



# **National Fish and Wildlife Foundation**

## **Mojave Desert Tortoise Recovery Implementation Plan**

**February 2022**

## Purpose of this Implementation Plan

The purpose of this Implementation Plan is to provide a concise blueprint of the strategies and resources required to conserve the Mojave desert tortoise as committed to by the U.S. Fish and Wildlife Service and Department of Defense in the Recovery and Sustainment Partnership (RASP) initiative. The strategies reflect the view of the many federal, state, academic, and organizational experts that NFWF consulted during plan development. The intent of this plan is to invest in high-value and high-return conservation actions to optimize conservation and support the broader recovery effort. Over time the partners will adapt this plan, subject to the availability of additional funding.

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## About NFWF

NFWF protects and restores the nation's fish, wildlife, plants and habitats. Chartered by Congress in 1984, NFWF directs public conservation dollars to the most pressing environmental needs and matches those investments with private contributions. NFWF works with government, nonprofit and corporate partners to find solutions for the most complex conservation challenges. NFWF has funded more than 5,000 organizations and committed more than \$6.8 billion to conservation projects. Learn more at [www.nfwf.org](http://www.nfwf.org).

**Cover photo credit:** *Mojave desert tortoise* (Kimberleigh Field/USFWS).

## Background

The Desert Tortoise Recovery Partnership (DTRP) was formed by the National Fish and Wildlife Foundation (NFWF), U.S. Marines Corps, U.S. Army, Department of Defense (DoD), U.S. Fish and Wildlife Service (USFWS) and the U.S. Bureau of Land Management (BLM) to coordinate implementation of strategies and provide additional resources to address the pressing conservation needs of the Mojave desert tortoise (*Gopherus agassizii*) in the West Mojave Desert of southeastern California.

The DTRP was established in September 2020 through Cooperative Agreement number N62473-20-2-0003 between NFWF and the Department of the Navy (DON) to establish a funding framework between NFWF and the Marine Corps Air Ground Center (MCAGCC) Twentynine Palms for desert tortoise conservation under the Recovery and Sustainment Partnership (RASP). This 10-year Implementation Plan will guide future investments to achieve conservation goals for the Mojave desert tortoise and its habitat in California's Mojave Desert, particularly the Western Mojave Recovery Unit.

## Conservation Need

Desert tortoises have inhabited the region of the southwestern United States for an estimated 15 to 20 million years, making it one of the oldest extant species in the U.S. The Mojave desert tortoise (*Gopherus agassizii*) occurs primarily north and west of the Colorado River in California, Nevada, Arizona, and Utah, and their population has declined acutely in the past several decades. Between 2004 and 2014, adult desert tortoise densities decreased across the range (Allison and McLuckie 2018). By 2014, the adult population density in the Western Mojave and Eastern Mojave Recovery Units had decreased by 49 percent and 33 percent from their 2004 levels, respectively. The proportion of juveniles in these recovery units also declined from 2004 levels.

The Mojave desert tortoise spends up to 95% of its life underground, and is well-suited to endure in a highly variable and often harsh desert environment (Nagy and Medica 1986; Hemen 1997). During winter and summers of drought years, they reduce above ground activity and remain mostly quiescent in burrows, reducing their metabolism, water loss and food requirements. They can survive for more than a year without drinking (Nagy and Medica 1986). The desert tortoise lives in a variety of habitats from sandy flats to rocky foothills, including alluvial fans, washes and canyons where suitable soils for den construction or caliche crevices offer refugia from predators and extreme surface weather. It lives from near sea level to around 3,500 feet in elevation, and is a keystone species of the Mojave Desert ecosystem, providing refugia for other wildlife and, via digestion, dispersing seeds that help form and stabilize the vegetative landscape.

Desert tortoises may live 50 or more years in the wild. Their diet consists primarily of wildflowers, grasses, and cacti. Their large urinary bladder, which allows water resorption to keep them hydrated for months at a time, also conserves water via excretion of nitrogenous wastes as uric acid. When sufficient rain falls, tortoises drink from temporary rain pools, including pools in basins they dig in advance. Desert tortoises may void portions of their bladder contents as a common defensive behavior when attacked or handled inappropriately, leaving tortoises particularly vulnerable to harsh weather and predation during periodic droughts.

Desert tortoises require 13 to 20 years to reach sexual maturity, which is when females reproduce by laying eggs. A clutch typically contains between 1 and 14 eggs, with clutch frequency reduced during years with low rainfall. Nesting occurs in late spring or early summer, with egg incubation culminating in hatching during August and September. Tortoises use burrows to escape extreme temperatures, and for protection from predators such as coyotes, kit fox, ravens, ground squirrels and desert fire ants. The high mortality of eggs and juveniles, up to 100% per year, severely constrains natural rates of population and species recovery. Consequently, it is critical that conservation actions include substantial and sustained efforts to increase egg production and recruitment, and decrease juvenile mortality for species recovery to succeed.

Tortoise densities vary considerably throughout their range. In the Western Mojave Recovery Unit, many areas have densities below 3.9 adults per square kilometer, which is considered the minimum tortoise density for viable reproduction (Allison and McLuckie 2018). Mojave desert tortoise populations have declined sharply in association with a variety of changes to their habitat in the past century. The many, ongoing threats that increase tortoise mortality and habitat loss include urbanization, large-scale renewable energy projects, proliferation of roads and highways, off-highway vehicle (OHV) activity, predation by subsidized predators (e.g., ravens and coyotes) habitat invasion by non-native invasive plant species and wildfire.

A primary threat to Mojave desert tortoise populations is increasing habitat loss and degradation, which are driven by a wide range of human activities and climate-related stressors (USFWS 2011, Abella and Berry 2016). One factor contributing to reduced habitat quality and connectivity is OHV activity, which can degrade tortoise habitat by compacting soils, reducing infiltration, spreading invasive plants, and harming vegetation, thus reducing suitable habitat for tortoise burrows as well as forage (Lovich and Bainbridge 1999). Areas in the West Mojave with heavy OHV use have been found to host fewer tortoises and tortoises with lower body mass than comparable undisturbed areas (Bury and Luckenback 2002; Berry et al. 2014).

Highway and paved road mortality contributes substantially to range-wide declines of the desert tortoise. Road effects deplete populations, fragment habitat and populations, isolate populations physically and genetically, subsidize predator populations, and provide human access that supports collection, vandalism, and poaching in remote areas (Boarman and Sasaki 1996; USFWS 2011; Nafus et al. 2013; Peaden et al. 2015).

## **Current Conservation Context**

The Mojave population of the desert tortoise was listed as Threatened under the federal Endangered Species Act on April 2, 1990. In 1994, the USFWS and others published a recovery plan for the Mojave desert tortoise, proposed Desert Wildlife Management Areas (DWMA), and designated critical habitat where the species occurred in four states. The 2011 revision of the Recovery Plan assigned the tortoise a recovery priority number of 12C. The 12C category means that a moderate degree of threat and low potential of recovery existed for the Mojave desert tortoise based on: “a) a moderate degree of threat, which, although increased since 1994, does not place the species at imminent risk of extinction; b) a low potential for recovery, adjusted based on current uncertainties about various threats and our ability to manage them; c) listed population below the species level; and d) potential conflict with development or other forms of economic activity.” The recovery priority number was changed to 11C to reflect its new status as a distinct species after the Sonoran Desert tortoise was rigorously described as a distinct species (Murphy et al. 2011).

In October 2020, the California Fish and Game Commission granted temporary, state level, endangered species status to the Mojave desert tortoise, and is considering the species as a candidate for permanent listing as endangered.

