5-YEAR REVIEW
Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*)

GENERAL INFORMATION:

Species: Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*)
Date listed: July 8, 1988
FR citation(s): 50 CFR 58454
Classification: Endangered

State Listing:
The Tipton kangaroo rat was listed by the State of California as endangered in 1989.

BACKGROUND:

Most recent status review:

[Service] U.S. Fish and Wildlife Service. 2010. Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*). 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California. 102pp. [CLICK HERE TO VIEW DOCUMENT].

Notice citation announcing this status review:

[Service] U.S. Fish and Wildlife Service. 2019. Endangered and Threatened Wildlife and Plants: Initiation of 5-Year Status Reviews of 58 Species in California, Nevada, and the Klamath Basin of Oregon. Federal Register 84:36116-36118. [CLICK HERE TO VIEW DOCUMENT]

ASSESSMENT:

Information acquired since the last status review: This 5-year review was conducted by the U.S. Fish and Wildlife Service's (Service) Sacramento Fish and Wildlife Office. We solicited data from interested parties through a Federal Register notice announcing the review and the opening of a 60-day public comment period on July 26, 2019. The Service did not receive any comments regarding the Tipton kangaroo rat. We searched for new and updated literature, conducted a review of our files, and obtained data from an occurrence search of the California Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Wildlife. We also requested data or information from the California Department of Fish and Wildlife, Service Refuge staff, academic researchers who study endangered and sensitive plants and animals in the San Joaquin Valley, as well as private, environmental consultants who monitor Tipton kangaroo rats.

New and Relevant Natural History Information
Kangaroo rats (Genus: *Dipodomys*) are small mammals in the family Heteromyidae, which travel rapidly through their environment by hopping on their hind legs (Bartholomew and Caswell 1951; Grinnell 1922). Kangaroo rats possess many adaptations for this type of movement, including elongated hind limbs, a long tail, a short neck, and a large head (Service 1988). Kangaroo rats are granivorous; seeds from native grasses and forbs make up most of their diet (Service 1998). Unlike some kangaroo rat species, Tipton kangaroo rats do not hide seeds for later consumption. Instead,

they forage for food frequently throughout a large home-range, sifting through the upper layers of sand and soil for fallen seeds (Service 1998; Germano *et al.* 2013; Tennant *et al.* 2013; Tennant pers. comm. 2019). Kangaroo rats were historically abundant in the arid plains of California's San Joaquin Valley; however, Tipton kangaroo rats are currently extremely rare and populations exist on small patches of fragmented habitat (Service 2010).

Tipton kangaroo rats have a short lifespan; they might only live between 10 – 12 months of age and rarely survive longer than three years (Germano and Saslaw 2017; Tennant pers. comm. 2019). Due to their short life cycle, they are particularly sensitive to stressors that might interrupt their life cycle. If habitat conditions are poor (increased interspecific competition, increase of non-native grasses, etc.), there is an increased chance that populations will decline (Tennant and Germano 2013; Tennant pers. comm. 2019).

Recent Taxonomic Information

The Tipton kangaroo rat is one of three recognized subspecies of the more widely spread San Joaquin kangaroo rat (*Dipodomys nitratoides*)(Best 1991). The three subspecies include the Tipton, Fresno (*Dipodomys nitratoides exilis*), and the short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*) (Best 1991). Recent evidence has confirmed significant morphological differences that distinguish the three subspecies described above (Patton *et al.* 2019). The genetic relationship between the three taxa was also analyzed using available DNA. Researchers were unable to find significant haplotype variation across the range of the San Joaquin kangaroo rat to determine sub-specific partitioning at the genetic level (Patton *et al.* 2019). Due to the limitations of sample size and molecular extraction techniques, this information neither confirms nor refutes the status of the three existing subspecies within the San Joaquin kangaroo rat lineage (Patton *et al.* 2019). Therefore, the genetic data was inconclusive. Currently, evidence from morphological characteristics across the range of the San Joaquin kangaroo rat is strong enough to support the current classification of three distinct subspecies. Based on the best available science during this review, Fresno and Tipton kangaroo rats are morphologically distinct and separate listable entities under the Endangered Species Act (Act).

Population Surveys

During survey efforts conducted between October 2013 and March 2015, researchers trapped at 44 survey locations (Cypher *et al.* 2016; Figure 1). Fifteen of these locations (34%) had positive detections of Tipton kangaroo rats. While these surveys were not entirely comprehensive (there were properties that researchers could not access), they are useful at describing the known locations where the species persists (Cypher *in litt.* 2019). Tipton kangaroo rat populations are known to fluctuate annually, based on climatic conditions such as precipitation and vegetative productivity (Cypher *in litt.* 2019).

In the past decade, populations of Tipton kangaroo rats on several protected areas declined rapidly due to a variety of threats and might now be locally extirpated in some areas (Tennant pers. comm. 2019; Appendix 1). For example, Pixley National Wildlife Refuge, part of the Kern National Wildlife Complex, had confirmed populations of Tipton kangaroo rats up until several years ago (Grisdale pers. comm. 2019). Recent trapping efforts have been unable to detect any Tipton kangaroo rats on the refuge (Grisdale pers. comm. 2019). While the exact cause of the decline is unknown, high rain years caused flooding on the refuge unit, which might have contributed to habitat degradation.

