phase 1 raven monitoring	REAT
2016	CA01	In progress: Desert Tortoise Route Signing and Restoration: Lane Mountain Area within Superior-Cronese Critical Habitat Unit	\$300,000 CA BLM
2017-18		In progress: Phase 2 raven monitoring and management	REAT

2018	CA39	In progress: Raven Subsidy Site Removal: Owl Canyon Campground Area Superior-Cronese Critical Habitat Unit	\$22,000 CA BLM
Ord-Rodman Critical Habitat Unit -8.2%/year			
2016-17		Completed: Phase 1 raven monitoring	REAT
2018		In progress: Phase 2 raven monitoring and management	REAT
2018	CA38	In progress: Desert Tortoise Route Signing and Restoration: Newberry/Rodman Area within Ord-Rodman Critical Habitat Unit	\$25,000 CA BLM
California RIT - Colorado Workgroup			
Chemehuevi Critical Habitat Unit -10.8%/year			
2014-16		Completed: Phase 1 raven monitoring	REAT
2017-18		In progress: Phase 2 raven monitoring and management	REAT
Chuckwalla Critical Habitat Unit -4.1%/year			
2013-15		Completed: Phase 1 raven monitoring	REAT
2019	CA17	In progress: Closed Wash Fencing/Signing in the Chuckwalla DWMA	\$50,000 CA BLM
Joshua Tree National Park +6.2%/year			
2016-17		Completed: Phase 1 raven monitoring	REAT
2018		In progress: Phase 2 raven monitoring and management	REAT
Pinto Mountain Critical Habitat Unit -8.3%/year			
2016-17		Completed: Phase 1 raven monitoring	REAT
2018		In progress: Phase 2 raven monitoring and management	REAT
North-East Mojave RIT - Rangewide			
2020	NE15	In progress: Quantifying Desert Tortoise Habitat Quality	\$1,370,000 NV BLM
North-East Mojave RIT - Southwest Nevada Workgroup			
2018	NE14	In progress: Road Warriors: Citizen Scientist Monitoring for Mojave Desert Road Mortality and Live Encounters to Identify Priority Areas for Fence Installation, Phase 1	\$35,000 Clark County
2020	NE17	Pilot Study-Evaluation of Common Raven Density and Depredation Threat to the Mojave Desert Tortoise in Southern Nevada	\$40,000 NPS
Desert National Wildlife Refuge			

North-East Mojave RIT - Southeast Nevada Workgroup			
Coyote Springs Critical Habitat Unit +10.2%/year			
~2012		In progress: Burned Desert Tortoise Habitat Restoration in Nevada	NV BLM
Mormon Mesa Critical Habitat Unit +8.2%/year			
Beaver Dam Slope Critical Habitat Unit +22.2%/year			
Gold Butte Critical Habitat Unit +14.4%/year			
Lake Mead National Recreation Area			
Piute-Eldorado Critical Habitat Unit (Piute Valley) +4.4%/year			
Piute-Eldorado Critical Habitat Unit (Eldorado Valley) -9.2%/year			
North-East Mojave RIT - Arizona/Utah Workgroup			
Beaver Dam Slope Critical Habitat Unit +22.2%/year			
20xx		In progress: Desert Tortoise Habitat Restoration in burned areas within the Beaver Dam Slope Critical Habitat Unit (Utah)	\$93,000 xxx
Virgin Slope ACEC +14.4%/year			
Grand Canyon-Parashant National Monument +14.4%/year			
Lake Mead National Recreation Area			
Upper Virgin River RIT -3.2%/year			
		In progress: Raven monitoring study	\$5,500 ¹
		In progress: Removal of non-native shrubs and trees from the Red Cliffs Desert Reserve	\$20,400

¹ Ongoing project; ~\$5000 per year

	UVR02	In progress: Desert tortoise habitat restoration in burned areas within the RCDR	\$104,688 xxx
	UVR07	Completed: Tortoise surveys in the UVR Recovery Unit	\$5,000 ² Washtn Co.
2020	UVR12	In progress: Survival analysis of desert tortoises within the Red Cliffs Desert Reserve	\$19,896 UDWR, TNC, USFWS

² Estimated \$20-30,000 in staff hours contributed