In addition to describing the ecological needs of and threats to the Mojave desert tortoise, the USFWS' 2011 Revised Recovery Plan conveys the suite of conservation actions necessary to recover the species. This Recovery Plan is the foundation for conservation strategies that appear in biological opinions related to the RASP and in this Implementation Plan. Due to the species' federally threatened status, actions with a federal nexus and which may impact Mojave desert tortoises and their habitat, must involve consultation with the USFWS under Section 7 of the Endangered Species Act.

In 2016, BLM's Desert Renewable Energy Conservation Plan (DRECP) identified areas of critical environmental concern (ACECs), which are BLM areas within public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems of processes, or to protect life and safety from natural hazards (BLM 2016). For resource management purposes, ACECs have replaced the DWMAAs identified in the Recovery Plan.

Many public and non-profit conservation entities are committed to recovering the Mojave desert tortoise. The USFWS' Desert Tortoise Recovery Office (DTRO) explicitly addresses ongoing population declines and focuses on research, monitoring, recovery plan implementation, and associated recovery permitting. The DTRO was established based on recommendations from the General Accounting Office's 2002 audit of desert tortoise recovery actions, and from the October 2004 Desert Tortoise Recovery Plan Assessment's guidance to improve coordination among entities working to recover the Mojave desert tortoise.

This Implementation Plan aims to use significant, existing recovery plans to describe a road map to invest future resources across jurisdictional boundaries consistent with these actions. Local entities seek funds to implement the vision of the Revised Recovery Plan, and the DTRP aims to pool and streamline investments to accelerate recovery of the species. This approach aims to address ongoing challenges to recovery that stem from insufficient information on the effectiveness of management actions and the broad geographic distribution of threats to the species (Averill-Murray et al., 2012). By prioritizing conservation activities and evaluating their effectiveness over many focal areas across the species' range (Figure 1), in a framework that encourages a cross-jurisdictional approach, the DTRP is designed to optimize the impact of the conservation investments.

The climate and expanse of the Mojave Desert helped the development of Department of Defense (DoD) weapons testing and training sites in the region in the second half of the 20<sup>th</sup> century. Today, each of those military installations are dedicated to ensuring compliance with environmental regulations, including recovering the Mojave desert tortoise under the Endangered Species Act. The installation tortoise programs have driven numerous basic and applied scientific discoveries, including sequencing the tortoise genome (Tollis et al. 2017), using genomics to identify landscape effects upon the species' distribution (Sanchez-Ramirez et al. 2018), developing species distribution models to identify climate refugia and risks of climate warming (Barrows et al. 2016), quantifying temperature-dependent sex determination risks to reproductive success and long-term demography (Nagy et al. 2016) and evaluating risks and successful methods to augment tortoise populations via head-starting (Nagy et al. 2015a,b, 2016). These installations have also quantified predation risks from subsidized predators (e.g.,

coyotes [Esque et al. 2010] and ravens [Nagy et al. 2015a,b]), and advanced methods to control such predators (e.g., oiling raven eggs in nests).

These programs continue today and offer numerous opportunities to drive scientific advances, such as climate change risks to demographic stability and species recovery (Nagy et al. 2016). The Environmental Affairs Division recovery and compliance actions at the Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms ensures environmental compliance, and actively leads advances via many recovery actions, including population augmentation (head-starting and translocation) of desert tortoises. The U.S. Army's National Training Center and Ft. Irwin Directorate of Public Works Environmental Division implements tortoise population augmentation research and efforts (head-starting and translocation), sustains fencing that minimizes road-kill of desert tortoises, protects other listed species (e.g., Lane Mountain milk-vetch) and implements other environmental compliance. Environmental Support within Operations and Management at the Naval Air Weapons Station China Lake implements tortoise conservation and addresses other wildlife issues. At Edwards Air Force Base (EAFB), the 412<sup>th</sup> Civil Engineers Group's Environmental Management Division designs and implements innovative strategies for head-starting tortoises and controlling subsidized predators (e.g., oiling of raven eggs).

State agencies in California actively implement conservation efforts for Mojave desert tortoise recovery. The California Department of Transportation (Caltrans) is advancing design of tortoise exclusionary fencing and road crossing infrastructure that may reduce vehicle strike mortalities and other road effects (Hunt 2014; Caltrans 2020). The California Department of Fish and Wildlife (CDFW) issues permits for research and recovery purposes, and determines the species conservation status at the State level. The California State Parks also engage in Mojave desert tortoise conservation, including restoration grantmaking, through their Off-Highway Motor Vehicle Recreation Division.

Other federal agencies, including the U.S. Bureau of Land Management (BLM) and U.S. Geological Survey (USGS), are active in Mojave desert tortoise recovery. The BLM is an indispensable federal partner in species recovery as a land manager and cross-jurisdictional planner. In the West Mojave, the BLM manages large swaths of this land for multiple uses such as conservation, power transmission, mining, mineral extraction, renewable energy, natural gas and petroleum transmission, and recreation. The BLM is currently implementing the West Mojave Route Network Project (WMRNP; BLM 2019b), a travel management planning effort covering 9.24 million acres in California's West Mojave Desert that supplements the 2006 West Mojave Plan. The agency's California Desert District manages 3.1 million acres in the WMRNP planning area, which includes much of the tortoise's critical habitat areas in the Western Mojave Recovery Unit. The DRECP sets disturbance caps and mitigation actions for activities occurring in ACECs on BLM-managed lands.

The BLM has also played a critical role in developing a road map for native seed resources for the Mojave Desert through its chairmanship of the Plant Conservation Alliance (PCA) Federal Committee, which implements the National Seed Strategy for Rehabilitation and Restoration (NSS). In support of the NSS, the Mojave Desert Native Plant Program published a five-year strategy for implementing the NSS across the Mojave Desert ecoregion beginning in 2022 (MDNPP 2021). The BLM also leads regulatory permitting for disturbance activities on BLM lands, and for such activities that impact the tortoise, collects and manages mitigation funding. Although the DTRP considers only proactive funding for Mojave desert tortoise recovery, it also considers the significant, ongoing mitigation resources provided to recovery efforts, such as corvid control.

Meanwhile, a substantial USGS focus is monitoring and scientific research aimed to better understand the habitat needs of, threats to and impacts of recovery actions on the species. USGS scientists are key partners in identifying and evaluating priority recovery actions range wide.

As tortoise populations continue to decline (see Allison and McLuckie 2018, and references therein), federal partners have sought new ways to collaborate to advance species recovery. In June 2018, the DoD and Department of the Interior (DOI) signed a Memorandum of Understanding (MOU) to establish the Recovery and Sustainment Partnership (RASP) to develop species conservation and recovery initiatives and increase flexibility for military missions (DoD and DOI 2018a). The Mojave desert tortoise is one priority species DoD and DOI identified for recovery through the RASP. DoD and the USFWS developed a species action plan (DoD and DOI 2018b; DoD and DOI 2019), with the goal of “[identifying] actions required by DoD and the USFWS to reduce the regulatory burden on DoD for the management of the target species and its designated critical habitat, as part of an overall effort to accelerate the recovery of the desert tortoise in partnership with other federal and state agencies, and other partners.” Subsequently, the USFWS is conducting consultation under Section 7 of the Endangered Species Act to address future training impacts and effective, long-term and coordinated DoD contributions to desert tortoise recovery. Installations may contribute funding to support RASP activities as part of this partnership.