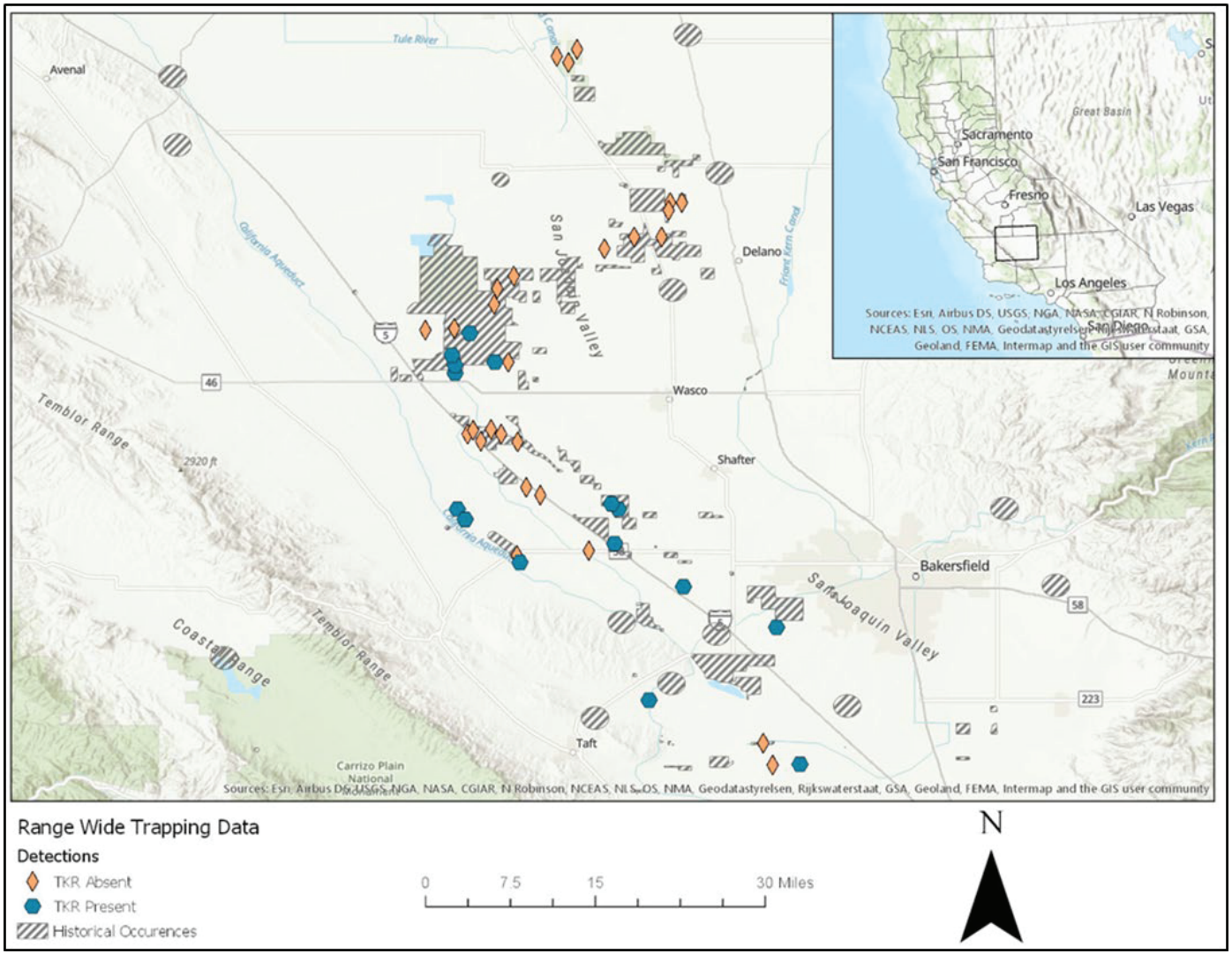

Figure 1. Recent detections of Tipton kangaroo rats within the species' range. Trapping data indicate where Tipton kangaroo rats were detected by the Endangered Species Recovery Program (ESRP) at California State University, Stanislaus. Areas where Tipton kangaroo rats were present are shown by blue hexagons, while negative trapping data is shown by coral diamonds (Cypher *et al.* 2016). Occurrence data from CNDDB* is represented by the grey hash-marked areas. These data show the decline of the species in the northern and eastern portions of its range (CDFW 2019).

*The CNDDB data shown to the west of the California Aqueduct (two polygons near Avenal, one west of the Temblor Range, and one near Taft) do not fall within the Tipton kangaroo rat's described range (Hafner 1979; Cypher *et al.* 2016).

The largest Tipton kangaroo rat populations exist in areas of contiguous suitable habitats, such as Lokern Ecological Reserve and adjacent lands. While populations on large areas of habitat continue to do well, the available information suggests that Tipton kangaroo rats have declined throughout their range during the past decade (Cypher *et al.* 2016; Grisdale pers. comm. 2019; Tennant pers. comm. 2019).

Tipton kangaroo rats are still abundant at some sites, such as Semi Tropic Ecological Reserve and Lokern Natural Area and Preserve. However, many of the smaller populations have declined or become locally extinct within the past ten years. All populations have fluctuated annually in recent years, driven partially by inter-annual climatic extremes. As such, the future of the Tipton kangaroo rat remains uncertain.

Translocation of Kangaroo Rats

Tipton kangaroo rat populations currently exist in many small, fragmented habitat patches throughout the subspecies' range (Cypher *et al.* 2016), and isolated populations such as these are at greater risk of extinction (see section *Updated Status of Threats to the Tipton Kangaroo Rat*; Ralls *et al.* 2018). Conservationists have suggested translocation (moving individual animals from one area of its native range to another for conservation purposes (IUCN 1998)) might be needed for the subspecies to recover (Ralls *et al.* 2019; Tennant *et al.* 2013). Some management agencies have proposed translocation as a tool to save individual Tipton kangaroo rats impacted by land development activities (Germano 2001; Tennant *et al.* 2013; Tennant pers. comm. 2019). The goal of translocation efforts is for individuals to survive and reproduce in a new, uninhabited, and protected habitat (Germano 2001). For many endangered species, including other small rodents, translocations have been successful at augmenting existing populations or establishing new ones (Holler *et al.* 1989; Shier and Swaisgood 2012). However, attempts at translocating Tipton kangaroo rats have proved to be challenging.

In the early 1990s, natural resource professionals began translocating Tipton kangaroo rats (Germano 2001). The first recorded effort took place on an oil pad in the southern San Joaquin Valley. Researchers captured and held Tipton kangaroo rats in captivity for three weeks, or until construction activities were complete. Animals were then released back into the habitat from which they were captured initially (Germano 2001). Two weeks later the site was surveyed and two relocated (i.e., marked) individuals were captured (Germano 2001). This effort was not a real translocation event since wildlife professionals released the animals back into their original home-range rather than new habitat; however, subsequent efforts were actual translocation efforts. Although most translocation attempts ultimately failed due to a variety of factors, including a high density of predators, competition with conspecifics, and flooding (Germano 2001), some appeared initially successful but lacked long-term monitoring. In one case, researchers translocated 13 Tipton kangaroo rats approximately 2 km away and several months later three of the translocated individuals were found again on the new site, suggesting these individuals survived long enough to establish territories on new habitat (Germano 2001).

In 2001, researchers conducted the first formal study to determine the success of a Tipton kangaroo rat translocation (Germano 2010). Researchers moved four Tipton and three Heermann's kangaroo rats (*Dipodomys heermanni*) from a development site near Buttonwillow, California. Approximately two months later, the animals were placed in artificial burrows on habitat protected by the Center for Natural Lands Management. All Tipton kangaroo rats perished within five days, many from unknown causes (Germano 2010). This particular site had resident Heermann's kangaroo rats

present, which can contribute to low survival rates for translocated Tipton kangaroo rats (see *Competition with Heermann's kangaroo rat* section below; Germano 2010).

In 2006, academic researchers translocated 144 Tipton kangaroo rats to the Allensworth Ecological Reserve (Reserve)(Germano *et al.* 2013). The investigators used two methods to release animals within the study area. Researchers placed some Tipton kangaroo rats in mesh cages underground to allow individuals time to acclimate to a new environment (soft-released animals). The second group was placed directly into artificial burrows with no cage (hard-released animals). Of the soft-released animals, an estimated 58% survived >30 days compared to 37% of the hard-released animals. One year later, thirteen adults from the relocation effort were recaptured, along with three young-of-the-year. The three young-of-the-year were genetically similar to the individuals from the relocation effort, suggesting the translocated individuals were breeding within the Reserve. Over the course of the study, the Tipton kangaroo rat population at the Reserve failed to grow, possibly due to a rapid increase in Heermann's kangaroo rats at the site (Germano *et al.* 2013). Two Tipton kangaroo rats translocated in December 2006 were recaptured during the final trapping effort in the fall of 2009 (Germano *et al.* 2013) and Tipton kangaroo rats continued to be captured at the site until October 2010 (Tennant and Germano 2013); however, Tipton kangaroo rats were not detected at this site during the 2013-2015 trapping effort and they are considered likely extirpated from the Reserve (Cypher *et al.* 2016; Tennant pers. comm. 2019; Appendix 1). The exact cause of this likely extirpation is not well understood. Interspecific competition and the increase of non-native grasses at the Reserve might have decreased habitat suitability for the Tipton kangaroo rat (Tennant pers. comm. 2019; see discussion in the *Competition with Heermann's kangaroo rats* and *Updated Status of Threats* sections below).

There are many challenges associated with successfully translocating small mammals to a new location. In the first three days at a new site, predation rates are high for kangaroo rats not imprinted on their new habitat. Additionally, predators appear to be attracted to new odors associated with disturbed soils (Germano 2010). The interspecific competition also reduces the likelihood that a new population of Tipton kangaroo rats will become established after a translocation effort (Tennant *et al.* 2013; Tennant pers. comm. 2019). It is difficult to establish new populations of Tipton kangaroo rats if Heermann's kangaroo rats are present. Many experts believe Tipton kangaroo rats compete directly with Heermann's kangaroo rats for resources (Tennant and Germano 2013; see *Competition with Heermann's kangaroo rat* section below).

Based on the results of past translocation efforts discussed above, establishing new populations of Tipton kangaroo rats from translocation has only been documented once and that population is now likely extirpated. However, the survival of individuals during these attempts indicate capturing, holding, and releasing animals as part of a translocation effort could be used as a conservation tool. Translocation efforts for another endangered kangaroo rat species, the Stephen's kangaroo rat (*Dipodomys stephensi*), suggest they have complex social relationships and same-species neighbor relationships should be maintained when translocating individuals. Maintaining these relationships while establishing a translocated population to protected habitat in southern California increased the likelihood of settlement, survival, and reproductive success compared to a translocated population that did not maintain neighbor relationships (Shier and Swaisgood 2012). Individuals translocated with their original neighbors also settled faster, traveled shorter distances from the release site, foraged more frequently, established more burrows, and initiated fights less frequently than those without neighbors (Shier and Swaisgood 2012). To our knowledge, there has only been one attempt to translocate Tipton kangaroo rats while considering neighbor relationships; however, we do not

know the current status of those translocated individuals (MESA Biological, LLC 2017). Further research is needed to understand if Tipton kangaroo rats would benefit from keeping neighbor relationships intact during translocation efforts.

Competition with Heermann's Kangaroo Rat

Where Tipton kangaroo rat populations remain, competition with conspecifics is considered a significant threat to the subspecies (Cypher *in litt.* 2019; Tennant *et al.* 2013; Warrick *in litt.* 2019). Here, we define competition as the interaction between members of two taxa (interspecies competition), which results in aggressive behavior. Competition for food and resources affects the structure and function of granivorous rodent communities in many desert ecosystems in western North America (Heske *et al.* 1994). The larger, native Heermann's kangaroo rat is common and abundant in many of the same habitats as Tipton kangaroo rats (Kelt 1988). Heermann's kangaroo rats are generalists and found in many areas that are not suitable habitat for Tipton kangaroo rats (Kelt 1988). These different foraging strategies might be an example of niche partitioning between species. In habitats containing both Tipton and Heermann's kangaroo rats, the annual abundance of either species appears to be cyclical based on competition and local environmental conditions (Germano *in litt.* 2019; Tennant pers. comm. 2019; Warrick *in litt.* 2019; see *Updated Status of Threats Section*).

In 2009, investigators researched the competitive interactions between Heermann's and Tipton kangaroo rats (Tennant and Germano 2013). The offspring of the translocated population at the Reserve was the subject of this study. Researchers reported that the population of Tipton kangaroo rats at the Reserve was declining due to unknown causes. When researchers excluded Heermann's kangaroo rats from an area, the population of Tipton kangaroo rats increased by 500%. The Tipton kangaroo rat population continued to decline at a nearby control site where Heermann's kangaroo rats were allowed to remain. These results indicate that competition between Tipton kangaroo rats and Heermann's kangaroo rats plays a significant role in the community structure of heteromyid rodents in central California (Tennent and Germano 2013). Other researchers have reported similar observations on the community structure of rodents, which support this conclusion (Cypher *et al.* 2016; Grisdale pers. comm. 2019; Warrick *in litt.* 2019).