Federal and state engagement in recovery efforts is complemented by that of several conservation organizations, including the Amargosa Conservancy, the Desert Tortoise Preserve Committee, Friends of El Mirage, Friends of Jawbone, Mojave Desert Land Trust, Preservation Ranch and Transition Habitat Conservancy. The Desert Tortoise Council, an organization of desert tortoise researchers, NGOs, and government agencies, provides a significant forum and guidance to advance tortoise conservation biology, and convene stakeholders to disseminate the latest conservation strategies.

Another important source of support for desert tortoise conservation is mitigation funding resulting from development activities in the Mojave Desert. NFWF’s Impact-Directed Investment Accounts (IDEA) division manages mitigation funds to support raven monitoring and management, and has for several years funded research on the interaction between desert tortoises and ravens in California deserts at the Joshua Tree National Park and Pinto Mountains CHU; Mojave National Preserve, Piute-Fenner and Ivanpah CHU; Superior-Cronese CHU and Fort Irwin’s southeast conservation area; Chemehuevi CHU; Ord-Rodman CHU; and the Fremont-Kramer CHU (including a portion within Edwards Air Force Base and Desert Tortoise Research Natural Area). NFWF IDEA funds this work in consultation with the Renewable Energy Action Team (consisting of CDFW, California Energy Commission, the BLM, and USFWS) to implement a regional raven management plan to reduce predation by ravens on the desert tortoise in California deserts. Funding for implementation of the regional raven management plan is provided to and administered by NFWF IDEA as mitigation for impacts to the desert tortoise in the California desert. Since this funding source for raven management exists, this Plan does not propose to direct additional non-mitigation funding resources toward raven management.

The remarkable magnitude of federal resources contributes substantially to advancing and implementing recovery actions for the Mojave desert tortoise. These strengths are bolstered by state and non-profit resources, but effective conservation requires greater coordination and capacity to accelerate tangible recovery impacts. With funding strategically focused on achieving measurable, high-value conservation benefits, the Mojave Desert Tortoise Recovery Implementation Plan can reinforce these partners in advancing recovery of this American desert icon.

## Implementation Plan Objectives

The ultimate goal of this Plan is to support the Recovery Plan's de-listing criteria via coordination and collaboration among governmental and non-governmental recovery partners. While this Plan is initially designed for a 10-year implementation time-frame, the objectives addressed are medium-term, 5-year objectives. It is the intention that long-term 10-year objectives will be added to the plan around the 5-year mark. Through priority strategies, this Plan will guide investments in projects that optimize habitat and demographic improvements for Mojave desert tortoises in California's western Mojave Desert (Table 1). This plan is not an exhaustive list of recovery actions, but it addresses key drivers of population declines.

To reduce mortality rates due to vehicle strikes, **this Plan invests in the installation of 32 miles of exclusion fencing along priority highways in the western Mojave Desert within the first five years.** These fences will be accompanied by flood control culverts or other underpass or overpass structures that reduce population isolation by allowing tortoises to pass safely under or over roadways. These road improvement structures reduce tortoise mortality and increase population connectivity and gene flow. Installing barrier fencing may enable repopulation of road-effect zones, where populations have been significantly depleted along road mortality hot spots (Nafus et al. 2013, Peaden et al. 2015). Tortoise densities can be much lower adjacent to unfenced highways compared to areas further away from highways (Peaden et al. 2015), and juvenile tortoise home ranges decrease in size, while carapace temperatures increase, with proximity to roads (Peaden et al. 2017). Prudently placed highway fencing could enable nature-assisted restoration of these areas as desirable tortoise habitat, and thus expand the total habitat available to tortoises.

To mitigate impacts from unauthorized OHV use, **this Plan invests in the marking and vertical mulching of unauthorized OHV routes, to result in the incorporation of an additional 7,500 acres within defensible polygons in the first five years.** Defensible polygons are contiguous tracks of land where human intrusion and disturbance can be greatly diminished or eliminated through successful OHV route closures, land protection, and restoration. This will be achieved by marking and signing unauthorized OHV routes, and likely involve obscuring routes using vertical mulching. Vertical mulching can increase compliance with route closures through placement of structures such as live vegetation, rocks, dead shrubs, and woody material on the closed roadway surface to obscure the route. When vertical mulching is not successful in closing an unauthorized route, fencing or other physical barriers may be necessary to achieve closure.

To further reclaim and rehabilitate tortoise habitat, **this Plan will support the protection and restoration of 250,000 acres of habitat within the focal areas in the first five years.** To protect tortoise habitat and create larger continuous tracts of tortoise habitat, the Plan supports the purchase of inholdings and the establishment of conservation easements that remove habitat from future development or mitigate losses of habitat elsewhere. Restoration activities such as soil remediation, weed management, and revegetation with native plants, may be required to restore natural functions to closed routes and other patches of habitat. Degraded habitat provides areas less suitable for foraging, breeding and resting (Abella and Berry 2016), which likely leads to a decline in tortoise health and reproductive success. To support habitat restoration activities, this Plan will invest in seed collection and propagation where native seed banks have been depleted through competition with non-native plants.

Population augmentation via translocation or head-starting to zones depauperate of tortoises could bolster tortoise populations. Head-starting involves raising young tortoises in protected areas until they



reach sizes that are less vulnerable to threats, such as predation by ravens, before release to the wild. DoD has funded head-starting research and recovery efforts at MCAGCC, Ft. Irwin and EAFB, with MCAGCC's Tortoise Research and Captive Rearing Site continuing numerous analyses, including demographic monitoring of released, headstarted tortoises. Within all focal areas in the Western Mojave Recovery Unit, desert tortoise densities are below a minimum viable density threshold of 3.9 adults per square kilometer (USFWS 1994). Below this threshold, reproductive potential and survival diminish, genetic diversity is lost, and local extirpation is likely without intervention. Additionally, high predation on juveniles compromises recruitment of small tortoises to reproductive size classes. Augmenting depleted populations should bolster adult reproduction and juvenile recruitment into adult populations.

Finally, community outreach performed in tandem with habitat improvements can convey more success than improvements alone. Information and education campaigns can build public support for and involvement in the recovery of the Mojave desert tortoise. An educated public is more likely to be aware of how their actions can negatively impact tortoises. Through education and outreach initiatives, this Plan hopes to reduce human subsidies of predator communities like ravens that prey on young tortoises and severely reduce recruitment. Outreach and additional staffing (not funded by NFWF) for law enforcement or visitor contact rangers can also increase compliance with OHV route designations and aid in the protection of tortoises and their habitat within defensible polygons.

## **Environmental and Cultural Clearance Needs**

Conservation activities are subject to many critical environmental and cultural compliance requirements, like those defined by the National Environmental Policy Act (NEPA). Planning for smooth compliance is key to accomplishing tangible benefits for the Mojave desert tortoise. There are several existing authorizations for the work implemented under this Plan. The West Mojave Route Network Project (WEMO) amended the California Desert Conservation Area Plan and resulted from an Environmental Impact Statement (EIS; BLM 2019a). That document analyzed all of the restoration and conservation activities proposed under this Plan. The EIS also addresses compliance with the Endangered Species Act (ESA), National Historic Preservation Act (NHPA), and Clean Air Act (CAA).

Projects activities that have not been analyzed in the WEMO will need to obtain the appropriate compliance documentation as part of project implementation prior to work commencing. This process benefits incredibly from early planning, which improves the best management of resources. Many implementing organizations are experienced in completing these legal requirements. We expect funding applications will clearly and completely document the applicants' environmental authorizations for their projects. This Plan budgets funds to assist grantees in completing these compliance requirements as part of their projects.