Although these two species use similar food and habitat resources, they are distinguishable by size and behavioral differences (Tennant pers. comm. 2019). Tipton kangaroo rats are small and forage over a large area, whereas Heermann's kangaroo rats are large and feed almost exclusively in the vicinity of their burrows (Tennant and Germano 2013). Tipton kangaroo rats appear to avoid interspecific altercations by fleeing (Tennant pers. comm. 2019) and their size and tendency to avoid other species makes it difficult for Tipton kangaroo rats to compete with the more aggressive Heermann's kangaroo rat (Tennant and Germano 2013). The presence of interspecific competitors within their habitat can make it difficult for Tipton kangaroo rats to thrive (Tennant pers. comm. 2019) and when Heermann's kangaroo rat populations reach high densities on the landscape, Tipton kangaroo rat populations decrease dramatically (Tennant and Germano 2013). However, when Heermann's kangaroo rats are removed from a site and Tipton kangaroo rats are allowed to establish, the two species are able to co-exist as Tipton kangaroo rats can move throughout their large home range, successfully avoiding the aggressive Heermann's kangaroo rats (Tennant *et al.* 2013).

Tipton kangaroo rats and Heermann's kangaroo rats co-occur in many areas throughout the San Joaquin Valley (Halstead *in litt.* 2019; Tennant *in litt.* 2019). Competition plays a vital role in the community structure of Heteromyid rodents, and competition between Tipton and Heermann's kangaroo rats is likely a threat to the continued existence of Tipton kangaroo rats in some habitats (Tennant *in litt.* 2019). Competitive effects between the two species are also essential to consider in potential translocation efforts (Tennant and Germano 2013; Tennant *et al.* 2013).

Habitat Suitability

Tipton kangaroo rats are sensitive to local habitat conditions (Service 1998). Researchers believe saltbush scrub and valley sink scrub vegetative communities are important predictors for Tipton kangaroo rats (Service 1988); however the exact micro-habitat characteristics needed to support Tipton kangaroo rat populations are not well understood and researchers have debated which habitat factors are required to manage habitat for the subspecies (Tennant pers. comm. 2019). In 2016, researchers collected range-wide habitat data to build a habitat suitability model for the Tipton kangaroo rat (Cypher *et al.* 2016). These data showed open, desert communities with large alkali scalds (areas naturally bare of vegetation), and no apparent signs of past or present agriculture is the habitat preferred by Tipton kangaroo rats (Morrison *et al.* 1996; Cypher *et al.* 2016). Sparse ground cover with bush seepweed (*Suaeda nigra*) and few invasive grasses also correlate with Tipton kangaroo occurrences (Cypher *et al.* 2016; Tennant pers. comm. 2019).

Updated Status of Threats to the Tipton Kangaroo Rat

Habitat loss due to agricultural development throughout the range is the main threat to the survival of the Tipton kangaroo rat (Service 1988). Other threats such as small population size, habitat fragmentation, and broad-scale application of rodenticides were also described in the listing decision (Service 1988) and the previous 5-year review identified flooding, interspecific competition with Heermann's kangaroo rats, thatch accumulation, and climate change as additional threats (Service 2010). Since the previous 5-year review, there have been no new threats identified; however, our understanding of threats and factors integral to the conservation of the Tipton kangaroo rat has changed (Service 2010).

Tipton kangaroo rats remain on a small proportion of the historically occupied range (Figure 1). In areas where the Tipton kangaroo rat is protected, habitat degradation and competition still threaten the species and cause population declines (Cypher *et al.* 2016; Appendix 1). What little natural habitat remains in the San Joaquin Valley continues to be converted to agriculture, especially on privately owned parcels (Cypher *in litt.* 2019). Some experts believe the warming climatic trend and new groundwater regulations in California will result in fallowed land, which over time, could be restored to native habitat for endangered species, such as the Tipton kangaroo rat (Kelsey *et al.* 2019; TNC 2019). These experts are optimistic that the amount of available habitat for the Tipton kangaroo rat will expand soon. However, others doubt that large-scale restoration will occur (Wilson *et al.* 2017). As the debate around the amount of available habitat continues, the future of the Tipton kangaroo rat remains uncertain.

Tipton kangaroo rats are vulnerable to climate patterns, and populations periodically undergo drastic fluctuations in abundance, based on local, annual weather patterns, and other environmental conditions (Uptain *et al.* 1999; Cypher *et al.* 2016). Their short lifespan makes them especially sensitive to changing environmental conditions (Tennant pers. comm. 2019). Habitat fragmentation seems to exacerbate a population's rate of decline when environmental conditions are not suitable (Tennant pers. comm. 2019). When habitat patches are small, populations are at a higher risk of

local extirpation due to climatic changes and the subsequent population response (Cypher *in litt.* 2019). Experts on the Tipton kangaroo rat's ecology acknowledge that habitats of adequate size are needed to support populations large enough to sustain the species during extremely dry or wet climatic spells and during times when populations decline to low numbers (Service 2019). However, the exact size and type of habitat needed to accomplish this is not well understood (Cypher *et al.* 2016). More information is required to precisely assess how best to conserve natural lands and maintain self-sustaining Tipton kangaroo rat populations.

High precipitation can cause an increase in the growth of invasive grasses, further decreasing habitat suitability for Tipton kangaroo rats (Grisdale pers. comm. 2019; Tennant pers. comm. 2019). Non-native grasses appear to have a negative effect on Tipton kangaroo rat populations as researchers have recorded declines of Tipton kangaroo rats during years of high non-native grass growth (Single *et al.* 1996; Tennant pers. comm. 2019). Dense, non-native grasses might decrease the ability of kangaroo rats to hop and move quickly through the environment (Tennant pers. comm. 2019). In dry years or during periods of drought, Tipton kangaroo rat populations increase in response to the reduced growth of non-native grasses (Cypher *et al.* 2016).

Between 2012 and 2017, California experienced a prolonged, intense drought (Prugh *et al.* 2018). At Semi-tropic Ecological Reserve, where the California Department of Fish and Wildlife (CDFW) has been surveying small mammal populations for 14 years (Tennant *in litt.* 2019; Tennant pers. comm. 2019; Appendix 2), this 5-year drought caused Heermann's kangaroo rat populations to decline (Appendix 2). Simultaneously, Tipton kangaroo rat abundance increased, reaching the highest level seen in the past decade (Warrick *in litt.* 2019; Tennant pers. comm. 2019; Appendix 2). When the drought ended in 2018, Heermann's kangaroo rat abundance increased, and Tipton kangaroo rat populations decreased (Warrick *in litt.* 2019; Grisdale pers. comm. 2019; Tennant pers. comm. 2019).

Droughts in central California might increase Tipton kangaroo rat abundance. However, experts warn that if droughts persist for too long, Tipton kangaroo rat numbers will eventually decline along with many other species of plants and animals (Cypher *in litt.* 2019). Monitoring data during the most recent California drought showed that Tipton kangaroo rat abundance decreased (Cypher *in litt.* 2019). During prolonged drought, Tipton kangaroo rat abundance might initially increase, but will then be followed by eventual population crashes as the drought persists (Warrick *in litt.* 2019). Short, mild droughts might help reduce competition with Heermann's kangaroo rats, allowing Tipton kangaroo rat abundance to increase and populations to thrive. Wet years can also have a detrimental effect on populations of Tipton kangaroo rat (Service 2010). Thus, small changes in climatic regimes can have huge consequences on Tipton kangaroo rat abundance. While exact outcomes are difficult to predict, the timing and duration of precipitation cycles have a large effect on Tipton kangaroo rat populations.

Despite the many threats facing the species, there are some natural areas were Tipton kangaroo rats still occur in relatively high numbers. At Semi-tropic Ecological Reserve, Tipton kangaroo rats have been the dominant species found over the past 18 years of monitoring (Warrick *in litt.* 2019; Tennant pers. comm. 2019). There are also consistently high numbers at Lokern Ecological Reserve (Tennant pers. comm. 2019). Where conditions are suitable, the species appears to do well locally.

Conservation

Habitat loss and fragmentation continue to threaten the Tipton kangaroo rat throughout its range. However, development projects that are subject to section 7 consultation or result in the issuance of an incidental take permit under the Act typically include habitat compensation, which can reduce the severity of overall habitat loss typically associated with these projects. Habitat compensation for the Tipton kangaroo rat can occur via a variety of mechanisms, including the purchase of credits at approved conservation banks, through permittee responsible mitigation, and through the development of habitat conservation plans (HCPs).

Conservation Banks

A mitigation bank or conservation bank (bank) is a property or suite of properties (i.e., umbrella bank, phased bank, etc.), providing habitat or other conservation values that are conserved and managed in perpetuity, and provides ecological functions and services for specified listed species or resources. Mitigation and conservation banks function to offset adverse impacts that occurred elsewhere; therefore, the Service approves a specified number of credits that the bank owner may sell to developers or other project proponents for use as compensation to offset adverse impacts their projects will likely have on listed species. The money from the initial investment and bank credit sales is then used to permanently protect and manage the land for those species and resources. There is currently one active conservation bank for the Tipton kangaroo rat. The 3,267 acre Kern Water Bank is located in Kern County, California. More information about conservation banks within the Sacramento Fish and Wildlife Office's service area can be found at: https://www.fws.gov/sacramento/es/Conservation-Banking/Banks/In-Area/.

Permittee Responsible Mitigation

Permittee-responsible mitigation, also sometimes referred to as turn-key mitigation, includes activities or projects undertaken by a permittee (or authorized agent) to provide compensatory mitigation to offset impacts from a single project. The permittee retains full responsibility for this mitigation. Ideally, permittee-responsible mitigation projects are established in advance of the project-related impacts they are offsetting; however, this typically does not occur due to multiple factors. Habitat compensation through permittee responsible mitigation for the Tipton kangaroo rat has occurred throughout the subspecies' range for a number of projects. The primary agencies implementing permittee responsible mitigation for the Tipton kangaroo rat include the California Department of Transportation and Bureau of Land Management.

Habitat Conservation Plans

Habitat Conservation Plans (HCPs) are planning documents required as part of an application for an incidental take permit. They describe the anticipated effects of the proposed taking; how those impacts will be minimized, or mitigated; and how the HCP is to be funded. HCPs can apply to both listed and non-listed species, including those that are candidates or have been proposed for listing. Regional HCPs develop large-scale conservation strategies within a specific region that are designed to conserve functional ecological systems and the covered species that depend on them. Such HCPs aim to avoid a fragmented conservation landscape by working with local land use authorities and a designated implementing entity to conserve, enhance, and manage a preserve system. Project-level HCPs are designed to fully offset the impacts associated with the permitted activity by contributing to a larger conservation design.

Being included as a covered species under an HCP can result in habitat being set aside and managed for the species as mitigation for impacts associated with covered activities, such as planned urban

development, within the HCP permit area. In addition to mitigation, avoidance, minimization, and other conservation measures (e.g. monitoring, seasonal work windows, habitat management, etc.) are implemented. HCPs can also utilize banks, in-lieu fee programs, or other mechanisms to preserve habitat in perpetuity and contribute to a regional conservation strategy.

There are ten HCPs that include the Tipton kangaroo rat as a covered species (Table 1). More information about HCPs that include the Tipton kangaroo rat as a covered species can be found at: https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A08S

Table 1. Habitat conservation plans which include Tipton kangaroo rats as a covered species and the year the permit for the HCP was issued.