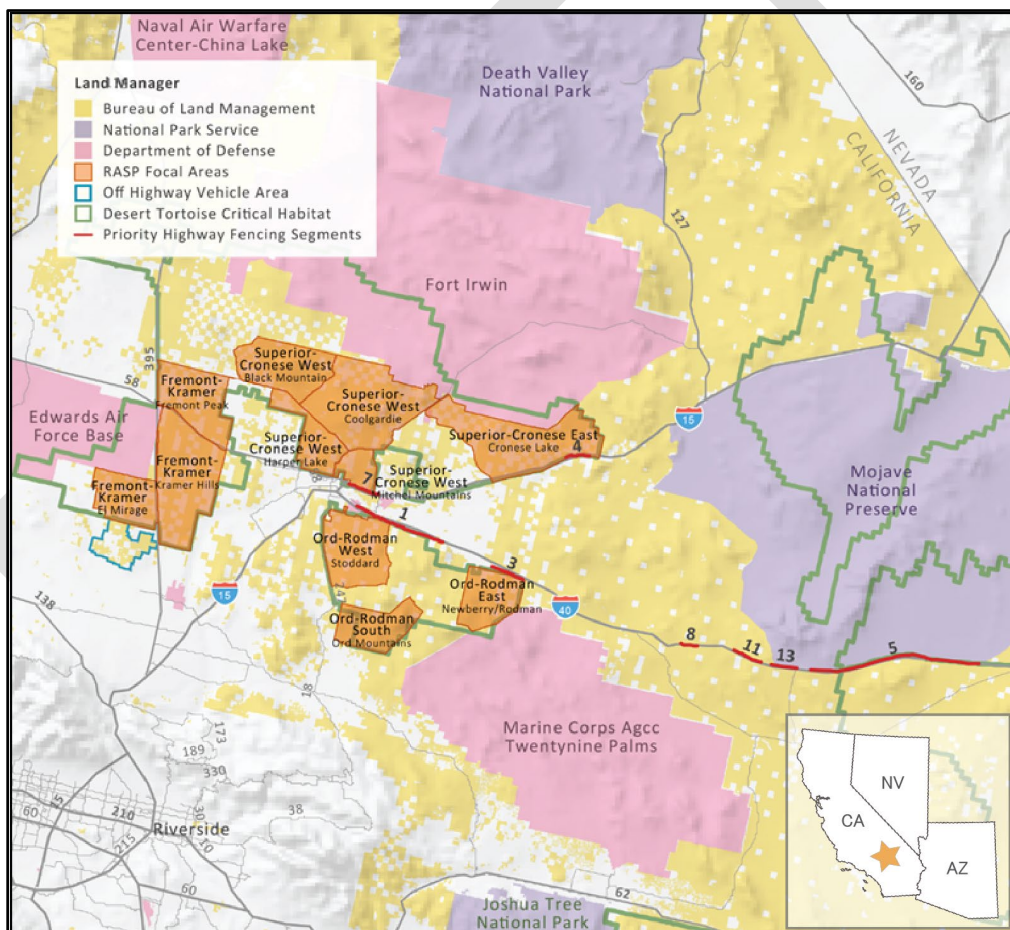
**Table 1. Desert tortoise RASP objectives in the Plan’s first five years**

Short-term habitat objectives
Construct 32 miles of desert tortoise exclusion fencing along high-priority highways in the western Mojave Desert
Rehabilitate unauthorized routes of travel in the identified recovery focal areas to incorporate an additional 75,000 acres within defensible polygon units
Protect and restore up to 250,000 acres of habitat in identified recovery focal areas
Medium-term species objectives
The focal area populations have an increasing rate of adult survival, reproductive success, and juvenile recruitment that is statistically greater than those measured at reference sites outside focal areas for a period of 5 years
Desert tortoise density in the focal areas is above minimum viable density (3.9 tortoises per square kilometer) for a period of 5 years
The proportion of juvenile desert tortoises in focal area populations is statistically greater than those measured in reference sites outside of focal areas for a period of 5 years

# Geographic Focus

The RASP Implementation Plan focuses recovery actions in specific focal areas in the western Mojave Desert so resources can provide the greatest benefit to recovery of the desert tortoise (Figure 1). These focal areas are predominantly large sections of public lands managed by the BLM, are within designated critical habitat, and are located near DoD installations participating in the RASP. Protecting these focal areas would benefit from efforts to reduce encroachment on military missions. Relevant characteristics of each focal area are described in Table 2.

The RASP focal areas support landscape-scale connectivity and minimize overlap with grazing allotments and open OHV recreation areas, thereby reducing conflict with RASP objectives. Consequently, we expect that these focal areas will respond more readily to conservation investments due to existing conservation designations and their habitat and population characteristics. However, road crossing improvement projects will be supported across a broader geography, targeting priority road sections throughout the western Mojave Desert (Figure 1).



**Figure 1. Mojave Desert Tortoise RASP Implementation Plan focal areas and priority highway fencing segments in the Western Mojave Recovery Unit.** Priority fencing segments include: (1) I-40 Daggett to Newberry Springs, CA; (3) I-40 National Trails West of Pigsah, CA; (5) I-40 West of Van Winkle Wash to E of Essex Rd, CA; (7) I-15 North of Barstow, CA; (8) I-40 North of Black Ridge, CA; (11) I-40 Old Dad Mountains, CA; and (13) I-40 Kelbaker Rd, CA.

**Table 2. Conservation focal areas**

Focal Area	Description
Superior-Cronese West	<p>This region includes Black Mountain and Coolgardie. Black Mountain is dominated by the Black Mountain Wilderness area, a volcanic area that is largely protected and has low usage except during the fall hunting season. Landowners are primarily Federal agencies, state agencies or conservation organizations. This area has received recent restoration and the habitat is fair to good. Coolgardie is a diverse area with several listed or petitioned species including Lane Mountain milk-vetch, Joshua tree, and Mohave ground squirrel. It is comprised of BLM, DOD, and private ownership. This area is also impacted by the urban interface and mining. Subsidized predation, particularly by common ravens, is a major management issue. Restoration efforts have been challenging here due to land control issues. Continued intense monitoring will be required to maintain quality, safe habitat.</p>
Superior-Cronese East	<p>This region includes Calico Mountain and Cronese Lake. Calico Mountain includes BLM, DOD, and private holdings. Mining and exploration occur in this area, while the primary threats are unauthorized OHV use and illegal cannabis cultivation. Subsidized predation, particularly by common ravens, is a major management issue. The overall condition of the habitat is poor, and restoration is challenging due to the mixed ownership and urban interface. Cronese Lake is comprised of multiple ownerships, but primarily BLM and DoD managed lands. This area is primarily used for power and other utility transmission. Habitat degradation occurs from unauthorized OHV use and exploration. The subregion is remote and lends itself to restoration activity with islands of roadless areas and decent habitat. Areas closer to I-15 are impacted by travelers and trash.</p>
Fremont-Kramer	<p>This region includes Fremont Peak and Kramer Hills. Land owners in Fremont Peak include the BLM, CDFW, Wildlands Inc., and Transition Habitat Conservancy. The primary threat in this area is unauthorized OHV use and cannabis cultivation. The overall condition of the habitat is fair to poor; drought has caused a severe lack of water and deteriorating vegetation. Kramer Hills is pockmarked with multiple ownership, primarily BLM and private, with some contiguous parcels of DoD on the east side. This area is heavily influenced by the urban interface and private cannabis cultivation. Subsidized predation, particularly by common ravens, is a management issue more acute here than in other focal areas. The habitat in this area, where protected from hazards, is good, while the overall area is dissected with private parcels that inhibit scalable restoration.</p>