Name of HCP	**Year Permitted**
PG&E San Joaquin Valley Operations & Maintenance	2007
Nuevo-Torch	1999
Metropolitan Bakersfield	1994
Lamont Public Utility District	2005
Kern Water Bank	1997
Kern County Waste Facilities	1997
Champagne Shores	1994
California Department of Corrections Statewide Electrified Fence Project	2002
California Department of Corrections Delano Prison	1990
ARCO Coles Levee (ARCO Western Energy)	1996

Recovery Permits

Recovery permits, also referred to as 10(a)(1)(A) permits, allow scientists to take listed species as a means to ultimately contribute to the recovery of the listed species. The data acquired from some actions covered under recovery permits (e.g., occurrence, abundance, distribution, etc.) allow the Service to make informed decisions for the species that will enhance their survival and recovery. Recovery permits can be issued for activities which directly aid the recovery of a species, such as captive breeding, reintroductions, habitat restoration, removal or reduction of threats, and educational programs. The Service's recovery permitting program aids in the conservation of listed species by ensuring permittees have adequate field experience and qualifications for conducting activities with the target listed species and, for most species, ensures that permittees are following standardized protocols while surveying. The recovery permitting application process ensures that scientific proposals are crafted using the recommended actions laid out in the Recovery Plan for the target species. Minimum qualifications to obtain a recovery permit for the Tipton kangaroo rat can be found at: https://www.fws.gov/sacramento/es/Permits/. Protocol level guidance for conducting Tipton kangaroo rat surveys: https://www.fws.gov/sacramento/es/Survey-Protocols-Guidelines/Documents/SFWO%20Final%20San%20Joaquin%20K-Rat%20Trapping%20Protocol-2013.pdf.

Recovery permits have been issued to conduct studies in suitable habitat for the Tipton kangaroo rat throughout the range of the species. Many of these studies have been instrumental to enhance our understanding of the current status of the species that was discussed throughout this document.

Conservation Lands

Given the absence of range-wide surveys and the dynamic nature of Tipton kangaroo rat populations, we do not know what proportion of occupied land is in public/conservation ownership versus private ownership. As described in the 2010 status review (Service 2010), approximately 17 sites of currently or formerly occupied Tipton kangaroo rat habitat are in public or conservation ownership as a result of conservation actions (Appendices 3 and 4). The combined surface area of these sites is approximately 150,000 hectares (about 370,500 acres); however, the quantity of habitat actually occupied by the Tipton kangaroo rat is unknown and is likely much smaller than that value. Currently, a majority of the known, occupied sites that are under public/conservation ownership and are small, fragmented, and isolated from each other (Service 2010). The implementation of conservation recommendation 2 in the *Recommendations for Future Actions* section below will help the Service quantify the conservation value of these lands.

Recovery Criteria

The Tipton kangaroo rat's recovery strategy is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service 1998). The downlisting and delisting criteria for the Tipton kangaroo rat include:

Downlisting

1. Protection of occupied habitat:
   a) Three or more distinct areas with 2,000 hectares (4,940 acres) or more of contiguous, occupied habitat, and
   b) 30% each or more of the minimum acreage in public or conservation ownership.
2. A management plan that includes the survival of the Tipton kangaroo rat as an objective has been approved and implemented for all protected areas identified as important to continued survival.
3. The populations are stable or increasing through a precipitation cycle.

Delisting will be considered when, in addition to the criteria for downlisting, all of the following conditions have been met:

1. A total of 9,000 hectares (22,230 acres) or more of occupied habitat in public or conservation ownership, and
2. Protected sites have a mean density of 10 kangaroo rats per hectare (4 per acre) during a complete precipitation cycle.

The recovery criteria analysis in the last 5-year review still remains valid (Service 2010). Without the implementation of range-wide surveys we do not know what proportion of the subspecies' range is occupied, what proportion is in public/conservation ownership, or the current status of some populations (i.e., stable, increasing, decreasing). While habitat has been acquired or restored for conservation purposes (Appendices 3 and 4), the acreage of occupied habitat and the ownership metrics of downlisting and delisting criteria 1 have not been met. In addition, not all of the protected areas identified in the recovery plan (Service 1998) as important to the continued survival of the subspecies have management plans. Therefore, downlisting criterion 2 has not yet been met. Downlisting criterion 3 and delisting criterion 2 have also not been met as many of the known

populations have declined within the last decade (see *Population Surveys* section above) and they are unlikely to currently support a mean density of 10 individuals per hectare (4 per acre).

Conclusion

After reviewing the best available scientific information, we conclude that the Tipton kangaroo rat remains an endangered species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species in our 2010 5-year review remains an accurate reflection of the species' current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

Here we propose several habitat conservation and ecological research recommendations which will aid in the recovery and conservation of the Tipton kangaroo rat. Some of these recommendations have already been discussed in previous recovery documents (Service 1998; Service 2010) and remain valid.

1. *Habitat Acquisition, Management, and Restoration.* All sites with Tipton kangaroo rats present should be protected. Resource agencies and private partner groups should work to ensure land protection through acquisition or easement, and large unprotected areas currently occupied by the species should be given the highest priority. Large, formerly-occupied sites that are unoccupied but have a high restoration potential should also be considered. Protected lands must also be adequately managed or restored based on the best available science.

2. *Determine Population Status and Monitor at Occupied Sites.* Determine the current distribution and abundance of the Tipton kangaroo rat on sites where they occur, including all sites identified by Cypher *et al.* 2016, and develop a plan to monitor abundance and population trends at those sites. Survey results should be compiled into an analysis that identifies and characterizes currently occupied sites. These results should also be used to help inform decision-makers about the acquisition of appropriate sites where Tipton kangaroo rats occur but are unprotected, to suggest sites that could be acquired for restoration, and to develop an adaptive management program that will achieve the recovery of the Tipton kangaroo rat.

3. *Microhabitat Characterization and Mapping.* A map characterizing the floristic community at the microhabitat level will help identify habitat characteristics important for Tipton kangaroo rat abundance. These data should come from natural lands where large populations still exist. This map will inform future conservation actions for the species, such as identifying sites for habitat restoration and translocations.

4. *Water Control Systems for Natural Lands.* Natural lands on the floodplain of the Central Valley do not have levee infrastructure and are prone to flood in wet years or during heavy precipitation events. Water control systems might be needed to prevent flooding in areas where Tipton kangaroo rats are present.

5. *Translocation Study and Research* – Despite the inherent challenges involved with translocations, moving individuals might be necessary to establish or augment populations of Tipton kangaroo rats for recovery purposes. Research into new techniques is needed to determine best practices for translocations.

Field Supervisor, Sacramento Fish and Wildlife Office

Approve MICHAEL FRIS Digitally signed by MICHAEL FRIS Date: 2020.07.08 11:49:49 -07'00' Date _____

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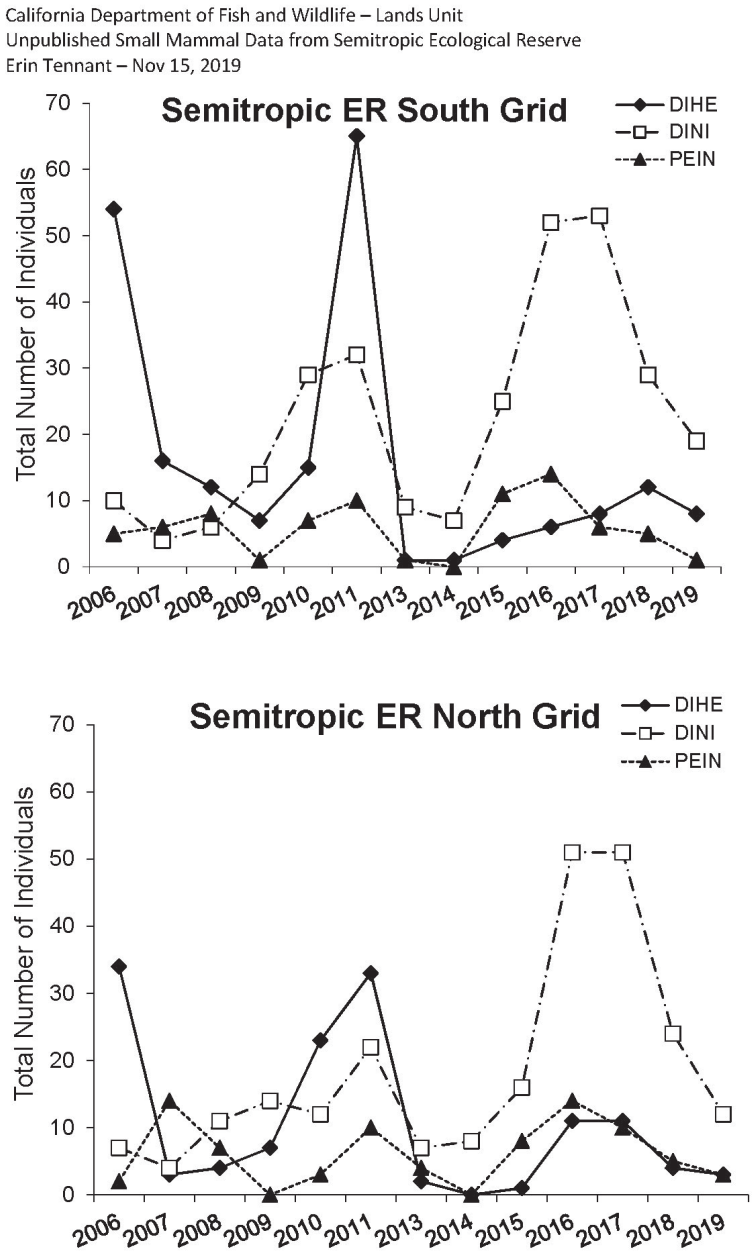
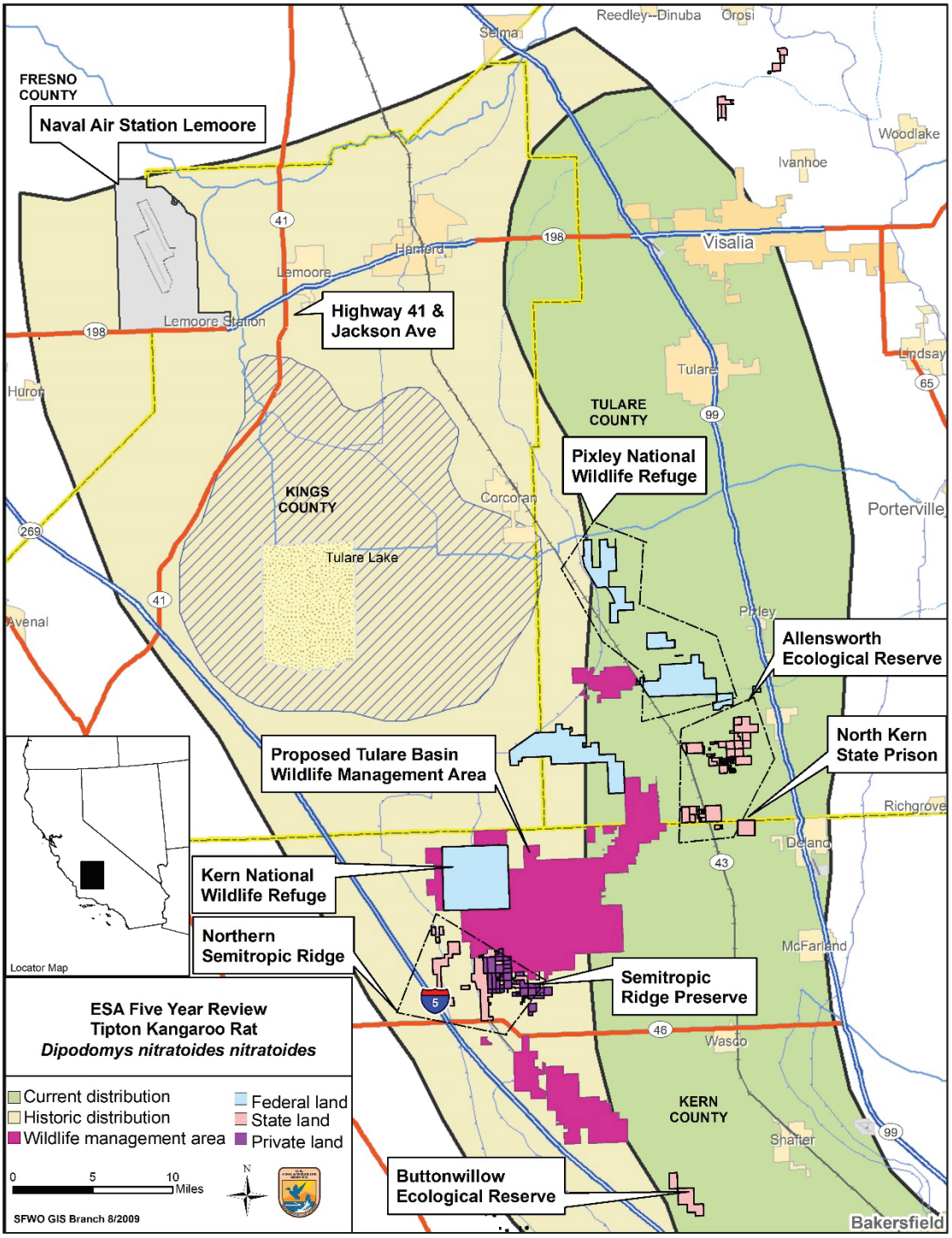
APPENDICIES