Ord-Rodman West	<p>This region is located east of Hwy 247 and is dominated by electric and natural gas transmission lines and contains an active grazing allotment. The primary threats in this area are unauthorized OHV use and cannabis cultivation. Subsidized predation, particularly by common ravens, is a major management issue. Recent translocations have increased tortoise density in this area, and the habitat is fair to good. The Ord Mountains typically get more rain and winter moisture than other focal areas.</p>
Ord-Rodman East	<p>The region is dominated by two large wilderness areas, Newberry Mountain and Rodman Mountain. This area is part of an active grazing allotment and is susceptible to unauthorized OHV use. Its proximity to the Johnson Valley OHV Area is contributing to this use, and it will take time determine the effectiveness of OHV fencing. Subsidized predation, particularly by common ravens, is a major management issue. Like the Ord Mountains, this area has seen greater than average moisture and the habitat is in fair to good shape. Along with Ord-Rodman South, this area was a recipient site for translocated desert tortoises from MCAGCC’s western expansion area, which supported tortoise recovery by augmenting tortoise populations in this focal area.</p>
Ord-Rodman South	<p>This region includes East Ord Mountain and has conditions similar to those of the Ord-Mountain West focal area. Subsidized predation, particularly by common ravens, is a major management issue. Along with Ord-Rodman East, this area was a recipient site for translocated desert tortoises from MCAGCC’s western expansion area, which supported tortoise recovery by augmenting tortoise populations in this focal area.</p>

# Priority Implementation Strategies

NFWF will fund the following implementation strategies over a 10-year period to support the short- and medium-term objectives described in this Plan. The results chain in Figure 2 provides a model for how the collective strategies are anticipated to contribute to the identified conservation objectives.

## Strategy 1. Mojave desert tortoise habitat improvement

**1.1 Establish defensible polygons of desert tortoise habitat** – Expanding existing or conserving new tracts of Mojave desert tortoise habitat via route restoration and land protection

**1.1.1 Land acquisitions and conservation easements** – Acquire land acquisitions or conservation easements within focal areas, with priority given to inholdings that are strategically important for moving restoration actions forward, which would connect multiple existing conservation lands within critical habitat areas, or which are particularly cost-effective. A funding mechanism for long-term stewardship of acquired lands or conservation easements should be included in this strategy.

**1.1.2 OHV route signage** – Install signs on unauthorized routes to indicate route closures. Signs may also include education material to encourage compliance.

**1.1.3 Vertical mulching** – Conduct restoration of unauthorized routes using vertical mulching to restore habitat and discourage incursions into tortoise habitat.

**1.1.4 Physical barrier installation** – Install physical barriers on unauthorized routes where signage and vertical mulching have been unsuccessful.

**1.1.5 Community outreach and education** – Build support for, understanding of, and compliance with authorized use of off highway vehicles to reduce human intrusion into desert tortoise habitat, maintain the integrity of existing habitat, and restore degraded habitat. Education programs can also reduce instances of mortality, poaching, and human subsidies of predators on tortoises.

**1.1.6 Increase visitor contact staffing to reduce non-compliance with route and habitat restoration closures** – Fund visitor contact ranger positions to educate land users on the purposes of route and habitat closures. *While no funding for this strategy will come through NFWF, other RASP partners intend to support this strategy.*

**1.2 Improve desert tortoise habitat on protected lands** – Restoring degraded tortoise habitat on defensible habitat space

**1.2.1 Habitat restoration**: Improve native species habitat function and health for desert tortoise within defensible polygons or along closed OHV routes. Priority actions may include de-compacting unauthorized routes, invasive plant control, native seeding and outplanting to help native plants reestablish.

**1.2.3 Increase native seed banks** – Support native seed collection to increase seed stocks for restoration and reclamation work to facilitate native seeding/outplanting restoration efforts.

## **Strategy 2. Support road crossing improvements**

- 2.1 Construct or repair exclusion fencing along roads** – Construct or repair exclusion fencing along paved road “hotspots,” and consequently reduce mortality of desert tortoises. Maintain fencing once installed or repaired.
- 2.2 Install or improve culverts, underpasses or overpasses** – Install or improve culverts or other underpass or overpass structures along exclusion fencing to mitigate effects of population fragmentation and allow for tortoises to circumvent dangerous movement across highways. Maintain culverts, underpasses, and overpasses once installed or improved.

## **Strategy 3. Augment depleted Mojave desert tortoise populations**

- 3.1 Head-starting and reintroduction** – Support efforts to obtain adult tortoises for progeny, captive-rearing of offspring, and reintroduction of young tortoises to appropriate locations that are sufficiently protected, maintained, and monitored to augment existing populations.
- 3.2 Translocation** – Translocate wild tortoises from construction or other disturbed sites into appropriate locations that are sufficiently protected, maintained, and monitored to augment existing populations. *While no funding for this strategy will come through NFWF, some RASP partners intend to support this strategy.*

## **Strategy 4. Increase capacity for project implementation and data management**

- 4.1 Create a RASP Coordinator position** – Create a dedicated position to coordinate partners and projects to ensure efficient delivery of on-the-ground recovery projects, and coordinate RASP partner meetings and reports to be funded annually for the duration of this Recovery and Sustainment Partnership.
- 4.2 Support regulatory compliance** – Identify or create staff capacity to coordinate regulatory compliance for recovery actions.
- 4.3 Support data collection and data management** – Identify or create capacity to fulfill data collection and management needs to meet federal agency and RASP requirements and support monitoring initiatives.

## **Strategy 5. Monitoring and Adaptive Management**

- 5.1 Species monitoring** – Support Mojave desert tortoise monitoring and analysis to inform progress towards medium-term population objectives and inform conservation decision-making.
- 5.2 Improve understanding of recovery action effectiveness** – Support applied research and effectiveness monitoring to elucidate impacts of priority management actions and improve tortoise recovery efforts.
- 5.3 Host annual stakeholder meetings** – Host annual RASP partner meetings to review progress towards Plan goals, review and integrate any lessons learned or relevant effectiveness monitoring results, and adaptively manage implementation by identifying priorities for the next annual request for proposals (RFP).
- 5.4 Assess and revise Plan in years 4 and 8** – Assess implementation of this Plan in years 3, 5, and 8 and make revisions as needed to adaptively manage partnership priorities.

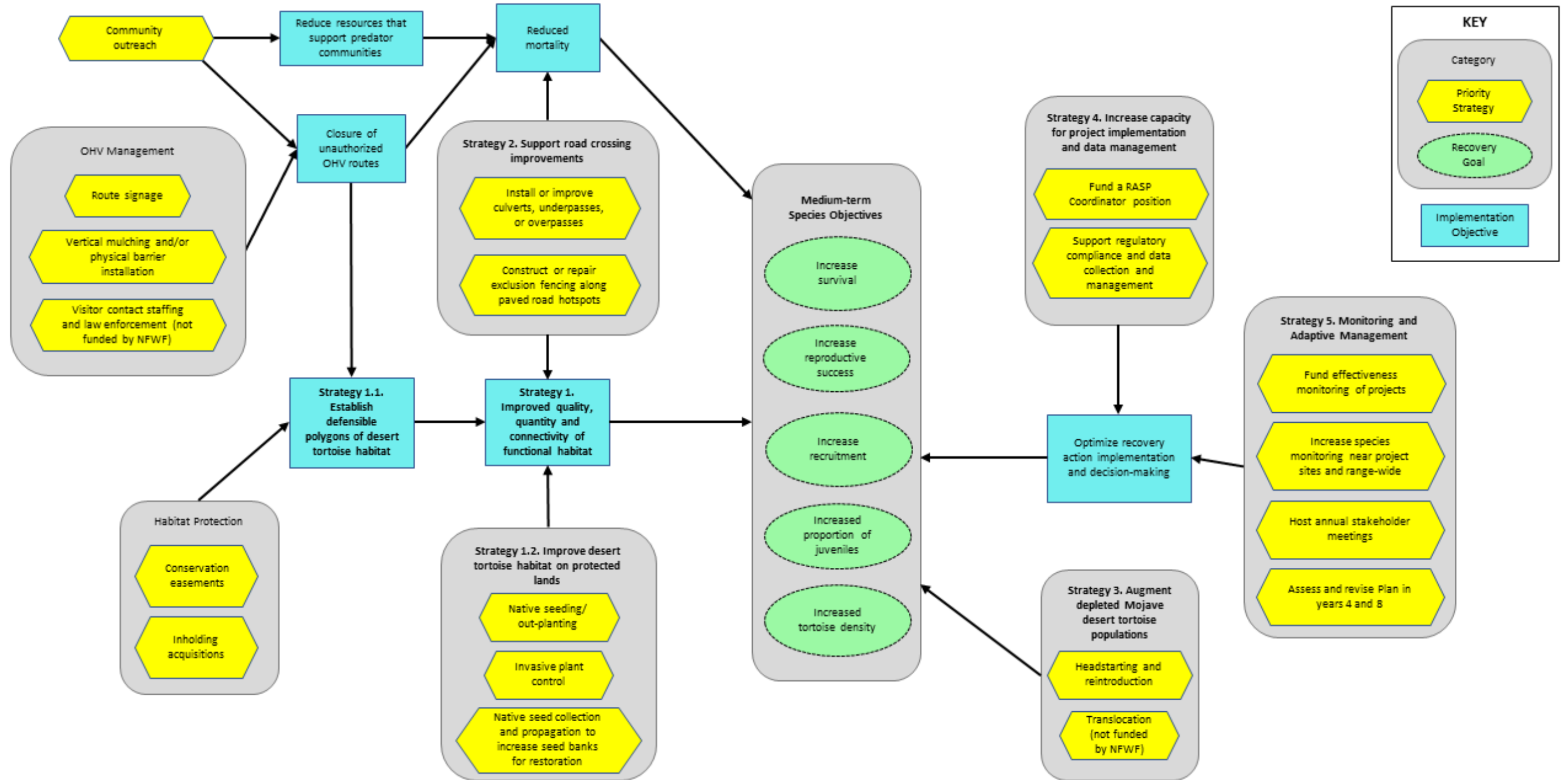


Figure 2. Results chain depicting the relationship of various strategies (yellow hexagons) within the Implementation Plan to each other, to the objectives (blue boxes) and ultimately to a goal for Mojave desert tortoise recovery (green ovals)

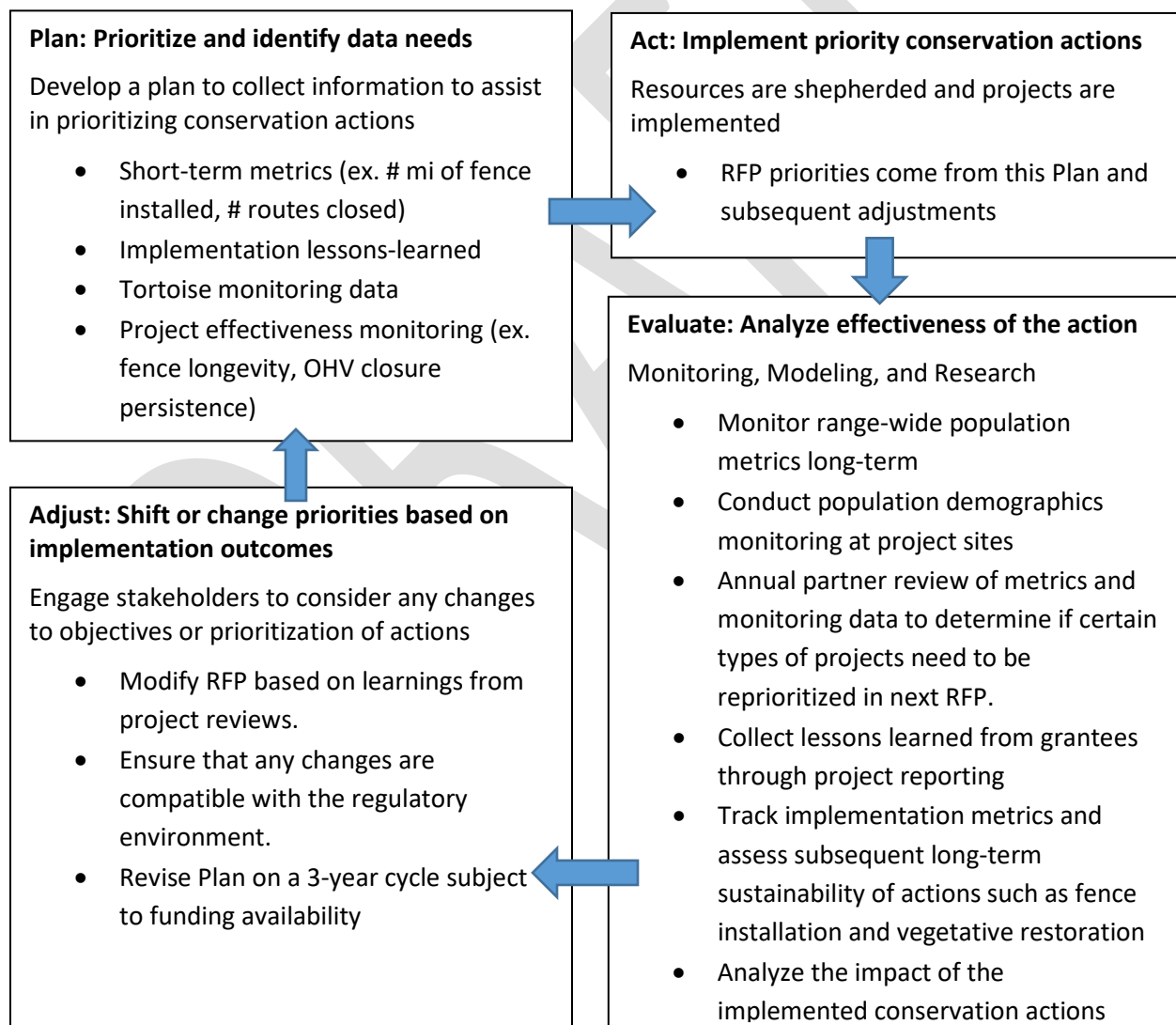


# Adaptive Management

Evaluation of project reporting, monitoring, and other research can inform how to better direct the type, scale and location of conservation actions to maximize benefits to Mojave desert tortoise populations. The National Research Council defines adaptive management as:

Adaptive management [is a decision process that] promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process.

For this Plan to improve recovery of the Mojave desert tortoise, it must include a process for adaptively managing partnership goals and strategies, with a commitment to **plan, act, evaluate, and adjust** partnership strategies over the life of the plan.



Key components of the adaptive management process include, but are not limited to:

### *Plan: Prioritize and identify data needs*

NFWF's robust, science-based grantmaking process is designed to collect information about funded project to support effective decision-making. The Foundation uses a reliable, transparent and transferable process to identify which activities are likely to be successful and have the largest conservation impact. NFWF's rigorous science and evaluation framework ensures that the Foundation's efforts will have the highest possible value and lasting effect.