SITE NAME	COUNTY	OWNERSHIP	STATUS
Kern National Wildlife Refuge	Kern	Service	Extant
Semi-tropic Ecological Reserve	Kern	CDFW	Extant
Buttonwillow Ecological Reserve	Kern	CDFW	Extant
Lokern Natural Area and Preserve	Kern	BLM, CDFW, and CNLM	Extant
Coles Levee Ecosystem Preserve	Kern	Area Energy Company	Extant
Allensworth Ecological Reserve	Tulare	CDFW	Likely extirpated
Naval Air Station Lemoore	Kings and Fresno	Department of Defense	Likely extirpated
North Kern State Prison	Kern	Department of Corrections & Rehabilitation	Likely extirpated
Pixley National Wildlife Refuge	Tulare	Service	Likely extirpated

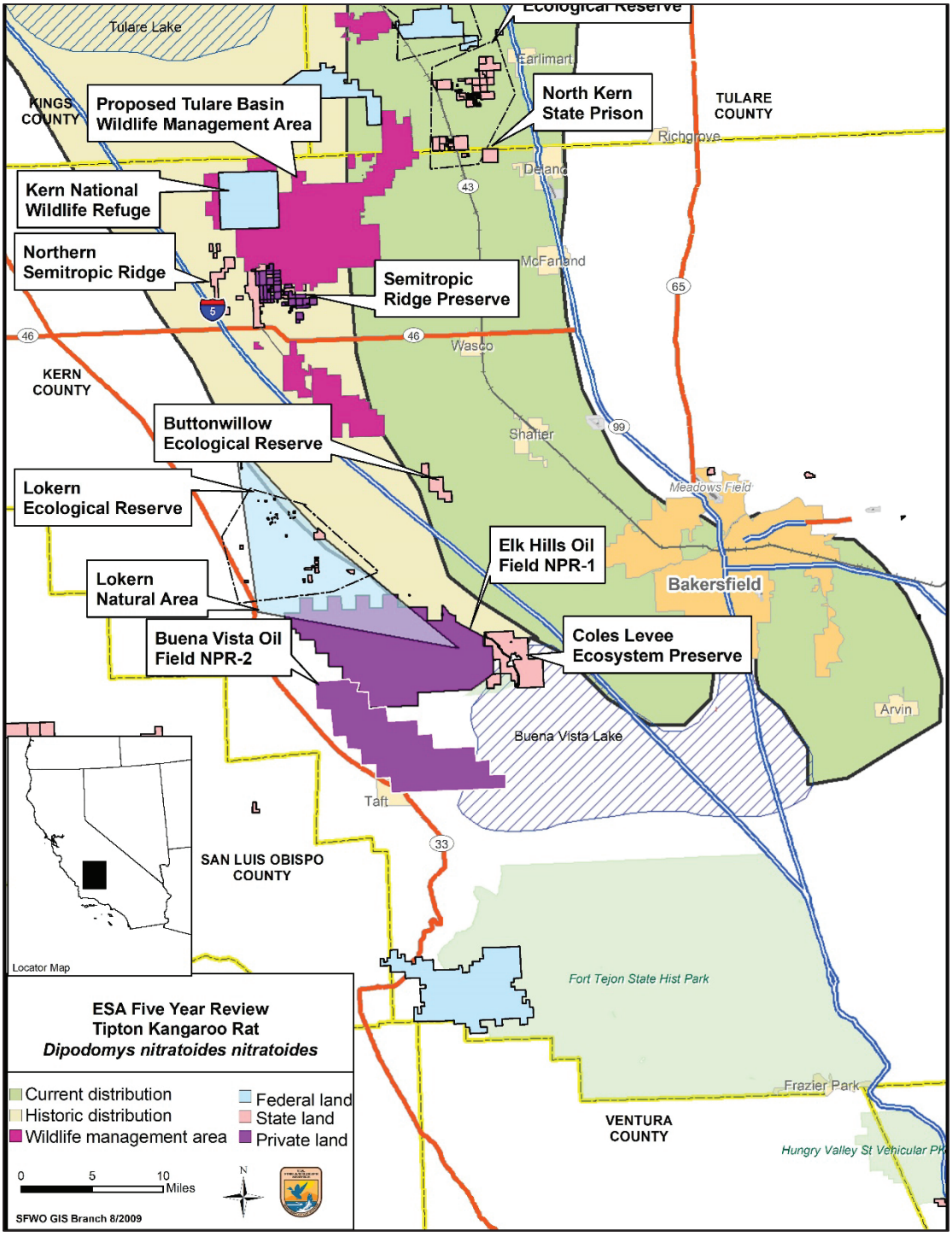
Appendix 1. Status of some of the protected, natural areas which are known to harbor Tipton kangaroo rat populations. Since the previous status review (USFWS 2010), several locations have seen population declines and possible extirpation events.



Appendix 2. Fifteen years of trapping and abundance data for three species of rodent at the Semi-tropic Ecological Reserve in Kern County, California. Tipton kangaroo rats (DINI), Heermann's kangaroo rats (DIHE), and Deer mice (PEIN). Tipton kangaroo rat abundance increased during drought years and decreased during wet years. Heermann's kangaroo rat populations show the opposite trend. Data provided by Erin Tennant, California Department of Fish and Wildlife – Lands Unit.



Appendix 3. Geographic distribution of proposed conservation and restoration areas for the Tipton kangaroo rat in California (Service 2010).



Appendix 4. Geographic distribution of proposed conservation and restoration areas for the Tipton kangaroo rat in California (Service 2010).