For example, the Foundation provides a list of standardized metrics on which grantees may choose to report to capture the achievements of their project. At the Full Proposal stage, these metrics provide a roadmap for setting priorities, establishing outcomes, and determining the projects with the greatest opportunity for impact and success. At the reporting stage, they enable the Foundation to gauge progress on individual grants and ensure greater consistency between the monitoring data provided by multiple grant projects to show impact at the partnership scale.

### *Act: Implement priority conservation actions*

In this stage, project resources are shepherded, and projects are implemented.

### *Evaluate: Analyze effectiveness of the actions*

Monitoring, modeling, and research are key components of adaptive management and are central to the Plan. Strategies include:

- Effectiveness monitoring at project sites: Monitor and evaluate population demographics and other effectiveness measures at project sites
- Grantee Project Reporting: Review and assess grantee project reports, especially lessons learned, as tools for evaluating project effectiveness and impact
- Evaluate lessons learned from projects funded in previous rounds of grantmaking.
- When available, new data on Mojave desert tortoise populations specific to partnership-funded projects as well as range wide population trends will be used to inform RFP priorities.

### *Adjust: Shift or change priorities based on implementation outcomes*

In the first few years of Plan implementation, adaptive management will focus primarily on adjusting RFP priorities as necessary based on results collected in effectiveness monitoring. Annual stakeholder meetings and RFP drafting meetings will facilitate incorporation of lessons learned and allow for priorities to evolve on an annual basis.

A formal Plan assessment may be conducted periodically, subject to funding availability. The assessments evaluate the initiative's implementation progress, conservation progress, and long-term sustainability of progress, highlight broader impacts of our grantmaking, and describe lessons learned.

# Risk Assessment

Risk is an uncertain event or condition which, if it occurs, could have a negative effect on a partnership’s desired outcome. We assessed seven risk event categories to determine the extent to which they could impede progress towards our stated recovery strategies and goals during the next 10 years. Below, we identify potential risks and describe strategies to minimize or avoid those risks, where applicable.

CATEGORY	RATING	RISK DESCRIPTION	MITIGATING STRATEGIES
<b>Economic Risks</b>	Moderate	Expansion of solar energy production and military installations into new areas may put increased pressure on Mojave desert tortoise habitat. An increase in the establishment of mining claims for locatable or saleable mineral resources could pose a similar threat.	Partners have drafted a plan to minimize impacts of solar power development to tortoises, and this Plan focuses on critical habitat units that would be excluded from solar energy development. Military partners are engaged in the RASP to help direct resources to priority recovery actions. If new mining claims continue to grow, the BLM may be able to pursue a mineral withdrawal of Mojave desert tortoise critical habitat from new mining claims.
<b>Environmental Risks</b>	High	Prolonged and more frequent drought can negatively impact Mojave desert tortoise reproduction and survival. Climate change is likely to contribute to more frequent drought in the Mojave Desert. Invasion of non-native plant species is decreasing food and shelter resources for the tortoise, and growing populations of predators like ravens and coyotes threaten tortoise reproductive success and survival.	Mitigation funding for Mojave desert tortoise recovery actions in the region is supporting raven control strategies. A focus on habitat and climate refugia could mitigate the overall impact of environmental challenges, which therefore makes the spatial component critical to prioritizing conservation actions.
<b>Financial Risks</b>	Moderate	Funding from federal partners is subject to appropriations and competitive grantmaking. The cost-effectiveness of many recovery actions is not yet understood, so there is a risk of not targeting available funding to the most cost-effective recovery actions. Some short-term project costs, such as exclusion fencing material, may fluctuate.	The partnership will seek to diversify funding sources beyond DoD to minimize dependence on any one funder, and will work with partners to advance the strongest funding proposals possible to potential funders. Projects will be geared towards, and adaptively managed, to address the highest priorities and values for recovery.
<b>Institutional Risks</b>	Low	The usefulness of this Plan will depend on its ability to fill gaps in an already robust recovery plan architecture. It relies on collaboration between a variety of different agency partners with different land management approaches and policies, but is founded on the understanding that the relevant work on critical habitat is located almost entirely on BLM lands. Leadership of these agencies and their priorities may change over the course of the implementation timeline, leading to changes in approach and policy within agencies. With regard to on-the-ground implementation, some key partners may be for-profit corporations, which currently are not eligible for most NFWF funding.	A wealth of information on which to base recovery strategies exists thanks to many years of work by USFWS, BLM, USGS, DOD, state agencies, academics and non-profits, and this Plan seeks to operationalize that groundwork, not duplicate existing efforts. If it proves difficult for NFWF to solicit enough high-quality proposals from eligible entities, it may be necessary to consider expanding the list of eligible entities or seek longer funding timelines from funders to identify projects and disburse funds.
<b>Regulatory Risks</b>	Moderate	Changes to the Endangered Species Act and its implementation may impact the motivation and strategies of partners. Additional capacity to complete necessary NEPA and cultural clearances may be needed.	Cross-jurisdictional partnerships like the RASP are designed to increase the conservation impact of ESA Section 7 recovery actions and offer greater flexibility to federal agencies for ESA Section 7 compliance. An inventory of existing programmatic NEPA coverages is included in this Plan, and a RASP coordinator position has been included to increase capacity for project-level NEPA and cultural clearances.
<b>Scientific Risks</b>	Low	Range-wide monitoring efforts have not been able to collect all relevant data to inform implementation of recovery actions. By focusing on the scale on which we measure recovery of the species, there is a risk that the plan may use short-term and long-term targets that are not adequate predictors of impact for range-wide recovery. Because tortoises are so long-lived and many effects are not obvious, monitoring impact can be challenging.	The partnership will fund range-wide monitoring efforts to address key information gaps.
<b>Social Risks</b>	High	Off-highway vehicle (OHV) recreationists are key stakeholders in the region, and it has proven a challenge for land managers to gain compliance from users in Mojave desert tortoise critical habitat units. Illegal cultivation of marijuana in the area is also a growing threat to tortoise critical habitat.	Strategies for route closures in the Plan take into account the need for community outreach to increase the effectiveness of this habitat restoration strategy. The Plan highlights the need to support and enhance law enforcement coverage, coordinating across agencies and jurisdictions, particularly with the San Bernardino County Sheriff’s Department, however no funding from the NFWF RFPs will support this.

## Partnership Sunsetting

This Plan was developed based on the expectation that a sustained, strategic investment could achieve measurable progress for the Mojave desert tortoise within a 10-year time frame, during which specific species recovery actions can be implemented, monitored, and measured for the effectiveness. Should further or sustained conservation investment for recovery of the species be required past this period, NFWF will work with the funding partners and other stakeholders to determine the most sustainable path forward for Mojave desert tortoise conservation funding.

NFWF will work with the RASP partners in year 4 of the NFWF partnership to examine progress toward the medium-term species objectives and determine what longer-term goals to set for the second 5-year period of this 10-year Plan. In year 9 of the partnership, NFWF will work with the RASP partners to determine next steps for tortoise recovery funding and to implement those next steps. Long-term options may include but are not limited to a 5-year extension of the NFWF partnership to a total 15-year term, or the establishment of a stewardship endowment managed by NFWF but directed by DoD and partners for the long-term maintenance of recovery actions. Alternatively, should Mojave desert tortoise populations show such significant improvement in the Western Mojave Recovery Unit, it may be prudent to close out the funding partnership entirely, or to expand it to other recovery units beyond the Western Mojave.

# Monitoring & Evaluating Performance

To track partnership performance and conservation outcomes, NFWF will monitor progress at the project and partnership scales. Table 4 summarizes the core metrics for tracking progress towards stated conservation goals over the 5-year term of the RASP objectives and over the longer 10-year term of this Plan. A detailed description of monitoring plans for population parameters including range-wide monitoring, which was developed by Conservation Science Partners under contract with NFWF, is in Appendix A. At the partnership scale, broader habitat and species outcomes will be monitored through targeted grants, existing external data sources, and/or contracted entities as needed.

**Table 3. Metrics for measuring progress towards conservation goals over 5 and 10 year periods (Focal area abbreviations: FK = Fremont-Kramer; OR = Ord-Rodman; SC = Superior-Cronese)**

	Goals	Metrics	Baseline (2022)	Target (2027)	Target (2032)	Data source(s)
<b>Strategy 1: Mojave desert tortoise habitat improvement</b>						
<i>Habitat Protection</i>	<i>Protect existing habitat from conversion</i>	# of acres acquired in fee	0	15,000	25,000	Grantee reporting
		# of acres protected under easement	0	15,000	25,000	Grantee reporting
<i>Habitat restoration and improvement</i>	<i>Improve the quality and quantity of functional habitat</i>	# of acres restored	0	250,000	600,000	Grantee reporting
		# of seedlings propagated	0	2,500	5,000	Grantee reporting
		lbs of seeds collected	0	5,000	12,000	Grantee reporting
	<i>Improve habitat connectivity and continuity of existing habitat</i>	# of signs displaying permitted use installed on unauthorized OHV routes	0	10,000	20,000	Grantee reporting
		# of sites with vertical mulching conducted and/or physical barriers installed to discourage use of unauthorized OHV routes	0	3,000	6,000	Grantee reporting
		# of defensible restoration polygons established	0	50	100	Grantee reporting
		# of established defensible restoration polygons persisting	0	20	60	Grantee reporting
		# of acres protected within an estimated defensible polygon	0	75,000	150,000	Grantee reporting
		# of people reached by outreach, training, or technical assistance activities	0	50,000	100,000	Grantee reporting

	Goals	Metrics	Baseline (2022)	Target (2027)	Target (2032)	Data source(s)
<b>Strategy 2. Support road crossing improvements</b>						
<i>Reduce indirect and direct sources of road mortality</i>	<i>Construct exclusion fencing along highways to reduce mortality from vehicle collisions, poaching and other sources of mortality</i>	Miles of new highway exclusion fencing installed	0	32	60	Grantee reporting
		Miles of highway exclusion fencing repaired	0	15	30	Grantee reporting
		# of highway underpasses such as culverts installed or improved	0	15	30	Grantee reporting
<b>Strategy 3. Augment depleted Mojave desert tortoise populations</b>						
<i>Population augmentation</i>	<i>Increase the number of desert tortoises in focal areas</i>	# of tortoises reared in head-starting programs	50/yr	500	1,000	Grantee reporting
<b>Strategy 4. Increase capacity for project implementation and data management</b>						
<i>Capacity Building</i>	<i>Increase staff capacity to coordinate the partnership and manage data</i>	# of jobs created	0	1	1	Grantee reporting
<i>Improved Data Management</i>	<i>Comply with state and federal data collection and management standards</i>	# of studies whose findings are reported to management	0	10	20	Grantee reporting

	Goals	Metrics	Baseline (2022)	Target (2027)	Target (2032)	Data source(s)
<b>Strategy 5. Monitoring and Adaptive Management</b>						
<i>Population monitoring</i>	<i>Improve population viability for tortoises within focal areas</i>	Adult tortoise survival rate	0.95 <sup>1</sup>	Increasing rate that is statistically greater than those measured at reference sites outside focal areas for a period of 5 years		Grantees or contractors
		Reproductive success (eggs female <sup>-1</sup> yr <sup>-1</sup> )	3.11 <sup>2</sup>			Grantees or contractors
		Juvenile recruitment (females/female/yr)	0.51 <sup>3</sup>			Grantees or contractors
		Proportion of juveniles	<32% <sup>4</sup>			Grantees or contractors
		Tortoise density <sup>5</sup> (tortoises/km <sup>2</sup> )	FK: 2.6 OR: 3.6 SC: 2.4	> min. viable density (3.9 tortoises/km <sup>2</sup> ) for a period of 5 years	DTRO, DoD installation monitoring programs, grantees or contractors	
<i>Effectiveness monitoring at projects sites</i>	<i>Monitor population demographics and other effectiveness measures at project sites</i>	# of sites being monitored	0	25	50	Grantee reporting

<sup>1</sup> 5-year average of adult tortoise survival at sites within the Western Mojave Recovery Unit (Henen 2022).

<sup>2</sup> Estimated average egg potential for adult females 2014-2018 in the Western Mojave Recovery Unit (Mitchell et al. 2021).

<sup>3</sup> Annual recruitment estimates calculated by Campbell et al. (2015) assuming hatchling survival to be 0.30. Estimates of hatchling survival are sparse, so baseline recruitment is estimated from best available data until monitoring efforts are implemented.

<sup>4</sup> Berry et al. (2020) estimated juveniles accounted for 32% of the sampled population or 19 out of 60 individuals in a protected area (DTRNA). RASP focal areas are expected to host a fewer number of juveniles due to its unprotected status than comparable protected habitat.

<sup>5</sup> Average adult density estimates for FK, OR and SC from 2004-2014 (Allison and McLuckie 2018)

# Budget

The following budget shows the estimated costs to implement the activities identified in this Implementation Plan that NFWF intends to invest in through an annual Request for Proposals. This budget reflects NFWF’s anticipated engagement over the Implementation Plan period of performance; however, it is not an annual or even cumulative commitment by NFWF or our partners to invest. We acknowledge that in many cases the activities laid out in the plan build upon efforts funded by other organizations. This budget assumes that the current trajectory of funding by those other organizations continues over this partnership’s time frame; however, only NFWF funds are shown in the budget below.

**Table 4. NFWF-Administered Budget for Mojave Desert Tortoise Implementation Plan**

BUDGET CATEGORY	Years 1-5 (\$)	Years 6-10 (\$)	Total (\$)
<b>Strategy 1: Mojave desert tortoise habitat improvement</b>			
1.1 Establish defensible polygons of desert tortoise habitat	\$15,000,000	\$12,000,000	\$27,000,000
1.2 Improve desert tortoise habitat on protected lands	\$6,600,000	\$8,400,000	\$15,000,000
<b>Strategy 2. Support road crossing improvements</b>			
2.1 Construct exclusion fencing along highways	\$1,800,000	\$2,400,000	\$4,200,000
2.2 Install or improve culverts, underpasses or overpasses	\$800,000	\$1,255,000	\$2,055,000
<b>Strategy 3. Augment depleted Mojave desert tortoise populations</b>			
3.1 Head-starting and reintroduction	\$2,500,000	\$2,500,000	\$5,000,000
<b>Strategy 4. Increase capacity for project implementation and data management</b>			
4.1 Create a RASP Coordinator position	\$850,000	\$900,000	\$1,750,000
4.2 Support regulatory compliance	\$300,000	\$345,000	\$645,000
4.3 Support data collection and data management	\$170,000	\$185,000	\$355,000
<b>Strategy 5. Monitoring and Adaptive Management</b>			
5.1 Species monitoring	\$1,350,000	\$1,350,000	\$2,700,000
5.2 Improve understanding of recovery action effectiveness	\$400,000	\$400,000	\$800,000
5.3 Host annual stakeholder meetings	\$50,000	\$50,000	\$100,000
5.3 Assess and revise Plan in years 4 and 8	\$30,000	\$15,000	\$45,000
<b>Other</b>			
Communications and community relations	\$150,000	\$200,000	\$350,000
<b>TOTAL BUDGET</b>	<b>\$30 M</b>	<b>\$30 M</b>	<b>\$60 M</b>



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